

Rector Reservoir Bypass Valve Project

Draft Environmental Impact Report

APPENDICES ONLY

CEQA Lead Agency:

California Department of Veterans Affairs

CAL VET
CALIFORNIA DEPARTMENT OF VETERANS AFFAIRS

And

California Department of General Services
Real Estate Services Division

DGS CALIFORNIA DEPARTMENT OF GENERAL SERVICES

July 2021

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Draft Environmental Impact Report

Appendices

July 2021

1.0 A. Initial Study/Notice of Preparation and Scoping Comments (ECORP Consulting, Inc. 2020).

3.2 A. Air Quality CalEEMod Emissions (ECORP Consulting, Inc. 2021)

3.3 A. Biological Resources Assessment (ECORP Consulting, Inc. 2021)

B. Aquatic Resources Assessment (ECORP Consulting, Inc. 2021)

C. Rector Preliminary Instream Flow Habitat Report (Stillwater Sciences 2021)

D. Operations Simulation Modeling (Western Hydrologics 2021)

E. Rector Creek Stream Fish Population Technical Memorandum (Stillwater Sciences 2021)

3.5 A. GHG CalEEMod Emissions Model (ECORP Consulting, Inc. 2021)

3.6 A. Geotechnical Investigation Report (Fugro 2020)

B. Rector Reservoir Watershed Survey Update (Teri jo Barber, MS PH QSD/P Ridge to River Environmental 2017)

C. Basis of Design Memorandum & Drawings (Wood Rodgers July 2020)

3.8 A. Rector Creek Water Year Type and Watershed Model Technical Memorandum (Stillwater Sciences 2021)

3.9 A. Noise Model Output (ECORP Consulting, Inc. 2021)

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS
2525 Warren Drive
Rocklin, California 95677

APPENDIX 1.1-A

NOP, Initial Study, and Comments
Rector Reservoir Bypass Valve Project

Notice of Preparation

To: **All Interested Parties**

Subject: **Notice of Preparation of a Draft Environmental Impact Report**

Lead Agency and Address:	**Consulting Firm Name and Address:**
California Department of General Services/Real Estate Services Division 707 Third St., 4th Floor West Sacramento, California 95605	ECORP Consulting, Inc. 2525 Warren Drive, Rocklin, CA 95677
Contact Person and Phone Number: Terry Ash, Senior Environmental Planner Department of General Services / Real Estate Services Division/ Project Management and Development Branch / Environmental Services Phone: 916-376-3824 Email: terry.ash@dgs.ca.gov	**Contact Person and Phone Number:** Chris Stabenfeldt, Project Manager (916) 782-9100 cstabenfeldt@ecorpconsulting.com

The California Department of General Services (DGS) will be the Lead Agency and will prepare an Environmental Impact Report (EIR) for the project identified below. DGS is preparing the EIR on behalf of the California Department of Veterans Affairs (CalVet). The decision to prepare an EIR is based on the results of an Initial Study conducted by DGS (see attached). DGS will oversee the design and environmental review of the Proposed Project.

DGS is requesting information concerning the scope and content of the upcoming EIR from any and all interested parties. If you are an agency with statutory responsibilities in connection with the Proposed Project, your agency will need to use the EIR when considering your permit or other approval for the Project. A public scoping meeting will be held online via Zoom on **Tuesday, July 21, 2020 from 6–8 pm.** The scoping session is open to all interested parties and is accessible via the following link: https://us02web.zoom.us/j/84875055844?pwd=V2pEcWRCMHUrMjEzd0dJZ0c5dHI4Zz09.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but not later than ***30 days*** after the publication of this notice. **The response deadline is July 31, 2020**. Please send your response to Ms. Terry Ash at the address shown above or via email. Please provide the name of a contact person in your agency.

Project Title:	**Project Location:**
Rector Reservoir Bypass Valve Project	Rector Dam on Rector Creek, east of the Silverado Trail in Napa Valley near the Town of Yountville, California

Project Description

The following is a summarized description of the Rector Reservoir Bypass Valve Project. A more detailed description, including figures, is provided in the Initial Study attached to this NOP, available online at: http://www.ecorpconsulting.com/docs/Rector-NOP-IS.pdf.

Rector Creek flows from the east side of the Napa Valley and is a tributary to Conn Creek, which is a tributary to the Napa River. The State of California built Rector Dam in 1946 and CalVet has operated the dam and reservoir since that time to supply drinking water to the Veterans Home of California in Yountville, the Napa State Hospital, the California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, the Town of Yountville, and several local wineries. CalVet also supplies untreated water to the CDFW Silverado Fisheries Base (Fisheries Base), which includes a hatchery located along Rector Creek downstream of the dam, and to the CAL FIRE training facility, located at the base of Rector Dam. Water delivered to the Fisheries Base is returned to Rector Creek approximately 0.35 miles downstream of the spillway while water delivered to the other uses listed above are for consumptive purposes.

The stream reach below Rector Dam is accessible to anadromous fish. Neither CalVet's license to operate Rector Reservoir nor its water rights supporting those operations include specific instream flow release requirements. In response to a complaint filed in relation to the absence of specific instream flow release requirements, CalVet is proceeding in good faith to assess and implement minimum flow release requirements for Rector Reservoir and construct the needed infrastructure to facilitate these releases. In support of this effort a preliminary instream flow study was conducted to provide guidance in establishing an interim minimum flow release schedule at Rector Dam. DGS recognizes the need for further data collection and analysis needed in order to establish an effective and sustainable long-term minimum flow release schedule for Rector Reservoir and is currently in the process of conducting additional data collection and analysis.

Rector Creek Dam is a 164-foot-high earth-fill structure with a crest elevation of 381.5 feet above Mean Sea Level (MSL). A tower with intake inverts at 270, 291, 307, 323, 335, and 339 feet above MSL supplies the low-level outlet, a 30-inch iron pipe. In order to facilitate long-term releases to Rector Creek below Rector Dam, CalVet proposes to construct a bypass water pipe to provide a constant flow back to the creek at a point immediately downstream of the dam. Based on a preliminary design report, CalVet would construct a "hot tap" (bypass valve) which would connect to the existing 36" diameter raw water main that runs beneath the dam and carries water from the reservoir's intake tower to the CalVet water treatment plant. The bypass valve would be installed between an existing 8" tap which serves the CDFW fish hatchery and a 6" tap which serves the fire training facility. Raw water to be released to Rector Creek will be carried form the bypass valve via a short pipeline to an outfall structure located on the bank of Rector Creek.

With the completion of the bypass valve facilities described above, CalVet would implement minimum flow releases to Rector Creek in accordance with the recommendations presented in the Rector Creek Preliminary Instream Flow and Stream Habitat Assessment prepared by Stillwater Sciences and dated December 2018. The EIR will analyze the implementation of the interim minimum flow release schedule and construction and operation of the bypass valve facilities at the project level. In recognition that, with the completion of ongoing long-term minimum release studies, permanent minimum flow release schedules may be implemented that could vary from the proposed interim schedule, the EIR will address the future establishment of a permanent schedule at a programmatic level.

As determined in the Project's Initial Study, the potential environmental effects to be addressed in the EIR include: Air Quality; Biological Resources; Cultural Resources; Geology, Soils and Paleontological Resources; Greenhouse Gas Emissions; Hazards and Hazardous Materials; Hydrology and Water Quality; Public Utilities and Services (primarily agricultural, municipal and industrial water supply) and Tribal Resources.

Signature:	Chris Stabenfeldt, AICP	**Title:**	Program Manager
Date:	June 30, 2020	**Telephone:**	916-782-9100

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INITIAL STUDY
RECTOR RESERVOIR BYPASS VALVE PROJECT

SECTION 1.0 INTRODUCTION

This Initial Study (IS) was prepared pursuant to the California Environmental Quality Act (CEQA) of 1970 (as amended) (California Public Resources Code Sections 21050 et seq.) and in accordance with the CEQA Guidelines.

Rector Dam is located on Rector Creek on the east side of the Silverado Trail in Napa County near the Town of Yountville, California. Rector Creek flows from the east side of the Napa Valley and is a tributary to Conn Creek, which is a tributary to the Napa River. The State of California built Rector Dam in 1946 and the California Department of Veterans Affairs (CalVet) has operated the dam and reservoir since that time to supply drinking water to the Veterans Home of California in Yountville, the Napa State Hospital, the California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, the Town of Yountville, and several local wineries. CalVet also supplies untreated water to the CDFW Silverado Fisheries Base, which includes a hatchery located along Rector Creek downstream of the dam, and to the CAL FIRE training facility, located at the base of Rector Dam. Of these uses, water delivered to the fisheries base is returned to Rector Creek approximately 0.35 miles downstream of the spillway.

The License to operate Rector Dam does not include specific instream flow release requirements; however, California Fish and Game Code 5937 requires the owner or operator of any dam to allow sufficient flow to pass through or over the dam to keep fish downstream of the dam in good condition.

The proposed Rector Reservoir Bypass Valve Project (Project) would construct a bypass valve at the base of Rector Dam and a raw water pipeline connecting the valve to a proposed outfall structure on Rector Creek downstream of the dam. The proposed facilities would allow CalVet to divert and release water directly to Rector Creek for the purpose of maintaining minimum release flows to support Rector Creek fish resources. As part of the Project, CalVet will implement interim minimum release flows through the bypass facilities while additional long-term stream habitat studies are conducted. When those studies are complete, CalVet will implement a permanent schedule for minimum release flows to Rector Creek.

The California Department of General Services/Real Estate Services Division (DGS/RESD) will serve as the CEQA Lead Agency for this Project on behalf of CalVet, and has prepared this IS to determine the level of environmental review necessary for project approval. DGS has determined that the Project may have a significant effect on the environment: therefore, an EIR will be prepared for the proposed project. DGS will oversee the design and environmental review for the Project.

Section 1 of this Initial Study contains: 1) a project description; 2) a project overview with lead agency contact information; 3) a listing of issues found to have at least one potentially significant impact in the environmental checklist; 4) an explanation of the impact evaluation presented in the checklist; and 5) the environmental checklist itself. **Section 2** contains the Determination of Impact signed by the CEQA Lead Agency. **Section 3** includes a list of preparers of the Initial Study.

The environmental checklist identifies environmental issue areas that could be affected by the Project and lists the determination of whether the Project's effects on those areas are significant, potentially significant unless mitigation is incorporated, less than significant, or have no impact. The checklist also contains the rationale and support for each determination. The determination of impact is a statement following the checklist and shown in Section 4, endorsed by DGS the CEQA Lead Agency. DGS has concluded that preparation of an Environmental Impact Report (EIR) is appropriate to comply with CEQA.

1.1 Project Description

1.1.1 Project Location

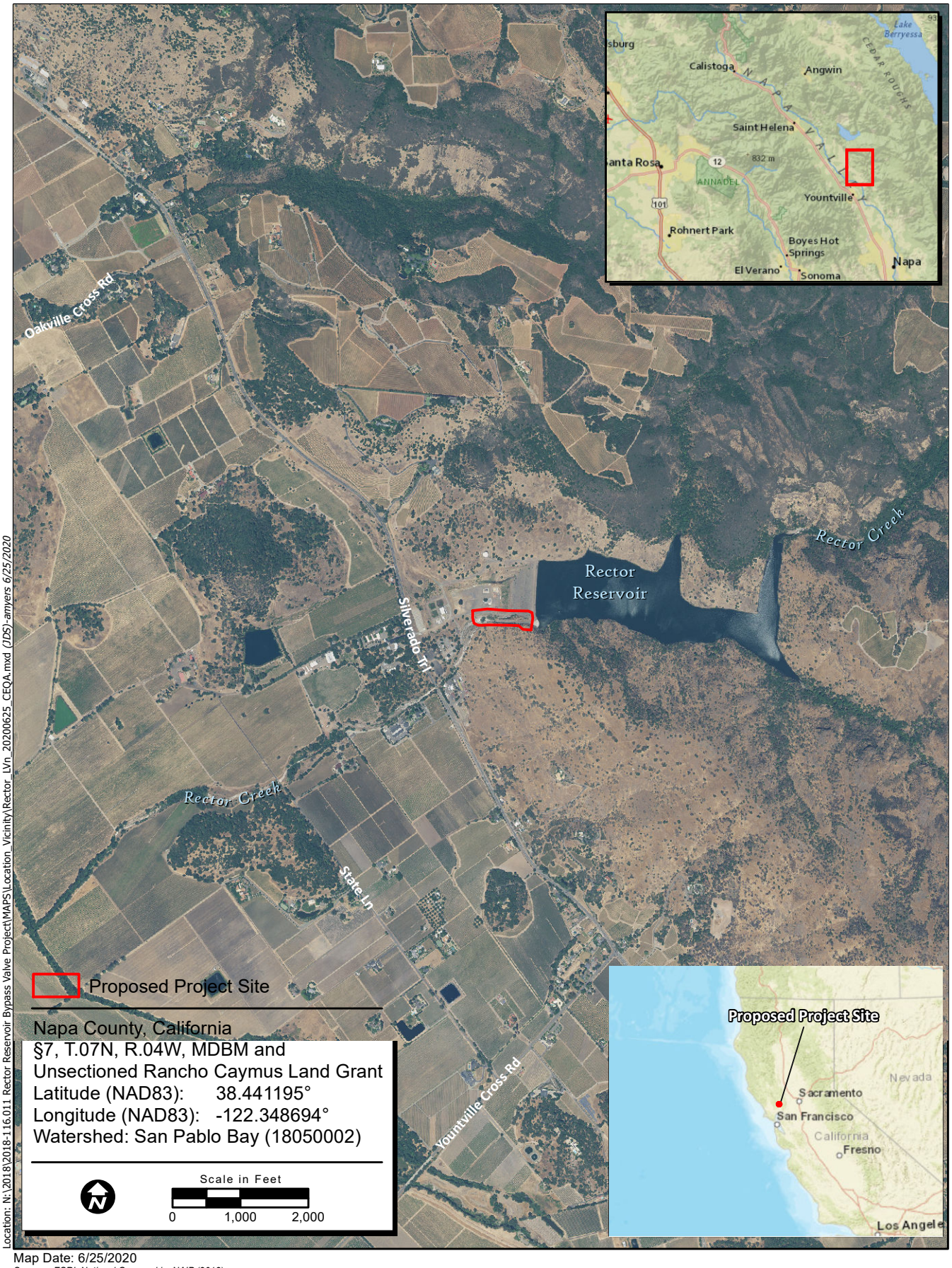
The Project is located at Rector Dam on Rector Creek, east of the Silverado Trail in Napa County near the Town of Yountville, California (see Figure 1. *Project Location and Vicinity*, Figure 2. *Project Site*, and Figure 3. *Proposed Facilities*).

1.1.2 Project Description

Rector Creek flows from the east side of the Napa Valley and is a tributary to Conn Creek, which is a tributary to the Napa River. As noted, the State of California built Rector Dam in 1946 and the California Department of Veterans Affairs (CalVet) has operated the dam and reservoir since that time to supply drinking water to the Veterans Home of California in Yountville, the Napa State Hospital, the California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, the Town of Yountville, and several local wineries. CalVet also supplies untreated water to the CDFW Silverado Fisheries Base, which includes a hatchery located along Rector Creek downstream of the dam, and to the CAL FIRE training facility, located at the base of Rector Dam. Water delivered to the Fisheries Base is returned to Rector Creek approximately 0.35 miles downstream of the spillway while water delivered to the other uses listed above are for consumptive purposes.

The stream reach below Rector Dam is accessible to anadromous fish. Neither CalVet's license to operate Rector Reservoir nor its water rights supporting those operations include specific instream flow release requirements. In response to a complaint filed in relation to the absence of specific instream flow release requirements, CalVet is proceeding in good faith to assess and implement minimum flow release requirements for Rector Reservoir and construct the needed infrastructure to facilitate these releases. In support of this effort a preliminary instream flow study was conducted to provide guidance in establishing an interim minimum flow release schedule at Rector Dam. DGS recognizes the need for further data collection and analysis in order to establish an effective and sustainable long-term minimum flow release schedule for Rector Reservoir and is currently in the process of conducting additional data collection and analysis.

Rector Creek Dam is a 164-foot-high earth-fill structure with a crest elevation of 381.5 feet above Mean Sea Level (MSL). A tower with intake inverts at 270, 291, 307, 323, 335, and 339 feet above MSL supplies the low-level outlet, a 30-inch iron pipe. In order to facilitate long-term releases to Rector Creek below Rector Dam, CalVet proposes to construct a bypass water pipe to provide a constant flow back to the creek at a point immediately downstream of the dam.



Location: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Location_Vicinity\Rector_LVn_20200625_CEQA.mxd (JDS)-amyers 6/25/2020

Map Date: 6/25/2020

Sources: ESRI, National Geographic, NAIP (2018)

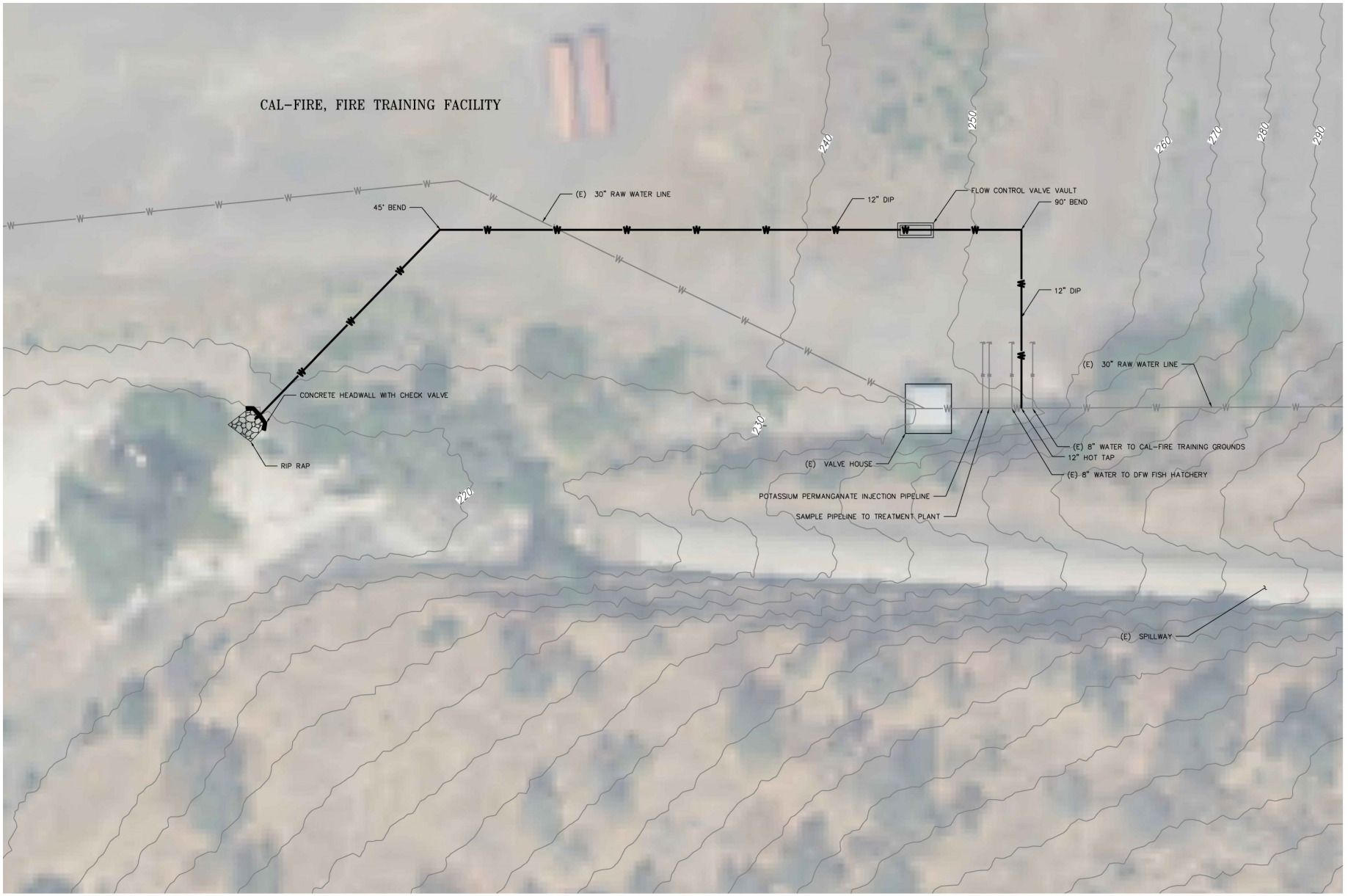
Figure 1. Project Location and Vicinity



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Figure 2. Project Site

2018-116.011 Rector Reservoir Bypass Valve



SITE PLAN

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Figure 3. Proposed Facilities

2018-116.011 Rector Reservoir Bypass Valve

Based on a preliminary design report, CalVet would construct a "hot tap" (bypass valve) which would connect to the existing 36" diameter raw water main that runs beneath the dam and carries water from the reservoir's intake tower to the CalVet water treatment plant. The bypass valve would be installed between an existing 8" tap which serves the CDFW fish hatchery and a 6" tap which serves the fire training facility. Raw water to be released to Rector Creek will be carried from the bypass valve via a short pipeline to an outfall structure located on the bank of Rector Creek (see Figure 3).

With the completion of the bypass valve facilities described above, CalVet would implement minimum flow releases to Rector Creek in accordance with the recommendations presented in the Rector Creek Preliminary Instream Flow and Stream Habitat Assessment prepared by Stillwater Sciences and dated December 2018. The EIR will analyze implementing interim minimum releases schedule and construction and operation of the bypass valve facilities at the project level. In recognition that with the completion of ongoing long-term minimum release studies, permanent minimum flow release schedules may be implemented that could vary from the proposed release schedule, the EIR will address the future establishment of a permanent schedule at a programmatic level.

1.2 Project Overview

Project Title:	Rector Reservoir Bypass Valve Project
Lead Agency Name and Address:	California Department of General Services/Real Estate Services Division 707 Third St., 4th Floor West Sacramento, California 95605
Contact Person and Phone Number:	Terry Ash, Senior Environmental Planner Department of General Services / Real Estate Services Division/ Project Management and Development Branch / Environmental Services Phone: 916-376-3824 Email: terry.ash@dgs.ca.gov
Project Location:	Rector Dam on Rector Creek, east of the Silverado Trail in Napa County near the Town of Yountville, California.
Project Sponsor's Name and Address:	California Department of Veterans Affairs 1227 O Street, Suite 314 Sacramento, California 95814
Land Designations:	Agriculture, Watershed, and Open (Napa County General Plan) Agricultural Watershed (Napa County Zoning Code)

1.3 Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture/Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Energy
☒ Geology/Soils	☒ Greenhouse Gas Emissions	☒ Hazards/ Hazardous Materials
☒ Hydrology/Water Quality	☐ Land Use/Planning	☐ Mineral Resources
☒ Noise	☐ Population/Housing	☐ Public Services
☐ Recreation	☐ Transportation/Traffic	☒ Tribal Resources
☒ Utilities/Service Systems	☐ Wildfire	☒ Mandatory Findings of Significance

1.4 Evaluation of Environmental Impact

In review of *Section 1.5 Environmental Checklist* the reader should note:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

5) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

6) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

7) The explanation of each issue should identify:

    a) The significance criteria or threshold, if any, used to evaluate each question.
    b) The mitigation measure identified, if any, to reduce the impact to less than significance.

1.5 Environmental Checklist

1.5.1 Aesthetics

Would the project:

Environmental Issue		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Have a substantial adverse effect on a scenic vista?				Yes
b)	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				Yes
c)	In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?			Yes	
d)	Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?			Yes	

Discussion

a-b) CEQA Guidelines do not contain a specific definition of what constitutes a "scenic vista." What some may consider a scenic vista may not be considered that by others. For purposes of this IS, a scenic vista is defined as a viewpoint that provides expansive views of a highly valued landscape for the benefit of the general public. Construction of the proposed Rector Dam Bypass Valve facilities will introduce new exposed piping and valve equipment in an area at the base Rector dam in an already industrialized location containing water conveyance and monitoring facilities, gravel roadways and parking areas and the dam spillway structure (see Figure 2). Proposed Project improvements are located exclusively on land owned and operated by CalVet and are remote from any public observation points. The Proposed Project also includes installation of an outfall adjacent to the Rector Creek stream channel approximately 100 feet downstream of the dam spillway. This too will be constructed on land owned by CalVet. As with the proposed bypass valve, the outfall would not be viewable from any public observation points given that properties adjacent to and north of the channel are owned by the State of California.

The area potentially affected by placement of the bypass valve, pipeline and outfall structure is limited and lacks any existing scenic resources such as mature trees, rock outcroppings or structures. As such, the Proposed Project would have no impact on scenic vistas or scenic resources.

c) The scenic character of the areas affected by the proposed project, namely, the areas in which the proposed bypass valve, pipeline and outfall would be installed, is dominated by Rector Dam and its spillway, water conveyance structures at the base of the dam, support facilities/structures, and the Rector Creek stream channel and adjacent areas of, at various locations, dense pockets of riparian vegetation. The CalVet water treatment plant is located approximately 300 yards west of the dam. Property to the west of the water treatment plant is operated by the Napa County Public Works Department and contains various structures and equipment storage areas. Views of the areas north and south of the project site are dominated by scenic wooded hillsides. Silverado Trail is located approximately one quarter mile west of the project site, but the proposed improvement areas are not visible from that roadway.

The relatively small size of the bypass valve above-ground structure, i.e., less than six feet high and ten feet long, and its location amongst existing conveyance structures suggests it would not significantly alter the scenic character of the area. The proposed outfall structure will also be relatively small in size, (less than 6x6x6 feet) and constructed primarily of concrete. While its placement adjacent to the stream channel would introduce a new structure to a relatively undeveloped section of streambank, the effect of the structure on the scenic character of the area which is already dominated by the dam, spillway, and related facilities would be less than significant.

d) The Project will not introduce new permanent sources of light.

1.5.2 Agricultural and Forest Resources

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?				Yes
b) Conflict with existing zoning for agricultural use or with a Williamson Act contract?			Yes	
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?				Yes
d) Result in the loss of forest land or conversion of forest land to non-forest use?				Yes

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?			Yes	

Discussion

a) As described above, the installation of proposed project facilities will occur exclusively within property owned and operated by CalVet. Areas potentially affected by installation of the bypass valve, pipeline and outfall are not designated as Prime or Unique Farmland or Farmland of Statewide Importance by the Farmland Mapping and Monitoring Program. The Project does not propose to convert lands currently or historically (i.e., after completion of Rector Reservoir in 1946) used for agriculture. As such, the Project would have no impact for Item a).

b) As shown in the 2008-2030 Napa County Land Use Plan (as revised 12/20/2016) the County land use designation for the Project site and surrounding parcels is "Agricultural, Watershed, and Open Space." This designation occupies the largest amount of land in the unincorporated areas of Napa County and is intended to protect lands within this designation from being subdivided or converted to other land uses without a countywide vote.[1] As described above, the Project would not convert areas affected by valve, pipeline or outfall installation from agricultural use. The proposed facilities are considered consistent with existing uses on and adjacent to the Project Site. The Project Site is zoned as Agricultural Watershed (AW). As the Project is consistent with current and historical use of the Project site and does not substantially expand any of those uses, the Project is considered consistent with current zoning.

c-d) The Project is not located in an area zoned for Forestland nor would Project construction or operation directly or indirectly affect forest or timberland resources. The Project, therefore, would have no impact relative to Items (c) and (d).

e) No other changes to the existing environment would occur as a result of the Project that could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use.

[1] City of Calistoga General Plan Land Use Element. 2015

1.5.3 Air Quality

Would the project:

Environmental Issue		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Conflict with or obstruct implementation of the applicable air quality plan?	Yes			
b)	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	Yes			
c)	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	Yes			
d)	Expose sensitive receptors to substantial pollutant concentrations?	Yes			
e)	Create objectionable odors affecting a substantial number of people?	Yes			

Discussion

a-e) Project construction will require site preparation, excavation, grading, pipe and valve installation and construction of the proposed outfall structure. Air pollutant emissions associated with these activities are considered mobile sources and short term. While these activities will affect a relatively small area and be of short duration, these activities would generate dust and other pollutant emissions associated with heavy equipment operation. Emission of pollutants generated during these activities could adversely affect air quality and expose CalVet employees and contractors at Rector Reservoir and Water Treatment Plan to pollutants or objectionable odors. Although these are temporary impacts occurring only during project construction, they are considered ***potentially significant*** and warrant further evaluation in the Draft EIR.

No long-term impacts related to Project operation are anticipated.

1.5.4 Biological Resources

Would the project:

Environmental Issue		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Yes			
b)	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Yes			
c)	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	Yes			
d)	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	Yes			
e)	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	Yes			
f)	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				Yes

Discussion

a) The Project would construct a bypass valve in a previously disturbed area relatively devoid of native vegetation and near other existing water conveyance facilities. Excavation to install a raw water line between the bypass valve and the proposed outfall structure would occur as part of Project construction. An outfall structure to release water conveyed through the proposed pipeline and bypass valve into Rector Creek would be constructed. Removal of vegetation within the proposed pipeline alignment and at the outfall location could occur, potentially having a substantial adverse effect to special-status terrestrial and aquatic wildlife species through habitat modification. This is considered a potentially significant impact and will be evaluated in the Draft EIR.

Short-term operation of the Project will establish interim minimum release flows while additional information is collected for the purpose of benefitting native fish species in Rector Creek and downstream. This information will be used to evaluate whether the environmental flows are sufficient to keep fish downstream of the dam in good condition. With the development of additional information and analysis, a schedule for long-term minimum release flows will be implemented. The effects of implementing short- and long-term minimum release flows in Rector Creek could have significant effects (either adverse or beneficial) on aquatic species identified as a candidate, sensitive, or special-status species and warrant further evaluation in the Draft EIR.

b-c) Construction and operation of the Project could have a substantial adverse effect on riparian habitat and other sensitive communities including freshwater emergent wetlands and will be evaluated further in the Draft EIR.

d) While construction activities related to the Project are not excepted to significantly affect the movement of wildlife or migratory fish species, the implementation of short-term and long-term minimum release flows in Rector Creek could alter the migratory behavior of native and/or non-native fish species that use Rector Creek to forage, spawn or rear young. This is a potentially significant impact and will be evaluated further in the Draft EIR.

e) The Project would install new facilities within the Rector Creek riparian corridor and stream channel and would implement short- and long-term minimum release flows in Rector Creek. This may or may not conflict with existing local policies or ordinances pertaining to the protection of biological resources. This issue will be evaluated further in the Draft EIR.

f) The Project is not located in nor would it affect resources included within any approved County or Regional Conservation Plan Natural Community Conservation Plan or Habitat Conservation Plan. Therefore, the Project would have no impact on such plans.

1.5.5 Cultural Resources

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historic resource as defined in Section 15064.5?	Yes			
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	Yes			
c) Disturb any human remains, including those interred outside of formal cemeteries?	Yes			

Discussion

a) Construction activities for the Project, including excavation for valve, water pipeline and outfall construction, will disturb less than one acre of land. The potential effect of these activities on any significant historic resources is currently unknown and is, therefore, considered potentially significant. This issue will be evaluated in the Draft EIR.

b) CEQA guidelines state that an archaeological resource shall first be evaluated for historical significance as defined under subdivision (a) of Section 15064.5. If an archaeological site does not meet the criteria of a historical resource, it is then determined whether it meets the definition of a unique archeological resource under Section 21083.2 of the Public Resources Code. As with historic resources discussed above in Item a), the potential effect of Project construction activities on significant archeological resources is unknown and is therefore, considered potentially significant, warranting further evaluation in the Draft EIR.

c) While there is no reason to suspect the presence of human remains at the Project site, it is possible that currently unknown remains may occur and, therefore, further evaluation will be conducted for the Draft EIR.

1.5.6 Energy

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?			Yes	
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?				Yes

Discussion

a) Construction activities for the Project will be limited to bypass valve and water pipeline installation and outfall construction. Project construction will be of short duration, lasting no more than one construction season. Standard construction practices will be used. Significant impact due to wasteful or inefficient energy consumption are not expected and are highly unlikely. Long-term implementation of the minimum release flow through Project facilities will be accomplished entirely via gravity without the use of pumps or other machinery and, therefore, energy required to operate the Project would be minimal.

b) For reasons present above and given the nature of the Project, it presents no conflict or obstruction to any state or local energy plans.

Geology and Soils

Would the project:

Environmental Issue	Potentially Significantly Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)				Yes
ii) Strong seismic ground shaking?				Yes
iii) Seismic-related ground failure, including liquefaction?				Yes
iv) Landslides?				Yes
b) Result in substantial soil erosion or the loss of topsoil?	Yes			
c) Be located in a geological unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	Yes			
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				Yes
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				Yes

Discussion

a) The Project is a water infrastructure project and would not construct any inhabited structures nor would it induce the construction of inhabited structures. Therefore, the proposed project would have no impact due to increased risk due to earthquake, seismic ground shaking, seismic-related ground failure or landslide.

b) The effect of the Project on soil erosion, particularly in relation to the construction and operation of the proposed outfall structure on Rector Creek is unknown and, therefore, considered a potentially significant impact requiring further evaluation in the Draft EIR.

c) The geologic and soil conditions on which the Project would be located have yet to be evaluated, thus the stability or suitability of those conditions to support the proposed facilities is unknown. This is considered a potentially significant impact relative to Item c) and will be evaluated further in the Draft EIR. The effect of the Project on soil erosion, particularly in relation to the construction and operation of the proposed outfall structure on Rector Creek is unknown and, therefore, considered a potentially significant impact requiring further evaluation in the Draft EIR.

d) As noted, the Project would construct no permanent inhabited structures and, therefore, poses no risk to life and property through construction on expansive soil.

e) The Proposed Project would not introduce septic tanks or alternative wastewater disposal systems and, therefore, would have no impact relative to Item e).

1.5.7 Greenhouse Gas Emissions

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	Yes			
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	Yes			

Discussion

a-b) Certain gases in Earth's atmosphere naturally trap solar energy to maintain global average temperatures within a range suitable for terrestrial life.[2] Those gases (primarily carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride) act as a "greenhouse" on a global scale. Those heat-trapping gases are known as greenhouse gases (GHG). The proposed construction of the bypass valve, pipeline and outfall would create temporary sources of GHG emissions. Although these emissions would be short-term and individually insignificant relative to the vast quantities of GHG contained in the earth's atmosphere, they must be accounted for because the impact from the emissions of GHGs is considered cumulative.

As noted, long-term operation of the Project would require minimal energy use. The potential for future GHG emissions would be limited largely to those generated during future maintenance activities. Long-term production of GHG is, therefore, considered insignificant.

[2] California Natural Resources Agency. *Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97.* December 2009.

Because GHG emissions caused by proposed construction activities would contribute to cumulative adverse conditions associated with GHG and their role in global warming, the Proposed Project could have a potentially significant impact on GHG and may be inconsistent with applicable plans, policies, or regulations adopted to reduce GHG emissions. This impact, therefore, will be assessed further in the Draft EIR.

Hazards and Hazardous Materials

Would the project:

Environmental Issue		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	Yes			
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	Yes			
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				Yes
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				Yes
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				Yes
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing in the project area?				Yes
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				Yes
h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				Yes

Discussion

a) The Project construction would require the transport or disposal of hazardous materials and the temporary use of materials such as fuel and lubricants. These materials would be transported to, stored at, and used on the Project site. The storage and use of such materials, particularly in close proximity to Rector Creek could present a significant hazard to the environment of public safety if not properly handled. This issue will be further evaluated in the Draft EIR.

b) With the use of fuels, lubricants and other chemicals during Project construction, there is the potential for accidental release during the transport or use of these materials. This issue will be evaluated in the Draft EIR.

c) No school is located within 0.25 mile of the site of Project construction.

d) The Project site is not included on any list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. The Project, therefore, would have no impact.

e-f) No existing or planned airport is located in the vicinity of the Project.

g) The construction of Project facilities would occur exclusively on CalVet property near the base of Rector Dam and adjacent to and in the Rector Creek stream channel just downstream. The Project construction activities will not pose any temporary or permanent impediment to public roadways or emergency response plans or evacuation routes.

h) None of the elements of the project would directly or indirectly provide for permanent residences that would relocate people into areas subject to wildfires. Therefore, the project would have ***no impact*** on hazards associated with wildland fires.

Hydrology and Water Quality

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	Yes			
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?			Yes	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner that would:				

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
i) result in substantial erosion or siltation on- or off-site;	Yes			
ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;			Yes	
iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	Yes			
iv) impede or redirect flood flows?	Yes			
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?			Yes	
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	Yes			

Discussion

a) Activities associated with Project construction would require the use of heavy equipment and vehicles containing fuel, oil, and grease, as well as materials such as cements, paints, solvents, glues, cement, and cleaners. Fluids such as oil or grease could leak from construction vehicles or be inadvertently released in the event of an accident, potentially releasing petroleum compounds laden with metals and other pollutants. Unless properly managed, such releases could enter into Rector Creek through surface runoff or by subsurface absorption through soils, which in turn could result in adverse human health or environmental effects. This impact is considered potentially significant and will be evaluated further in the Draft EIR.

b) Construction of the Project would not require the use of groundwater. Implementation of the interim and long-term minimum release flows in Rector Creek will supplement flow in the creek relative to historic conditions that have occurred since completion of Rector Dam. As such, the Project is likely to enhance groundwater recharge and supplies in areas hydrologically connected to the creek. The potential impact of the Project relative to Item b), therefore, is considered less than significant.

c)

i. The effect of the Project on soil erosion, particularly in relation to the construction and operation of the proposed outfall structure on Rector Creek is unknown and, therefore, considered a potentially significant impact requiring further evaluation in the Draft EIR.

ii. The proposed pipeline would be buried and, upon Project completion, the area along the pipeline alignment would be restored to its grade. As such, the existing drainage characteristics of the Project site would not be substantially altered by Project construction.

iii. As noted above, the proposed project would not create or contribute new sources of runoff water. The potential for the project to result in polluted runoff either through inadvertent releases of fuel or chemicals during Project construction is discussed in Item a) above, and in the Hazards and Hazardous Materials section of this Initial Study. The impact is considered potentially significant and will be evaluated further in the Draft EIR.

iv. As noted, the Project would install a bypass valve, water pipeline from the valve to a proposed outfall structure on Rector Creek. Installation of the outfall structure within the north bank of Rector Creek could affect stream hydraulics. The extent of this effect is currently unknown and, therefore, is considered potentially significant. This effect will be evaluated in the Draft EIR.

d) A tsunami is a series of large waves that are caused by earthquakes that occur on the seafloor or in coastal areas. The Project site is not located in an area subject to such hazard. Mudflows generally occur in areas having steep slopes of exposed soil. Seiches are standing waves created by seismically induced ground shaking (or volcanic eruptions or explosions) that occur in large, freestanding bodies of water. The Project is located adjacent to Rector Reservoir however the Project does not pose a significant risk of release of pollutants due to inundation that could occur in the event of a seiche created at the reservoir.

e) The potential impact of the Project on any applicable water quality control plan or sustainable groundwater management plan is currently unknown and, therefore, considered potentially significant. This issue will be assessed further in the Draft EIR.

1.5.8 Land Use and Planning

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significantly Impact	No Impact
a) Physically divide an established community?				Yes
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?			Yes	

Discussion

a) Project facilities would be constructed entirely on CalVet property adjacent to Rector Dam and Rector Creek. It would have no impact on any established community.

b) As noted, the Project would be constructed entirely on CalVet property adjacent to Rector Dam and Rector Creek and would be consistent with ongoing approved uses on the site which include the

operation and maintenance of Rector Dam and Reservoir, raw water conveyance, water treatment, and raw release to Rector Creek. As such, the Project is consistent with approved use of the site and poses no significant impact relative to Item b).

Mineral Resources

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?			Yes	
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?			Yes	

Discussion

a-b) As noted, the Project would install a bypass valve, raw water pipeline between the valve and outfall structure, and the outfall itself. These activities would not adversely affect available mineral resources or access to mineral resources.

1.5.9 Noise

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	Yes			
b) Generation of excessive groundborne vibration or groundborne noise levels?	Yes			
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				Yes

Discussion

a-b) Project construction activities such as grading, excavation, valve and pipe installation and outfall construction would generate temporary high noise levels and potential ground-borne vibration. The impact on sensitive receptors, however, is not yet known and is, therefore considered potentially significant. Analysis of this impact will be included in the Draft EIR. Long-term operation of the Project would entail water diversions through the bypass valve to the outfall. Diversions will be done via gravity and will not require the operation of pumps of other machinery. Therefore, noise levels related to Project operation would be less than significant.

c) Other than during construction, the Project would not introduce any new workers of residents to the Project site. The Project, therefore, would have no potential for significant impact relative to Item c).

1.5.10 Population and Housing

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				Yes
b) Displace substantial numbers of people or existing housing, necessitating the construction of replacement housing elsewhere?				Yes

Discussion

a) Implementation of the Project as proposed will increase long-term releases from Rector Reservoir to Rector Creek and, thus, potentially reduce the availability of water deliveries to CalVet residential, agricultural, and institutional customers. As such, the Project has no potential to induce substantial population growth either directly or indirectly.

b) As described above, the Project would not displace existing housing or residents. The Project, therefore, would have no impact relative to Item b), above.

Public Services

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Fire protection?				Yes
b) Police protection?				Yes
c) Schools?				Yes
d) Parks?				Yes
e) Other public facilities?				Yes

Discussion

a-e) For reasons presented above, the Project would not directly or indirectly cause or support any increase in residential use or employment. As such, demand for each of the public services listed above, would be unaffected by the Project.

Recreation

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that physical deterioration of the facility would occur or be accelerated?				Yes
b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				Yes

Discussion

a) For reasons presented above, the Project would not directly or indirectly cause or support any increase in residential use or employment. As such, the Project will not affect the levels of use of local recreational facilities.

b) The Project does not include recreational facilities or require their construction.

1.5.11 Transportation

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?			Yes	
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?			Yes	
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				Yes
d) Result in inadequate emergency access?			Yes	

Discussion

a-b) As described above the Project would not create new uses that would induce long-term increases in traffic to and from the area.

The Project, however, would generate short-term increases in traffic during Project construction. These increases would be temporary and limited to the periodic delivery of equipment and materials, and daily transport of construction personnel to and from the Project site. Traffic generated by Project construction personnel would vary on a daily basis but is not expected to exceed twenty vehicle trips per day. Transport of equipment to and from the project site would occur sporadically and would include concrete deliveries during construction of the outfall structure. The delivery of concrete to the Project site would occur over one to two days.

Project operations, i.e., implementation of interim and long-term minimum release flows, would generate no increases in future traffic.

c) The Project would not modify any existing roadways.

d) Project construction activities including excavation, pipeline installation, outfall construction and onsite equipment/materials would in no way block or impede emergency access to the Project site or Rector Dam and Reservoir. There is sufficient room at and around the Project site to ensure adequate access during Project construction.

1.5.12 Tribal Cultural resources

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or	Yes			
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.	Yes			

Discussion:

i and ii) The potential impact of Project construction and operation on Tribal cultural resources is currently unknown. Potential Project impacts on these resources, therefore, is considered potentially significant and will be evaluated in the Draft EIR.

1.5.13 Utilities and Service Systems

Would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	Yes			
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	Yes			

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				Yes
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?			Yes	
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?				Yes

Discussion

a) The Project would not introduce any new residences or other permanent uses to the project area that would increase demand for wastewater treatment, storm water drainage, electric power, natural gas, or telecommunications facilities on utilities or service systems including wastewater treatment, storm water drainage, or water supply. Any impact of the Project relative to increased demand for these services, therefore, is less than significant. The Project however does propose the construction of facilities designed to divert and release raw water supplies from Rector Reservoir which, as discussed above, could have an adverse effect on a variety of environmental resources. As such, this impact is considered potentially significant and will be evaluated further in the Draft EIR.

b) Operation of the Project would require implementation of interim and long-term minimum release flows to Rector Creek from Rector Reservoir. Operation of the Project could, and likely would, substantially reduce water storage in Rector Reservoir and thus reduce the volume of water supply available to CalVet to serve existing and future water demand in certain circumstances. The impact of the Project on water supply is currently unknown and, therefore, is considered potentially significant. This issue will be evaluated in the Draft EIR.

c) The Project would not directly or indirectly increase demand for wastewater treatment.

d-e) Any solid waste generated by Project construction would be disposed of in a manner consistent with state and local standards. The Project is expected to generate only limited amounts of waste. No significant demolition of existing facilities is proposed nor is the export of excavated materials expected.

1.5.14 Wildfire

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

Environmental Issue	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?				Yes
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?				Yes
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or				Yes
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?				Yes

Discussion

a-b) As noted previously, the Project would not construct permanent inhabited structures.

c) The installation of a bypass valve, water pipeline and outfall structure will not require the construction of fire-related infrastructure.

d) See a).

1.5.15 Mandatory Findings of Significance

Would the project:

Environmental Issue	Potentially Significant	Potentially Significant Unless Mitigation Incorporated	Less Than Significant	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	Yes			

Environmental Issue	Potentially Significant	Potentially Significant Unless Mitigation Incorporated	Less Than Significant	No Impact
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?.	Yes			
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	Yes			

Discussion

a) This Initial Study identifies a number of resource areas for which the proposed project could have a significant adverse impact. These areas include air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hydrology and water quality, hazardous materials, noise, utilities (i.e., water supply), and Tribal cultural resources. As discussed in the previous sections, each of the impacts identified as potentially significant are subject to further evaluation in the Draft EIR.

b) Project construction and/or operation has the potential to adversely affect environmental resources identified in this checklist. The incremental effect of the Project on these resources could be considered cumulatively considerable and will be subject to further evaluation in the Draft EIR.

c) Project construction activities could affect humans through short-term increases in air pollutant emissions and noise and the use of potentially hazardous materials in the construction process. Project operation has the long-term potentially to adversely affect the availability of water supply to serve existing and future users. The extent of these effects are currently unknown and will be subject to further analysis in the Draft EIR.

SECTION 2.0 DETERMINATION OF IMPACT

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "less than significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Chris Stabenfeldt	6/30/2020
Signature	Date
Chris Stabenfeldt	Program Manager
Name	Title

SECTION 3.0 LIST OF PREPARERS

The following individuals participated in the preparation and review of this Initial Study:

3.1 California Department of General Services/Real Estate Services Division

Terry Ash, Senior Environmental Planner

Michele Leong, Project Director

Dan O'Brien, Manager

3.2 ECORP Consulting, Inc

Chris Stabenfeldt, AICP, Program Manager

Rick Hanson, Senior Environmental Analyst

Matteo Rodriquez, Assistant Environmental Planner

Laura Hesse, Technical Editor

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APPENDIX 1.1-A

CDFW Comment on NOP and Initial Study
Rector Reservoir Bypass Valve Project

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State of California
Department of Fish and Wildlife

M e m o r a n d u m

Date: August 5, 2020

To: Ms. Terry Ash
California Department of Veterans Affairs
Department of General Services
707 3rd Street, 4th Floor
West Sacramento, CA 95605
Terry.Ash@dgs.ca.gov

DocuSigned by:
Gregg Erickson
BE74D4C93C604EA...

From: Mr. Gregg Erickson, Regional Manager
California Department of Fish and Wildlife-Bay Delta Region, 2825 Cordelia Road, Suite 100, Fairfield, CA 94534

Subject: Rector Reservoir Bypass Valve Project, Notice of Preparation of a Draft Environmental Impact Report, SCH No. 2020070017, Town of Yountville, Napa County

The California Department of Fish and Wildlife (CDFW) reviewed the Notice of Preparation (NOP) of a draft Environmental Impact Report (EIR) provided by the California Department of Veterans Affairs (CalVet) for the Rector Reservoir Bypass Valve Project (Project), located at the Rector Dam just east of the Town of Yountville, Napa County.

CDFW is commenting on the NOP as a trustee agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 15386). CDFW has the following concerns, comments, and recommendations regarding the Project.

ENVIRONMENTAL SETTING

Sufficient information regarding the environmental setting is necessary to understand the Project's potentially significant impacts on the environment (CEQA Guidelines, §§ 15125, 15360). CDFW recommends that the draft EIR provide baseline habitat assessments for any special-status plant, fish, and wildlife species known to occur in the vicinity of the Project area, including all rare, threatened, or endangered species (CEQA Guidelines, § 15380). Fully protected, threatened, endangered, and other special-status species that are known to occur, or have the potential to occur in or near the Project site, include, but are not limited to:

- White-tailed kite (*Elanus leucurus*), a fully protected species under Fish and Game Code section 3511;
- Steelhead (*Oncorhynchus mykiss*), threatened under the federal Endangered Species Act;
- Foothill yellow-legged frog (*Rana boylii*), a California (State) Species of Special Concern (SSC);
- Western pond turtle (*Actinemys marmorata*), SSC;

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- Greene's narrow-leaved daisy (*Erigeron greenei*), California Rare Plant Rank 1B.2, protected under CEQA (Pub. Resources Code, § 15380);
- Napa bluecurls (*Trichostema ruygtii*), California Rare Plant Rank 1B.2, protected under CEQA (Pub. Resources Code, § 15380);
- Sonoma beardtongue (*Penstemon newberryi var. sonomensis*), California Rare Plant Rank 1B.3, protected under CEQA (Pub. Resources Code, § 15380); and
- Holly-leaved ceanothus (*Ceanothus purpureus*) California Rare Plant Rank 1B.2, protected under CEQA (Pub. Resources Code, § 15380).

Habitat descriptions and species profiles should include information from multiple sources, such as, aerial imagery, historical and recent survey data, field reconnaissance, scientific literature and reports, and findings from "positive occurrence" databases such as California Natural Diversity Database. Based on the data and information from the habitat assessment, the draft EIR can then adequately assess which special-status species are likely to occur in the Project vicinity.

CDFW recommends that prior to Project implementation, surveys be conducted for special-status species with potential to occur, following recommended survey protocols if available. Survey and monitoring protocols and guidelines are available at: https://www.wildlife.ca.gov/Conservation/Survey-Protocol.

Botanical surveys for special-status plant species, including those listed by the California Native Plant Society (http://www.cnps.org/cnps/rareplants/inventory/), must be conducted during the blooming period for all sensitive plant species potentially occurring within the Project area and require the identification of reference populations. Please refer to CDFW protocols for surveying and evaluating impacts to rare plants available at: https://www.wildlife.ca.gov/Conservation/Plants.

PROJECT DESCRIPTION

In response to a complaint filed against CalVet for failing to allow sufficient water to pass Rector Dam to keep fish below the dam in good condition as required by Fish and Game Code section 5937, CalVet agreed to implement minimum flow release requirements for lower Rector Creek and to construct the infrastructure to facilitate these releases. A preliminary instream flow study titled, *Rector Creek Preliminary Instream Flow and Stream Habitat Assessment,* prepared by Stillwater Sciences in December 2018, was conducted to provide guidance to establish an interim minimum flow release schedule at the dam. As part of the Project, further data collection and analysis will occur to establish an effective and sustainable long-term minimum flow release schedule. To accomplish these releases, CalVet intends to install a bypass water pipe and outfall structure to deliver water from the reservoir into the creek at a point immediately downstream of the dam.

The CEQA Guidelines (Cal. Code Regs, tit. 14, §§ 15124, 15378) require a draft EIR to incorporate a full project description, including reasonably foreseeable future phases of the project, and that contains sufficient information to evaluate and review the project's

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environmental impacts. Please include a complete description of the following Project components in the Project description:

- Footprints of permanent Project features and temporarily impacted areas, such as staging areas and access routes, including a construction schedule, activities, equipment, and crew sizes.
- Anticipated utility upgrade areas and associated impacts from the work.
- Footprint of temporary staging areas.
- Encroachments into riparian habitats, wetlands, and other sensitive areas.
- Acreage of temporary and permanent impacts to woodlands on the Project site, including the approximate size (diameter at breast height) of any trees, especially oak trees, proposed for removal.
- Area and plans for any proposed buildings/structures, ground-disturbing activities, fencing, paving, stationary machinery, landscaping, and storm water systems.
- Operational features of the Project, including level of anticipated human presence (describe seasonal or daily peaks in activity, if relevant), artificial lighting/light reflection, noise and greenhouse gas generation, traffic generation, and other features.

IMPACT ANALYSIS AND MITIGATION MEASURES

The CEQA Guidelines (Cal. Code Regs., tit. 14, § 15126.2) require a draft EIR to discuss all direct and indirect impacts (temporary and permanent) the Project may cause. This includes evaluating and describing impacts, such as:

- Potential for “take” (Fish & G. Code, § 86) of special-status species;
- Locations and acreage of encroachment into riparian habitat and other sensitive areas;
- Loss or modification of breeding, nesting, dispersal and foraging habitat, including vegetation removal, alteration of soils and hydrology, and removal of habitat structural features (e.g., snags, roosts, overhanging banks);
- Permanent and temporary habitat disturbances associated with ground disturbance, noise, lighting, reflection, air pollution, traffic, or human presence; and
- Impacts to rare and special-status plant species and their habitat.

The draft EIR also should identify reasonably foreseeable future projects in the Project vicinity, disclose any cumulative impacts associated with these projects, determine the significance of each cumulative impact, and assess the significance of the project’s contribution to the impact (Cal. Code Regs., tit. 14, § 15355). Although a project’s impacts may be insignificant individually, its contributions to a cumulative impact may be considerable; a contribution to a significant cumulative impact, e.g., reduction of available habitat for a listed species, should be considered cumulatively considerable without mitigation to minimize or avoid the impact.

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Based on the comprehensive analysis of the direct, indirect, and cumulative impacts of the Project, the CEQA Guidelines (Cal. Code Regs., tit. 14, §§ 15021, 15063, 15071, 15126.2, 15126.4, 15370) direct the lead agency to consider and describe all feasible mitigation measures to avoid potentially significant impacts in the draft EIR, and/or mitigate significant impacts of the Project on the environment. This includes a discussion of take avoidance and minimization measures for special-status species, which are recommended to be developed in early consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and CDFW. These measures can then be incorporated as enforceable Project conditions to reduce potential impacts to biological resources to less-than-significant levels.

Fully protected species such as white-tailed kite may not be taken or possessed at any time (Fish & G. Code, § 3511). Therefore, CDFW recommends the draft EIR include measures to ensure complete take avoidance of such fully protected species.

Instream Flow Requirements and Fish and Game Code Section 5937

CDFW agrees that a long-term bypass plan be developed to adequately address the needs of aquatic resources. Instream flow studies will inform the decision of what is necessary to keep fisheries resources below Rector Dam in good condition. To this end, CDFW recommends that the draft EIR address the following concerns regarding flows:

- How minimum flows in Rector Creek will be maintained during construction.
- How adequate flows will be maintained to CDFW's Silverado Fisheries Base (SFB) to avoid interruptions.
- How any habitat between the dam and SFB that might result from the Project will be maintained with the new water conveyance system.
- How CalVet will ensure that the Project and future operations of the new water conveyance system, inclusive of releases to meet minimum instream flow requirements, will meet existing water demands and priorities on Rector Reservoir water.

CDFW AS DOWNSTREAM LANDOWNER

CDFW is a landowner operating SFB downstream of the dam. CDFW requests that the draft EIR identify where the new bypass valve will be installed relative to the existing hatchery valve. Also, please explain how the location and size of the valve will be determined, how and when the valve will be used, and how CalVet will address any impacts that may occur to SFB flows during use. Finally, please outline if the new valve will require additional communication with CDFW to ensure that required instream flows are met. CDFW's concern here is that the installation and operation of the new valve and bypass pipe will not interfere with the volume and quality of water SFB needs to conduct its normal operations.

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REGULATORY REQUIREMENTS

Lake and Streambed Alteration Agreement (Fish & G. Code, § 1600 et seq.)

CalVet will need to submit a notification to CDFW under Fish and Game Code section 1602 if the Project will substantially divert or obstruct the natural flow of, or substantially change the bed, bank, or channel of lower Rector Creek.

California Endangered Species Act (Fish & G. Code, § 2050 et seq.)

CalVet will need authorization under the California Endangered Species Act (CESA) if the Project could result in "take" of a plant or animal listed under CESA, either during construction or over the life of the Project. If the Project could impact a CESA-listed species, early consultation with CDFW is encouraged, as significant modification to the Project and mitigation measures identified in the draft EIR may be required in order to obtain take authorization.

CEQA mandates the lead agency to make a Finding of Significance if a project is likely to substantially impact threatened or endangered species (Pub. Resources Code, §§ 21001, subd. (c), 21083; Cal. Code Regs., tit. 14, §§ 15380, 15064, 15065). Impacts must be avoided or mitigated to less-than-significant levels unless the lead agency makes and supports Findings of Overriding Consideration (FOC). However, the lead agency's FOC does not eliminate the Project proponent's obligation to comply with CESA.

FILING FEES

CDFW reminds CalVet that the lead agency will need to pay a filing fee for the Project pursuant to Fish and Game Code section 711.4 (see also Pub. Resources Code, § 21089). Fees are payable upon filing of the Notice of Determination by the lead agency.

If you have any questions, please contact Mr. Garrett Allen, Environmental Scientist, at garrett.allen@wildlife.ca.gov; or Ms. Karen Weiss, Senior Environmental Scientist (Supervisory), at karen.weiss@wildlife.ca.gov.

cc: State Clearinghouse

APPENDIX 3.2-A

Air Quality CalEEMod Emissions Model
Rector Reservoir Bypass Valve Project

Pipeline Construction

Napa County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.65	1000sqft	0.11	4,650.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Pipeline Construction - Napa County, Summer

Project Characteristics -

Land Use -

Construction Phase - Construction Phase and Timing updated to mathcin information in the project description and Project Detail (Wood Rodgers)

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by wood rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Grading - Material imported and exported porvided by Wood Rodgers

Trips and VMT - Worker trips provided by Wood Rodgers.

Construction Off-road Equipment Mitigation - Mitigation imposed to account for best management practices

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	2.00
tblConstructionPhase	NumDays	1.00	2.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	5.00	2.00
tblConstructionPhase	PhaseEndDate	9/1/2021	2/16/2022
tblConstructionPhase	PhaseEndDate	8/18/2021	2/10/2022
tblConstructionPhase	PhaseEndDate	3/31/2021	2/8/2022
tblConstructionPhase	PhaseEndDate	8/25/2021	2/14/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/7/2022
tblConstructionPhase	PhaseStartDate	8/26/2021	2/15/2022

Pipeline Construction - Napa County, Summer

tblConstructionPhase	PhaseStartDate	4/1/2021	2/9/2022
tblConstructionPhase	PhaseStartDate	3/30/2021	2/8/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/11/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/1/2022
tblGrading	AcresOfGrading	0.00	1.00
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialExported	0.00	10.00
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblOffRoadEquipment	HorsePower	402.00	16.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
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tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
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tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

Pipeline Construction - Napa County, Summer

tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Tractors
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tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
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tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00

tblTripsAndVMT	HaulingTripNumber	20.00	12.00
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tblTripsAndVMT	VendorTripNumber	1.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
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tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.5092	12.9909	12.2273	0.0395	0.6931	0.4674	1.0667	0.0994	0.4314	0.4709	0.0000	3,858.2413	3,858.2413	1.0894	0.0000	3,885.4761
Maximum	**1.5092**	**12.9909**	**12.2273**	**0.0395**	**0.6931**	**0.4674**	**1.0667**	**0.0994**	**0.4314**	**0.4709**	**0.0000**	**3,858.2413**	**3,858.2413**	**1.0894**	**0.0000**	**3,885.4761**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.5092	12.9909	12.2273	0.0395	0.3920	0.4674	0.7657	0.0665	0.4314	0.4709	0.0000	3,858.2413	3,858.2413	1.0894	0.0000	3,885.4761
Maximum	**1.5092**	**12.9909**	**12.2273**	**0.0395**	**0.3920**	**0.4674**	**0.7657**	**0.0665**	**0.4314**	**0.4709**	**0.0000**	**3,858.2413**	**3,858.2413**	**1.0894**	**0.0000**	**3,885.4761**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**43.44**	**0.00**	**28.22**	**33.12**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**0.0000**	**1.0800e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**0.0000**	**1.0800e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Hot Tap Connection-Site Preparation	Site Preparation	2/1/2022	2/7/2022	5	5	
2	Hot Tap to Existing Pipeline	Trenching	2/8/2022	2/8/2022	5	1	
3	Pipeline Install- Utility Location	Site Preparation	2/9/2022	2/10/2022	5	2	
4	Pipeline Install- Trenching	Trenching	2/11/2022	2/14/2022	5	2	
5	Pipeline Install- Base and Pipe Install	Building Construction	2/15/2022	2/16/2022	5	2	
6	Pipeline Install- Backfill	Grading	2/17/2022	2/18/2022	5	2	
7	Pipeline Install- Testing	Paving	2/19/2022	2/22/2022	5	2	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.11

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Install- Base and Pipe Install	Air Compressors	0	6.00	78	0.48
Pipeline Install- Trenching	Cement and Mortar Mixers	0	6.00	9	0.56
Pipeline Install- Testing	Cement and Mortar Mixers	0	6.00	9	0.56

Pipeline Construction - Napa County, Summer

Hot Tap to Existing Pipeline	Concrete/Industrial Saws	0	8.00	81	0.73
Pipeline Install- Utility Location	Cranes	0	4.00	231	0.29
Pipeline Install- Utility Location	Forklifts	0	6.00	89	0.20
Hot Tap Connection-Site Preparation	Graders	0	8.00	187	0.41
Pipeline Install- Trenching	Pavers	0	7.00	130	0.42
Pipeline Install- Trenching	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Hot Tap to Existing Pipeline	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Utility Location	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Cranes	0	4.00	231	0.29
Hot Tap to Existing Pipeline	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Forklifts	0	6.00	89	0.20
Pipeline Install- Utility Location	Graders	0	8.00	187	0.41
Pipeline Install- Testing	Pavers	0	7.00	130	0.42
Pipeline Install- Testing	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Base and Pipe Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Off-Highway Trucks	2	8.00	16	0.38
Hot Tap Connection-Site Preparation	Excavators	1	8.00	158	0.38
Hot Tap Connection-Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Excavators	1	8.00	158	0.38
Hot Tap to Existing Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Off-Highway Trucks	1	8.00	402	0.38

Pipeline Install- Utility Location	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Utility Location	Excavators	1	7.00	158	0.38
Pipeline Install- Trenching	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Install- Trenching	Excavators	1	7.00	158	0.38
Pipeline Install- Base and Pipe Install	Off-Highway Trucks	2	7.00	402	0.38
Pipeline Install- Base and Pipe Install	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Off-Highway Trucks	1	7.00	402	0.38
Pipeline Install- Testing	Off-Highway Tractors	1	7.00	124	0.44

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Install- Backfill	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap Connection- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap to Existing Pipeline	4	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Utility Location	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Trenching	5	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Base and Pipe Install	4	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Testing	1	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Hot Tap Connection-Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.1065	0.0000	0.1065	0.0115	0.0000	0.0115			0.0000			0.0000
Off-Road	0.4416	3.9260	5.7602	9.0500e-003		0.1938	0.1938		0.1797	0.1797		864.6946	864.6946	0.2665		871.3569
Total	**0.4416**	**3.9260**	**5.7602**	**9.0500e-003**	**0.1065**	**0.1938**	**0.3003**	**0.0115**	**0.1797**	**0.1912**		**864.6946**	**864.6946**	**0.2665**		**871.3569**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.9200e-003	0.0990	0.0210	3.1000e-004	6.9700e-003	3.0000e-004	7.2700e-003	1.9100e-003	2.8000e-004	2.1900e-003		32.9684	32.9684	1.6100e-003		33.0087
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0204**	**0.1088**	**0.1502**	**6.9000e-004**	**0.0480**	**5.6000e-004**	**0.0486**	**0.0128**	**5.2000e-004**	**0.0133**		**70.3846**	**70.3846**	**2.5100e-003**		**70.4474**

3.2 Hot Tap Connection-Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0479	0.0000	0.0479	5.1800e-003	0.0000	5.1800e-003			0.0000			0.0000
Off-Road	0.4416	3.9260	5.7602	9.0500e-003		0.1938	0.1938		0.1797	0.1797	0.0000	864.6946	864.6946	0.2665		871.3569
Total	**0.4416**	**3.9260**	**5.7602**	**9.0500e-003**	**0.0479**	**0.1938**	**0.2418**	**5.1800e-003**	**0.1797**	**0.1849**	**0.0000**	**864.6946**	**864.6946**	**0.2665**		**871.3569**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.9200e-003	0.0990	0.0210	3.1000e-004	6.9700e-003	3.0000e-004	7.2700e-003	1.9100e-003	2.8000e-004	2.1900e-003		32.9684	32.9684	1.6100e-003		33.0087
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0204**	**0.1088**	**0.1502**	**6.9000e-004**	**0.0480**	**5.6000e-004**	**0.0486**	**0.0128**	**5.2000e-004**	**0.0133**		**70.3846**	**70.3846**	**2.5100e-003**		**70.4474**

3.3 Hot Tap to Existing Pipeline - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9315	7.5409	8.5762	0.0216		0.3180	0.3180		0.2939	0.2939		2,074.7651	2,074.7651	0.6579		2,091.2114
Total	**0.9315**	**7.5409**	**8.5762**	**0.0216**		**0.3180**	**0.3180**		**0.2939**	**0.2939**		**2,074.7651**	**2,074.7651**	**0.6579**		**2,091.2114**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0174**	**9.8200e-003**	**0.1292**	**3.8000e-004**	**0.0411**	**2.6000e-004**	**0.0413**	**0.0109**	**2.4000e-004**	**0.0111**		**37.4162**	**37.4162**	**9.0000e-004**		**37.4387**

3.3 Hot Tap to Existing Pipeline - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9315	7.5409	8.5762	0.0216		0.3180	0.3180		0.2939	0.2939	0.0000	2,074.7651	2,074.7651	0.6579		2,091.2114
Total	**0.9315**	**7.5409**	**8.5762**	**0.0216**		**0.3180**	**0.3180**		**0.2939**	**0.2939**	**0.0000**	**2,074.7651**	**2,074.7651**	**0.6579**		**2,091.2114**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0174**	**9.8200e-003**	**0.1292**	**3.8000e-004**	**0.0411**	**2.6000e-004**	**0.0413**	**0.0109**	**2.4000e-004**	**0.0111**		**37.4162**	**37.4162**	**9.0000e-004**		**37.4387**

3.4 Pipeline Install- Utility Location - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5474	0.0000	0.5474	0.0599	0.0000	0.0599			0.0000			0.0000
Off-Road	1.2401	9.6302	9.6135	0.0311		0.3689	0.3689		0.3394	0.3394		3,010.4614	3,010.4614	0.9736		3,034.8025
Total	**1.2401**	**9.6302**	**9.6135**	**0.0311**	**0.5474**	**0.3689**	**0.9163**	**0.0599**	**0.3394**	**0.3993**		**3,010.4614**	**3,010.4614**	**0.9736**		**3,034.8025**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.4 Pipeline Install- Utility Location - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2463	0.0000	0.2463	0.0269	0.0000	0.0269			0.0000			0.0000
Off-Road	1.2401	9.6302	9.6135	0.0311		0.3689	0.3689		0.3394	0.3394	0.0000	3,010.4614	3,010.4614	0.9736		3,034.8025
Total	**1.2401**	**9.6302**	**9.6135**	**0.0311**	**0.2463**	**0.3689**	**0.6153**	**0.0269**	**0.3394**	**0.3663**	**0.0000**	**3,010.4614**	**3,010.4614**	**0.9736**		**3,034.8025**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.5 Pipeline Install- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4479	11.4969	11.7833	0.0345		0.4627	0.4627		0.4269	0.4269		3,326.2996	3,326.2996	1.0643		3,352.9064
Total	**1.4479**	**11.4969**	**11.7833**	**0.0345**		**0.4627**	**0.4627**		**0.4269**	**0.4269**		**3,326.2996**	**3,326.2996**	**1.0643**		**3,352.9064**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.5 Pipeline Install- Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4479	11.4969	11.7833	0.0345		0.4627	0.4627		0.4269	0.4269	0.0000	3,326.2996	3,326.2996	1.0643		3,352.9064
Total	**1.4479**	**11.4969**	**11.7833**	**0.0345**		**0.4627**	**0.4627**		**0.4269**	**0.4269**	**0.0000**	**3,326.2996**	**3,326.2996**	**1.0643**		**3,352.9064**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.6 Pipeline Install- Base and Pipe Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1583	9.1412	8.3646	0.0270		0.3620	0.3620		0.3343	0.3343		2,603.9771	2,603.9771	0.8307		2,624.7435
Total	**1.1583**	**9.1412**	**8.3646**	**0.0270**		**0.3620**	**0.3620**		**0.3343**	**0.3343**		**2,603.9771**	**2,603.9771**	**0.8307**		**2,624.7435**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.6 Pipeline Install- Base and Pipe Install - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1583	9.1412	8.3646	0.0270		0.3620	0.3620		0.3343	0.3343	0.0000	2,603.9771	2,603.9771	0.8307		2,624.7435
Total	**1.1583**	**9.1412**	**8.3646**	**0.0270**		**0.3620**	**0.3620**		**0.3343**	**0.3343**	**0.0000**	**2,603.9771**	**2,603.9771**	**0.8307**		**2,624.7435**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.7 Pipeline Install- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0172	0.0000	0.0172	2.6000e-003	0.0000	2.6000e-003			0.0000			0.0000
Off-Road	0.6525	5.1928	4.8515	0.0146		0.2111	0.2111		0.1955	0.1955		1,403.9597	1,403.9597	0.4426		1,415.0234
Total	**0.6525**	**5.1928**	**4.8515**	**0.0146**	**0.0172**	**0.2111**	**0.2283**	**2.6000e-003**	**0.1955**	**0.1981**		**1,403.9597**	**1,403.9597**	**0.4426**		**1,415.0234**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.7 Pipeline Install- Backfill - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.7200e-003	0.0000	7.7200e-003	1.1700e-003	0.0000	1.1700e-003			0.0000			0.0000
Off-Road	0.6525	5.1928	4.8515	0.0146		0.2111	0.2111		0.1955	0.1955	0.0000	1,403.9597	1,403.9597	0.4426		1,415.0234
Total	**0.6525**	**5.1928**	**4.8515**	**0.0146**	**7.7200e-003**	**0.2111**	**0.2189**	**1.1700e-003**	**0.1955**	**0.1966**	**0.0000**	**1,403.9597**	**1,403.9597**	**0.4426**		**1,415.0234**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.8 Pipeline Install- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1927	1.8657	2.6550	4.0700e-003		0.0894	0.0894		0.0823	0.0823		394.0305	394.0305	0.1274		397.2164
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.1927**	**1.8657**	**2.6550**	**4.0700e-003**		**0.0894**	**0.0894**		**0.0823**	**0.0823**		**394.0305**	**394.0305**	**0.1274**		**397.2164**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

3.8 Pipeline Install- Testing - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1927	1.8657	2.6550	4.0700e-003		0.0894	0.0894		0.0823	0.0823	0.0000	394.0305	394.0305	0.1274		397.2164
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.1927**	**1.8657**	**2.6550**	**4.0700e-003**		**0.0894**	**0.0894**		**0.0823**	**0.0823**	**0.0000**	**394.0305**	**394.0305**	**0.1274**		**397.2164**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0438	1.4842	0.3148	4.6200e-003	0.1046	4.4500e-003	0.1091	0.0287	4.2600e-003	0.0329		494.5255	494.5255	0.0242		495.1310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0612**	**1.4941**	**0.4441**	**5.0000e-003**	**0.1457**	**4.7100e-003**	**0.1504**	**0.0395**	**4.5000e-003**	**0.0440**		**531.9417**	**531.9417**	**0.0251**		**532.5697**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Unmitigated	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	5.3000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**		**1.0800e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	5.3000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**		**1.0800e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Pipeline Construction

Napa County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.65	1000sqft	0.11	4,650.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Pipeline Construction - Napa County, Winter

Project Characteristics -

Land Use -

Construction Phase - Construction Phase and Timing updated to mathcin information in the project description and Project Detail (Wood Rodgers)

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by wood rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Grading - Material imported and exported porvided by Wood Rodgers

Trips and VMT - Worker trips provided by Wood Rodgers.

Construction Off-road Equipment Mitigation - Mitigation imposed to account for best management practices

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	2.00
tblConstructionPhase	NumDays	1.00	2.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	5.00	2.00
tblConstructionPhase	PhaseEndDate	9/1/2021	2/16/2022
tblConstructionPhase	PhaseEndDate	8/18/2021	2/10/2022
tblConstructionPhase	PhaseEndDate	3/31/2021	2/8/2022
tblConstructionPhase	PhaseEndDate	8/25/2021	2/14/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/7/2022
tblConstructionPhase	PhaseStartDate	8/26/2021	2/15/2022

Pipeline Construction - Napa County, Winter

tblConstructionPhase	PhaseStartDate	4/1/2021	2/9/2022
tblConstructionPhase	PhaseStartDate	3/30/2021	2/8/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/11/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/1/2022
tblGrading	AcresOfGrading	0.00	1.00
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialExported	0.00	10.00
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblOffRoadEquipment	HorsePower	402.00	16.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.44	0.44
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Tractors
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00

tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	1.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.5112	13.0292	12.2452	0.0394	0.6931	0.4675	1.0668	0.0994	0.4314	0.4710	0.0000	3,847.4591	3,847.4591	1.0906	0.0000	3,874.7248
Maximum	**1.5112**	**13.0292**	**12.2452**	**0.0394**	**0.6931**	**0.4675**	**1.0668**	**0.0994**	**0.4314**	**0.4710**	**0.0000**	**3,847.4591**	**3,847.4591**	**1.0906**	**0.0000**	**3,874.7248**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	1.5112	13.0292	12.2452	0.0394	0.3920	0.4675	0.7657	0.0665	0.4314	0.4710	0.0000	3,847.4591	3,847.4591	1.0906	0.0000	3,874.7248
Maximum	**1.5112**	**13.0292**	**12.2452**	**0.0394**	**0.3920**	**0.4675**	**0.7657**	**0.0665**	**0.4314**	**0.4710**	**0.0000**	**3,847.4591**	**3,847.4591**	**1.0906**	**0.0000**	**3,874.7248**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**43.44**	**0.00**	**28.22**	**33.12**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**0.0000**	**1.0800e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**0.0000**	**1.0800e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Hot Tap Connection-Site Preparation	Site Preparation	2/1/2022	2/7/2022	5	5	
2	Hot Tap to Existing Pipeline	Trenching	2/8/2022	2/8/2022	5	1	
3	Pipeline Install- Utility Location	Site Preparation	2/9/2022	2/10/2022	5	2	
4	Pipeline Install- Trenching	Trenching	2/11/2022	2/14/2022	5	2	
5	Pipeline Install- Base and Pipe Install	Building Construction	2/15/2022	2/16/2022	5	2	
6	Pipeline Install- Backfill	Grading	2/17/2022	2/18/2022	5	2	
7	Pipeline Install- Testing	Paving	2/19/2022	2/22/2022	5	2	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.11

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Install- Base and Pipe Install	Air Compressors	0	6.00	78	0.48
Pipeline Install- Trenching	Cement and Mortar Mixers	0	6.00	9	0.56
Pipeline Install- Testing	Cement and Mortar Mixers	0	6.00	9	0.56

Hot Tap to Existing Pipeline	Concrete/Industrial Saws	0	8.00	81	0.73
Pipeline Install- Utility Location	Cranes	0	4.00	231	0.29
Pipeline Install- Utility Location	Forklifts	0	6.00	89	0.20
Hot Tap Connection-Site Preparation	Graders	0	8.00	187	0.41
Pipeline Install- Trenching	Pavers	0	7.00	130	0.42
Pipeline Install- Trenching	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Hot Tap to Existing Pipeline	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Utility Location	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Cranes	0	4.00	231	0.29
Hot Tap to Existing Pipeline	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Forklifts	0	6.00	89	0.20
Pipeline Install- Utility Location	Graders	0	8.00	187	0.41
Pipeline Install- Testing	Pavers	0	7.00	130	0.42
Pipeline Install- Testing	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Base and Pipe Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Off-Highway Trucks	2	8.00	16	0.38
Hot Tap Connection-Site Preparation	Excavators	1	8.00	158	0.38
Hot Tap Connection-Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Excavators	1	8.00	158	0.38
Hot Tap to Existing Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Off-Highway Trucks	1	8.00	402	0.38

Pipeline Install- Utility Location	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Utility Location	Excavators	1	7.00	158	0.38
Pipeline Install- Trenching	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Install- Trenching	Excavators	1	7.00	158	0.38
Pipeline Install- Base and Pipe Install	Off-Highway Trucks	2	7.00	402	0.38
Pipeline Install- Base and Pipe Install	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Off-Highway Trucks	1	7.00	402	0.38
Pipeline Install- Testing	Off-Highway Tractors	1	7.00	124	0.44

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Install- Backfill	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap Connection- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap to Existing Pipeline	4	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Utility Location	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Trenching	5	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Base and Pipe Install	4	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Testing	1	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Hot Tap Connection-Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.1065	0.0000	0.1065	0.0115	0.0000	0.0115			0.0000			0.0000
Off-Road	0.4416	3.9260	5.7602	9.0500e-003		0.1938	0.1938		0.1797	0.1797		864.6946	864.6946	0.2665		871.3569
Total	**0.4416**	**3.9260**	**5.7602**	**9.0500e-003**	**0.1065**	**0.1938**	**0.3003**	**0.0115**	**0.1797**	**0.1912**		**864.6946**	**864.6946**	**0.2665**		**871.3569**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.0000e-003	0.1013	0.0225	3.0000e-004	6.9700e-003	3.0000e-004	7.2800e-003	1.9100e-003	2.9000e-004	2.2000e-003		32.4367	32.4367	1.7000e-003		32.4792
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0213**	**0.1138**	**0.1468**	**6.5000e-004**	**0.0480**	**5.6000e-004**	**0.0486**	**0.0128**	**5.3000e-004**	**0.0133**		**67.0453**	**67.0453**	**2.5500e-003**		**67.1091**

3.2 Hot Tap Connection-Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0479	0.0000	0.0479	5.1800e-003	0.0000	5.1800e-003			0.0000			0.0000
Off-Road	0.4416	3.9260	5.7602	9.0500e-003		0.1938	0.1938		0.1797	0.1797	0.0000	864.6946	864.6946	0.2665		871.3569
Total	**0.4416**	**3.9260**	**5.7602**	**9.0500e-003**	**0.0479**	**0.1938**	**0.2418**	**5.1800e-003**	**0.1797**	**0.1849**	**0.0000**	**864.6946**	**864.6946**	**0.2665**		**871.3569**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.0000e-003	0.1013	0.0225	3.0000e-004	6.9700e-003	3.0000e-004	7.2800e-003	1.9100e-003	2.9000e-004	2.2000e-003		32.4367	32.4367	1.7000e-003		32.4792
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0213**	**0.1138**	**0.1468**	**6.5000e-004**	**0.0480**	**5.6000e-004**	**0.0486**	**0.0128**	**5.3000e-004**	**0.0133**		**67.0453**	**67.0453**	**2.5500e-003**		**67.1091**

3.3 Hot Tap to Existing Pipeline - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9315	7.5409	8.5762	0.0216		0.3180	0.3180		0.2939	0.2939		2,074.7651	2,074.7651	0.6579		2,091.2114
Total	**0.9315**	**7.5409**	**8.5762**	**0.0216**		**0.3180**	**0.3180**		**0.2939**	**0.2939**		**2,074.7651**	**2,074.7651**	**0.6579**		**2,091.2114**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0183**	**0.0125**	**0.1243**	**3.5000e-004**	**0.0411**	**2.6000e-004**	**0.0413**	**0.0109**	**2.4000e-004**	**0.0111**		**34.6086**	**34.6086**	**8.5000e-004**		**34.6298**

3.3 Hot Tap to Existing Pipeline - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9315	7.5409	8.5762	0.0216		0.3180	0.3180		0.2939	0.2939	0.0000	2,074.7651	2,074.7651	0.6579		2,091.2114
Total	**0.9315**	**7.5409**	**8.5762**	**0.0216**		**0.3180**	**0.3180**		**0.2939**	**0.2939**	**0.0000**	**2,074.7651**	**2,074.7651**	**0.6579**		**2,091.2114**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0183**	**0.0125**	**0.1243**	**3.5000e-004**	**0.0411**	**2.6000e-004**	**0.0413**	**0.0109**	**2.4000e-004**	**0.0111**		**34.6086**	**34.6086**	**8.5000e-004**		**34.6298**

3.4 Pipeline Install- Utility Location - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5474	0.0000	0.5474	0.0599	0.0000	0.0599			0.0000			0.0000
Off-Road	1.2401	9.6302	9.6135	0.0311		0.3689	0.3689		0.3394	0.3394		3,010.4614	3,010.4614	0.9736		3,034.8025
Total	**1.2401**	**9.6302**	**9.6135**	**0.0311**	**0.5474**	**0.3689**	**0.9163**	**0.0599**	**0.3394**	**0.3993**		**3,010.4614**	**3,010.4614**	**0.9736**		**3,034.8025**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.4 Pipeline Install- Utility Location - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2463	0.0000	0.2463	0.0269	0.0000	0.0269			0.0000			0.0000
Off-Road	1.2401	9.6302	9.6135	0.0311		0.3689	0.3689		0.3394	0.3394	0.0000	3,010.4614	3,010.4614	0.9736		3,034.8025
Total	**1.2401**	**9.6302**	**9.6135**	**0.0311**	**0.2463**	**0.3689**	**0.6153**	**0.0269**	**0.3394**	**0.3663**	**0.0000**	**3,010.4614**	**3,010.4614**	**0.9736**		**3,034.8025**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.5 Pipeline Install- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4479	11.4969	11.7833	0.0345		0.4627	0.4627		0.4269	0.4269		3,326.2996	3,326.2996	1.0643		3,352.9064
Total	**1.4479**	**11.4969**	**11.7833**	**0.0345**		**0.4627**	**0.4627**		**0.4269**	**0.4269**		**3,326.2996**	**3,326.2996**	**1.0643**		**3,352.9064**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.5 Pipeline Install- Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4479	11.4969	11.7833	0.0345		0.4627	0.4627		0.4269	0.4269	0.0000	3,326.2996	3,326.2996	1.0643		3,352.9064
Total	**1.4479**	**11.4969**	**11.7833**	**0.0345**		**0.4627**	**0.4627**		**0.4269**	**0.4269**	**0.0000**	**3,326.2996**	**3,326.2996**	**1.0643**		**3,352.9064**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.6 Pipeline Install- Base and Pipe Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1583	9.1412	8.3646	0.0270		0.3620	0.3620		0.3343	0.3343		2,603.9771	2,603.9771	0.8307		2,624.7435
Total	**1.1583**	**9.1412**	**8.3646**	**0.0270**		**0.3620**	**0.3620**		**0.3343**	**0.3343**		**2,603.9771**	**2,603.9771**	**0.8307**		**2,624.7435**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.6 Pipeline Install- Base and Pipe Install - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1583	9.1412	8.3646	0.0270		0.3620	0.3620		0.3343	0.3343	0.0000	2,603.9771	2,603.9771	0.8307		2,624.7435
Total	**1.1583**	**9.1412**	**8.3646**	**0.0270**		**0.3620**	**0.3620**		**0.3343**	**0.3343**	**0.0000**	**2,603.9771**	**2,603.9771**	**0.8307**		**2,624.7435**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.7 Pipeline Install- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0172	0.0000	0.0172	2.6000e-003	0.0000	2.6000e-003			0.0000			0.0000
Off-Road	0.6525	5.1928	4.8515	0.0146		0.2111	0.2111		0.1955	0.1955		1,403.9597	1,403.9597	0.4426		1,415.0234
Total	**0.6525**	**5.1928**	**4.8515**	**0.0146**	**0.0172**	**0.2111**	**0.2283**	**2.6000e-003**	**0.1955**	**0.1981**		**1,403.9597**	**1,403.9597**	**0.4426**		**1,415.0234**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.7 Pipeline Install- Backfill - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.7200e-003	0.0000	7.7200e-003	1.1700e-003	0.0000	1.1700e-003			0.0000			0.0000
Off-Road	0.6525	5.1928	4.8515	0.0146		0.2111	0.2111		0.1955	0.1955	0.0000	1,403.9597	1,403.9597	0.4426		1,415.0234
Total	**0.6525**	**5.1928**	**4.8515**	**0.0146**	**7.7200e-003**	**0.2111**	**0.2189**	**1.1700e-003**	**0.1955**	**0.1966**	**0.0000**	**1,403.9597**	**1,403.9597**	**0.4426**		**1,415.0234**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.8 Pipeline Install- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1927	1.8657	2.6550	4.0700e-003		0.0894	0.0894		0.0823	0.0823		394.0305	394.0305	0.1274		397.2164
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.1927**	**1.8657**	**2.6550**	**4.0700e-003**		**0.0894**	**0.0894**		**0.0823**	**0.0823**		**394.0305**	**394.0305**	**0.1274**		**397.2164**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

3.8 Pipeline Install- Testing - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1927	1.8657	2.6550	4.0700e-003		0.0894	0.0894		0.0823	0.0823	0.0000	394.0305	394.0305	0.1274		397.2164
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.1927**	**1.8657**	**2.6550**	**4.0700e-003**		**0.0894**	**0.0894**		**0.0823**	**0.0823**	**0.0000**	**394.0305**	**394.0305**	**0.1274**		**397.2164**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0450	1.5198	0.3377	4.5500e-003	0.1046	4.5400e-003	0.1092	0.0287	4.3400e-003	0.0330		486.5509	486.5509	0.0255		487.1886
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0633**	**1.5323**	**0.4620**	**4.9000e-003**	**0.1457**	**4.8000e-003**	**0.1505**	**0.0395**	**4.5800e-003**	**0.0441**		**521.1595**	**521.1595**	**0.0264**		**521.8184**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Unmitigated	2.2200e-003	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	5.3000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**		**1.0800e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	5.3000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.7000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.0200e-003	1.0200e-003	0.0000		1.0800e-003
Total	**2.2200e-003**	**0.0000**	**4.7000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.0200e-003**	**1.0200e-003**	**0.0000**		**1.0800e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Pipeline Construction

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.65	1000sqft	0.11	4,650.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Pipeline Construction - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construction Phase and Timing updated to mathcin information in the project description and Project Detail (Wood Rodgers)

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by wood rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Grading - Material imported and exported porvided by Wood Rodgers

Trips and VMT - Worker trips provided by Wood Rodgers.

Construction Off-road Equipment Mitigation - Mitigation imposed to account for best management practices

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	2.00
tblConstructionPhase	NumDays	1.00	2.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	5.00	2.00
tblConstructionPhase	PhaseEndDate	9/1/2021	2/16/2022
tblConstructionPhase	PhaseEndDate	8/18/2021	2/10/2022
tblConstructionPhase	PhaseEndDate	3/31/2021	2/8/2022
tblConstructionPhase	PhaseEndDate	8/25/2021	2/14/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/7/2022
tblConstructionPhase	PhaseStartDate	8/26/2021	2/15/2022

Pipeline Construction - Napa County, Annual

tblConstructionPhase	PhaseStartDate	4/1/2021	2/9/2022
tblConstructionPhase	PhaseStartDate	3/30/2021	2/8/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/11/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/1/2022
tblGrading	AcresOfGrading	0.00	1.00
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialExported	0.00	10.00
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblOffRoadEquipment	HorsePower	402.00	16.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.44	0.44
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Tractors
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00

tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	1.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	6.6200e-003	0.0588	0.0586	1.7000e-004	1.6700e-003	2.1600e-003	3.8300e-003	3.2000e-004	2.0000e-003	2.3200e-003	0.0000	15.2003	15.2003	4.1400e-003	0.0000	15.3039
Maximum	**6.6200e-003**	**0.0588**	**0.0586**	**1.7000e-004**	**1.6700e-003**	**2.1600e-003**	**3.8300e-003**	**3.2000e-004**	**2.0000e-003**	**2.3200e-003**	**0.0000**	**15.2003**	**15.2003**	**4.1400e-003**	**0.0000**	**15.3039**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	6.6200e-003	0.0588	0.0586	1.7000e-004	1.2100e-003	2.1600e-003	3.3800e-003	2.7000e-004	2.0000e-003	2.2700e-003	0.0000	15.2003	15.2003	4.1400e-003	0.0000	15.3039
Maximum	**6.6200e-003**	**0.0588**	**0.0586**	**1.7000e-004**	**1.2100e-003**	**2.1600e-003**	**3.3800e-003**	**2.7000e-004**	**2.0000e-003**	**2.2700e-003**	**0.0000**	**15.2003**	**15.2003**	**4.1400e-003**	**0.0000**	**15.3039**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**27.54**	**0.00**	**11.75**	**15.63**	**0.00**	**2.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
4	12-15-2021	3-14-2022	0.0630	0.0630
		Highest	0.0630	0.0630

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Pipeline Construction - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Hot Tap Connection-Site Preparation	Site Preparation	2/1/2022	2/7/2022	5	5	
2	Hot Tap to Existing Pipeline	Trenching	2/8/2022	2/8/2022	5	1	
3	Pipeline Install- Utility Location	Site Preparation	2/9/2022	2/10/2022	5	2	
4	Pipeline Install- Trenching	Trenching	2/11/2022	2/14/2022	5	2	
5	Pipeline Install- Base and Pipe Install	Building Construction	2/15/2022	2/16/2022	5	2	
6	Pipeline Install- Backfill	Grading	2/17/2022	2/18/2022	5	2	
7	Pipeline Install- Testing	Paving	2/19/2022	2/22/2022	5	2	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.11

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Install- Base and Pipe Install	Air Compressors	0	6.00	78	0.48
Pipeline Install- Trenching	Cement and Mortar Mixers	0	6.00	9	0.56
Pipeline Install- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Hot Tap to Existing Pipeline	Concrete/Industrial Saws	0	8.00	81	0.73
Pipeline Install- Utility Location	Cranes	0	4.00	231	0.29
Pipeline Install- Utility Location	Forklifts	0	6.00	89	0.20
Hot Tap Connection-Site Preparation	Graders	0	8.00	187	0.41
Pipeline Install- Trenching	Pavers	0	7.00	130	0.42
Pipeline Install- Trenching	Rollers	0	7.00	80	0.38

Pipeline Construction - Napa County, Annual

Pipeline Install- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Hot Tap to Existing Pipeline	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Utility Location	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Cranes	0	4.00	231	0.29
Hot Tap to Existing Pipeline	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Forklifts	0	6.00	89	0.20
Pipeline Install- Utility Location	Graders	0	8.00	187	0.41
Pipeline Install- Testing	Pavers	0	7.00	130	0.42
Pipeline Install- Testing	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Base and Pipe Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Off-Highway Trucks	2	8.00	16	0.38
Hot Tap Connection-Site Preparation	Excavators	1	8.00	158	0.38
Hot Tap Connection-Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Excavators	1	8.00	158	0.38
Hot Tap to Existing Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Off-Highway Trucks	1	8.00	402	0.38
Pipeline Install- Utility Location	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Utility Location	Excavators	1	7.00	158	0.38
Pipeline Install- Trenching	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Install- Trenching	Excavators	1	7.00	158	0.38

Pipeline Install- Base and Pipe Install	Off-Highway Trucks	2	7.00	402	0.38
Pipeline Install- Base and Pipe Install	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Off-Highway Trucks	1	7.00	402	0.38
Pipeline Install- Testing	Off-Highway Tractors	1	7.00	124	0.44

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Install- Backfill	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap Connection- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap to Existing Pipeline	4	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Utility Location	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Trenching	5	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Base and Pipe Install	4	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Testing	1	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Hot Tap Connection-Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-003	9.8200e-003	0.0144	2.0000e-005		4.8000e-004	4.8000e-004		4.5000e-004	4.5000e-004	0.0000	1.9611	1.9611	6.0000e-004	0.0000	1.9762
Total	**1.1000e-003**	**9.8200e-003**	**0.0144**	**2.0000e-005**	**2.7000e-004**	**4.8000e-004**	**7.5000e-004**	**3.0000e-005**	**4.5000e-004**	**4.8000e-004**	**0.0000**	**1.9611**	**1.9611**	**6.0000e-004**	**0.0000**	**1.9762**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**5.0000e-005**	**2.8000e-004**	**3.5000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1536**	**0.1536**	**0.0000**	**0.0000**	**0.1538**

3.2 Hot Tap Connection-Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-003	9.8200e-003	0.0144	2.0000e-005		4.8000e-004	4.8000e-004		4.5000e-004	4.5000e-004	0.0000	1.9611	1.9611	6.0000e-004	0.0000	1.9762
Total	**1.1000e-003**	**9.8200e-003**	**0.0144**	**2.0000e-005**	**1.2000e-004**	**4.8000e-004**	**6.0000e-004**	**1.0000e-005**	**4.5000e-004**	**4.6000e-004**	**0.0000**	**1.9611**	**1.9611**	**6.0000e-004**	**0.0000**	**1.9762**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**5.0000e-005**	**2.8000e-004**	**3.5000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1536**	**0.1536**	**0.0000**	**0.0000**	**0.1538**

3.3 Hot Tap to Existing Pipeline - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7000e-004	3.7700e-003	4.2900e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.5000e-004	1.5000e-004	0.0000	0.9411	0.9411	3.0000e-004	0.0000	0.9486
Total	**4.7000e-004**	**3.7700e-003**	**4.2900e-003**	**1.0000e-005**		**1.6000e-004**	**1.6000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**0.9411**	**0.9411**	**3.0000e-004**	**0.0000**	**0.9486**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	6.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0159	0.0159	0.0000	0.0000	0.0159
Total	**1.0000e-005**	**1.0000e-005**	**6.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0159**	**0.0159**	**0.0000**	**0.0000**	**0.0159**

3.3 Hot Tap to Existing Pipeline - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7000e-004	3.7700e-003	4.2900e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.5000e-004	1.5000e-004	0.0000	0.9411	0.9411	3.0000e-004	0.0000	0.9486
Total	**4.7000e-004**	**3.7700e-003**	**4.2900e-003**	**1.0000e-005**		**1.6000e-004**	**1.6000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**0.9411**	**0.9411**	**3.0000e-004**	**0.0000**	**0.9486**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	6.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0159	0.0159	0.0000	0.0000	0.0159
Total	**1.0000e-005**	**1.0000e-005**	**6.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0159**	**0.0159**	**0.0000**	**0.0000**	**0.0159**

3.4 Pipeline Install- Utility Location - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.5000e-004	0.0000	5.5000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2400e-003	9.6300e-003	9.6100e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.4000e-004	3.4000e-004	0.0000	2.7310	2.7310	8.8000e-004	0.0000	2.7531
Total	**1.2400e-003**	**9.6300e-003**	**9.6100e-003**	**3.0000e-005**	**5.5000e-004**	**3.7000e-004**	**9.2000e-004**	**6.0000e-005**	**3.4000e-004**	**4.0000e-004**	**0.0000**	**2.7310**	**2.7310**	**8.8000e-004**	**0.0000**	**2.7531**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.4 Pipeline Install- Utility Location - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.5000e-004	0.0000	2.5000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2400e-003	9.6300e-003	9.6100e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.4000e-004	3.4000e-004	0.0000	2.7310	2.7310	8.8000e-004	0.0000	2.7531
Total	**1.2400e-003**	**9.6300e-003**	**9.6100e-003**	**3.0000e-005**	**2.5000e-004**	**3.7000e-004**	**6.2000e-004**	**3.0000e-005**	**3.4000e-004**	**3.7000e-004**	**0.0000**	**2.7310**	**2.7310**	**8.8000e-004**	**0.0000**	**2.7531**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.5 Pipeline Install- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4500e-003	0.0115	0.0118	3.0000e-005		4.6000e-004	4.6000e-004		4.3000e-004	4.3000e-004	0.0000	3.0176	3.0176	9.7000e-004	0.0000	3.0417
Total	**1.4500e-003**	**0.0115**	**0.0118**	**3.0000e-005**		**4.6000e-004**	**4.6000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**3.0176**	**3.0176**	**9.7000e-004**	**0.0000**	**3.0417**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.5 Pipeline Install- Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4500e-003	0.0115	0.0118	3.0000e-005		4.6000e-004	4.6000e-004		4.3000e-004	4.3000e-004	0.0000	3.0176	3.0176	9.7000e-004	0.0000	3.0417
Total	**1.4500e-003**	**0.0115**	**0.0118**	**3.0000e-005**		**4.6000e-004**	**4.6000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**3.0176**	**3.0176**	**9.7000e-004**	**0.0000**	**3.0417**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.6 Pipeline Install- Base and Pipe Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1600e-003	9.1400e-003	8.3600e-003	3.0000e-005		3.6000e-004	3.6000e-004		3.3000e-004	3.3000e-004	0.0000	2.3623	2.3623	7.5000e-004	0.0000	2.3811
Total	**1.1600e-003**	**9.1400e-003**	**8.3600e-003**	**3.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.3000e-004**	**3.3000e-004**	**0.0000**	**2.3623**	**2.3623**	**7.5000e-004**	**0.0000**	**2.3811**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.6 Pipeline Install- Base and Pipe Install - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1600e-003	9.1400e-003	8.3600e-003	3.0000e-005		3.6000e-004	3.6000e-004		3.3000e-004	3.3000e-004	0.0000	2.3623	2.3623	7.5000e-004	0.0000	2.3811
Total	**1.1600e-003**	**9.1400e-003**	**8.3600e-003**	**3.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.3000e-004**	**3.3000e-004**	**0.0000**	**2.3623**	**2.3623**	**7.5000e-004**	**0.0000**	**2.3811**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.7 Pipeline Install- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.5000e-004	5.1900e-003	4.8500e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.2737	1.2737	4.0000e-004	0.0000	1.2837
Total	**6.5000e-004**	**5.1900e-003**	**4.8500e-003**	**1.0000e-005**	**2.0000e-005**	**2.1000e-004**	**2.3000e-004**	**0.0000**	**2.0000e-004**	**2.0000e-004**	**0.0000**	**1.2737**	**1.2737**	**4.0000e-004**	**0.0000**	**1.2837**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.7 Pipeline Install- Backfill - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.5000e-004	5.1900e-003	4.8500e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.2737	1.2737	4.0000e-004	0.0000	1.2837
Total	**6.5000e-004**	**5.1900e-003**	**4.8500e-003**	**1.0000e-005**	**1.0000e-005**	**2.1000e-004**	**2.2000e-004**	**0.0000**	**2.0000e-004**	**2.0000e-004**	**0.0000**	**1.2737**	**1.2737**	**4.0000e-004**	**0.0000**	**1.2837**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.8 Pipeline Install- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-004	1.8700e-003	2.6600e-003	0.0000		9.0000e-005	9.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.3575	0.3575	1.2000e-004	0.0000	0.3604
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.9000e-004**	**1.8700e-003**	**2.6600e-003**	**0.0000**		**9.0000e-005**	**9.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.3575**	**0.3575**	**1.2000e-004**	**0.0000**	**0.3604**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.8 Pipeline Install- Testing - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-004	1.8700e-003	2.6600e-003	0.0000		9.0000e-005	9.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.3575	0.3575	1.2000e-004	0.0000	0.3604
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.9000e-004**	**1.8700e-003**	**2.6600e-003**	**0.0000**		**9.0000e-005**	**9.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.3575**	**0.3575**	**1.2000e-004**	**0.0000**	**0.3604**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Unmitigated	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Bypass Valve Construction

Napa County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	7.20	1000sqft	0.17	7,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Bypass Valve Construction - Napa County, Summer

Project Characteristics -

Land Use -

Construction Phase - Construcion pahsing and timing updated to matych the project and infomratio provided by the applicant.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Grading - Cut and fill information provided by Wood Rodgers

Trips and VMT - Worker and hul trips updated to match the project description.

Construction Off-road Equipment Mitigation - Mitigation accounts for BMP

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	5.00	7.00
tblConstructionPhase	NumDays	100.00	7.00
tblConstructionPhase	NumDays	100.00	8.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	PhaseEndDate	8/25/2021	3/4/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/23/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/24/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/23/2022
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	70.00
tblGrading	MaterialExported	0.00	25.00
tblGrading	MaterialImported	0.00	70.00

Bypass Valve Construction - Napa County, Summer

tblGrading	MaterialImported	0.00	25.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

Bypass Valve Construction - Napa County, Summer

tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	6.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	HaulingTripNumber	18.00	9.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	WorkerTripNumber	13.00	6.00
tblTripsAndVMT	WorkerTripNumber	10.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.3557	19.3498	18.4606	0.0531	0.6600	0.8585	1.1397	0.0911	0.7898	0.8081	0.0000	5,147.0347	5,147.0347	1.6202	0.0000	5,187.5393
Maximum	**2.3557**	**19.3498**	**18.4606**	**0.0531**	**0.6600**	**0.8585**	**1.1397**	**0.0911**	**0.7898**	**0.8081**	**0.0000**	**5,147.0347**	**5,147.0347**	**1.6202**	**0.0000**	**5,187.5393**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.3557	19.3498	18.4606	0.0531	0.3625	0.8585	0.9259	0.0587	0.7898	0.8081	0.0000	5,147.0347	5,147.0347	1.6202	0.0000	5,187.5393
Maximum	**2.3557**	**19.3498**	**18.4606**	**0.0531**	**0.3625**	**0.8585**	**0.9259**	**0.0587**	**0.7898**	**0.8081**	**0.0000**	**5,147.0347**	**5,147.0347**	**1.6202**	**0.0000**	**5,187.5393**

Bypass Valve Construction - Napa County, Summer

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**45.08**	**0.00**	**18.76**	**35.56**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**	**0.0000**	**1.6800e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**	**0.0000**	**1.6800e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Flow Facility- Site Preparation	Site Preparation	2/23/2022	2/23/2022	5	1	
2	Flow Facility- Prep and Pour Foundation	Paving	2/24/2022	3/4/2022	5	7	
3	Flow Facility- Install of Piping	Building Construction	3/5/2022	3/15/2022	5	7	
4	Power Line- Trenching	Trenching	3/16/2022	3/17/2022	5	2	
5	Power Line- Base & Conduit Install	Building Construction	3/18/2022	3/29/2022	5	8	
6	Power Line- Backfill	Grading	3/30/2022	4/5/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.17

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Power Line- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Flow Facility- Prep and Pour Foundation	Cement and Mortar Mixers	1	6.00	9	0.56
Flow Facility- Install of Piping	Cranes	0	4.00	231	0.29

Power Line- Base & Conduit Install	Cranes	0	4.00	231	0.29
Flow Facility- Install of Piping	Forklifts	0	6.00	89	0.20
Power Line- Base & Conduit Install	Forklifts	0	6.00	89	0.20
Flow Facility- Site Preparation	Graders	0	8.00	187	0.41
Flow Facility- Prep and Pour Foundation	Pavers	0	7.00	130	0.42
Flow Facility- Prep and Pour Foundation	Rollers	0	7.00	80	0.38
Power Line- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Flow Facility- Install of Piping	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Base & Conduit Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Flow Facility- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Prep and Pour Foundation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Flow Facility- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Flow Facility- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Flow Facility- Site Preparation	Excavators	1	7.00	158	0.38
Flow Facility- Prep and Pour Foundation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Excavators	1	7.00	158	0.38
Power Line- Trenching	Excavators	1	8.00	158	0.38
Power Line- Trenching	Trenchers	1	8.00	78	0.50
Power Line- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Power Line- Base & Conduit Install	Excavators	1	8.00	158	0.38
Power Line- Base & Conduit Install	Trenchers	1	8.00	78	0.50
Power Line- Base & Conduit Install	Off-Highway Trucks	3	8.00	402	0.38
Power Line- Backfill	Excavators	1	8.00	158	0.38
Power Line- Backfill	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Flow Facility- Install of Piping	4	6.00	1.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Site Preparation	5	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Base & Conduit Install	6	5.00	1.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Backfill	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Prep and Pour Foundation	4	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Trenching	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5410	0.0000	0.5410	0.0589	0.0000	0.0589			0.0000			0.0000
Off-Road	1.4783	11.7704	12.1023	0.0350		0.4764	0.4764		0.4397	0.4397		3,372.6406	3,372.6406	1.0776		3,399.5809
Total	**1.4783**	**11.7704**	**12.1023**	**0.0350**	**0.5410**	**0.4764**	**1.0174**	**0.0589**	**0.4397**	**0.4986**		**3,372.6406**	**3,372.6406**	**1.0776**		**3,399.5809**

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0292	0.9895	0.2099	3.0800e-003	0.0697	2.9700e-003	0.0727	0.0191	2.8400e-003	0.0219		329.6836	329.6836	0.0162		330.0874
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0501**	**1.0013**	**0.3650**	**3.5300e-003**	**0.1190**	**3.2800e-003**	**0.1223**	**0.0322**	**3.1300e-003**	**0.0353**		**374.5831**	**374.5831**	**0.0172**		**375.0138**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2434	0.0000	0.2434	0.0265	0.0000	0.0265			0.0000			0.0000
Off-Road	1.4783	11.7704	12.1023	0.0350		0.4764	0.4764		0.4397	0.4397	0.0000	3,372.6406	3,372.6406	1.0776		3,399.5809
Total	**1.4783**	**11.7704**	**12.1023**	**0.0350**	**0.2434**	**0.4764**	**0.7199**	**0.0265**	**0.4397**	**0.4662**	**0.0000**	**3,372.6406**	**3,372.6406**	**1.0776**		**3,399.5809**

3.2 Flow Facility- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0292	0.9895	0.2099	3.0800e-003	0.0697	2.9700e-003	0.0727	0.0191	2.8400e-003	0.0219		329.6836	329.6836	0.0162		330.0874
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0501**	**1.0013**	**0.3650**	**3.5300e-003**	**0.1190**	**3.2800e-003**	**0.1223**	**0.0322**	**3.1300e-003**	**0.0353**		**374.5831**	**374.5831**	**0.0172**		**375.0138**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2503	9.8099	8.9406	0.0298		0.3830	0.3830		0.3532	0.3532		2,872.2318	2,872.2318	0.9206		2,895.2472
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2503**	**9.8099**	**8.9406**	**0.0298**		**0.3830**	**0.3830**		**0.3532**	**0.3532**		**2,872.2318**	**2,872.2318**	**0.9206**		**2,895.2472**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.1700e-003	0.1414	0.0300	4.4000e-004	9.9600e-003	4.2000e-004	0.0104	2.7300e-003	4.1000e-004	3.1300e-003		47.0977	47.0977	2.3100e-003		47.1553
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0251**	**0.1531**	**0.1850**	**8.9000e-004**	**0.0593**	**7.3000e-004**	**0.0600**	**0.0158**	**7.0000e-004**	**0.0165**		**91.9971**	**91.9971**	**3.3900e-003**		**92.0818**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2503	9.8099	8.9406	0.0298		0.3830	0.3830		0.3532	0.3532	0.0000	2,872.2318	2,872.2318	0.9206		2,895.2472
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2503**	**9.8099**	**8.9406**	**0.0298**		**0.3830**	**0.3830**		**0.3532**	**0.3532**	**0.0000**	**2,872.2318**	**2,872.2318**	**0.9206**		**2,895.2472**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.1700e-003	0.1414	0.0300	4.4000e-004	9.9600e-003	4.2000e-004	0.0104	2.7300e-003	4.1000e-004	3.1300e-003		47.0977	47.0977	2.3100e-003		47.1553
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0251**	**0.1531**	**0.1850**	**8.9000e-004**	**0.0593**	**7.3000e-004**	**0.0600**	**0.0158**	**7.0000e-004**	**0.0165**		**91.9971**	**91.9971**	**3.3900e-003**		**92.0818**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4048	11.3058	11.8515	0.0342		0.4590	0.4590		0.4223	0.4223		3,311.7003	3,311.7003	1.0711		3,338.4771
Total	**1.4048**	**11.3058**	**11.8515**	**0.0342**		**0.4590**	**0.4590**		**0.4223**	**0.4223**		**3,311.7003**	**3,311.7003**	**1.0711**		**3,338.4771**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.1700e-003	0.1414	0.0300	4.4000e-004	9.9600e-003	4.2000e-004	0.0104	2.7300e-003	4.1000e-004	3.1300e-003		47.0977	47.0977	2.3100e-003		47.1553
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0282**	**0.2554**	**0.2095**	**1.1600e-003**	**0.0660**	**9.4000e-004**	**0.0670**	**0.0178**	**9.0000e-004**	**0.0186**		**120.4129**	**120.4129**	**4.7600e-003**		**120.5318**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4048	11.3058	11.8515	0.0342		0.4590	0.4590		0.4223	0.4223	0.0000	3,311.7003	3,311.7003	1.0711		3,338.4771
Total	**1.4048**	**11.3058**	**11.8515**	**0.0342**		**0.4590**	**0.4590**		**0.4223**	**0.4223**	**0.0000**	**3,311.7003**	**3,311.7003**	**1.0711**		**3,338.4771**

3.4 Flow Facility- Install of Piping - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.1700e-003	0.1414	0.0300	4.4000e-004	9.9600e-003	4.2000e-004	0.0104	2.7300e-003	4.1000e-004	3.1300e-003		47.0977	47.0977	2.3100e-003		47.1553
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0209	0.0118	0.1551	4.5000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		44.8994	44.8994	1.0800e-003		44.9264
Total	**0.0282**	**0.2554**	**0.2095**	**1.1600e-003**	**0.0660**	**9.4000e-004**	**0.0670**	**0.0178**	**9.0000e-004**	**0.0186**		**120.4129**	**120.4129**	**4.7600e-003**		**120.5318**

3.5 Power Line- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6312	13.2500	12.6344	0.0351		0.6204	0.6204		0.5708	0.5708		3,401.8600	3,401.8600	1.1002		3,429.3657
Total	**1.6312**	**13.2500**	**12.6344**	**0.0351**		**0.6204**	**0.6204**		**0.5708**	**0.5708**		**3,401.8600**	**3,401.8600**	**1.1002**		**3,429.3657**

3.5 Power Line- Trenching - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0329	1.1132	0.2361	3.4700e-003	0.0785	3.3400e-003	0.0818	0.0215	3.1900e-003	0.0247		370.8941	370.8941	0.0182		371.3483
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0503**	**1.1230**	**0.3654**	**3.8500e-003**	**0.1195**	**3.6000e-003**	**0.1231**	**0.0324**	**3.4300e-003**	**0.0358**		**408.3103**	**408.3103**	**0.0191**		**408.7870**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6312	13.2500	12.6344	0.0351		0.6204	0.6204		0.5708	0.5708	0.0000	3,401.8600	3,401.8600	1.1002		3,429.3657
Total	**1.6312**	**13.2500**	**12.6344**	**0.0351**		**0.6204**	**0.6204**		**0.5708**	**0.5708**	**0.0000**	**3,401.8600**	**3,401.8600**	**1.1002**		**3,429.3657**

3.5 Power Line- Trenching - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0329	1.1132	0.2361	3.4700e-003	0.0785	3.3400e-003	0.0818	0.0215	3.1900e-003	0.0247		370.8941	370.8941	0.0182		371.3483
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0503**	**1.1230**	**0.3654**	**3.8500e-003**	**0.1195**	**3.6000e-003**	**0.1231**	**0.0324**	**3.4300e-003**	**0.0358**		**408.3103**	**408.3103**	**0.0191**		**408.7870**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3270	18.9594	18.2479	0.0515		0.8572	0.8572		0.7886	0.7886		4,988.4791	4,988.4791	1.6134		5,028.8135
Total	**2.3270**	**18.9594**	**18.2479**	**0.0515**		**0.8572**	**0.8572**		**0.7886**	**0.7886**		**4,988.4791**	**4,988.4791**	**1.6134**		**5,028.8135**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.2100e-003	0.2783	0.0590	8.7000e-004	0.0196	8.3000e-004	0.0205	5.3700e-003	8.0000e-004	6.1700e-003		92.7235	92.7235	4.5400e-003		92.8371
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0287**	**0.3903**	**0.2127**	**1.5200e-003**	**0.0675**	**1.3000e-003**	**0.0688**	**0.0182**	**1.2400e-003**	**0.0195**		**158.5555**	**158.5555**	**6.8100e-003**		**158.7258**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3270	18.9594	18.2479	0.0515		0.8572	0.8572		0.7886	0.7886	0.0000	4,988.4791	4,988.4791	1.6134		5,028.8135
Total	**2.3270**	**18.9594**	**18.2479**	**0.0515**		**0.8572**	**0.8572**		**0.7886**	**0.7886**	**0.0000**	**4,988.4791**	**4,988.4791**	**1.6134**		**5,028.8135**

3.6 Power Line- Base & Conduit Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.2100e-003	0.2783	0.0590	8.7000e-004	0.0196	8.3000e-004	0.0205	5.3700e-003	8.0000e-004	6.1700e-003		92.7235	92.7235	4.5400e-003		92.8371
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0287**	**0.3903**	**0.2127**	**1.5200e-003**	**0.0675**	**1.3000e-003**	**0.0688**	**0.0182**	**1.2400e-003**	**0.0195**		**158.5555**	**158.5555**	**6.8100e-003**		**158.7258**

3.7 Power Line- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0100e-003	0.0000	6.0100e-003	9.1000e-004	0.0000	9.1000e-004			0.0000			0.0000
Off-Road	1.3891	11.1102	11.7009	0.0341		0.4473	0.4473		0.4115	0.4115		3,299.2050	3,299.2050	1.0670		3,325.8807
Total	**1.3891**	**11.1102**	**11.7009**	**0.0341**	**6.0100e-003**	**0.4473**	**0.4533**	**9.1000e-004**	**0.4115**	**0.4124**		**3,299.2050**	**3,299.2050**	**1.0670**		**3,325.8807**

3.7 Power Line- Backfill - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0131	0.4453	0.0945	1.3900e-003	0.0314	1.3400e-003	0.0327	8.5900e-003	1.2800e-003	9.8700e-003		148.3576	148.3576	7.2700e-003		148.5393
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0306**	**0.4551**	**0.2237**	**1.7700e-003**	**0.0725**	**1.6000e-003**	**0.0741**	**0.0195**	**1.5200e-003**	**0.0210**		**185.7738**	**185.7738**	**8.1700e-003**		**185.9780**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7000e-003	0.0000	2.7000e-003	4.1000e-004	0.0000	4.1000e-004			0.0000			0.0000
Off-Road	1.3891	11.1102	11.7009	0.0341		0.4473	0.4473		0.4115	0.4115	0.0000	3,299.2050	3,299.2050	1.0670		3,325.8807
Total	**1.3891**	**11.1102**	**11.7009**	**0.0341**	**2.7000e-003**	**0.4473**	**0.4500**	**4.1000e-004**	**0.4115**	**0.4119**	**0.0000**	**3,299.2050**	**3,299.2050**	**1.0670**		**3,325.8807**

3.7 Power Line- Backfill - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0131	0.4453	0.0945	1.3900e-003	0.0314	1.3400e-003	0.0327	8.5900e-003	1.2800e-003	9.8700e-003		148.3576	148.3576	7.2700e-003		148.5393
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0306**	**0.4551**	**0.2237**	**1.7700e-003**	**0.0725**	**1.6000e-003**	**0.0741**	**0.0195**	**1.5200e-003**	**0.0210**		**185.7738**	**185.7738**	**8.1700e-003**		**185.9780**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Unmitigated	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.5500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	7.0000e-005	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**		**1.6800e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.5500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	7.0000e-005	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**		**1.6800e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Bypass Valve Construction

Napa County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	7.20	1000sqft	0.17	7,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Bypass Valve Construction - Napa County, Winter

Project Characteristics -

Land Use -

Construction Phase - Construcion pahsing and timing updated to matych the project and infomratio provided by the applicant.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Grading - Cut and fill information provided by Wood Rodgers

Trips and VMT - Worker and hul trips updated to match the project description.

Construction Off-road Equipment Mitigation - Mitigation accounts for BMP

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	5.00	7.00
tblConstructionPhase	NumDays	100.00	7.00
tblConstructionPhase	NumDays	100.00	8.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	PhaseEndDate	8/25/2021	3/4/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/23/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/24/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/23/2022
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	70.00
tblGrading	MaterialExported	0.00	25.00
tblGrading	MaterialImported	0.00	70.00

Bypass Valve Construction - Napa County, Winter

tblGrading	MaterialImported	0.00	25.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

Bypass Valve Construction - Napa County, Winter

tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	6.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	HaulingTripNumber	18.00	9.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	WorkerTripNumber	13.00	6.00
tblTripsAndVMT	WorkerTripNumber	10.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.3570	19.3601	18.4637	0.0530	0.6600	0.8585	1.1398	0.0911	0.7899	0.8081	0.0000	5,142.0411	5,142.0411	1.6205	0.0000	5,182.5535
Maximum	**2.3570**	**19.3601**	**18.4637**	**0.0530**	**0.6600**	**0.8585**	**1.1398**	**0.0911**	**0.7899**	**0.8081**	**0.0000**	**5,142.0411**	**5,142.0411**	**1.6205**	**0.0000**	**5,182.5535**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.3570	19.3601	18.4637	0.0530	0.3625	0.8585	0.9260	0.0587	0.7899	0.8081	0.0000	5,142.0410	5,142.0410	1.6205	0.0000	5,182.5535
Maximum	**2.3570**	**19.3601**	**18.4637**	**0.0530**	**0.3625**	**0.8585**	**0.9260**	**0.0587**	**0.7899**	**0.8081**	**0.0000**	**5,142.0410**	**5,142.0410**	**1.6205**	**0.0000**	**5,182.5535**

Bypass Valve Construction - Napa County, Winter

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**45.08**	**0.00**	**18.76**	**35.56**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**	**0.0000**	**1.6800e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**	**0.0000**	**1.6800e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Flow Facility- Site Preparation	Site Preparation	2/23/2022	2/23/2022	5	1	
2	Flow Facility- Prep and Pour Foundation	Paving	2/24/2022	3/4/2022	5	7	
3	Flow Facility- Install of Piping	Building Construction	3/5/2022	3/15/2022	5	7	
4	Power Line- Trenching	Trenching	3/16/2022	3/17/2022	5	2	
5	Power Line- Base & Conduit Install	Building Construction	3/18/2022	3/29/2022	5	8	
6	Power Line- Backfill	Grading	3/30/2022	4/5/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.17

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Power Line- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Flow Facility- Prep and Pour Foundation	Cement and Mortar Mixers	1	6.00	9	0.56
Flow Facility- Install of Piping	Cranes	0	4.00	231	0.29

Bypass Valve Construction - Napa County, Winter

Power Line- Base & Conduit Install	Cranes	0	4.00	231	0.29
Flow Facility- Install of Piping	Forklifts	0	6.00	89	0.20
Power Line- Base & Conduit Install	Forklifts	0	6.00	89	0.20
Flow Facility- Site Preparation	Graders	0	8.00	187	0.41
Flow Facility- Prep and Pour Foundation	Pavers	0	7.00	130	0.42
Flow Facility- Prep and Pour Foundation	Rollers	0	7.00	80	0.38
Power Line- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Flow Facility- Install of Piping	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Base & Conduit Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Flow Facility- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Prep and Pour Foundation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Flow Facility- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Flow Facility- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Flow Facility- Site Preparation	Excavators	1	7.00	158	0.38
Flow Facility- Prep and Pour Foundation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Excavators	1	7.00	158	0.38
Power Line- Trenching	Excavators	1	8.00	158	0.38
Power Line- Trenching	Trenchers	1	8.00	78	0.50
Power Line- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Power Line- Base & Conduit Install	Excavators	1	8.00	158	0.38
Power Line- Base & Conduit Install	Trenchers	1	8.00	78	0.50
Power Line- Base & Conduit Install	Off-Highway Trucks	3	8.00	402	0.38
Power Line- Backfill	Excavators	1	8.00	158	0.38
Power Line- Backfill	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Flow Facility- Install of Piping	4	6.00	1.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Site Preparation	5	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Base & Conduit Install	6	5.00	1.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Backfill	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Prep and Pour Foundation	4	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Trenching	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5410	0.0000	0.5410	0.0589	0.0000	0.0589			0.0000			0.0000
Off-Road	1.4783	11.7704	12.1023	0.0350		0.4764	0.4764		0.4397	0.4397		3,372.6406	3,372.6406	1.0776		3,399.5809
Total	**1.4783**	**11.7704**	**12.1023**	**0.0350**	**0.5410**	**0.4764**	**1.0174**	**0.0589**	**0.4397**	**0.4986**		**3,372.6406**	**3,372.6406**	**1.0776**		**3,399.5809**

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0300	1.0132	0.2251	3.0300e-003	0.0697	3.0200e-003	0.0728	0.0191	2.8900e-003	0.0220		324.3673	324.3673	0.0170		324.7924
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0520**	**1.0282**	**0.3742**	**3.4500e-003**	**0.1190**	**3.3300e-003**	**0.1224**	**0.0322**	**3.1800e-003**	**0.0354**		**365.8976**	**365.8976**	**0.0180**		**366.3482**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2434	0.0000	0.2434	0.0265	0.0000	0.0265			0.0000			0.0000
Off-Road	1.4783	11.7704	12.1023	0.0350		0.4764	0.4764		0.4397	0.4397	0.0000	3,372.6406	3,372.6406	1.0776		3,399.5809
Total	**1.4783**	**11.7704**	**12.1023**	**0.0350**	**0.2434**	**0.4764**	**0.7199**	**0.0265**	**0.4397**	**0.4662**	**0.0000**	**3,372.6406**	**3,372.6406**	**1.0776**		**3,399.5809**

3.2 Flow Facility- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0300	1.0132	0.2251	3.0300e-003	0.0697	3.0200e-003	0.0728	0.0191	2.8900e-003	0.0220		324.3673	324.3673	0.0170		324.7924
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0520**	**1.0282**	**0.3742**	**3.4500e-003**	**0.1190**	**3.3300e-003**	**0.1224**	**0.0322**	**3.1800e-003**	**0.0354**		**365.8976**	**365.8976**	**0.0180**		**366.3482**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2503	9.8099	8.9406	0.0298		0.3830	0.3830		0.3532	0.3532		2,872.2318	2,872.2318	0.9206		2,895.2472
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2503**	**9.8099**	**8.9406**	**0.0298**		**0.3830**	**0.3830**		**0.3532**	**0.3532**		**2,872.2318**	**2,872.2318**	**0.9206**		**2,895.2472**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.2800e-003	0.1447	0.0322	4.3000e-004	9.9600e-003	4.3000e-004	0.0104	2.7300e-003	4.1000e-004	3.1400e-003		46.3382	46.3382	2.4300e-003		46.3989
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0263**	**0.1597**	**0.1813**	**8.5000e-004**	**0.0593**	**7.4000e-004**	**0.0600**	**0.0158**	**7.0000e-004**	**0.0165**		**87.8685**	**87.8685**	**3.4500e-003**		**87.9547**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2503	9.8099	8.9406	0.0298		0.3830	0.3830		0.3532	0.3532	0.0000	2,872.2318	2,872.2318	0.9206		2,895.2472
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2503**	**9.8099**	**8.9406**	**0.0298**		**0.3830**	**0.3830**		**0.3532**	**0.3532**	**0.0000**	**2,872.2318**	**2,872.2318**	**0.9206**		**2,895.2472**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.2800e-003	0.1447	0.0322	4.3000e-004	9.9600e-003	4.3000e-004	0.0104	2.7300e-003	4.1000e-004	3.1400e-003		46.3382	46.3382	2.4300e-003		46.3989
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0263**	**0.1597**	**0.1813**	**8.5000e-004**	**0.0593**	**7.4000e-004**	**0.0600**	**0.0158**	**7.0000e-004**	**0.0165**		**87.8685**	**87.8685**	**3.4500e-003**		**87.9547**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4048	11.3058	11.8515	0.0342		0.4590	0.4590		0.4223	0.4223		3,311.7003	3,311.7003	1.0711		3,338.4771
Total	**1.4048**	**11.3058**	**11.8515**	**0.0342**		**0.4590**	**0.4590**		**0.4223**	**0.4223**		**3,311.7003**	**3,311.7003**	**1.0711**		**3,338.4771**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.2800e-003	0.1447	0.0322	4.3000e-004	9.9600e-003	4.3000e-004	0.0104	2.7300e-003	4.1000e-004	3.1400e-003		46.3382	46.3382	2.4300e-003		46.3989
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0296**	**0.2630**	**0.2095**	**1.1100e-003**	**0.0660**	**9.6000e-004**	**0.0670**	**0.0178**	**9.1000e-004**	**0.0187**		**115.5935**	**115.5935**	**4.9400e-003**		**115.7170**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4048	11.3058	11.8515	0.0342		0.4590	0.4590		0.4223	0.4223	0.0000	3,311.7003	3,311.7003	1.0711		3,338.4771
Total	**1.4048**	**11.3058**	**11.8515**	**0.0342**		**0.4590**	**0.4590**		**0.4223**	**0.4223**	**0.0000**	**3,311.7003**	**3,311.7003**	**1.0711**		**3,338.4771**

3.4 Flow Facility- Install of Piping - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.2800e-003	0.1447	0.0322	4.3000e-004	9.9600e-003	4.3000e-004	0.0104	2.7300e-003	4.1000e-004	3.1400e-003		46.3382	46.3382	2.4300e-003		46.3989
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0220	0.0150	0.1491	4.2000e-004	0.0493	3.1000e-004	0.0496	0.0131	2.9000e-004	0.0134		41.5303	41.5303	1.0200e-003		41.5558
Total	**0.0296**	**0.2630**	**0.2095**	**1.1100e-003**	**0.0660**	**9.6000e-004**	**0.0670**	**0.0178**	**9.1000e-004**	**0.0187**		**115.5935**	**115.5935**	**4.9400e-003**		**115.7170**

3.5 Power Line- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6312	13.2500	12.6344	0.0351		0.6204	0.6204		0.5708	0.5708		3,401.8600	3,401.8600	1.1002		3,429.3657
Total	**1.6312**	**13.2500**	**12.6344**	**0.0351**		**0.6204**	**0.6204**		**0.5708**	**0.5708**		**3,401.8600**	**3,401.8600**	**1.1002**		**3,429.3657**

3.5 Power Line- Trenching - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0337	1.1399	0.2533	3.4100e-003	0.0785	3.4000e-003	0.0819	0.0215	3.2600e-003	0.0247		364.9132	364.9132	0.0191		365.3914
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0521**	**1.1523**	**0.3775**	**3.7600e-003**	**0.1195**	**3.6600e-003**	**0.1232**	**0.0324**	**3.5000e-003**	**0.0359**		**399.5218**	**399.5218**	**0.0200**		**400.0213**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6312	13.2500	12.6344	0.0351		0.6204	0.6204		0.5708	0.5708	0.0000	3,401.8600	3,401.8600	1.1002		3,429.3657
Total	**1.6312**	**13.2500**	**12.6344**	**0.0351**		**0.6204**	**0.6204**		**0.5708**	**0.5708**	**0.0000**	**3,401.8600**	**3,401.8600**	**1.1002**		**3,429.3657**

3.5 Power Line- Trenching - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0337	1.1399	0.2533	3.4100e-003	0.0785	3.4000e-003	0.0819	0.0215	3.2600e-003	0.0247		364.9132	364.9132	0.0191		365.3914
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0521**	**1.1523**	**0.3775**	**3.7600e-003**	**0.1195**	**3.6600e-003**	**0.1232**	**0.0324**	**3.5000e-003**	**0.0359**		**399.5218**	**399.5218**	**0.0200**		**400.0213**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3270	18.9594	18.2479	0.0515		0.8572	0.8572		0.7886	0.7886		4,988.4791	4,988.4791	1.6134		5,028.8135
Total	**2.3270**	**18.9594**	**18.2479**	**0.0515**		**0.8572**	**0.8572**		**0.7886**	**0.7886**		**4,988.4791**	**4,988.4791**	**1.6134**		**5,028.8135**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.4300e-003	0.2850	0.0633	8.5000e-004	0.0196	8.5000e-004	0.0205	5.3700e-003	8.1000e-004	6.1900e-003		91.2283	91.2283	4.7800e-003		91.3479
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0300**	**0.4007**	**0.2158**	**1.4600e-003**	**0.0675**	**1.3300e-003**	**0.0688**	**0.0182**	**1.2600e-003**	**0.0195**		**153.5619**	**153.5619**	**7.1200e-003**		**153.7400**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3270	18.9594	18.2479	0.0515		0.8572	0.8572		0.7886	0.7886	0.0000	4,988.4791	4,988.4791	1.6134		5,028.8135
Total	**2.3270**	**18.9594**	**18.2479**	**0.0515**		**0.8572**	**0.8572**		**0.7886**	**0.7886**	**0.0000**	**4,988.4791**	**4,988.4791**	**1.6134**		**5,028.8135**

3.6 Power Line- Base & Conduit Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.4300e-003	0.2850	0.0633	8.5000e-004	0.0196	8.5000e-004	0.0205	5.3700e-003	8.1000e-004	6.1900e-003		91.2283	91.2283	4.7800e-003		91.3479
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0300**	**0.4007**	**0.2158**	**1.4600e-003**	**0.0675**	**1.3300e-003**	**0.0688**	**0.0182**	**1.2600e-003**	**0.0195**		**153.5619**	**153.5619**	**7.1200e-003**		**153.7400**

3.7 Power Line- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0100e-003	0.0000	6.0100e-003	9.1000e-004	0.0000	9.1000e-004			0.0000			0.0000
Off-Road	1.3891	11.1102	11.7009	0.0341		0.4473	0.4473		0.4115	0.4115		3,299.2050	3,299.2050	1.0670		3,325.8807
Total	**1.3891**	**11.1102**	**11.7009**	**0.0341**	**6.0100e-003**	**0.4473**	**0.4533**	**9.1000e-004**	**0.4115**	**0.4124**		**3,299.2050**	**3,299.2050**	**1.0670**		**3,325.8807**

3.7 Power Line- Backfill - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0135	0.4559	0.1013	1.3600e-003	0.0314	1.3600e-003	0.0328	8.5900e-003	1.3000e-003	9.9000e-003		145.9653	145.9653	7.6500e-003		146.1566
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0318**	**0.4684**	**0.2256**	**1.7100e-003**	**0.0725**	**1.6200e-003**	**0.0741**	**0.0195**	**1.5400e-003**	**0.0210**		**180.5738**	**180.5738**	**8.5000e-003**		**180.7864**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7000e-003	0.0000	2.7000e-003	4.1000e-004	0.0000	4.1000e-004			0.0000			0.0000
Off-Road	1.3891	11.1102	11.7009	0.0341		0.4473	0.4473		0.4115	0.4115	0.0000	3,299.2050	3,299.2050	1.0670		3,325.8807
Total	**1.3891**	**11.1102**	**11.7009**	**0.0341**	**2.7000e-003**	**0.4473**	**0.4500**	**4.1000e-004**	**0.4115**	**0.4119**	**0.0000**	**3,299.2050**	**3,299.2050**	**1.0670**		**3,325.8807**

3.7 Power Line- Backfill - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0135	0.4559	0.1013	1.3600e-003	0.0314	1.3600e-003	0.0328	8.5900e-003	1.3000e-003	9.9000e-003		145.9653	145.9653	7.6500e-003		146.1566
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0318**	**0.4684**	**0.2256**	**1.7100e-003**	**0.0725**	**1.6200e-003**	**0.0741**	**0.0195**	**1.5400e-003**	**0.0210**		**180.5738**	**180.5738**	**8.5000e-003**		**180.7864**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Unmitigated	3.4400e-003	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.5500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	7.0000e-005	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**		**1.6800e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.5500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	7.0000e-005	1.0000e-005	7.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.5800e-003	1.5800e-003	0.0000		1.6800e-003
Total	**3.4400e-003**	**1.0000e-005**	**7.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.5800e-003**	**1.5800e-003**	**0.0000**		**1.6800e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Bypass Valve Construction

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	7.20	1000sqft	0.17	7,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Bypass Valve Construction - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construcion pahsing and timing updated to matych the project and infomratio provided by the applicant.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Grading - Cut and fill information provided by Wood Rodgers

Trips and VMT - Worker and hul trips updated to match the project description.

Construction Off-road Equipment Mitigation - Mitigation accounts for BMP

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	5.00	7.00
tblConstructionPhase	NumDays	100.00	7.00
tblConstructionPhase	NumDays	100.00	8.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	PhaseEndDate	8/25/2021	3/4/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/23/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/24/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/23/2022
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	70.00
tblGrading	MaterialExported	0.00	25.00
tblGrading	MaterialImported	0.00	70.00

Bypass Valve Construction - Napa County, Annual

tblGrading	MaterialImported	0.00	25.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

Bypass Valve Construction - Napa County, Annual

tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	6.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	HaulingTripNumber	18.00	9.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	WorkerTripNumber	13.00	6.00
tblTripsAndVMT	WorkerTripNumber	10.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0249	0.2025	0.1969	5.9000e-004	1.3200e-003	8.3700e-003	9.6900e-003	3.1000e-004	7.7100e-003	8.0200e-003	0.0000	51.9984	51.9984	0.0162	0.0000	52.4029
Maximum	**0.0249**	**0.2025**	**0.1969**	**5.9000e-004**	**1.3200e-003**	**8.3700e-003**	**9.6900e-003**	**3.1000e-004**	**7.7100e-003**	**8.0200e-003**	**0.0000**	**51.9984**	**51.9984**	**0.0162**	**0.0000**	**52.4029**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0249	0.2025	0.1969	5.9000e-004	1.1600e-003	8.3700e-003	9.5300e-003	2.9000e-004	7.7100e-003	8.0000e-003	0.0000	51.9984	51.9984	0.0162	0.0000	52.4029
Maximum	**0.0249**	**0.2025**	**0.1969**	**5.9000e-004**	**1.1600e-003**	**8.3700e-003**	**9.5300e-003**	**2.9000e-004**	**7.7100e-003**	**8.0000e-003**	**0.0000**	**51.9984**	**51.9984**	**0.0162**	**0.0000**	**52.4029**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**12.12**	**0.00**	**1.65**	**6.45**	**0.00**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
4	**12-15-2021**	**3-14-2022**	0.0877	0.0877
5	**3-15-2022**	**6-14-2022**	0.1417	0.1417
		Highest	0.1417	0.1417

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.2000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.2000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Bypass Valve Construction - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Flow Facility- Site Preparation	Site Preparation	2/23/2022	2/23/2022	5	1	
2	Flow Facility- Prep and Pour Foundation	Paving	2/24/2022	3/4/2022	5	7	
3	Flow Facility- Install of Piping	Building Construction	3/5/2022	3/15/2022	5	7	
4	Power Line- Trenching	Trenching	3/16/2022	3/17/2022	5	2	
5	Power Line- Base & Conduit Install	Building Construction	3/18/2022	3/29/2022	5	8	
6	Power Line- Backfill	Grading	3/30/2022	4/5/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.17

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Power Line- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Flow Facility- Prep and Pour Foundation	Cement and Mortar Mixers	1	6.00	9	0.56
Flow Facility- Install of Piping	Cranes	0	4.00	231	0.29
Power Line- Base & Conduit Install	Cranes	0	4.00	231	0.29
Flow Facility- Install of Piping	Forklifts	0	6.00	89	0.20
Power Line- Base & Conduit Install	Forklifts	0	6.00	89	0.20
Flow Facility- Site Preparation	Graders	0	8.00	187	0.41
Flow Facility- Prep and Pour Foundation	Pavers	0	7.00	130	0.42
Flow Facility- Prep and Pour Foundation	Rollers	0	7.00	80	0.38

Power Line- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Flow Facility- Install of Piping	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Base & Conduit Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Flow Facility- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Prep and Pour Foundation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Flow Facility- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Flow Facility- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Flow Facility- Site Preparation	Excavators	1	7.00	158	0.38
Flow Facility- Prep and Pour Foundation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Excavators	1	7.00	158	0.38
Power Line- Trenching	Excavators	1	8.00	158	0.38
Power Line- Trenching	Trenchers	1	8.00	78	0.50
Power Line- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Power Line- Base & Conduit Install	Excavators	1	8.00	158	0.38
Power Line- Base & Conduit Install	Trenchers	1	8.00	78	0.50
Power Line- Base & Conduit Install	Off-Highway Trucks	3	8.00	402	0.38
Power Line- Backfill	Excavators	1	8.00	158	0.38
Power Line- Backfill	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Flow Facility- Install of Piping	4	6.00	1.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Site Preparation	5	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Base & Conduit Install	6	5.00	1.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Backfill	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Prep and Pour Foundation	4	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Trenching	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.4000e-004	5.8900e-003	6.0500e-003	2.0000e-005		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	1.5298	1.5298	4.9000e-004	0.0000	1.5420
Total	**7.4000e-004**	**5.8900e-003**	**6.0500e-003**	**2.0000e-005**	**2.7000e-004**	**2.4000e-004**	**5.1000e-004**	**3.0000e-005**	**2.2000e-004**	**2.5000e-004**	**0.0000**	**1.5298**	**1.5298**	**4.9000e-004**	**0.0000**	**1.5420**

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	7.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0191
Total	**2.0000e-005**	**5.1000e-004**	**1.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.1676**	**0.1676**	**1.0000e-005**	**0.0000**	**0.1678**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.4000e-004	5.8900e-003	6.0500e-003	2.0000e-005		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	1.5298	1.5298	4.9000e-004	0.0000	1.5420
Total	**7.4000e-004**	**5.8900e-003**	**6.0500e-003**	**2.0000e-005**	**1.2000e-004**	**2.4000e-004**	**3.6000e-004**	**1.0000e-005**	**2.2000e-004**	**2.3000e-004**	**0.0000**	**1.5298**	**1.5298**	**4.9000e-004**	**0.0000**	**1.5420**

3.2 Flow Facility- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	7.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0191
Total	**2.0000e-005**	**5.1000e-004**	**1.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.1676**	**0.1676**	**1.0000e-005**	**0.0000**	**0.1678**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.3800e-003	0.0343	0.0313	1.0000e-004		1.3400e-003	1.3400e-003		1.2400e-003	1.2400e-003	0.0000	9.1198	9.1198	2.9200e-003	0.0000	9.1928
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.3800e-003**	**0.0343**	**0.0313**	**1.0000e-004**		**1.3400e-003**	**1.3400e-003**		**1.2400e-003**	**1.2400e-003**	**0.0000**	**9.1198**	**9.1198**	**2.9200e-003**	**0.0000**	**9.1928**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**8.0000e-005**	**5.5000e-004**	**6.1000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.2818**	**0.2818**	**1.0000e-005**	**0.0000**	**0.2821**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.3800e-003	0.0343	0.0313	1.0000e-004		1.3400e-003	1.3400e-003		1.2400e-003	1.2400e-003	0.0000	9.1198	9.1198	2.9200e-003	0.0000	9.1928
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.3800e-003**	**0.0343**	**0.0313**	**1.0000e-004**		**1.3400e-003**	**1.3400e-003**		**1.2400e-003**	**1.2400e-003**	**0.0000**	**9.1198**	**9.1198**	**2.9200e-003**	**0.0000**	**9.1928**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**8.0000e-005**	**5.5000e-004**	**6.1000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.2818**	**0.2818**	**1.0000e-005**	**0.0000**	**0.2821**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9200e-003	0.0396	0.0415	1.2000e-004		1.6100e-003	1.6100e-003		1.4800e-003	1.4800e-003	0.0000	10.5151	10.5151	3.4000e-003	0.0000	10.6002
Total	**4.9200e-003**	**0.0396**	**0.0415**	**1.2000e-004**		**1.6100e-003**	**1.6100e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**10.5151**	**10.5151**	**3.4000e-003**	**0.0000**	**10.6002**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	1.0000e-005	3.6000e-004	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0893	0.0893	0.0000	0.0000	0.0894
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**9.0000e-005**	**9.1000e-004**	**7.0000e-004**	**0.0000**	**2.2000e-004**	**0.0000**	**2.3000e-004**	**6.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.3711**	**0.3711**	**1.0000e-005**	**0.0000**	**0.3715**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9200e-003	0.0396	0.0415	1.2000e-004		1.6100e-003	1.6100e-003		1.4800e-003	1.4800e-003	0.0000	10.5151	10.5151	3.4000e-003	0.0000	10.6001
Total	**4.9200e-003**	**0.0396**	**0.0415**	**1.2000e-004**		**1.6100e-003**	**1.6100e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**10.5151**	**10.5151**	**3.4000e-003**	**0.0000**	**10.6001**

3.4 Flow Facility- Install of Piping - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	1.0000e-005	3.6000e-004	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0893	0.0893	0.0000	0.0000	0.0894
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**9.0000e-005**	**9.1000e-004**	**7.0000e-004**	**0.0000**	**2.2000e-004**	**0.0000**	**2.3000e-004**	**6.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.3711**	**0.3711**	**1.0000e-005**	**0.0000**	**0.3715**

3.5 Power Line- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.6300e-003	0.0133	0.0126	4.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	3.0861	3.0861	1.0000e-003	0.0000	3.1111
Total	**1.6300e-003**	**0.0133**	**0.0126**	**4.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**3.0861**	**3.0861**	**1.0000e-003**	**0.0000**	**3.1111**

3.5 Power Line- Trenching - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**5.0000e-005**	**1.1500e-003**	**3.6000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.3659**	**0.3659**	**2.0000e-005**	**0.0000**	**0.3664**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.6300e-003	0.0133	0.0126	4.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	3.0861	3.0861	1.0000e-003	0.0000	3.1111
Total	**1.6300e-003**	**0.0133**	**0.0126**	**4.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**3.0861**	**3.0861**	**1.0000e-003**	**0.0000**	**3.1111**

3.5 Power Line- Trenching - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**5.0000e-005**	**1.1500e-003**	**3.6000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.3659**	**0.3659**	**2.0000e-005**	**0.0000**	**0.3664**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.3100e-003	0.0758	0.0730	2.1000e-004		3.4300e-003	3.4300e-003		3.1500e-003	3.1500e-003	0.0000	18.1019	18.1019	5.8500e-003	0.0000	18.2483
Total	**9.3100e-003**	**0.0758**	**0.0730**	**2.1000e-004**		**3.4300e-003**	**3.4300e-003**		**3.1500e-003**	**3.1500e-003**	**0.0000**	**18.1019**	**18.1019**	**5.8500e-003**	**0.0000**	**18.2483**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	1.0000e-005	4.1000e-004	1.0000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1021	0.1021	1.0000e-005	0.0000	0.1022
Worker	7.0000e-005	4.0000e-005	4.8000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1270	0.1270	0.0000	0.0000	0.1270
Total	**1.1000e-004**	**1.5900e-003**	**8.2000e-004**	**0.0000**	**2.7000e-004**	**0.0000**	**2.7000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.5632**	**0.5632**	**3.0000e-005**	**0.0000**	**0.5638**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.3100e-003	0.0758	0.0730	2.1000e-004		3.4300e-003	3.4300e-003		3.1500e-003	3.1500e-003	0.0000	18.1019	18.1019	5.8500e-003	0.0000	18.2482
Total	**9.3100e-003**	**0.0758**	**0.0730**	**2.1000e-004**		**3.4300e-003**	**3.4300e-003**		**3.1500e-003**	**3.1500e-003**	**0.0000**	**18.1019**	**18.1019**	**5.8500e-003**	**0.0000**	**18.2482**

3.6 Power Line- Base & Conduit Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	1.0000e-005	4.1000e-004	1.0000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1021	0.1021	1.0000e-005	0.0000	0.1022
Worker	7.0000e-005	4.0000e-005	4.8000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1270	0.1270	0.0000	0.0000	0.1270
Total	**1.1000e-004**	**1.5900e-003**	**8.2000e-004**	**0.0000**	**2.7000e-004**	**0.0000**	**2.7000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.5632**	**0.5632**	**3.0000e-005**	**0.0000**	**0.5638**

3.7 Power Line- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.4700e-003	0.0278	0.0293	9.0000e-005		1.1200e-003	1.1200e-003		1.0300e-003	1.0300e-003	0.0000	7.4825	7.4825	2.4200e-003	0.0000	7.5430
Total	**3.4700e-003**	**0.0278**	**0.0293**	**9.0000e-005**	**2.0000e-005**	**1.1200e-003**	**1.1400e-003**	**0.0000**	**1.0300e-003**	**1.0300e-003**	**0.0000**	**7.4825**	**7.4825**	**2.4200e-003**	**0.0000**	**7.5430**

3.7 Power Line- Backfill - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**7.0000e-005**	**1.1700e-003**	**5.4000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.4135**	**0.4135**	**2.0000e-005**	**0.0000**	**0.4140**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.4700e-003	0.0278	0.0293	9.0000e-005		1.1200e-003	1.1200e-003		1.0300e-003	1.0300e-003	0.0000	7.4825	7.4825	2.4200e-003	0.0000	7.5430
Total	**3.4700e-003**	**0.0278**	**0.0293**	**9.0000e-005**	**1.0000e-005**	**1.1200e-003**	**1.1300e-003**	**0.0000**	**1.0300e-003**	**1.0300e-003**	**0.0000**	**7.4825**	**7.4825**	**2.4200e-003**	**0.0000**	**7.5430**

3.7 Power Line- Backfill - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**7.0000e-005**	**1.1700e-003**	**5.4000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.4135**	**0.4135**	**2.0000e-005**	**0.0000**	**0.4140**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Unmitigated	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.7000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Total	**6.3000e-004**	**0.0000**	**7.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.7000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Total	**6.3000e-004**	**0.0000**	**7.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Outfall Construction Activities

Napa County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.30	1000sqft	0.10	4,300.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Outfall Construction Activities - Napa County, Summer

Project Characteristics -

Land Use -

Construction Phase - Construcion phase and timing updated to match information provided for the Project

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Grading - Import and export info provided in Project description

Trips and VMT - Trips u[dated to match info in the PD

Construction Off-road Equipment Mitigation - BMP is show as "mitigation"

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	6.00
tblConstructionPhase	NumDays	1.00	4.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	100.00	10.00
tblConstructionPhase	NumDays	5.00	10.00
tblConstructionPhase	PhaseEndDate	8/18/2021	4/19/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	4/11/2022
tblConstructionPhase	PhaseStartDate	4/1/2021	4/12/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	4/6/2022
tblGrading	AcresOfGrading	0.00	2.50
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	5.00

Outfall Construction Activities - Napa County, Summer

tblGrading	MaterialImported	0.00	200.00
tblGrading	MaterialImported	0.00	5.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	0.00	2.00
tblTripsAndVMT	HaulingTripNumber	20.00	10.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.0626	16.3868	16.0929	0.0503	0.6130	0.6351	1.1019	0.0787	0.5857	0.6033	0.0000	4,869.0882	4,869.0882	1.5200	0.0000	4,907.0870
Maximum	**2.0626**	**16.3868**	**16.0929**	**0.0503**	**0.6130**	**0.6351**	**1.1019**	**0.0787**	**0.5857**	**0.6033**	**0.0000**	**4,869.0882**	**4,869.0882**	**1.5200**	**0.0000**	**4,907.0870**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.0626	16.3868	16.0929	0.0503	0.3176	0.6351	0.8066	0.0467	0.5857	0.6033	0.0000	4,869.0882	4,869.0882	1.5200	0.0000	4,907.0870
Maximum	**2.0626**	**16.3868**	**16.0929**	**0.0503**	**0.3176**	**0.6351**	**0.8066**	**0.0467**	**0.5857**	**0.6033**	**0.0000**	**4,869.0882**	**4,869.0882**	**1.5200**	**0.0000**	**4,907.0870**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**48.19**	**0.00**	**26.80**	**40.71**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.0600e-003**	**0.0000**	**4.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**0.0000**	**1.0000e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.0600e-003**	**0.0000**	**4.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**0.0000**	**1.0000e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Discharge Headwall- Site Preparation	Site Preparation	4/6/2022	4/11/2022	5	4	
2	Pour Headwall & Install Valve	Building Construction	4/12/2022	4/19/2022	5	6	
3	Rip Rap- Tree Removal	Site Preparation	4/20/2022	4/26/2022	5	5	
4	Rip Rap- Install	Building Construction	4/27/2022	5/10/2022	5	10	
5	Rip Rap- Testing	Paving	5/11/2022	5/24/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Rip Rap- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Rip Rap- Install	Cranes	0	4.00	231	0.29
Rip Rap- Install	Forklifts	0	6.00	89	0.20
Rip Rap- Tree Removal	Graders	0	8.00	187	0.41
Pour Headwall & Install Valve	Cranes	0	4.00	231	0.29

Pour Headwall & Install Valve	Forklifts	0	6.00	89	0.20
Discharge Headwall- Site Preparation	Graders	0	8.00	187	0.41
Rip Rap- Testing	Pavers	0	7.00	130	0.42
Rip Rap- Testing	Rollers	0	7.00	80	0.38
Rip Rap- Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Pour Headwall & Install Valve	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Tree Removal	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Excavators	1	8.00	158	0.38
Discharge Headwall- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Discharge Headwall- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Pour Headwall & Install Valve	Off-Highway Trucks	3	8.00	402	0.38
Pour Headwall & Install Valve	Dumpers/Tenders	1	8.00	16	0.38
Pour Headwall & Install Valve	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Tree Removal	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Off-Highway Trucks	2	8.00	402	0.38
Rip Rap- Install	Excavators	1	8.00	158	0.38
Rip Rap- Install	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Install	Off-Highway Trucks	3	8.00	402	0.38
Rip Rap- Testing	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Outfall Construction Activities - Napa County, Summer

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Rip Rap- Install	6	5.00	1.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Discharge Headwall- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Testing	2	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pour Headwall & Install Valve	6	5.00	1.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Tree Removal	5	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.1331	0.0000	0.1331	0.0144	0.0000	0.0144			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496		3,435.4551	3,435.4551	1.0979		3,462.9033
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.1331**	**0.4872**	**0.6203**	**0.0144**	**0.4496**	**0.4640**		**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9033**

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.6500e-003	0.1237	0.0262	3.9000e-004	8.7200e-003	3.7000e-004	9.0900e-003	2.3900e-003	3.5000e-004	2.7400e-003		41.2105	41.2105	2.0200e-003		41.2609
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0211**	**0.1335**	**0.1555**	**7.7000e-004**	**0.0498**	**6.3000e-004**	**0.0504**	**0.0133**	**5.9000e-004**	**0.0139**		**78.6267**	**78.6267**	**2.9200e-003**		**78.6996**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0599	0.0000	0.0599	6.4800e-003	0.0000	6.4800e-003			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496	0.0000	3,435.4551	3,435.4551	1.0979		3,462.9032
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.0599**	**0.4872**	**0.5471**	**6.4800e-003**	**0.4496**	**0.4561**	**0.0000**	**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9032**

3.2 Discharge Headwall- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.6500e-003	0.1237	0.0262	3.9000e-004	8.7200e-003	3.7000e-004	9.0900e-003	2.3900e-003	3.5000e-004	2.7400e-003		41.2105	41.2105	2.0200e-003		41.2609
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0211**	**0.1335**	**0.1555**	**7.7000e-004**	**0.0498**	**6.3000e-004**	**0.0504**	**0.0133**	**5.9000e-004**	**0.0139**		**78.6267**	**78.6267**	**2.9200e-003**		**78.6996**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846		4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**		**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.4300e-003	0.0825	0.0175	2.6000e-004	5.8100e-003	2.5000e-004	6.0600e-003	1.5900e-003	2.4000e-004	1.8300e-003		27.4736	27.4736	1.3500e-003		27.5073
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0230**	**0.1945**	**0.1712**	**9.1000e-004**	**0.0536**	**7.2000e-004**	**0.0544**	**0.0144**	**6.8000e-004**	**0.0151**		**93.3056**	**93.3056**	**3.6200e-003**		**93.3960**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846	0.0000	4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**	**0.0000**	**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.3 Pour Headwall & Install Valve - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.4300e-003	0.0825	0.0175	2.6000e-004	5.8100e-003	2.5000e-004	6.0600e-003	1.5900e-003	2.4000e-004	1.8300e-003		27.4736	27.4736	1.3500e-003		27.5073
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0230**	**0.1945**	**0.1712**	**9.1000e-004**	**0.0536**	**7.2000e-004**	**0.0544**	**0.0144**	**6.8000e-004**	**0.0151**		**93.3056**	**93.3056**	**3.6200e-003**		**93.3960**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5370	0.0000	0.5370	0.0583	0.0000	0.0583			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496		3,435.4551	3,435.4551	1.0979		3,462.9033
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.5370**	**0.4872**	**1.0242**	**0.0583**	**0.4496**	**0.5079**		**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9033**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0146	0.4947	0.1050	1.5400e-003	0.0349	1.4800e-003	0.0364	9.5500e-003	1.4200e-003	0.0110		164.8418	164.8418	8.0700e-003		165.0437
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0320**	**0.5046**	**0.2342**	**1.9200e-003**	**0.0759**	**1.7400e-003**	**0.0777**	**0.0204**	**1.6600e-003**	**0.0221**		**202.2580**	**202.2580**	**8.9700e-003**		**202.4824**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2417	0.0000	0.2417	0.0262	0.0000	0.0262			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496	0.0000	3,435.4551	3,435.4551	1.0979		3,462.9032
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.2417**	**0.4872**	**0.7289**	**0.0262**	**0.4496**	**0.4759**	**0.0000**	**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9032**

3.4 Rip Rap- Tree Removal - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0146	0.4947	0.1050	1.5400e-003	0.0349	1.4800e-003	0.0364	9.5500e-003	1.4200e-003	0.0110		164.8418	164.8418	8.0700e-003		165.0437
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0320**	**0.5046**	**0.2342**	**1.9200e-003**	**0.0759**	**1.7400e-003**	**0.0777**	**0.0204**	**1.6600e-003**	**0.0221**		**202.2580**	**202.2580**	**8.9700e-003**		**202.4824**

3.5 Rip Rap- Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846		4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**		**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.5 Rip Rap- Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.3000e-003	0.2474	0.0525	7.7000e-004	0.0174	7.4000e-004	0.0182	4.7700e-003	7.1000e-004	5.4800e-003		82.4209	82.4209	4.0400e-003		82.5218
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0278**	**0.3594**	**0.2061**	**1.4200e-003**	**0.0653**	**1.2100e-003**	**0.0665**	**0.0176**	**1.1500e-003**	**0.0188**		**148.2529**	**148.2529**	**6.3100e-003**		**148.4105**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846	0.0000	4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**	**0.0000**	**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.5 Rip Rap- Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.3000e-003	0.2474	0.0525	7.7000e-004	0.0174	7.4000e-004	0.0182	4.7700e-003	7.1000e-004	5.4800e-003		82.4209	82.4209	4.0400e-003		82.5218
Vendor	3.0900e-003	0.1022	0.0244	2.7000e-004	6.7600e-003	2.1000e-004	6.9700e-003	1.9500e-003	2.0000e-004	2.1500e-003		28.4158	28.4158	1.3700e-003		28.4500
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0278**	**0.3594**	**0.2061**	**1.4200e-003**	**0.0653**	**1.2100e-003**	**0.0665**	**0.0176**	**1.1500e-003**	**0.0188**		**148.2529**	**148.2529**	**6.3100e-003**		**148.4105**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0621	8.0676	6.7510	0.0266		0.2934	0.2934		0.2699	0.2699		2,570.7604	2,570.7604	0.8314		2,591.5463
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.0621**	**8.0676**	**6.7510**	**0.0266**		**0.2934**	**0.2934**		**0.2699**	**0.2699**		**2,570.7604**	**2,570.7604**	**0.8314**		**2,591.5463**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.3000e-003	0.2474	0.0525	7.7000e-004	0.0174	7.4000e-004	0.0182	4.7700e-003	7.1000e-004	5.4800e-003		82.4209	82.4209	4.0400e-003		82.5218
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0247**	**0.2572**	**0.1817**	**1.1500e-003**	**0.0585**	**1.0000e-003**	**0.0595**	**0.0157**	**9.5000e-004**	**0.0166**		**119.8371**	**119.8371**	**4.9400e-003**		**119.9605**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0621	8.0676	6.7510	0.0266		0.2934	0.2934		0.2699	0.2699	0.0000	2,570.7604	2,570.7604	0.8314		2,591.5463
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.0621**	**8.0676**	**6.7510**	**0.0266**		**0.2934**	**0.2934**		**0.2699**	**0.2699**	**0.0000**	**2,570.7604**	**2,570.7604**	**0.8314**		**2,591.5463**

3.6 Rip Rap- Testing - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.3000e-003	0.2474	0.0525	7.7000e-004	0.0174	7.4000e-004	0.0182	4.7700e-003	7.1000e-004	5.4800e-003		82.4209	82.4209	4.0400e-003		82.5218
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0174	9.8200e-003	0.1292	3.8000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		37.4162	37.4162	9.0000e-004		37.4387
Total	**0.0247**	**0.2572**	**0.1817**	**1.1500e-003**	**0.0585**	**1.0000e-003**	**0.0595**	**0.0157**	**9.5000e-004**	**0.0166**		**119.8371**	**119.8371**	**4.9400e-003**		**119.9605**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Unmitigated	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.9000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5200e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Total	**2.0500e-003**	**0.0000**	**4.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**		**1.0000e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.9000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5200e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Total	**2.0500e-003**	**0.0000**	**4.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**		**1.0000e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Outfall Construction Activities

Napa County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.30	1000sqft	0.10	4,300.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Outfall Construction Activities - Napa County, Winter

Project Characteristics -

Land Use -

Construction Phase - Construcion phase and timing updated to match information provided for the Project

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Grading - Import and export info provided in Project description

Trips and VMT - Trips u[dated to match info in the PD

Construction Off-road Equipment Mitigation - BMP is show as "mitigation"

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	6.00
tblConstructionPhase	NumDays	1.00	4.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	100.00	10.00
tblConstructionPhase	NumDays	5.00	10.00
tblConstructionPhase	PhaseEndDate	8/18/2021	4/19/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	4/11/2022
tblConstructionPhase	PhaseStartDate	4/1/2021	4/12/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	4/6/2022
tblGrading	AcresOfGrading	0.00	2.50
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	5.00

Outfall Construction Activities - Napa County, Winter

tblGrading	MaterialImported	0.00	200.00
tblGrading	MaterialImported	0.00	5.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	0.00	2.00
tblTripsAndVMT	HaulingTripNumber	20.00	10.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.0639	16.3964	16.0955	0.0503	0.6130	0.6351	1.1020	0.0787	0.5857	0.6034	0.0000	4,864.2607	4,864.2607	1.5202	0.0000	4,902.2666
Maximum	**2.0639**	**16.3964**	**16.0955**	**0.0503**	**0.6130**	**0.6351**	**1.1020**	**0.0787**	**0.5857**	**0.6034**	**0.0000**	**4,864.2607**	**4,864.2607**	**1.5202**	**0.0000**	**4,902.2666**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	2.0639	16.3964	16.0955	0.0503	0.3176	0.6351	0.8066	0.0467	0.5857	0.6034	0.0000	4,864.2607	4,864.2607	1.5202	0.0000	4,902.2666
Maximum	**2.0639**	**16.3964**	**16.0955**	**0.0503**	**0.3176**	**0.6351**	**0.8066**	**0.0467**	**0.5857**	**0.6034**	**0.0000**	**4,864.2607**	**4,864.2607**	**1.5202**	**0.0000**	**4,902.2666**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**48.19**	**0.00**	**26.80**	**40.71**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.0600e-003**	**0.0000**	**4.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**0.0000**	**1.0000e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**2.0600e-003**	**0.0000**	**4.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**0.0000**	**1.0000e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Discharge Headwall- Site Preparation	Site Preparation	4/6/2022	4/11/2022	5	4	
2	Pour Headwall & Install Valve	Building Construction	4/12/2022	4/19/2022	5	6	
3	Rip Rap- Tree Removal	Site Preparation	4/20/2022	4/26/2022	5	5	
4	Rip Rap- Install	Building Construction	4/27/2022	5/10/2022	5	10	
5	Rip Rap- Testing	Paving	5/11/2022	5/24/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Rip Rap- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Rip Rap- Install	Cranes	0	4.00	231	0.29
Rip Rap- Install	Forklifts	0	6.00	89	0.20
Rip Rap- Tree Removal	Graders	0	8.00	187	0.41
Pour Headwall & Install Valve	Cranes	0	4.00	231	0.29

Pour Headwall & Install Valve	Forklifts	0	6.00	89	0.20
Discharge Headwall- Site Preparation	Graders	0	8.00	187	0.41
Rip Rap- Testing	Pavers	0	7.00	130	0.42
Rip Rap- Testing	Rollers	0	7.00	80	0.38
Rip Rap- Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Pour Headwall & Install Valve	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Tree Removal	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Excavators	1	8.00	158	0.38
Discharge Headwall- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Discharge Headwall- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Pour Headwall & Install Valve	Off-Highway Trucks	3	8.00	402	0.38
Pour Headwall & Install Valve	Dumpers/Tenders	1	8.00	16	0.38
Pour Headwall & Install Valve	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Tree Removal	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Off-Highway Trucks	2	8.00	402	0.38
Rip Rap- Install	Excavators	1	8.00	158	0.38
Rip Rap- Install	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Install	Off-Highway Trucks	3	8.00	402	0.38
Rip Rap- Testing	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Outfall Construction Activities - Napa County, Winter

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Rip Rap- Install	6	5.00	1.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Discharge Headwall- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Testing	2	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pour Headwall & Install Valve	6	5.00	1.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Tree Removal	5	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.1331	0.0000	0.1331	0.0144	0.0000	0.0144			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496		3,435.4551	3,435.4551	1.0979		3,462.9033
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.1331**	**0.4872**	**0.6203**	**0.0144**	**0.4496**	**0.4640**		**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9033**

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.7500e-003	0.1267	0.0281	3.8000e-004	8.7200e-003	3.8000e-004	9.1000e-003	2.3900e-003	3.6000e-004	2.7500e-003		40.5459	40.5459	2.1300e-003		40.5991
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0221**	**0.1391**	**0.1524**	**7.3000e-004**	**0.0498**	**6.4000e-004**	**0.0504**	**0.0133**	**6.0000e-004**	**0.0139**		**75.1545**	**75.1545**	**2.9800e-003**		**75.2289**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0599	0.0000	0.0599	6.4800e-003	0.0000	6.4800e-003			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496	0.0000	3,435.4551	3,435.4551	1.0979		3,462.9032
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.0599**	**0.4872**	**0.5471**	**6.4800e-003**	**0.4496**	**0.4561**	**0.0000**	**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9032**

3.2 Discharge Headwall- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.7500e-003	0.1267	0.0281	3.8000e-004	8.7200e-003	3.8000e-004	9.1000e-003	2.3900e-003	3.6000e-004	2.7500e-003		40.5459	40.5459	2.1300e-003		40.5991
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0221**	**0.1391**	**0.1524**	**7.3000e-004**	**0.0498**	**6.4000e-004**	**0.0504**	**0.0133**	**6.0000e-004**	**0.0139**		**75.1545**	**75.1545**	**2.9800e-003**		**75.2289**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846		4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**		**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.5000e-003	0.0844	0.0188	2.5000e-004	5.8100e-003	2.5000e-004	6.0600e-003	1.5900e-003	2.4000e-004	1.8300e-003		27.0306	27.0306	1.4200e-003		27.0660
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0241**	**0.2002**	**0.1712**	**8.6000e-004**	**0.0536**	**7.3000e-004**	**0.0544**	**0.0144**	**6.9000e-004**	**0.0151**		**89.3642**	**89.3642**	**3.7600e-003**		**89.4581**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846	0.0000	4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**	**0.0000**	**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.3 Pour Headwall & Install Valve - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.5000e-003	0.0844	0.0188	2.5000e-004	5.8100e-003	2.5000e-004	6.0600e-003	1.5900e-003	2.4000e-004	1.8300e-003		27.0306	27.0306	1.4200e-003		27.0660
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0241**	**0.2002**	**0.1712**	**8.6000e-004**	**0.0536**	**7.3000e-004**	**0.0544**	**0.0144**	**6.9000e-004**	**0.0151**		**89.3642**	**89.3642**	**3.7600e-003**		**89.4581**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5370	0.0000	0.5370	0.0583	0.0000	0.0583			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496		3,435.4551	3,435.4551	1.0979		3,462.9033
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.5370**	**0.4872**	**1.0242**	**0.0583**	**0.4496**	**0.5079**		**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9033**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0150	0.5066	0.1126	1.5200e-003	0.0349	1.5100e-003	0.0364	9.5500e-003	1.4500e-003	0.0110		162.1836	162.1836	8.5000e-003		162.3962
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0333**	**0.5191**	**0.2368**	**1.8700e-003**	**0.0759**	**1.7700e-003**	**0.0777**	**0.0204**	**1.6900e-003**	**0.0221**		**196.7922**	**196.7922**	**9.3500e-003**		**197.0260**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2417	0.0000	0.2417	0.0262	0.0000	0.0262			0.0000			0.0000
Off-Road	1.5037	11.9936	12.5112	0.0356		0.4872	0.4872		0.4496	0.4496	0.0000	3,435.4551	3,435.4551	1.0979		3,462.9032
Total	**1.5037**	**11.9936**	**12.5112**	**0.0356**	**0.2417**	**0.4872**	**0.7289**	**0.0262**	**0.4496**	**0.4759**	**0.0000**	**3,435.4551**	**3,435.4551**	**1.0979**		**3,462.9032**

3.4 Rip Rap- Tree Removal - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0150	0.5066	0.1126	1.5200e-003	0.0349	1.5100e-003	0.0364	9.5500e-003	1.4500e-003	0.0110		162.1836	162.1836	8.5000e-003		162.3962
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0333**	**0.5191**	**0.2368**	**1.8700e-003**	**0.0759**	**1.7700e-003**	**0.0777**	**0.0204**	**1.6900e-003**	**0.0221**		**196.7922**	**196.7922**	**9.3500e-003**		**197.0260**

3.5 Rip Rap- Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846		4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**		**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.5 Rip Rap- Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.5000e-003	0.2533	0.0563	7.6000e-004	0.0174	7.6000e-004	0.0182	4.7700e-003	7.2000e-004	5.5000e-003		81.0918	81.0918	4.2500e-003		81.1981
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0291**	**0.3691**	**0.2087**	**1.3700e-003**	**0.0653**	**1.2400e-003**	**0.0665**	**0.0176**	**1.1700e-003**	**0.0188**		**143.4254**	**143.4254**	**6.5900e-003**		**143.5902**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0348	16.0274	15.8867	0.0489		0.6339	0.6339		0.5846	0.5846	0.0000	4,720.8353	4,720.8353	1.5137		4,758.6764
Total	**2.0348**	**16.0274**	**15.8867**	**0.0489**		**0.6339**	**0.6339**		**0.5846**	**0.5846**	**0.0000**	**4,720.8353**	**4,720.8353**	**1.5137**		**4,758.6764**

3.5 Rip Rap- Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.5000e-003	0.2533	0.0563	7.6000e-004	0.0174	7.6000e-004	0.0182	4.7700e-003	7.2000e-004	5.5000e-003		81.0918	81.0918	4.2500e-003		81.1981
Vendor	3.2700e-003	0.1033	0.0282	2.6000e-004	6.7600e-003	2.2000e-004	6.9800e-003	1.9500e-003	2.1000e-004	2.1600e-003		27.7251	27.7251	1.4900e-003		27.7623
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0291**	**0.3691**	**0.2087**	**1.3700e-003**	**0.0653**	**1.2400e-003**	**0.0665**	**0.0176**	**1.1700e-003**	**0.0188**		**143.4254**	**143.4254**	**6.5900e-003**		**143.5902**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0621	8.0676	6.7510	0.0266		0.2934	0.2934		0.2699	0.2699		2,570.7604	2,570.7604	0.8314		2,591.5463
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.0621**	**8.0676**	**6.7510**	**0.0266**		**0.2934**	**0.2934**		**0.2699**	**0.2699**		**2,570.7604**	**2,570.7604**	**0.8314**		**2,591.5463**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.5000e-003	0.2533	0.0563	7.6000e-004	0.0174	7.6000e-004	0.0182	4.7700e-003	7.2000e-004	5.5000e-003		81.0918	81.0918	4.2500e-003		81.1981
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0258**	**0.2658**	**0.1805**	**1.1100e-003**	**0.0585**	**1.0200e-003**	**0.0595**	**0.0157**	**9.6000e-004**	**0.0166**		**115.7004**	**115.7004**	**5.1000e-003**		**115.8279**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0621	8.0676	6.7510	0.0266		0.2934	0.2934		0.2699	0.2699	0.0000	2,570.7604	2,570.7604	0.8314		2,591.5463
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.0621**	**8.0676**	**6.7510**	**0.0266**		**0.2934**	**0.2934**		**0.2699**	**0.2699**	**0.0000**	**2,570.7604**	**2,570.7604**	**0.8314**		**2,591.5463**

3.6 Rip Rap- Testing - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	7.5000e-003	0.2533	0.0563	7.6000e-004	0.0174	7.6000e-004	0.0182	4.7700e-003	7.2000e-004	5.5000e-003		81.0918	81.0918	4.2500e-003		81.1981
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0183	0.0125	0.1243	3.5000e-004	0.0411	2.6000e-004	0.0413	0.0109	2.4000e-004	0.0111		34.6086	34.6086	8.5000e-004		34.6298
Total	**0.0258**	**0.2658**	**0.1805**	**1.1100e-003**	**0.0585**	**1.0200e-003**	**0.0595**	**0.0157**	**9.6000e-004**	**0.0166**		**115.7004**	**115.7004**	**5.1000e-003**		**115.8279**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Unmitigated	2.0600e-003	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.9000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5200e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Total	**2.0500e-003**	**0.0000**	**4.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**		**1.0000e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.9000e-004					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5200e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	4.0000e-005	0.0000	4.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		9.4000e-004	9.4000e-004	0.0000		1.0000e-003
Total	**2.0500e-003**	**0.0000**	**4.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**9.4000e-004**	**9.4000e-004**	**0.0000**		**1.0000e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Outfall Construction Activities

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.30	1000sqft	0.10	4,300.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Outfall Construction Activities - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construcion phase and timing updated to match information provided for the Project

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Grading - Import and export info provided in Project description

Trips and VMT - Trips u[dated to match info in the PD

Construction Off-road Equipment Mitigation - BMP is show as "mitigation"

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	6.00
tblConstructionPhase	NumDays	1.00	4.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	100.00	10.00
tblConstructionPhase	NumDays	5.00	10.00
tblConstructionPhase	PhaseEndDate	8/18/2021	4/19/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	4/11/2022
tblConstructionPhase	PhaseStartDate	4/1/2021	4/12/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	4/6/2022
tblGrading	AcresOfGrading	0.00	2.50
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	5.00

Outfall Construction Activities - Napa County, Annual

tblGrading	MaterialImported	0.00	200.00
tblGrading	MaterialImported	0.00	5.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	0.00	2.00
tblTripsAndVMT	HaulingTripNumber	20.00	10.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0288	0.2278	0.2204	7.1000e-004	2.6400e-003	8.7500e-003	0.0114	4.5000e-004	8.0700e-003	8.5200e-003	0.0000	61.9689	61.9689	0.0193	0.0000	62.4520
Maximum	**0.0288**	**0.2278**	**0.2204**	**7.1000e-004**	**2.6400e-003**	**8.7500e-003**	**0.0114**	**4.5000e-004**	**8.0700e-003**	**8.5200e-003**	**0.0000**	**61.9689**	**61.9689**	**0.0193**	**0.0000**	**62.4520**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0288	0.2278	0.2204	7.1000e-004	1.7500e-003	8.7500e-003	0.0105	3.6000e-004	8.0700e-003	8.4200e-003	0.0000	61.9688	61.9688	0.0193	0.0000	62.4520
Maximum	**0.0288**	**0.2278**	**0.2204**	**7.1000e-004**	**1.7500e-003**	**8.7500e-003**	**0.0105**	**3.6000e-004**	**8.0700e-003**	**8.4200e-003**	**0.0000**	**61.9688**	**61.9688**	**0.0193**	**0.0000**	**62.4520**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**33.71**	**0.00**	**7.81**	**20.00**	**0.00**	**1.17**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
5	3-15-2022	6-14-2022	0.2559	0.2559
		Highest	0.2559	0.2559

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Outfall Construction Activities - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Discharge Headwall- Site Preparation	Site Preparation	4/6/2022	4/11/2022	5	4	
2	Pour Headwall & Install Valve	Building Construction	4/12/2022	4/19/2022	5	6	
3	Rip Rap- Tree Removal	Site Preparation	4/20/2022	4/26/2022	5	5	
4	Rip Rap- Install	Building Construction	4/27/2022	5/10/2022	5	10	
5	Rip Rap- Testing	Paving	5/11/2022	5/24/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating - sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Rip Rap- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Rip Rap- Install	Cranes	0	4.00	231	0.29
Rip Rap- Install	Forklifts	0	6.00	89	0.20
Rip Rap- Tree Removal	Graders	0	8.00	187	0.41
Pour Headwall & Install Valve	Cranes	0	4.00	231	0.29
Pour Headwall & Install Valve	Forklifts	0	6.00	89	0.20
Discharge Headwall- Site Preparation	Graders	0	8.00	187	0.41
Rip Rap- Testing	Pavers	0	7.00	130	0.42
Rip Rap- Testing	Rollers	0	7.00	80	0.38
Rip Rap- Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37

Pour Headwall & Install Valve	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Tree Removal	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Excavators	1	8.00	158	0.38
Discharge Headwall- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Discharge Headwall- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Pour Headwall & Install Valve	Off-Highway Trucks	3	8.00	402	0.38
Pour Headwall & Install Valve	Dumpers/Tenders	1	8.00	16	0.38
Pour Headwall & Install Valve	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Tree Removal	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Off-Highway Trucks	2	8.00	402	0.38
Rip Rap- Install	Excavators	1	8.00	158	0.38
Rip Rap- Install	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Install	Off-Highway Trucks	3	8.00	402	0.38
Rip Rap- Testing	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Rip Rap- Install	6	5.00	1.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Discharge Headwall- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Testing	2	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pour Headwall & Install Valve	6	5.00	1.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Tree Removal	5	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.0100e-003	0.0240	0.0250	7.0000e-005		9.7000e-004	9.7000e-004		9.0000e-004	9.0000e-004	0.0000	6.2332	6.2332	1.9900e-003	0.0000	6.2830
Total	**3.0100e-003**	**0.0240**	**0.0250**	**7.0000e-005**	**2.7000e-004**	**9.7000e-004**	**1.2400e-003**	**3.0000e-005**	**9.0000e-004**	**9.3000e-004**	**0.0000**	**6.2332**	**6.2332**	**1.9900e-003**	**0.0000**	**6.2830**

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0635	0.0635	0.0000	0.0000	0.0635
Total	**4.0000e-005**	**2.7000e-004**	**2.9000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**2.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1377**	**0.1377**	**0.0000**	**0.0000**	**0.1379**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.0100e-003	0.0240	0.0250	7.0000e-005		9.7000e-004	9.7000e-004		9.0000e-004	9.0000e-004	0.0000	6.2332	6.2332	1.9900e-003	0.0000	6.2830
Total	**3.0100e-003**	**0.0240**	**0.0250**	**7.0000e-005**	**1.2000e-004**	**9.7000e-004**	**1.0900e-003**	**1.0000e-005**	**9.0000e-004**	**9.1000e-004**	**0.0000**	**6.2332**	**6.2332**	**1.9900e-003**	**0.0000**	**6.2830**

3.2 Discharge Headwall- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0635	0.0635	0.0000	0.0000	0.0635
Total	**4.0000e-005**	**2.7000e-004**	**2.9000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**2.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1377**	**0.1377**	**0.0000**	**0.0000**	**0.1379**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.1000e-003	0.0481	0.0477	1.5000e-004		1.9000e-003	1.9000e-003		1.7500e-003	1.7500e-003	0.0000	12.8480	12.8480	4.1200e-003	0.0000	12.9510
Total	**6.1000e-003**	**0.0481**	**0.0477**	**1.5000e-004**		**1.9000e-003**	**1.9000e-003**		**1.7500e-003**	**1.7500e-003**	**0.0000**	**12.8480**	**12.8480**	**4.1200e-003**	**0.0000**	**12.9510**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	1.0000e-005	3.1000e-004	8.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0766	0.0766	0.0000	0.0000	0.0766
Worker	5.0000e-005	3.0000e-005	3.6000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0952	0.0952	0.0000	0.0000	0.0953
Total	**7.0000e-005**	**5.9000e-004**	**4.9000e-004**	**0.0000**	**1.6000e-004**	**0.0000**	**1.6000e-004**	**4.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2460**	**0.2460**	**0.0000**	**0.0000**	**0.2463**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.1000e-003	0.0481	0.0477	1.5000e-004		1.9000e-003	1.9000e-003		1.7500e-003	1.7500e-003	0.0000	12.8480	12.8480	4.1200e-003	0.0000	12.9510
Total	**6.1000e-003**	**0.0481**	**0.0477**	**1.5000e-004**		**1.9000e-003**	**1.9000e-003**		**1.7500e-003**	**1.7500e-003**	**0.0000**	**12.8480**	**12.8480**	**4.1200e-003**	**0.0000**	**12.9510**

3.3 Pour Headwall & Install Valve - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	1.0000e-005	3.1000e-004	8.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0766	0.0766	0.0000	0.0000	0.0766
Worker	5.0000e-005	3.0000e-005	3.6000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0952	0.0952	0.0000	0.0000	0.0953
Total	**7.0000e-005**	**5.9000e-004**	**4.9000e-004**	**0.0000**	**1.6000e-004**	**0.0000**	**1.6000e-004**	**4.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2460**	**0.2460**	**0.0000**	**0.0000**	**0.2463**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.3400e-003	0.0000	1.3400e-003	1.5000e-004	0.0000	1.5000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7600e-003	0.0300	0.0313	9.0000e-005		1.2200e-003	1.2200e-003		1.1200e-003	1.1200e-003	0.0000	7.7915	7.7915	2.4900e-003	0.0000	7.8537
Total	**3.7600e-003**	**0.0300**	**0.0313**	**9.0000e-005**	**1.3400e-003**	**1.2200e-003**	**2.5600e-003**	**1.5000e-004**	**1.1200e-003**	**1.2700e-003**	**0.0000**	**7.7915**	**7.7915**	**2.4900e-003**	**0.0000**	**7.8537**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**8.0000e-005**	**1.2900e-003**	**5.7000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.9000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4507**	**0.4507**	**2.0000e-005**	**0.0000**	**0.4512**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-004	0.0000	6.0000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7600e-003	0.0300	0.0313	9.0000e-005		1.2200e-003	1.2200e-003		1.1200e-003	1.1200e-003	0.0000	7.7915	7.7915	2.4900e-003	0.0000	7.8537
Total	**3.7600e-003**	**0.0300**	**0.0313**	**9.0000e-005**	**6.0000e-004**	**1.2200e-003**	**1.8200e-003**	**7.0000e-005**	**1.1200e-003**	**1.1900e-003**	**0.0000**	**7.7915**	**7.7915**	**2.4900e-003**	**0.0000**	**7.8537**

3.4 Rip Rap- Tree Removal - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**8.0000e-005**	**1.2900e-003**	**5.7000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.9000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4507**	**0.4507**	**2.0000e-005**	**0.0000**	**0.4512**

3.5 Rip Rap- Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0102	0.0801	0.0794	2.4000e-004		3.1700e-003	3.1700e-003		2.9200e-003	2.9200e-003	0.0000	21.4134	21.4134	6.8700e-003	0.0000	21.5850
Total	**0.0102**	**0.0801**	**0.0794**	**2.4000e-004**		**3.1700e-003**	**3.1700e-003**		**2.9200e-003**	**2.9200e-003**	**0.0000**	**21.4134**	**21.4134**	**6.8700e-003**	**0.0000**	**21.5850**

3.5 Rip Rap- Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	2.0000e-005	5.2000e-004	1.3000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1276	0.1276	1.0000e-005	0.0000	0.1277
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.4000e-004**	**1.8400e-003**	**1.0000e-003**	**0.0000**	**3.1000e-004**	**0.0000**	**3.2000e-004**	**8.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.6576**	**0.6576**	**3.0000e-005**	**0.0000**	**0.6583**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0102	0.0801	0.0794	2.4000e-004		3.1700e-003	3.1700e-003		2.9200e-003	2.9200e-003	0.0000	21.4133	21.4133	6.8700e-003	0.0000	21.5850
Total	**0.0102**	**0.0801**	**0.0794**	**2.4000e-004**		**3.1700e-003**	**3.1700e-003**		**2.9200e-003**	**2.9200e-003**	**0.0000**	**21.4133**	**21.4133**	**6.8700e-003**	**0.0000**	**21.5850**

3.5 Rip Rap- Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	2.0000e-005	5.2000e-004	1.3000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1276	0.1276	1.0000e-005	0.0000	0.1277
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.4000e-004**	**1.8400e-003**	**1.0000e-003**	**0.0000**	**3.1000e-004**	**0.0000**	**3.2000e-004**	**8.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.6576**	**0.6576**	**3.0000e-005**	**0.0000**	**0.6583**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.3100e-003	0.0403	0.0338	1.3000e-004		1.4700e-003	1.4700e-003		1.3500e-003	1.3500e-003	0.0000	11.6608	11.6608	3.7700e-003	0.0000	11.7551
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.3100e-003**	**0.0403**	**0.0338**	**1.3000e-004**		**1.4700e-003**	**1.4700e-003**		**1.3500e-003**	**1.3500e-003**	**0.0000**	**11.6608**	**11.6608**	**3.7700e-003**	**0.0000**	**11.7551**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.2000e-004**	**1.3200e-003**	**8.7000e-004**	**0.0000**	**2.8000e-004**	**0.0000**	**2.9000e-004**	**7.0000e-005**	**0.0000**	**8.0000e-005**	**0.0000**	**0.5300**	**0.5300**	**2.0000e-005**	**0.0000**	**0.5306**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.3100e-003	0.0403	0.0338	1.3000e-004		1.4700e-003	1.4700e-003		1.3500e-003	1.3500e-003	0.0000	11.6608	11.6608	3.7700e-003	0.0000	11.7550
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.3100e-003**	**0.0403**	**0.0338**	**1.3000e-004**		**1.4700e-003**	**1.4700e-003**		**1.3500e-003**	**1.3500e-003**	**0.0000**	**11.6608**	**11.6608**	**3.7700e-003**	**0.0000**	**11.7550**

3.6 Rip Rap- Testing - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.2000e-004**	**1.3200e-003**	**8.7000e-004**	**0.0000**	**2.8000e-004**	**0.0000**	**2.9000e-004**	**7.0000e-005**	**0.0000**	**8.0000e-005**	**0.0000**	**0.5300**	**0.5300**	**2.0000e-005**	**0.0000**	**0.5306**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Unmitigated	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	9.0000e-005					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	9.0000e-005					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX 3.3-A

Biological Resources Assessment
Rector Reservoir Bypass Valve Project

Biological Resources Assessment

Rector Dam Bypass Valve Project

Napa County, California

Prepared For:

California Department of Veterans Affairs

April 2021

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

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LIST OF ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment
BCC	Birds of Conservation Concern
BDR	Baseline Data Report
BMPs	Best Management Practices
BO	Biological Opinion
BRA	Biological Resources Assessment
CCC	Central California Coast
CalVet	California Department of Veterans Affairs
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Cfs	Cubic feet per second
CLN	Conservation Lands Network
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRLF	California red-legged frog
CRPR	California Rare Plant Rank
CWA	Clean Water Act
DPS	Distinct Population Segment
EFH	Essential fish habitat
ESA	Endangered Species Act
F	Fahrenheit
FYLF	Foothill yellow-legged frog
IPaC	Information, Planning and Consultation
LSA	Lake or Streambed Alteration
MBTA	Migratory Bird Treaty Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
Project	Rector Dam Bypass Project

LIST OF ACRONYMS AND ABBREVIATIONS

RWQCB	Regional Water Quality Control Board
SCS	Soil Conservation Service
SSC	Species of Special Concern
Study Area	Rector Dam Bypass Valve Project
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
WBWG	Western Bat Working Group

1.0 INTRODUCTION

On behalf of California Department of Veterans Affairs (CalVet), ECORP Consulting, Inc. conducted a Biological Resources Assessment (BRA) for the ±3.3-acre (Study Area) Rector Dam Bypass Valve Project (Project) located in Napa County, California. The purpose of the assessment was to collect information on the biological resources present and evaluate the potential for special-status species and their habitats to occur in the Study Area, assess potential biological impacts related to Project construction activities, and identify potential mitigation measures to inform the Project's California Environmental Quality Act (CEQA) documentation for biological resources. Analysis of the Project's operational impacts is addressed separately.

1.1 Project Location

The Study Area is located between the Silverado Trail and Rector Reservoir, approximately two miles north of the Town of Yountville in Napa County, California (Figure 1. *USGS Topo Quad Map*). The Study Area corresponds to a portion of Section 19, Township 7 North, Range 4 West (Mount Diablo Base and Meridian) of the "Yountville, California" 7.5-minute quadrangle (U.S. Geological Survey [USGS] 1951, photorevised 1968). The approximate center of the Study Area is located at NAD83 coordinates 38.441373° latitude and -122.348519° longitude within the San Pablo Watershed (Hydrologic Unit Code #18050002, Natural Resources Conservation Service [NRCS], et al. 2016).

1.2 Purpose of this Biological Resources Assessment

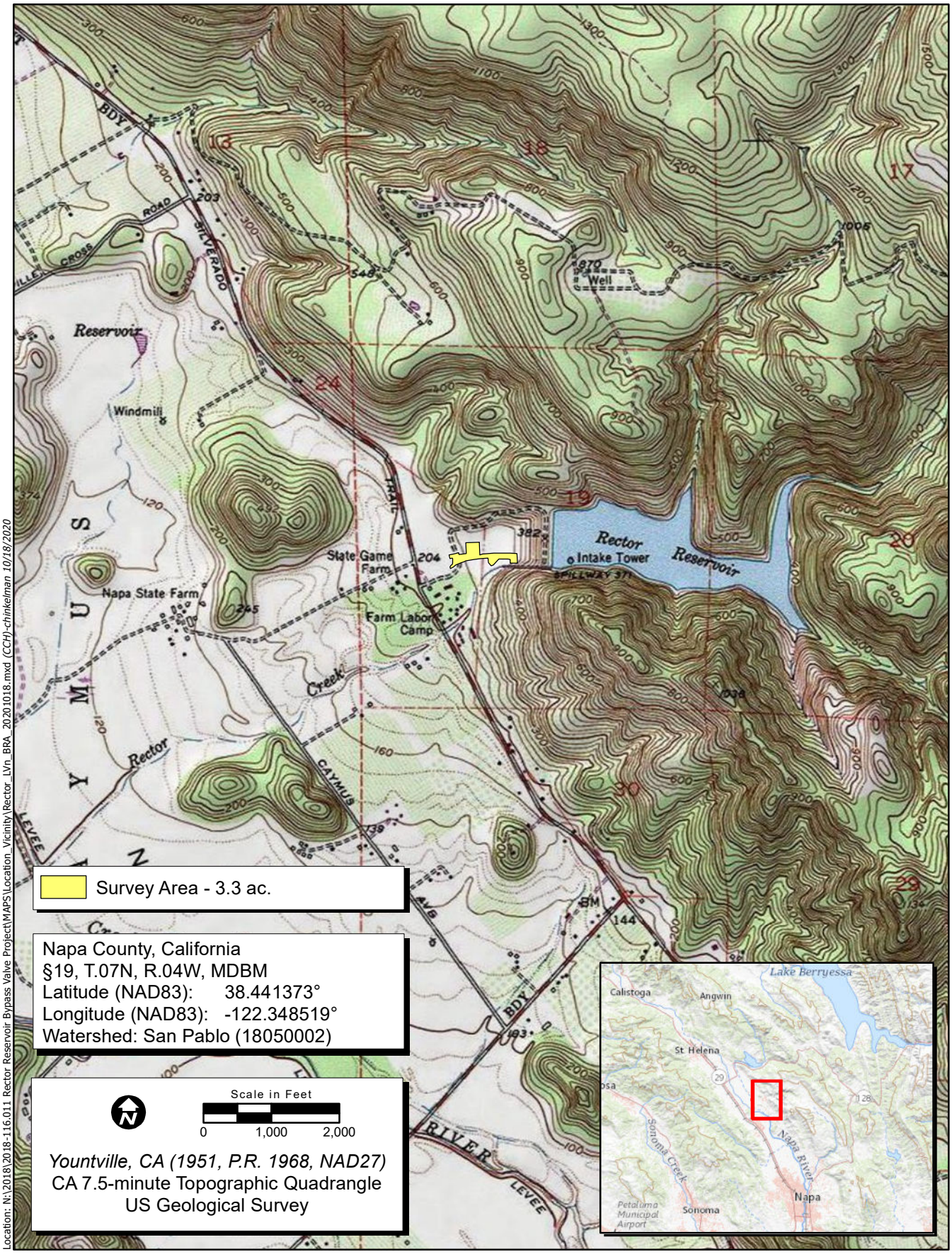
The purpose of this BRA is to assess the potential for occurrence of special-status plant and animal species or their habitats and sensitive habitats such as wetlands, riparian communities, and sensitive natural communities within the Study Area.

This assessment includes information generated from assessment-level and determinate surveys of the Study Area, including a burrowing owl survey and habitat assessment, a California tiger salamander habitat assessment, a dry season survey for federally listed large branchiopods, and a preliminary aquatic resources assessment. This BRA does not include determinate field surveys for other wildlife or plant species.

This assessment includes an analysis of impacts on biological resources anticipated to result from construction of the Project (impacts due to Project operation are addressed separately). The analysis specifically addresses the biological resources Environmental Checklist Questions presented in CEQA Guidelines Appendix G. The mitigation recommendations presented in this assessment are intended to reduce impacts below the identified thresholds of significance based on the analysis, a review of existing literature, and the results of site reconnaissance surveys.

For the purposes of this assessment, special-status species are defined as plants or animals that:

- are listed, proposed for listing, or candidates for future listing as threatened or endangered under the federal Endangered Species Act (ESA);
- are listed or candidates for future listing as threatened or endangered under the California ESA;



Location: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Location_Vicinity\Rector_LVn_BRA_20201018.mxd (CCH)-chinkelman 10/18/2020

Map Date: 10/18/2020

Sources:

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Figure 1. USGS Topo Quad Map

2018-116.11 Rector Reservoir Bypass Valve Project

- meet the definitions of endangered or rare under Section 15380 of the CEQA Guidelines;
- are identified as a species of special concern (SSC) by the California Department of Fish and Wildlife (CDFW);
- are birds identified as birds of conservation concern (BCC) by the U.S. Fish and Wildlife Service (USFWS);
- are plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" [California Rare Plant Rank (CRPR) 1 and 2] ", "plants about which more information is needed" (i.e., species with a CRPR of 3), or "plants of limited distribution – a watch list" (i.e., species with a CRPR of 4);
- are plants listed as rare under the California Native Plant Protection Act (NPPA, California Fish and Game Code, § 1900 et seq.); or
- are fully protected in California in accordance with the California Fish and Game Code, §§ 3511 (birds), 4700 (mammals), 5050 (amphibians and reptiles), and 5515 (fishes).

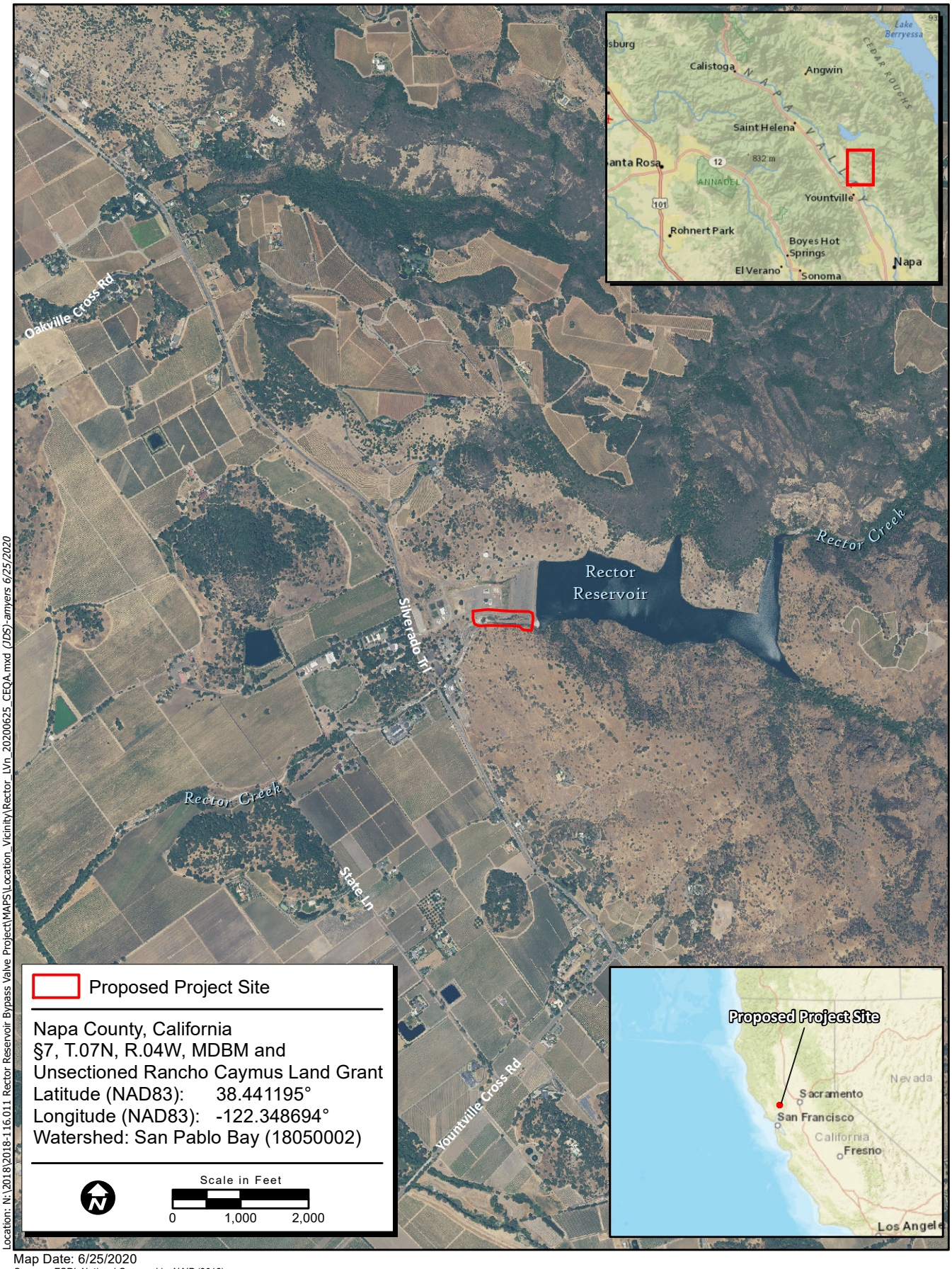
Only species that fall into one of the above-listed groups were considered for this assessment. While other species (i.e., special-status lichens, California Natural Diversity Database- (CNDDB-) tracked species with no special status) are sometimes found in database searches or within the literature, these species do not meet the above definition for sensitive species and therefore are not included in this analysis.

1.3 Project Description

1.3.1 Project Location

Rector Creek Dam and Reservoir are located at approximately 38°26'28.91"N, 122°20'50.85"W at the base of the Howell Mountain in Napa County (see Figure 2. *Project Location and Vicinity*). The dam and reservoir are approximately 2.5 miles northeast from the Town of Yountville on Silverado Trail, in Napa County between Napa and St. Helena. Rector Creek crosses Silverado Trail approximately 700 feet downstream of the dam's spillway. Vehicle access to the reservoir and the water treatment plant is through the gate at 7300 Silverado Trail.

Three main tributaries contribute to Rector Reservoir storage: North Fork Rector Creek; mainstem Rector Creek and South Fork (known locally as No Name Creek or LeRette Creek). The drainage area contributing to Rector Reservoir encompasses about 11 square miles or roughly 6,971 acres (Barber 2017). The watershed boundary around Rector's contributing drainage area extends upstream easterly 4.7 miles to Atlas Peak Mountain. Rector Canyon is steep and narrow and is bounded by the wide plateau, which continues to be developed for wine grape agriculture. Rector Creek, downstream of the dam, runs west to its confluence with Conn Creek, a tributary to the Napa River approximately 2.5 miles downstream of Rector Dam.



Location: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Location_Vicinity\Rector_LVn_20200625_CEQA.mxd (JDS)-amyers 6/25/2020

Map Date: 6/25/2020

Sources: ESRI, National Geographic, NAIP (2018)

Figure 2. Project Location and Vicinity

1.3.2 Project Objectives

CalVet seeks to develop a flow regime for Rector Reservoir with two stated goals:

1. Compliance Goal: To allow sufficient water ("environmental flows") to pass over, around, or through Rector Dam to keep fish below the dam in good condition, and prevent unlawful take of federally or state designated protected species; and

2. Water Management Goal: To maintain the other purposes of the dam's operations while accomplishing the Compliance Goal, specifically to reduce or avoid adverse water supply impacts to all lawful users of water sourced from Rector Creek that may result from environmental flow releases.

1.3.3 Existing Facilities

Rector Creek Dam is a 164-foot-high earth-fill structure with a crest elevation of 381.5 feet above mean sea level (MSL). The spillway has a crest elevation of 372.5 feet above MSL and a curvilinear crest length of 141.5 feet. The spillway crest elevation was 370.0 feet above MSL prior to 1989, when the spillway was raised to store more water.

A 21-inch pipe with an invert elevation 370.0 feet above MSL was installed when the spillway was raised to allow water to be released onto the spillway from the upper 2.5 feet of the reservoir. A slide gate covers the pipe and has blocked water from the reservoir for several years, according to Rector Water Treatment Plant operators, who monitor the dam.

Behind the dam, water collected from local run-off following storm events is discharged through an outlet tower, or during exceptionally rainy years, via a concrete spillway to Rector Creek. The tower has six intake inverts located 270, 291, 307, 323, 335, and 339 feet above MSL, respectively, however, the intake at 270 feet above MSL is buried by sediment, as determined by a 2000 Department of Water Resources (DWR) bathymetric survey. The lowest operational intake is at 291 feet above MSL, and the dead pool storage below this intake is 478 acre-feet.

The outlet tower feeds a 30-inch steel pipeline that travels approximately 900 feet through the dam, to a control facility or valve house. Once at the valve house, water is directed to either the water treatment plant (via a continuation of the 30-inch steel pipe), or to Rector Creek, via a 24-inch emergency relief pipeline and gate valve (see Figure 3. *Emergency Relief Valve*). Water typically is stored in Rector Reservoir over the wet winter months and is withdrawn from storage over the summer irrigation season.

Since the 30-inch pipeline's original construction, a number of connections have been made just upstream of the valve house. The existing connections include the following:

1. CAL FIRE Training Connection, which feeds fire hydrants at onsite training facility;

2. CDFW Connection, which supplies water to the fish hatchery across Silverado Trail;

3. Potassium Permanganate Connection, a feed line from the water treatment plant (currently not operational); and



Source: Wood-Rodgers

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Figure 3. Emergency Relief Valve

2018-116.011 Rector Reservoir Bypass Valve

4. Raw Water Sampling Connection, which supplies sample water to the treatment plant (see Figure 4. *Existing 30-Inch Steel Pipeline and Connections*).

1.3.4 Proposed Project Facilities

The proposed Project includes construction of the following facilities:

- **Diversion Pipeline**: The Project would construct a new 425-foot long, 12-inch Diversion Pipeline to convey water from the existing 30-inch water line at the base of Rector Dam to Rector Creek. This new line will greatly increase Rector Dam downstream release operational flexibility.
- **Bypass Valve and Flow Meter Station:** A new Bypass Valve and Flow Meter Station would be constructed along the new 12-inch diversion pipeline to allow for bypass flow management and monitoring.
- **Outfall Structure:** A new headwall, outfall and energy dissipating riprap would be constructed at the end of the new 12-inch diversion pipeline where it discharges to Rector Creek.

These facilities and the construction approach are further described below and shown in Figure 5. *Existing Facilities and Proposed Improvements*.

Diversion Pipeline

The Project would construct a new 425-foot long, 12-inch Diversion Pipeline to convey water from the existing 30-inch water line at the base of Rector Dam to Rector Creek. The proposed alignment is shown in Figure 6. *Diversion Pipeline Alignment*. To accommodate placement of the pipeline, a trench would be constructed approximately 36 inches wide and a minimum of three feet below existing ground elevation. An additional seven feet would be allotted for staging and the temporary placement of excavated material. Clean base material would be placed at the bottom of the trench on which the pipeline would be laid. The trench would then be refilled with engineered fill to within six inches of ground elevation in areas along the pipeline alignment supporting native and ruderal vegetation. The remaining six inches would be filled with native soil excavated during construction. All temporarily disturbed areas would be hydroseeded upon completion of pipeline installation. The underground pipeline would not result in permanent habitat impacts.

A "hot tap" connection would be used to connect the proposed Diversion Pipeline to the existing 30-inch pipeline. This process consists of attaching a tapping sleeve and valve to the mainline and then utilizing specialized drilling equipment to core an opening. This technique allows the attachment of the proposed line to the existing line without disrupting water service.

Construction of the diversion pipeline is expected to take 10 working days and would result in a temporary disturbance area of 4,250 square feet (10' wide x 425' long). Construction of the hot tap connection is expected to take 6 working days and would result in a temporary disturbance area of 400 square feet (20'x20').



Source: Wood-Rodgers

ECORP Consulting, Inc.
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Figure 4. Existing 30-Inch Steel Pipeline and Connections

2018-116.011 Rector Reservoir Bypass Valve

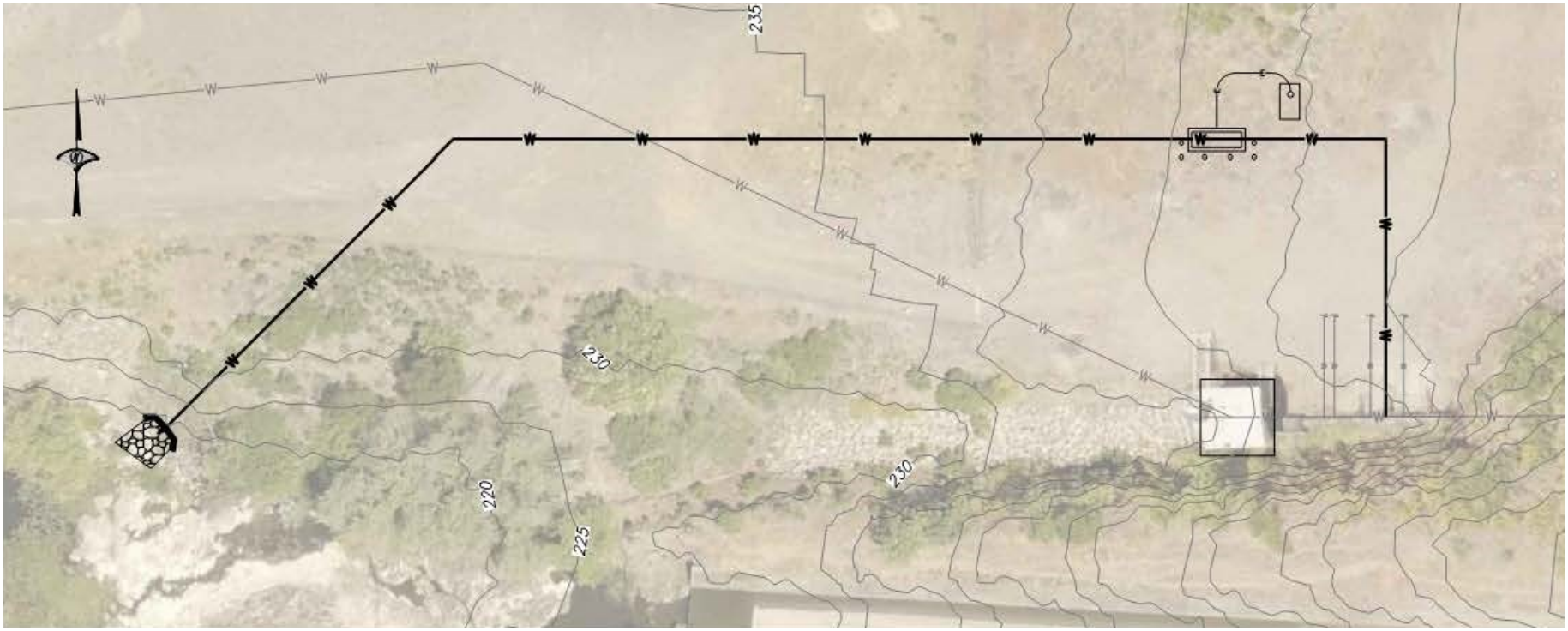


Source: Wood-Rodgers

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Figure 5. Existing Facilities and Proposed Improvements

2018-116.011 Rector Reservoir Bypass Valve



Source: Wood-Rodgers

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Figure 6. Diversion Pipeline Alignment

2018-116.011 Rector Reservoir Bypass Valve

Bypass Valve and Flow Meter Station

To allow for flow management and monitoring, a new above ground Bypass Valve and Flow Meter Station would be constructed on a 12'x26' concrete pad placed along the new 12-inch diversion pipeline alignment as shown on Figure 6. *Diversion Pipeline Alignment*. Meter Station construction is expected to take 10 working days and would result in a temporary disturbance area of 1,500-square feet (30'x50' = 1,500). Meter Station improvements would result in 312-square feet of permanent impact due to pad construction.

Electric service for the Bypass Valve and Flow Meter Station would be provided by a new 950-foot long underground electric service line extending from the Cal Fire Training Facility to the Bypass Valve and Flow Meter Station following the alignment shown in Figure 5. This line would be constructed to a depth of 3 feet below existing grade. Staging, trenching and temporary side cast of excavated material would result in a six-foot wide temporary disturbance along the 950-foot alignment for a total temporary disturbance area of 5,700-square feet (6'x950' = 5,700 sf). Following construction all temporarily disturbed areas would be restored/hydroseeded.

Outfall Structure

A new energy dissipating rip-rap outfall structure would be constructed at the end of the new 12-inch diversion pipeline where it discharges to Rector Creek (see Figure 5). At the pipeline terminus, a concrete headwall with check valve would be installed to prevent debris or animals from entering the pipe. Immediately downstream of the headwall, up to 4,250-square feet (10'x425') of energy-dissipating riprap or engineered energy dissipation/slope protection would be constructed.

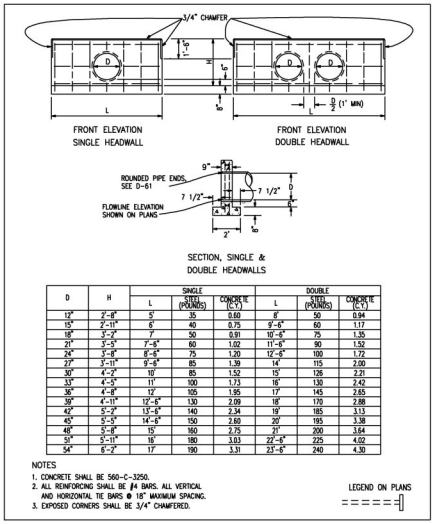
Outfall Structure construction is expected to take 10 working days for headwall construction and 15 working days for riprap. Headwall improvements would result in temporary disturbance area of 50-square feet (10'x5') and permanent disturbance of 12-square feet (6'x2'=12'). Riprap improvements would result in up to 4,250-square feet of permanent disturbance. A construction diagram of the outfall structure is shown on Figure 7. *Rector Creek Outfall Structure*.

2.0 REGULATORY SETTING

2.1 Federal Regulations

2.1.1 Federal Endangered Species Act

The ESA protects plants and animals that are listed as endangered or threatened by the USFWS and the National Marine Fisheries Service (NMFS). Section 9 of ESA prohibits the taking of listed wildlife, where take is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct" (50 Code of Federal Regulations [CFR] 17.3). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any listed plant on federal land and removing, cutting, digging up, damaging, or destroying any listed plant on non-federal land in knowing violation of state law (16 U.S. Code [USC] 1538).

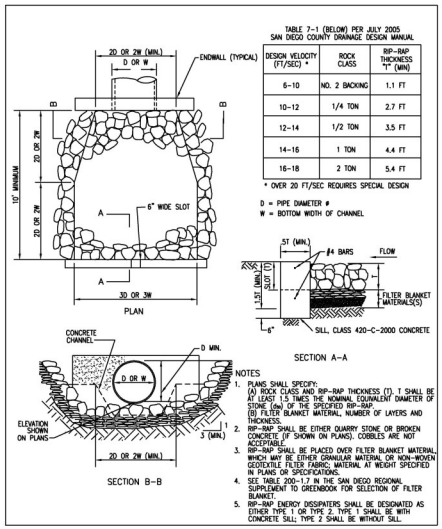


D	H	SINGLE L	SINGLE STEEL (POUNDS)	SINGLE CONCRETE (C.Y.)	DOUBLE L	DOUBLE STEEL (POUNDS)	DOUBLE CONCRETE (C.Y.)
12"	2'-8"	5'	35	0.60	8'	50	0.94
15"	2'-11"	6'	40	0.75	9'-6"	60	1.17
18"	3'-2"	7'	50	0.91	10'-6"	75	1.35
21"	3'-5"	7'-6"	60	1.02	11'-6"	90	1.52
24"	3'-8"	8'-6"	75	1.20	12'-6"	100	1.72
27"	3'-11"	9'-6"	85	1.39	14'	115	2.00
30"	4'-2"	10'	85	1.52	15'	126	2.21
33"	4'-5"	11'	100	1.73	16'	130	2.42
36"	4'-8"	12'	105	1.95	17'	145	2.65
39"	4'-11"	12'-6"	130	2.09	18'	170	2.88
42"	5'-2"	13'-6"	140	2.34	19'	185	3.13
45"	5'-5"	14'-6"	150	2.60	20'	195	3.38
48"	5'-8"	15'	160	2.75	21'	200	3.64
51"	5'-11"	16'	180	3.03	22'-6"	225	4.02
54"	6'-2"	17'	190	3.31	23'-6"	240	4.30

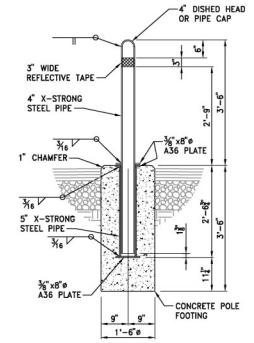
NOTES
1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS @ 18" MAXIMUM SPACING.
3. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS

1 C-02 C-03 CONCRETE HEADWALL



2 C-02 C-03 RIP RAP ENERGY DISSIPATER



NOTES:
1. ALL TRAFFIC BOLLARD STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
2. AFTER GALVANIZING, PAINT ALL ABOVE GRADE BOLLARD STEEL SAFETY YELLOW.

3 C-02 C-03 REMOVABLE BOLLARD

Source: Wood-Rodgers

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Figure 7. Rector Creek Outfall Structure

2018-116.011 Rector Reservoir Bypass Valve

Under Section 7 of ESA, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect a listed (or proposed) species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion (BO), the USFWS may issue an incidental take statement allowing take of the species that is incidental to an otherwise authorized activity provided the activity will not jeopardize the continued existence of the species. Section 10 of ESA provides for issuance of incidental take permits where no other federal actions are necessary provided a habitat conservation plan is developed.

Section 7

Section 7 of ESA mandates that all federal agencies consult with USFWS and/or NMFS to ensure that federal agencies' actions do not jeopardize the continued existence of a listed species or adversely modify Critical Habitat for listed species. If direct and/or indirect effects will occur to Critical Habitat that appreciably diminish the value of Critical Habitat for both the survival and recovery of a species, the adverse modifications will require formal consultation with USFWS or NMFS. If adverse effects are likely, the applicant must conduct a biological assessment (BA) for the purpose of analyzing the potential effects of the project on listed species and critical habitat to establish and justify an "effect determination." The federal agency reviews the BA; if it concludes that the project may adversely affect a listed species or its habitat, it prepares a BO, which may recommend "reasonable and prudent alternatives" to the project to avoid jeopardizing or adversely modifying habitat.

Critical Habitat and Essential Habitat

Critical Habitat is defined in Section 3 of the ESA as:

1. the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features essential to the conservation of the species and that may require special management considerations or protection; and

2. specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Critical Habitat designations identify, to the extent known and using the best scientific data available, habitat areas that provide essential lifecycle needs of the species. These include but are not limited to the following:

1. Space for individual and population growth and for normal behavior;

2. Food, water, air, light, minerals, or other nutritional or physiological requirements;

3. Cover or shelter;

4. Sites for breeding, reproduction, or rearing (or development) of offspring;

5. Habitats that are protected from disturbance or are representative of the historic, geographical, and ecological distributions of a species;

2.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements international treaties between the United States and other nations devised to protect migratory birds, any of their parts, eggs, and nests from activities such as hunting, pursuing, capturing, killing, selling, and shipping, unless expressly authorized in the regulations or by permit. As authorized under the MBTA, USFWS issues permits to qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, special purposes (rehabilitation, education, migratory game bird propagation, and salvage), take of depredating birds, taxidermy, and waterfowl sale and disposal. The regulations governing migratory bird permits can be found in 50 CFR Part 13 General Permit Procedures and 50 CFR Part 21 Migratory Bird Permits. The State of California has incorporated the protection of non-game birds in § 3800, migratory birds in § 3513, and birds of prey in § 3503.5 of the California Fish and Game Code.

2.1.3 Federal Clean Water Act

The purpose of the federal Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Section 404 of the CWA prohibits the discharge of dredged or fill material into "Waters of the United States" without a permit from the U.S. Army Corps of Engineers (USACE). The definition of Waters of the U.S. includes rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands. Wetlands are defined as those areas "that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3 7b). The U.S. Environmental Protection Agency (USEPA) also has authority over wetlands and may override a USACE permit.

Substantial impacts to wetlands may require an individual permit. Projects that only minimally affect wetlands may meet the conditions of one of the existing Nationwide Permits. A Water Quality Certification or waiver pursuant to Section 401 of the CWA is required for Section 404 permit actions; in California, this certification or waiver is issued by the Regional Water Quality Control Board (RWQCB).

2.1.4 Magnuson-Stevens Fishery Conservation and Management Act

The 1996 Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 USC 1801), requires federal agencies to consult with NMFS whenever a proposed action has a potential to adversely affect essential fish habitat (EFH). Although states are not required to consult with NMFS, NMFS is required to develop EFH conservation recommendations for any state agency activities with the potential to affect EFH. EFH is defined as "…those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity" and includes the necessary habitat for managed fish to complete their life cycles and contribute to a sustainable fishery and healthy ecosystem. Although the concept of EFH is similar to the ESA definition of Critical Habitat, measures recommended by NMFS or a regional fisheries management council to protect EFH are advisory, rather than prescriptive (NMFS 1998).

2.2 State or Local Regulations

2.2.1 California Endangered Species Act

The California ESA (California Fish and Game Code §§ 2050-2116) protects species of fish, wildlife, and plants listed by the State as endangered or threatened. Species identified as candidates for listing may also receive protection. Section 2080 of the California ESA prohibits the taking, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit. Take is defined in Section 86 of the California Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The California ESA allows for take incidental to otherwise lawful projects under permits issued by CDFW.

2.2.2 Fully Protected Species

The State of California first began to designate species as "fully protected" prior to the creation of the federal and the California ESAs. Lists of fully protected species were initially developed to provide protection to those animals that were rare or faced possible extinction and included fish, amphibians and reptiles, birds, and mammals. Most fully protected species have since been listed as threatened or endangered under the federal and/or California ESAs. Fully protected species are identified in the California Fish and Game Code § 4700 for mammals, § 3511 for birds, § 5050 for reptiles and amphibians, and § 5515 for fish.

These sections of the California Fish and Game Code provide that fully protected species may not be taken or possessed at any time, including prohibition of CDFW from issuing incidental take permits for fully protected species under the California ESA. CDFW will issue licenses or permits for take of these species for necessary scientific research or live capture and relocation pursuant to the permit and may allow incidental take for lawful activities carried out under an approved Natural Community Conservation Plan within which such species are covered.

2.2.3 Native Plant Protection Act

The NPPA of 1977 (California Fish and Game Code §§ 1900-1913) was established with the intent to "preserve, protect and enhance rare and endangered plants in this state." The NPPA is administered by CDFW. The Fish and Game Commission has the authority to designate native plants as "endangered" or "rare." The NPPA prohibits the take of plants listed under the NPPA, but the NPPA contains a number of exemptions to this prohibition that have not been clarified by regulation or judicial rule. In 1984, the California ESA brought under its protection all plants previously listed as endangered under NPPA. Plants listed as rare under NPPA are not protected under the California ESA but are still protected under the provisions of NPPA. The Fish and Game Commission no longer lists plants under NPPA, reserving all listings to the California ESA.

2.2.4 California Fish and Game Code Special Protections for Birds

In addition to protections contained within the California ESA and California Fish and Game Code § 3511 described above, the California Fish and Game Code includes a number of sections that specifically protect certain birds:

- Section 3800 states that it is unlawful to take nongame birds, such as those occurring naturally in California that are not resident game birds, migratory game birds, or fully protected birds, except when in accordance with regulations of the California Fish and Game Commission or a mitigation plan approved by CDFW for mining operations.
- Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird.
- Section 3503.5 protects birds of prey (which includes eagles, hawks, falcons, kites, ospreys, and owls) and prohibits the take, possession, or destruction of any birds and their nests.
- Section 3505 makes it unlawful to take, sell, or purchase egrets, ospreys, and several exotic nonnative species, or any part of these birds.
- Section 3513 specifically prohibits the take or possession of any migratory nongame bird as designated in the MBTA.

2.2.5 Lake or Streambed Alteration Agreements

Section 1602 of the California Fish and Game Code requires individuals or agencies to provide a Notification of Lake or Streambed Alteration (LSA) to CDFW for "any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake." CDFW reviews the proposed actions and, if necessary, proposed measures to protect affected fish and wildlife resources. The final proposal mutually agreed upon by CDFW and the applicant is the LSA Agreement.

2.2.6 Porter-Cologne Water Quality Act

The RWQCB implements water quality regulations under the federal CWA and the state Porter-Cologne Water Quality Act. These regulations require compliance with the National Pollutant Discharge Elimination System (NPDES), including compliance with the California Storm Water NPDES General Construction Permit for discharges of storm water runoff associated with construction activities. General Construction Permits for projects that disturb one or more acres of land require development and implementation of a Storm Water Pollution Prevention Plan. Under the Porter-Cologne Water Quality Act, the RWQCB regulates actions that would involve "discharging waste, or proposing to discharge waste, with any region that could affect the water of the state" (Water Code 13260(a)). Waters of the State are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (Water Code 13050 (e)). The RWQCB regulates all such activities, as well as dredging, filling, or discharging materials into Waters of the State that are not regulated by the USACE due to a lack of

connectivity with a navigable water body. The RWQCB may require issuance of a Waste Discharge Requirements for these activities.

2.2.7 California Environmental Quality Act

In accordance with CEQA Guidelines § 15380, a species or subspecies not specifically protected under the federal or California ESAs or NPPA may be considered endangered, rare, or threatened for CEQA review purposes if the species meets certain criteria specified in the Guidelines. These criteria parallel the definitions used in the ESA, California ESA, and NPPA. Section 15380 was included in the CEQA Guidelines primarily to address situations in which a project under review may have a significant effect on a species that has not been listed under the ESA, California ESA, or NPPA, but that may meet the definition of endangered, rare, or threatened. Animal species identified as SSC by CDFW, birds identified as a conservation concern by USFWS, and plants identified by the CNPS as rare, threatened, or endangered may meet the CEQA definition of rare or endangered.

Species of Special Concern

SSC are defined by CDFW as a species, subspecies, or distinct population of an animal native to California that are not legally protected under the federal ESA, California ESA, or California Fish and Game Code, but currently satisfies one or more of the following criteria:

- The species has been completely extirpated from the state or, as in the case of birds, it has been extirpated from its primary seasonal or breeding range.
- The species is listed as federally (but not state) threatened or endangered or meets the state definition of threatened or endangered but has not formally been listed.
- The species has or is experiencing serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for State threatened or endangered status.
- The species has naturally small populations that exhibit high susceptibility to risk from any factor that if realized, could lead to declines that would qualify it for State threatened or endangered status.
- SSC are typically associated with habitats that are threatened.

Projects that result in substantial impacts to SSC may be considered significant under CEQA.

U.S. Fish and Wildlife Service Birds of Conservation Concern

The 1988 amendment to the Fish and Wildlife Conservation Act mandates USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under ESA." To meet this requirement, USFWS published a list of BCC (USFWS 2008) for the U.S. The list identifies the migratory and nonmigratory bird species (beyond those already designated as federally threatened or endangered) that represent USFWS' highest

conservation priorities. Projects that result in substantial impacts to BCC may be considered significant under CEQA.

Sensitive Natural Communities

The CDFW maintains the *California Natural Community List* (CDFW 2019), which provides a list of vegetation alliances, associations, and special stands as defined in the *Manual of California Vegetation* (Sawyer et al. 2009), along with their respective state and global rarity ranks. Natural communities with a state rarity rank of S1, S2, or S3 are considered sensitive natural communities. Impacts to sensitive natural communities may be considered significant under CEQA.

California Rare Plant Ranks

The CNPS maintains the *Inventory of Rare and Endangered Plants of California* (CNPS 2020), which provides a list of plant species native to California that are threatened with extinction, have limited distributions, and/or low populations. Plant species meeting one of these criteria are assigned to one of six CRPRs. The rank system was developed in collaboration with government, academia, non-governmental organizations, and private-sector botanists, and is jointly managed by CDFW and the CNPS. The CRPRs are currently recognized in the CNDDB. The following are definitions of the CNPS CRPRs:

- Rare Plant Rank 1A – presumed extirpated in California and either rare or extinct elsewhere.
- Rare Plant Rank 1B – rare, threatened, or endangered in California and elsewhere.
- Rare Plant Rank 2A – presumed extirpated in California, but more common elsewhere.
- Rare Plant Rank 2B – rare, threatened, or endangered in California but more common elsewhere.
- Rare Plant Rank 3 – a review list of plants about which more information is needed.
- Rare Plant Rank 4 – a watch list of plants of limited distribution.

Additionally, CNPS has defined Threat Ranks that are added to the CRPR as an extension. Threat Ranks designate the level of threat on a scale of 1 through 3, with 1 being the most threatened and 3 being the least threatened. Threat Ranks are generally present for all plants ranked 1B, 2B, or 4, and for the majority of plants ranked 3. Plant species ranked 1A and 2A (presumed extirpated in California), and some species ranked 3, which lack threat information, do not typically have a Threat Rank extension. The following are definitions of the CNPS Threat Ranks:

- Threat Rank 0.1 – Seriously threatened in California (over 80 percent of occurrences threatened/high degree and immediacy of threat).
- Threat Rank 0.2 – Moderately threatened in California (20-80 percent occurrences threatened/moderate degree and immediacy of threat).
- Threat Rank 0.3 – Not very threatened in California (less than 20 percent of occurrences threatened/low degree and immediacy of threat or no current threats known).

Factors such as habitat vulnerability and specificity, distribution, and condition of occurrences are considered in setting the Threat Rank; and differences in Threat Ranks do not constitute additional or different protection (CNPS 2020).

Substantial impacts to plants ranked 1A, 1B, 2, and 3 are typically considered significant under CEQA Guidelines § 15380. Significance under CEQA is typically evaluated on a case-by-case basis for plants ranked 4 and at the discretion of the CEQA lead agency.

CEQA Significance Criteria

Sections 15063-15065 of the CEQA Guidelines address how an impact is identified as significant. Generally, impacts to listed (rare, threatened, or endangered) species are considered significant. Assessment of "impact significance" to populations of non-listed species (e.g., SSC) usually considers the proportion of the species' range that will be affected by a project, impacts to habitat, and the regional and population level effects.

Specifically, § 15064.7 of the CEQA Guidelines encourages local agencies to develop and publish the thresholds that the agency uses in determining the significance of environmental effects caused by projects under its review. However, agencies may also rely upon the guidance provided by the expanded Initial Study checklist contained in Appendix G of the CEQA Guidelines, which provides examples of impacts that would normally be considered significant. As discussed and presented below in section 5.0 Impacts and Mitigation Measures, this BRA impact analysis relies on the CEQA Guidelines Appendix G significance thresholds.

An evaluation of whether an impact on biological resources would be significant must consider both the resource itself and how that resource fits into a regional or local context. Significant impacts would be those that would diminish, or result in the loss of, an important biological resource, or those that would obviously conflict with local, state, or federal resource conservation plans, goals, or regulations. Impacts are sometimes locally important but not significant under CEQA. The reason for this is that although the impacts would result in an adverse alteration of existing conditions, they would not substantially diminish or result in the permanent loss of an important resource on a population-wide or region-wide basis.

2.2.8 Napa County General Plan

The Conservation Element of the Napa County General Plan (Napa County 2009) provides goals, policies, and action items related to open space conservation as well as a wide range of other topics that together comprise the natural environment of Napa County, including its natural and water resources. The goals and policies of this Conservation Element are intended to recognize and support positive industry trends, private-public partnership efforts, and effective elements of the existing regulatory framework.

The following Conservation Element Goals and Policies are pertinent to this Project:

Goals:

CON-2: Maintain and enhance the existing level of biodiversity.

CON-3: Protect the continued presence of special-status species, including special-status plants, special-status wildlife, and their habitats, and comply with all applicable state, federal, or local laws or regulations.

CON-4: Conserve, protect, and improve plant, wildlife, and fishery habitats for all native species in Napa County.

CON-5: Protect connectivity and continuous habitat areas for wildlife movement.

Policies:

CON-10: The County shall conserve and improve fisheries and wildlife habitat in cooperation with governmental agencies, private associations and individuals in Napa County.

CON-11: The County shall maintain and improve fisheries habitat through a variety of appropriate measures.

CON-12: Public water development projects shall provide an adequate release flow of water to preserve fish populations and public access to the water via public lands.

CON-13: The County shall require that all discretionary residential, commercial, industrial, recreational, agricultural, and water development projects consider and address impacts to wildlife habitat and avoid impacts to fisheries and habitat supporting special-status species to the extent feasible.

CON-16: The County shall require a biological resources evaluation for discretionary projects in areas identified to contain or potentially contain special-status species based upon data provided in the Baseline Data Report (BDR), California Natural Diversity Database (CNDDB), or other technical materials. This evaluation shall be conducted prior to the approval of any earthmoving activities. The County shall also encourage the development of programs to protect special-status species and disseminate updated information to state and federal resource agencies.

3.0 METHODS

3.1 Literature Review

The following resources were queried to determine the special-status species that had been documented within or in the vicinity of the Study Area:

- CDFW CNDDB data for the "Yountville, California" 7.5-minute USGS quadrangle and the 8 surrounding USGS quadrangles (CDFW 2020a).
- USFWS Information, Planning, and Consultation System (IPaC) Resource Report List for the Study Area (USFWS 2020).
- CNPS' electronic *Inventory of Rare and Endangered Plants of California* for the "Yountville, California" 7.5-minute USGS quadrangle and the eight surrounding USGS quadrangles (CNPS 2020).

The results of the database queries are included in Attachment A.

3.2 Field Surveys Conducted

This biological resource assessment includes an initial site visit to generally characterize onsite resources, including plant communities, wildlife, special-status species, aquatic resources (i.e., potential Waters of the U.S./State), and sensitive natural communities. No focused technical studies specific to the Study Area have been completed to date. Stillwater Sciences prepared two studies for Rector Creek: *Rector Creek Preliminary Instream Flow and Steelhead Habitat Assessment-DRAFT* (2018a) and *Rector Creek Preliminary Instream Flow and Stream Habitat Assessment* (2018b).

3.2.1 Special-Status Species Assessment

A field assessment for special-status species was conducted by ECORP biologist Keith Kwan on October 13, 2020. The purpose of this assessment was to identify potential onsite biological resource constraints (e.g., aquatic resources, special-status species) and related impacts and mitigation under CEQA. The BRA also identifies regulatory requirements for development of the site. During the assessment, the following biological resource information was collected:

- Direct observations of special-status species;
- Animal and plant species directly observed;
- Habitat and vegetation communities.

3.2.2 Preliminary Aquatic Resources Assessment

A preliminary field assessment for aquatic resources was conducted on October 13, 2020, by ECORP biologist Keith Kwan to evaluate existing conditions and boundaries of potential aquatic resources within the Study Area. This assessment was intended for general planning purposes, and was not performed in accordance with the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) or the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Arid West Region Supplement; USACE 2008).

3.3 Special-Status Species Considered for the Project

Based on species occurrence information from the literature review and field observations, a list of special-status species considered to have the potential to occur within the Study Area was generated (Table 1, Section 3.6). Each of the species that were considered as potentially occurring within the Study Area or vicinity was evaluated based on the following criteria:

- **Present** - Species was observed during field surveys or is known to occur within the Study Area based on documented occurrences within the CNDDB or other literature.
- **Potential to Occur** - Habitat (including soils and elevation requirements) for the species occurs within the Study Area.
- **Low Potential to Occur** - Marginal or limited amounts of habitat occur, and/or the species is not known to occur within the vicinity of the Study Area based on CNDDB records and other available documentation.
- **Absent** - No suitable habitat (including soils and elevation requirements), and/or the species is not known to occur within the Study Area or the vicinity of the Study Area based on CNDDB records and other documentation or determinate field surveys.

3.4 Sensitive Natural Communities

Napa County Vegetation Alliance data (Thorne et al. 2004; CDFW 2020b) were used to initially delineate vegetation communities onsite (Figure 8. *Land Cover Types*). This was further refined and categorized, if necessary, according to the *Manual of California Vegetation, Second Edition* (Sawyer et al., 2009) following the site assessment on October 13, 2020. Sensitive natural communities are those that are listed in the CNDDB and identified in the Napa County Baseline Data Report as a sensitive biotic community (Jones & Stokes and EDAW 2005).

4.0 RESULTS

4.1 Site Characteristics and Land Use

The Study Area is located in heavily impacted area near the base of Rector Dam and in Rector Creek at the proposed Rector Reservoir outfall. The existing spillway is not included in the Study Area. The Study Area is located within gently rolling terrain situated at an elevational range of approximately 210 to 250 feet above mean sea level in the North Coast Range Subregion of the Northwestern California floristic region of California (Baldwin et. al. 2012). The average winter low temperature in the vicinity of the Study Area is 37.2˚ Fahrenheit (F) and the average summer high temperature is 85.6˚F. Average annual precipitation is approximately 33.79 inches, which falls as rain (National Oceanic and Atmospheric Administration [NOAA] 2020).

The Study Area is comprised of barren and compacted land, a small reach of Rector Creek and the Rector Reservoir outfall structure. The barren land is located in the uplands between the dam and the CalVet water treatment facilities (see Figures 5 and 8).



Map Features

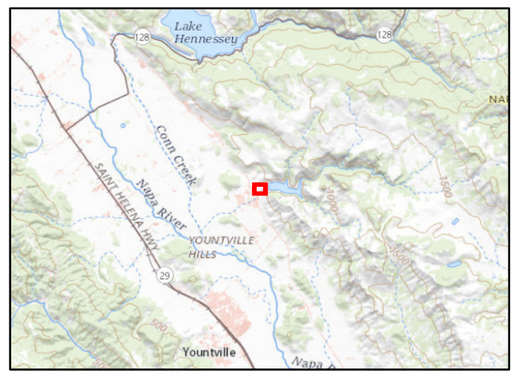
- Survey Area - 3.3 ac.

Vegetation - Napa County and Blue Ridge Berryessa [ds201] - Land Cover Types

- Blue Oak Alliance
- Coast Live Oak - Blue Oak - (Foothill Pine) NFD Association
- California Annual Grasslands Alliance
- Urban or Built-up

Photo Source: USGS Topo; NAIP (2018)
Boundary Source: ECORP/Wood Rodgers
Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

[1] *The information depicted on this graphic represents a preliminary wetland assessment. The assessment was not conducted in accordance with the Corps of Engineers Wetland Delineation Manual and San Francisco District Minimum Standards. The project boundaries, wetland boundaries, and acreage values are approximate.*



ECORP: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Land_Cover\Rector_LandCover_20201130.mxd (CCH)-chinkelman 11/30/2020

Map Date: 11/30/2020

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Source: Thorne et al. 2004

Scale in Feet
0 100

Figure 8. Land Cover Types

2018-116.011 Rector Reservoir Bypass Valve Project

Rector Creek is an intermittent stream. During the field visit in October 2020, there was water in a pool in the creek channel that appear to be present due to water being discharged from a hydrant. Otherwise, the creek bed was dry.

Representative photographs of the Study Area are included in Attachment B.

4.2 Vegetation Communities

The Study Area is mapped as "Urban or Built-up" (CDFW 2020b). While most of the Study Area consists or "Urban or Built-up" land consisting of heavily impacted and disturbed land, a small patch of degraded riparian scrub vegetation is located on the riprap bed and bank of Rector Creek. The extent of this habitat does not meet the minimum size for vegetation community mapping of 0.5 acre (CDFW and CNPS 2019) (*Figure 9. Vegetation Communities/Land Cover/Preliminary Aquatic Resources Assessment*). A small portion of the Study Area includes the developed portion of the Rector Reservoir water treatment operations facility. The disturbed/ruderal land cover is a clearing of mostly denuded and compacted dirt at the base of the dam. Scattered weeds include yellow star-thistle (*Centaurea solstitialis*), filaree (*Erodium* species), mustard (*Brassica* species), and wild oats (*Avena fatua*). Two coast live oak trees (*Quercus agrifolia*) are located within the ruderal-disturbed area.

The narrow degraded riparian scrub vegetation community is located on the steep creek bank that has been riprapped with boulders. The degraded riparian scrub is comprised of willows (*Salix* sp.), Fremont cottonwood (*Populus fremontii*), California wild grape (*Vitis californica*), Italian thistle (*Carduus pycnocephalus*), and yellow star-thistle. At the time of the field assessment on October 30, 2020, there was no flow from Rector Reservoir outfall, but water was being discharged into the creek from a hydrant. This created a pool in the creek bed with little to no downstream flow at the time. Aquatic vegetation found in the pool included water primrose (*Ludwigia peploides*).

A list of plant species observed is included in Attachment C.

4.3 Wildlife Observations and Movement/Corridors

The Study Area is located between Rector Dam and the Rector Reservoir operations facility. Undeveloped lands with oak woodland, oak savannah, and annual grassland is located to the south. The upland portions of the Study Area are largely disturbed, unvegetated, and/or subject to periodic disturbances, so wildlife use is expected to be minimal.

Rector Creek below Rector Dam is accessible to anadromous fish and falls within Conservation Lands Network (CLN) "fragmented critical habitat" (Bay Area Open Space Council 2011, Stillwater Sciences 2018a). The CLN identifies Bay Area habitats and linkages needed to meet goals for biodiversity conservation. CLN has identified areas that support irreplaceable, rare, and endemic plant and animal species, while also encompassing common plant and animal species (including vegetation types, stream and riparian networks, and migratory corridors).



Map Features

- Survey Area - 3.3 ac.
- Reference_Coordinates
- Coast Live Oak

Land Cover Type

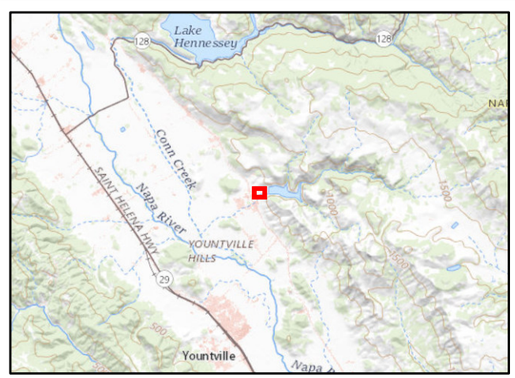
- Riparian Scrub (0.1 acres)
- Disturbed/Ruderal (3.1 acres)
- Developed (0.1 acres)

Aquatic Resources Assessment[1]

- Seasonal Creek (0.052 acres)

Photo Source: USGS Topo; NAIP (2018)
Boundary Source: ECORP/Wood Rodgers
Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

[1] *The information depicted on this graphic represents a preliminary wetland assessment. The assessment was not conducted in accordance with the Corps of Engineers Wetland Delineation Manual and San Francisco District Minimum Standards. The project boundaries, wetland boundaries, and acreage values are approximate.*



Map Date: 10/20/2020

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Scale in Feet
0 100

Figure 9. Vegetation Communities/Land Cover/ Preliminary Aquatic Resources Assessment

2018-116.011 Rector Reservoir Bypass Valve Project

ECORP- N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Jurisdictional_Delineation\Rector_ARA_20201018.mxd (CCH)-chinkelman 10/20/2020

Wildlife observed during the October 2020 site visit included western fence lizard (*Sceloporus occidentalis*), belted kingfisher (*Megaceryle alcyon*), acorn woodpecker (*Melanerpes formicivorus*), Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), house finch (*Haemorhous mexicanus*), and white-crowned sparrow (*Zonotrichia leucophrys*).

4.4 Soils

According to the Web Soil Survey (NRCS 2020a), two soil units, or types, have been mapped within the Study Area (Figure 10. *Natural Resources Conservation Service Soil Types*):

- 125 – Cortina very stony loam, 0 to 5 percent slopes and
- 174 – Riverwash

No soil units derived from serpentinite or other ultramafic parent materials are known to occur within the Study Area or its immediate vicinity (SCS 1978).

4.4.1 Cortina Series

Cortina series soils consist of excessively drained soils on flood plains and alluvial fans. These soils formed from recent stratified alluvium (Soil Conservation Service [SCS] 1978). Cortina very stony loam (125) contains riverwash hydric components in drainageways (NRCS 2020b).

4.4.2 Riverwash

Riverwash (174) is included in miscellaneous areas that are in active stream channels, on flood plains, and adjacent to drainageways. These areas are inundated during periods of waterflow and are subject to constant deposition and removal of material. Riverwash consists of erratically stratified layers of water-deposited sand, gravel, stones, and cobbles. Layers of sandy loam and silt loam are deposited for short periods but are subject to intermittent scouring and removal (SCS 1978). Riverwash (174) contains riverwash hydric components in channels and floodplains (NRCS 2020b).

4.5 Potential Waters of the U.S./State

An aquatic resources delineation to identify potential Waters of the U.S./State has not been conducted for the Study Area to date. During the site assessment in October 2020, a preliminary aquatic resources assessment was conducted. A total of ±0.052 acre of Rector Creek (intermittent creek) has been mapped within the Study Area (Figure 9).

Rector Creek is an intermittent creek below Rector Reservoir. The reach of the creek within the Study Area contains a bed of cobble of boulders with little to no vegetation due to the effects of scouring of reservoir discharges immediately upstream.

Figure 10. Natural Resources Conservation Service Soil Types



Map Features

Survey Area - 3.3 ac.

Series Number - Series Name

125 - Cortina very stony loam, 0 to 5 percent slopes

174 - Riverwash

Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database for Napa County, CA

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Location: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Soils_and_Geology\Rector_Soils_20201018.mxd (CCH)-chinkelman 10/18/2020

2018-116.011 Rector Reservoir Bypass Valve Project

Scale in Feet
0 100

Map Date: 10/18/2020

4.6 Evaluation of Potentially Occurring Special-Status Species

Table 1 lists all the special-status plant and wildlife species (as defined in Section 3.3) identified in the literature review as potentially occurring within the Study Area. Included in this table is the listing status for each species, a brief habitat description, and a determination on the potential to occur within the Study Area. Following the table is a brief description and discussion of each special-status species that is known to occur in the Study Area (from the literature review) or is considered to potentially occur within the Study Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Plants						
Henderson's bent grass *(Agrostis hendersonii)*	–	–	3.2	Vernal pools and mesic areas in valley and foothill grasslands (230'–1,001').	April–June	Absent-there is no suitable habitat onsite.
Franciscan onion (*Allium peninsulare* var. *franciscanum*)	–	–	1B.2	Clay, volcanic, and often serpentinite soil within cismontane woodlands and valley and foothill grassland (171'–1,001').	April–June	Absent-there is no suitable habitat onsite.
Napa false indigo (*Amorpha californica* var. *napensis*)	–	–	1B.2	Openings in broadleaf upland forest, chaparral, and cismontane woodland communities (394'–6,562').	April–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Bent-flowered fiddleneck (*Amsinckia lunaris*)	-	–	1B.2	Cismontane woodland, coastal bluff scrub, and valley and foothill grasslands (10'–1,640').	March–June	Absent-there is no suitable habitat onsite.
Twig-like snapdragon (*Antirrhinum virga*)	–	–	4.3	Rocky soils, openings, and often serpentinite in chaparral and lower montane coniferous forest (328'–6,611').	June–July	Absent-there is no suitable habitat onsite.
Modest rockcress *(Arabis modesta)*	–	–	4.3	Chaparral and lower and montane coniferous forest (393'–2,625').	March–July	Absent-there is no suitable habitat onsite.
Baker's manzanita (*Arctostaphylos bakeri* ssp. *bakeri*)	–	CR	1B.1	Often on serpentinite soils in broadleafed upland forest, and chaparral communities (246'–984').	February–April	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Rincon Ridge manzanita (*Arctostaphylos stanfordiana* ssp. *decumbens*)	–	–	1B.1	Highly restricted to red rhyolites in Sonoma County in chaparral and cismontane woodland communities (246'–1,214').	February–April	Absent-there is no suitable habitat onsite.
Brewer's milk-vetch *(Astragalus breweri)*	–		4.2	Often serpentine, volcanic soils in chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland (open, often gravelly) (295'-2,395')	April-June	Absent-there is no suitable habitat onsite.
Clara Hunt's milk-vetch *(Astragalus claranus)*	FE	CT	1B.1	Serpentinite or volcanic soils in chaparral openings, cismontane woodland, and valley and foothill grasslands (246'–902').	March–May	Absent-there is no suitable habitat onsite.
Cleveland's milk-vetch *(Astragalus clevelandii)*	–	–	4.3	Serpentine seeps in chaparral, cismontane woodland, riparian forest (656'–4,921').	June–September	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Alkali milk-vetch *(Astragalus tener* var. *tener)*	–	–	1B.2	Playas, mesic areas within valley and foothill grasslands, and alkaline vernal pools (3'–197').	March–June	Absent-there is no suitable habitat onsite.
Big-scale balsamroot *(Balsamorhiza macrolepis* var. *macrolepis)*	–	–	1B.2	Chaparral, cismontane woodland, and valley and foothill grassland, sometimes on serpentinite soils (148'–5,102').	March–June	Absent-there is no suitable habitat onsite.
Sonoma sunshine *(Blennosperma bakeri)*	FE	CE	1B.1	Mesic valley and foothill grasslands and vernal pools (33'–361').	March–May	Absent-there is no suitable habitat onsite.
Narrow-anthered brodiaea (*Brodiaea leptandra*)	–	–	1B.2	Volcanic soils in broad–leafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland (361'–3,002').	May–July	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Serpentine reed grass *(Calamagrostis ophitidis)*	–	–	4.3	Serpentine, rocky soils in chaparral (open, often north-facing slopes), lower montane coniferous forest, meadows and seeps, and valley and foothill grassland (295'–3,494').	April–July	Absent-there is no suitable habitat onsite.
Brewer's calandrinia *(Calandrinia breweri)*	–	–	4.2	Sandy or loamy soils, disturbed sites, and burns within chaparral and coastal scrub (33'–4,003').	March–June	Absent-there is no suitable habitat onsite.
Mt. Diablo fairy-lantern (*Calochortus pulchellus*)	–	–	1B.2	Chaparral, cismontane woodland, riparian woodland, and valley and foothill grassland (98'–2,756').	April–June	Absent-there is no suitable habitat onsite.
Small-flowered calycadenia *(Calycadenia micrantha)*	–	–	1B.2	Roadsides, rocky, talus, scree, sometimes serpentine, sparsely vegetated areas in chaparral, meadows and seeps, and valley and foothill grassland (16'–4,921').	June–September	Absent-there is no suitable habitat onsite.
Mt. Saint Helena morning-glory *(Calystegia collina* ssp. *oxyphylla)*	–	–	4.2	Serpentine soils in chaparral, lower montane coniferous forest, and valley and foothill grassland. (915'–3,314').	April–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Johnny-nip (*Castilleja ambigua* var. *ambigua*)	–	–	4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, and margins of vernal pools (0'–1,427').	March–August	Absent-there is no suitable habitat onsite.
Mead's owl's clover (*Castilleja ambigua* var. *meadii*)	–	–	1B.1	Gravelly, volcanic, and clay soils in meadows and seeps and vernal pools (1,476'–1,559').	April–May	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Rincon Ridge ceanothus (*Ceanothus confusus*)	–	–	1B.1	Volcanic or serpentine soils in closed-cone coniferous forest, chaparral, and cismontane woodland communities (246'–3,494').	February–June	Absent-there is no suitable habitat onsite.
Calistoga ceanothus *(Ceanothus divergens)*	–	–	1B.2	Chaparral (serpentine or volcanic, rocky soils) (558'–3,117').	February–April	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Holly-leaved ceanothus (*Ceanothus purpureus*)	–	–	1B.2	Volcanic, rocky slopes in chaparral and cismontane woodland communities (394'–2,100').	February–June	Absent-there is no suitable habitat onsite.
Sonoma ceanothus *(Ceanothus sonomensis)*	–	–	1B.2	Chaparral (sandy, serpentinite or volcanic soils) (705'–2,625').	February–April	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Parry's rough tarplant *(Centromadia parryi* ssp. *rudis)*	–	–	4.2	Alkaline, vernally mesic seeps in valley and foothill grassland and vernal pools, sometimes found on roadsides (0'–328').	May–October	Absent-there is no suitable habitat onsite.
Sonoma spineflower (*Chorizanthe valida*)	FE	CE	1B.1	Sandy soil in coastal prairie (32'–1,001').	June–August	Absent-there is no suitable habitat onsite.
Brewer's clarkia (*Clarkia breweri*)	–	–	4.2	Often serpentine soils in chaparral, cismontane woodland, and coastal scrub (705'–3,658').	April-June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Tracy's clarkia *(Clarkia gracilis* ssp. *tracyi)*	–	–	4.2	Openings, usually with serpentine soils, in chaparral (213'–2,132').	April–July	Absent-there is no suitable habitat onsite.
Serpentine collomia (*Collomia diversifolia*)	–	–	4.3	Serpentinite, rocky, or gravelly substrates in chaparral and cismontane woodland (656'–1,969').	May–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Serpentine bird's-beak *(Cordylanthus tenuis* ssp. *brunneus)*	–	–	4.3	Usually serpentinite soils of closed–cone coniferous forest, chaparral, and cismontane woodland (1,001'–3,002').	July–August	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Serpentine cryptantha *(Cryptantha dissita)*	–	–	1B.2	Serpentine in chaparral (1,295'–1,903').	April–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Swamp larkspur *(Delphinium uliginosum)*	–	–	4.2	Serpentinite seeps in chaparral and valley and foothill grassland (1,115'–2,001').	May–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Dwarf downingia *(Downingia pusilla)*	–	–	2B.2	Mesic areas in valley and foothill grassland, and vernal pools. Species appears to have an affinity for slight disturbance (i.e., scraped depressions, ditches) (Baldwin et al. 2012, CDFW 2020a) (3'–1,460').	March–May	Absent-there is no suitable habitat onsite.
Streamside daisy *(Erigeron biolettii)*	–	–	3	Rocky, mesic soils of broadleaved upland forest, cismontane woodland, and North Coast coniferous forest (98'–3,609').	June–October	Absent-there is no suitable habitat onsite.
Greene's narrow-leaved daisy *(Erigeron greenei)*	–	–	1B.2	Serpentine or volcanic soils in chaparral (262'–3,298').	May–September	Absent-there is no suitable habitat onsite.
Jepson's coyote thistle (*Eryngium jepsonii*)	–	–	1B.2	Clay soils of valley and foothill grassland, and vernal pools (10'–984').	April–August	Absent-there is no suitable habitat onsite.
San Joaquin spearscale (*Extriplex joaquinana*)	–	–	1B.2	Alkaline soils in chenopod scrub, meadows seeps, playas, and valley and foothill grassland (3'–2,740').	April–October	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Woolly-headed gilia *(Gilia capitata* ssp. *tomentosa)*	–	–	1B.1	Serpentine, rocky, outcrops in coastal bluff scrub, valley and foothill grassland (33'–722').	May–July	Absent-there is no suitable habitat onsite.
Nodding harmonia (*Harmonia nutans*)	–	–	4.3	Rocky, gravelly, often volcanic soils in chaparral and cismontane woodland (246'–4,199')	March–May	Absent-there is no suitable habitat onsite.
Congested-headed hayfield tarplant (*Hemizonia congesta* ssp. *congesta*)	–	–	1B.2	Grassy valleys and hills, often in fallow fields, and sometimes along roadsides in valley and foothill grassland communities (66'–1,837').	April–November	Absent-there is no suitable habitat onsite.
Two-carpellate western flax (*Hesperolinon bicarpellatum*)	–	–	1B.2	Serpentinite soils of chaparral (196'–3,298').	May–July	Absent-there is no suitable habitat onsite.
Brewer's western flax (*Hesperolinon breweri*)	–	–	1B.2	Usually in serpentinite soils of chaparral, cismontane woodland, and valley and foothill grassland (98'–3,100').	May–July	Absent-there is no suitable habitat onsite.
Sharsmith western flax (*Hesperolinon sharsmithiae*)	–	–	1B.2	Serpentinite soils of chaparral (885'–985').	May–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Thin-lobed horkelia (*Horkelia tenuiloba*)	–	–	1B.2	Mesic, sandy openings of broad–leafed upland forest, chaparral, valley and foothill grassland (164'–1,640').	May–July	Absent-there is no suitable habitat onsite.
Contra Costa goldfields *(Lasthenia conjugens)*	FE	–	1B.1	Mesic sites within cismontane woodland, playas with alkaline soils, valley and foothill grassland and vernal pools (16'–1,706').	March–June	Absent-there is no suitable habitat onsite.
Delta tule pea (*Lathyrus jepsonii* var. *jepsonii)*	–	–	1B.2	Freshwater and brackish marshes and swamps (0'–16').	May–September	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Colusa layia *(Layia septentrionalis)*	–	–	1B.2	Sandy or serpentinite soils in chaparral, cismontane woodland, and valley and foothill grasslands (328'–3,593').	April–May	Absent-there is no suitable habitat onsite.
Bristly leptosiphon (*Leptosiphon acicularis*)	–	–	4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland (180'–4,921').	April–July	Absent-there is no suitable habitat onsite.
Jepson's leptosiphon (*Leptosiphon jepsonii*)	–	–	1B.2	Usually volcanic; chaparral, cismontane woodland, and valley and foothill grassland (328'-1,640')	March-May	Absent-there is no suitable habitat onsite.
Broad-leaved leptosiphon (*Leptosiphon latisectus*)	–	–	4.3	Broad-leaved upland forest, cismontane woodland (558'-4,921')	April-June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Mason's lilaeopsis *(Lilaeopsis masonii)*	–	CR	1B.1	Brackish or freshwater marshes or swamps and riparian scrub (0'–33').	April–November	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Redwood lily (*Lilium rubescens*)	–	–	4.2	Sometimes serpentinite soils and roadsides of broadleaf upland forest, chaparral, lower and upper montane coniferous forest, and North Coast coniferous forest (98'–6,267').	May–August	Absent-there is no suitable habitat onsite.
Sebastopol meadowfoam *(Limnanthes vinculans)*	FE	CE	1B.1	Vernally mesic areas in meadows and seeps, valley and foothill grasslands, and vernal pools (49'–1,001').	April–May	Absent-there is no suitable habitat onsite.
Napa lomatium (*Lomatium repostum*)	–	–	4.3	Serpentinite soils of chaparral and cismontane woodland (295'–2,724').	March–June	Absent-there is no suitable habitat onsite.
Cobb Mountain lupine *(Lupinus sericatus)*	–	–	1B.2	Broadleaf upland forest, chaparral, cismontane woodland, and lower montane coniferous forest (902'–5,003').	March–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Heller's bush-mallow (*Malacothamnus helleri*)	–	–	3.3	Chaparral (sandstone) and riparian woodland (1,001'–2,083').	May–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Mt. Diablo cottonweed (*Micropus amphibolus*)	–	–	3.2	Rocky soils in broad–leafed upland forest, chaparral, cismontane woodland, valley and foothill grassland (148'–2,707').	March–May	Absent-there is no suitable habitat onsite.
Green monardella (*Monardella viridis*)	–	–	4.3	Broadleaf upland forest, chaparral, and cismontane woodland (328'-3,313')	June–September	Absent-there is no suitable habitat onsite.
Cotula navarretia *(Navarretia cotulifolia)*	–	–	4.2	Adobe soils in chaparral, cismontane woodland, and valley and foothill grassland (13'–6,004').	May–June	Absent-there is no suitable habitat onsite.
Tehama navarretia (*Navarretia heterandra*)	–	–	4.3	Mesic areas in valley and foothill grassland and vernal pools (98'–3,314').	April–June	Absent-there is no suitable habitat onsite.
Baker's navarretia *(Navarretia leucocephala* ssp. *bakeri)*	–	–	1B.1	Vernal pools and mesic areas within cismontane woodlands, lower montane coniferous forests, meadows and seeps, and valley and foothill grasslands (16'–5,709').	April–July	Absent-there is no suitable habitat onsite.
Few-flowered navarretia *(Navarretia leucocephala* ssp. *pauciflora)*	FE	CT	1B.1	Volcanic ash flow vernal pools (1,312'–2,805').	May–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Marin County navarretia *(Navarretia rosulata)*	–	–	1B.2	Serpentine, rocky soils in close-cone coniferous forest and chaparral (656'–2,083').	May–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Sonoma beardtongue *(Penstemon newberryi* var. *sonomensis)*	–	–	1B.2	Chaparral (rocky) (2,297–4,495').	April–August	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Lobb's aquatic buttercup (*Ranunculus lobbii*)	–	–	4.2	Mesic areas of cismontane woodland, North Coast coniferous forest, valley and foothill grassland, and vernal pools (49'–1,542').	February–May	Absent-there is no suitable habitat onsite.
California beaked-rush *(Rhynchospora californica)*	–	–	1B.1	Bogs and fens, lower montane coniferous forest, meadows and seeps, and freshwater marshes and swamps (137'–3,314').	May–July	Absent-there is no suitable habitat onsite.
Sanford's arrowhead *(Sagittaria sanfordii)*	–	–	1B.2	Shallow marshes and freshwater swamps (0'–2,133').	May–October	Absent-there is no suitable habitat onsite.
Cleveland's ragwort (*Senecio clevelandii* var. *clevelandii*)	–	–	4.3	Serpentine seeps of chaparral (1,197'–2,953').	June–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Napa checkerbloom (*Sidalcea hickmanii* ssp. *napensis*)	–	–	1B.1	Rhyolitic substrates in chaparral communities (1,361'–2,002').	April–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Marin checkerbloom (*Sidalcea hickmanii* ssp. *viridis*)	–	–	1B.1	Rhyolitic substrates in chaparral communities (164'–1,410').	May–June	Absent – there is no suitable habitat onsite
Keck's checkerbloom *(Sidalcea keckii)*	FE	–	1B.1	Serpentinite and clay soils within cismontane woodland and valley and foothill grasslands (246'–2,133').	April–May	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Marsh checkerbloom *(Sidalcea oregana* ssp. *hydrophila)*	–	–	1B.2	Mesic; meadows and seeps, riparian forests (377'–492').	July–August	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Green jewelflower (*Streptanthus hesperidis*)	–	–	1B.2	Rocky soils in chaparral and valley and foothill grassland (427'–2,493').	May–July	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Suisun marsh aster (*Symphyotrichum lentum*)	–	–	1B.2	Brackish and freshwater marshes and swamps (0'–10').	May–November	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Marsh zigadenus (*Toxicoscordion fontanum*)	–	–	4.2	Vernally mesic, often serpentinite in chaparral, cismontane woodland, lower montane coniferous forest, meadows and seeps, and marshes and swamps (49–3,281').	April–July	Absent-there is no suitable habitat onsite.
Napa bluecurls (*Trichostema ruygtii*)	–	–	1B.2	Chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland, and vernal pools (98'–2,231').	June–October	Absent-there is no suitable habitat onsite.
Two-fork clover *(Trifolium amoenum)*	FE	–	1B.1	Coastal bluff scrub and valley and foothill grassland communities and is sometimes associated with serpentinite soils (16'–1,362').	April–June	Absent-there is no suitable habitat onsite.
Saline clover *(Trifolium hydrophilum)*	–	–	1B.2	Marshes and swamps, mesic and alkaline areas in valley and foothill grassland, and vernal pools (0'–984').	April–June	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Dark-mouthed triteleia (*Triteleia lugens*)	–	–	4.3	Broadleaf upland forest, chaparral, coastal scrub, and lower montane coniferous forest (328'–3,281').	April–June	Absent-there is no suitable habitat onsite.
Oval-leaved viburnum *(Viburnum ellipticum)*	–	–	2B.3	Chaparral, cismontane woodland, and lower montane coniferous forest communities (705'–4,593').	May–June	Absent-there is no suitable habitat onsite and this species is not found at the elevation of the Project Area.
Invertebrates						
California freshwater shrimp *(Syncaris pacifica)*	FE	CE	-	They have been found only in low-elevation less than 116 m (less than 380 feet) and low-gradient (generally less than 1 percent) streams. Excellent habitat conditions include streams of 30 to 91 cm (12 to 36) inches in depth with exposed live roots of trees such as alder and willow along undercut banks greater than 15 cm (6 inches). The banks have overhanging woody debris or stream vegetation and vines such as stinging nettles, grasses, vine maple and mint.	N/A	Absent-there is no suitable habitat onsite.
Conservancy fairy shrimp (*Branchinecta conservatio)*	FE	-	-	Vernal pools/wetlands.	November-April	Absent-there is no suitable habitat onsite.
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT	-	-	Elderberry shrubs.	Any season	Absent-The Project is not within the known range of the species.
Fish						
Delta smelt (*Hypomesus transpacificus*)	FT	CE	-	Sacramento-San Joaquin delta.	N/A	Absent-the Project Area is not within the known distribution range.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Longfin smelt (*Spirinchus thaleichthys*)	FC	CT	SSC	Freshwater and seawater estuaries.	N/A	Absent-there is no suitable habitat onsite.
Steelhead (Central CA Coast DPS) *(Oncorhynchus mykiss irideus)*	FT	-	-	Undammed rivers, streams, creeks.	N/A	Potential-Rector Creek up to Rector Reservoir dam is considered suitable habitat.
Chinook salmon (Central Valley fall/late-fall-run evolutionarily significant unit (ESU)) (*O. tshawytscha*)	SC	SSC	-	Undammed rivers, streams, creeks.	N/A	Potential-Rector Creek up to Rector Reservoir dam is considered suitable habitat.
Pacific lamprey (*Lampetra tridentata*)	-	SSC	-	Undammed rivers, streams, creeks.	N/A	Potential-Rector Creek up to Rector Reservoir dam is considered suitable habitat.
River lamprey (*L. ayresi*)	-	SSC	-	Undammed rivers, streams, creeks.	N/A	Potential-Rector Creek up to Rector Reservoir dam is considered suitable habitat.
Riffle sculpin (*Cottus gulosus*)	-	SSC	-	Perennial coldwater streams with moderate gradients dominated by riffles with rocky substrates.	N/A	Potential-Rector Creek up to Rector Reservoir dam is considered suitable habitat.
Hardhead (*Mylopharodon conocephalus*)	-	SSC	-	Relatively undisturbed streams at low to mid elevations in the Sacramento-San Joaquin and Russian River drainages. In the San Joaquin River, scattered populations found in tributary streams, but only rarely in the valley reaches of the San Joaquin River.	N/A	Potential-this species occurs in the Napa River near the Study Area.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Sacramento splittail (*Pogonichthys macrolepidotus*)	-	SSC	-	Sloughs, lakes, and rivers of the Central Valley, Sacramento-San Joaquin Delta, and tributaries to the San Francisco estuary, including the Napa River.	N/A	Potential-this species occurs in the Napa River near the Study Area.
Amphibians						
Red-bellied newt (*Taricha rivularis*)	-	-	SSC	Adults are terrestrial in coastal woodlands and redwood forests along the northern California coast and become aquatic when breeding. Larvae retreat into vegetation and under stones during the day.		Absent-there is no suitable habitat onsite.
California giant salamander (*Dicamptodon ensatus*)	-	-	SSC	Occurs in wet coastal forests in or near clear, cold permanent and semi-permanent streams and seepages.		Absent-there is no suitable habitat onsite.
California red-legged frog (*Rana draytonii*)	FT	-	SSC	Lowlands or foothills at waters with dense shrubby or emergent riparian vegetation. Adults must have aestivation habitat to endure summer dry down.	May 1- November 1	Potential-Rector Creek (intermittent) represents suitable habitat.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Foothill yellow-legged frog *Northwest/North Coast Clade* (*Rana boylii*)	-	-	SSC	Foothill yellow-legged frogs can be active all year in warmer locations but may become inactive or hibernate in colder climates. At lower elevations, foothill yellow-legged frogs likely spend most of the year in or near streams. Adult frogs, primarily males, will gather along main-stem rivers during spring to breed. This clade is found in Colusa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Napa, Shasta, Solano, Sonoma, Tehama, Trinity, and Yolo counties; portions of Butte, Lassen, Modoc, and Siskiyou counties.	May - October	Potential-Rector Creek (intermittent) represents suitable habitat.
Reptiles						
Northwestern pond turtle (*Actinemys marmorata*)	-	-	SSC	Requires basking sites and upland habitats up to 0.5 km from water for egg laying. Uses ponds, streams, detention basins, and irrigation ditches.	April-September	Potential-Rector Creek represents potentially suitable habitat.
Birds						
Clark's grebe *(Aechmophorus clarkii)*	-	-	BCC	Winters on salt or brackish bays, estuaries, sheltered sea coasts, freshwater lakes, and rivers. Breeds on freshwater to brackish marshes, lakes, reservoirs and ponds, with a preference for large stretches of open water fringed with emergent vegetation.	June-August (breeding)	Absent-there is no suitable nesting or foraging habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Black swift *(Cypseloides niger)*	-	-	BCC, SSC	In California, nests from Cascade-Sierra Nevada region south to Tulare and Mono counties; coastal ranges (Santa Cruz south to San Luis Obispo counties), San Gabriel, San Bernardino, and San Jacinto Mountains. Nests on ledges or shallow caves on steep rock faces, usually behind waterfalls. Winter range, unknown, but thought to be northern and western South America, and West Indies.	May-September	Absent-there is no suitable habitat onsite.
Rufous hummingbird *(Selasphorus rufus)*	-	-	BCC	Breeds in British Columbia and Alaska (does not breed in California). Winters in coastal Southern California south into Mexico. Common migrant during March-April in Sierra Nevada foothills and June-August in Lower Conifer to Alpine zone of Sierra Nevada. Nesting habitat includes secondary succession communities and openings, mature forests, parks and residential area.	April-July	Absent-there is no suitable habitat onsite.
Yellow rail *(Coturnicops noveboracensis)*	-	-	BCC, SSC	Found in sedge meadows, dense stands of bulrush, high marshlands dominated by sedges and grasses (in California, found in Lassen, Plumas, Siskiyou, Modoc counties, and San Francisco Bay and Tomales Bay regions)	May-September	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Long-billed curlew (*Numenius americanus*)	-	-	BCC	Breeds east of the Cascades in Washington, Oregon, northeastern California (Siskiyou, Modoc, Lassen counties), east-central California (Inyo County), through Great Basin region into Great Plains. Winters in California, Texas, and Louisiana. Wintering habitat includes tidal mudflats and estuaries, wet pastures, sandy beaches, salt marsh, managed wetlands, evaporation ponds, sewage ponds, and grasslands.	September-March (wintering)	Absent-there is no suitable wintering or foraging habitat onsite.
Marbled godwit (*Limosa fedoa*)	-	-	BCC	Nests in Montana, North and South Dakota, Minnesota, into Canada. Winter range along Pacific Coast from British Columbia south to Central America, with small numbers wintering in interior California. Wintering habitat includes coastal mudflats, meadows, estuaries, sandy beaches, sandflats, and salt ponds.	August-April (Migrant/Wintering in CA)	Absent-there is no suitable wintering or foraging habitat onsite.
Short-billed Dowitcher *(Limnodromus griseus)*	-	-	BCC	Nests in Canada, southern Alaska; winters in coastal California south to South America; wintering habitat includes coastal mudflats and brackish lagoons	wintering/migrant period: late-August-May	Absent-there is no suitable wintering or foraging habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Willet (*Tringa semipalmata*)	-	-	BCC	Breeds locally in interior of western North America. In California, breeding range includes the Klamath Basin and Modoc Plateau and portions of Mono and possibly Inyo counties. Breeding habitat includes prairies, Breeds in wetlands and grasslands on semiarid plains; in uplands near brackish or saline wetlands; prefers temporary, seasonal, and alkali wetlands over semipermanent and permanent wetlands.	April-August	Absent-there is no suitable wintering or foraging habitat onsite.
Double-crested cormorant *(Phalacrocorax auritus)*	-	-	CDFW WL	Nests near ponds, lakes, artificial impoundments, slow-moving rivers, lagoons, estuaries, and open coastlines and typically forages in shallow water. Non-nesters are found in many coastal and inland waters.	April-August	Absent-there is no suitable nesting or foraging habitat onsite.
Osprey *(Pandion haliaetus)*	-	-	CDFW WL	Nesting habitat requires close proximity to accessible fish, open nest site free of mammalian predators, and extended ice-free season. The nest in large trees, snags, cliffs, transmission/ communication towers, artificial nest platforms, channel markers/buoys.	April-September	Absent-there is no suitable nesting or foraging habitat onsite.
White-tailed kite (*Elanus leucurus*)	-	-	CFP	Nesting occurs within trees in low elevation grassland, agricultural, wetland, oak woodland, riparian, savannah, and urban habitats.	March-August	Low Potential-the scattered oak trees onsite represent marginally suitable nesting habitat.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Golden eagle (*Aquila chrysaetos*)	-	-	BCC, CFP	Nesting habitat includes mountainous canyon land, rimrock terrain of open desert and grasslands, riparian, oak woodland/savannah, and chaparral. Nesting occurs on cliff ledges, river banks, trees, and human-made structures (e.g. windmills, platforms, and transmission towers). Breeding occurs throughout California, except the immediate coast, Central Valley floor, Salton Sea region, and the Colorado River region, where they can be found during Winter.	Nest (February-August); winter CV (October-February)	Absent-there is no suitable nesting or foraging habitat onsite.
Bald eagle (*Haliaeetus leucocephalus*)	Delisted	CE	CFP, BCC	Typically nests in forested areas near large bodies of water in the northern half of California; nest in trees and rarely on cliffs; wintering habitat includes forest and woodland communities near water bodies (e.g. rivers, lakes), wetlands, flooded agricultural fields, open grasslands	February – September (nesting); October-March (wintering)	Absent-there is no suitable nesting or foraging habitat onsite.
Swainson's hawk (*Buteo swainsoni*)	-	CT	BCC	Nesting occurs in trees in agricultural, riparian, oak woodland, scrub, and urban landscapes. Forages over grassland, agricultural lands, particularly during disking/harvesting, irrigated pastures	March-August	Absent-there is no suitable nesting or foraging habitat onsite.
Northern spotted owl *(Strix occidentalis caurina)*	FT	CC	SSC	Found from Marin County through coastal ranges north to British Columbia; breeds in old growth mature forest. They use forests with greater complexity and structure.	March-June	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Nuttall's woodpecker (*Dryobates nuttallii)*	-	-	BCC	Resident from northern California south to Baja California. Nests in tree cavities in oak woodlands and riparian woodlands.	April-July	Low Potential-the scattered oak trees onsite represent marginally suitable nesting habitat.
Bank swallow (*Riparia riparia*)	-	CT	-	Nests colonially along coasts, rivers, streams, lakes, reservoirs, and wetlands in vertical banks, cliffs, and bluffs in alluvial, friable soils. May also nest in sand, gravel quarries and road cuts. In California, breeding range includes northern and central California.	May-July	Absent-there is no suitable habitat onsite.
Purple martin (*Progne subis*)	-	-	SSC	In California, breeds along coast range, Cascade-northern Sierra Nevada region and isolated population in Sacramento. Nesting habitat includes montane forests, Pacific lowlands with dead snags; the isolated Sacramento population nests in weep holes under elevated highways/bridges. Winters in South America.	May-August	Absent-there is no suitable habitat onsite.
Wrentit (*Chamaea fasciata*)	-	-	BCC	Coastal sage scrub, northern coastal scrub, chaparral, dense understory of riparian woodlands, riparian scrub, coyote brush and blackberry thickets, and dense thickets in suburban parks and gardens.	March-August	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Lawrence's goldfinch (*Spinus lawrencei*)	-	-	BCC	Breeds in Sierra Nevada and inner Coast Range foothills surrounding the Central Valley and the southern Coast Range to Santa Barbara County east through southern California to the Mojave Desert and Colorado Desert into the Peninsular Range. Nests in arid and open woodlands with chaparral or other brushy areas, tall annual weed fields, and a water source (e.g. small stream, pond, lake), and to a lesser extent riparian woodland, coastal scrub, evergreen forests, pinyon-juniper woodland, planted conifers, and ranches or rural residences near weedy fields and water.	March-September	Low Potential-weedy margins of Rector Creek supports marginal nesting habitat.
San Pablo song sparrow (*Melospiza melodia samuelis*)	-	-	BCC, SSC	Resident of salt marshes of San Francisco and San Pablo Bays	year round resident; nests March-July	Absent-there is no suitable habitat onsite.
San Clemente spotted towhee (*Pipilo maculatus clementae*)	-	-	BCC, SSC	Resident on Santa Catalina and Santa Rosa Islands; extirpated on San Clemente Island, California. Breeds in dense, broadleaf shrubby brush, thickets, and tangles in chaparral, oak woodland, island woodland, and Bishop pine forest.	Year round resident; breeding season is April-July	Absent-this subspecies is only found on the Channel Islands.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Tricolored blackbird (*Agelaius tricolor*)	-	CT	BCC, SSC	Breeds locally west of Cascade-Sierra Nevada and southeastern deserts from Humboldt and Shasta Cos south to San Bernardino, Riverside and San Diego Counties. Central California, Sierra Nevada foothills and Central Valley, Siskiyou, Modoc and Lassen Counties. Nests colonially in freshwater marsh, blackberry bramble, milk thistle, triticale fields, weedy (mustard, mallow) fields, giant cane, safflower, stinging nettles, tamarisk, riparian scrublands and forests, fiddleneck and fava bean fields.	March-August	Absent-there is not suitable habitat onsite.
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	-	-	BCC, SSC	Breeds in salt marshes of San Francisco Bay; winters San Francisco south along coast to San Diego County.	March-July	Absent-there is not suitable habitat onsite.
Mammals						
Pallid bat *(Antrozous pallidus)*	-	-	SSC	Crevices in rocky outcrops and cliffs, caves, mines, trees (e.g. basal hollows of redwoods, cavities of oaks, exfoliating pine and oak bark, deciduous trees in riparian areas, and fruit trees in orchards). Also roosts in various human structures such as bridges, barns, porches, bat boxes, and human-occupied as well as vacant buildings (WBWG 2020).	April-September	Low Potential-The Rector Reservoir outfall structure may support marginal roosting habitat.
Townsend's big-eared bat *(Corynorhinus townsendii)*	-	-	SSC	Caves, mines, buildings, rock crevices, trees.	April-September	Absent-there is no suitable habitat onsite.

Table 1. Potentially Occurring Special-Status Species

Common Name (*Scientific Name*)	Status			Habitat Description	Survey Period	Potential To Occur Onsite
	ESA	CESA/ NPPA	Other			
Western red bat (*Lasiurus blossevillii*)	-	-	SSC	Roosts in foliage of trees or shrubs; Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. There may be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores) (WBWG 2020).	April-September	Low Potential-The scattered trees onsite represent marginally suitable roosting habitat.
American badger *(Taxidea taxus)*	-	-	SSC	Drier open stages of most shrub, forest, and herbaceous habitats with friable soils.	Any season	Absent-there is no suitable habitat onsite.

[1] Habitat descriptions for plant species are from the CNPS Inventory of Rare and Endangered Plants (CNPS 2020).

Status Codes:

Status Codes NOTE:

FESA	Federal Endangered Species Act
CESA	California Endangered Species Act
NPPA	California Native Plant Protection Act
FE	FESA listed, Endangered.
FT	FESA listed, Threatened.
FC	Candidate for FESA listing as Threatened or Endangered.
BCC	USFWS Bird of Conservation Concern (USFWS 2008).
CR	CESA- or NPPA-listed, Rare.
CT	CESA- or NPPA-listed, Threatened.
CC	Candidate for CESA listing as Endangered or Threatened.
CE	CESA or NPPA listed, Endangered.
CFP	California Fish and Game Code Fully Protected Species (§ 3511-birds, § 4700-mammals, §5 050-reptiles/amphibians).
CDFW WL	CDFW Watch List
SSC	CDFW Species of Special Concern (CDFW, updated July 2017).
1B	CRPR/Rare or Endangered in California and elsewhere.
2B	Plants rare, threatened, or endangered in California but more common elsewhere.
3	CRPR/Plants About Which More Information is Needed – A Review List.
4	CRPR/Plants of Limited Distribution – A Watch List.
0.1	Threat Rank/Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2	Threat Rank/Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
0.3	Threat Rank/Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)
Delisted	Formally Delisted (delisted species are monitored for 5 years).

4.6.1 Plants

Eighty-two special-status plant species were identified by the literature review as having the potential to occur within the vicinity of the Study Area. All of these special-status plant species were determined to be absent from the Study Area due to the lack of suitable habitat and/or the species is not known to occur at

the elevation of the Study Area (Table 1). No further discussion of those species is provided in this assessment. Consequently, there is no further discussion of special-status plants in this assessment.

4.6.2 Invertebrates

Three special-status invertebrate species were identified as having potential to occur in the Study Area based on the literature review (Table 1). However, upon further analysis and after the site visit, three species (California freshwater shrimp [*Syncaris pacifica*], Valley elderberry longhorn beetle [*Desmocerus californicus dimorphus*], and Conservancy fairy shrimp [*Branchinecta conservatio*]) were considered to be absent from the site due to the lack of suitable habitat or the Study Area is outside of the known range of the species. Two elderberry (*Sambucus nigra* ssp. *caerulea*) shrubs are located along Rector Creek in the immediate vicinity of the Study Area. However, the current known distribution of the federally threatened Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) does not include the Study Area and the Napa Valley. No further discussion of these species is provided within this assessment.

4.6.3 Fish

Nine special-status fish were initially identified as having potential to occur in the Study Area based on the literature review. However, upon further analysis and after the site visit, two of these special-status species, delta smelt (*Hypomesus transpacificus*) and longfin smelt (*Spirinchus thaleichthys*), were considered absent from the site due to the lack of suitable habitat and/or the Proposed Project is not within the known range of the species. No further discussion of these two fish species is provided within this assessment. In addition, coho salmon (*Oncorhynchus kisutch*) historically occurred in the watershed; however, this species has been extirpated and, therefore, does not have the potential to occur in the Study Area.

Based on this information, the seven special-status fish species with a potential to occur in the Study Area are:

- Central California Coast (CCC) Distinct Population Segment (DPS) steelhead (*Oncorhynchus mykiss)* - federal threatened species;
- Central Valley fall/late-fall-run evolutionarily significant unit (ESU) Chinook salmon (*O. tshawytscha*) – federal Species of Concern and California Species of Special Concern;
- Pacific lamprey (*Lampetra tridentata*) - California Species of Special Concern;
- River lamprey (*L. ayresi*) - California Species of Special Concern;
- Riffle sculpin (*Cottus gulosus*) - California Species of Special Concern;
- Hardhead (*Mylopharodon conocephalus*) - California Species of Special Concern; and
- Sacramento splittail (*Pogonichthys macrolepidotus*) - California Species of Special Concern.

A brief description of the seven special-status fish species that have the potential to occur within the Study Area is presented below. Other native fish species documented or potentially occurring in Rector

Creek include California roach (*Lavinia symmetricus*), threespine stickleback (*Gasterosteus aculeatus*), Sacramento sucker (*Catostomus occidentalis*), and Sacramento pikeminnow (*Ptychocheilus grandis*) (Stillwater Sciences. December 2018). In addition, Rector Creek in the Project area is designated critical habitat for CCC steelhead and is Essential Fish Habitat (EFH) for Chinook salmon downstream of Rector Reservoir.

Steelhead - Central California Coast DPS

The Central California Coast (CCC) Distinct Population Segment (DPS) Steelhead (*Oncorhynchus mykiss)* is considered a threatened species and protected under the ESA. The CCC DPS steelhead is found in streams from the Russian River to Aptos Creek, and the drainage of San Francisco, San Pablo, and Suisun bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers. Spawning takes place in shallow swift moving riffles with small gravel and cobble as the primary substrate.

There are no documented CNDDB occurrences of steelhead within five miles of the Study Area (CDFW 2020a), but steelhead are known to occur in Rector Creek downstream of the dam (Stillwater Sciences 2018a).

Chinook Salmon - Central Valley Fall-Run/Late Fall-Run ESU

While the San Francisco/San Pablo Bay complex historically supported a natal run of Chinook salmon, this population was extirpated from the Napa River watershed in the 1900s. In the last several decades, Chinook salmon have recolonized the watershed. Genetic analyses of the Chinook salmon currently occurring in the Napa River indicate that the population is primarily comprised of the Central Valley fall/late fall-run ESU, with a small number of strays from the Klamath River (Garza and Crandall 2013).

The Central Valley fall-run ESU, a federal Species of Concern and California Species of Special Concern, is considered the only run of Chinook salmon currently naturally occurring in the Napa River basin. Adult fall-run Chinook salmon migrate into the Napa, San Joaquin, and Sacramento river systems from September through January, with peak immigration occurring in October and November (Moyle 2002). Spawning typically occurs from October through December, and fry typically begin to emerge in late December and January. Fall-run Chinook salmon may emigrate as post-emergent fry, juveniles, or as smolts after rearing in their natal streams for up to six months.

While Chinook salmon have not been documented in Rector Creek in recent decades, this species has been documented in the Napa River (Blank and Koehler 2020) and Conn Creek (Stillwater Sciences. December 2018.). Therefore, this ESU has potential to occur in the Study Area during the adult immigration and juvenile emigration periods.

Pacific Lamprey

Pacific lamprey is not listed pursuant to either the federal or California ESAs; however, it is designated by CDFW as a Species of Special Concern due to declining abundance throughout its range in California (Moyle et al. 2015). The reason for this decline is believed to be a secondary effect of the reduction in abundance of anadromous salmonids, the primary prey of Pacific lamprey.

Lampreys are eel-like, jawless fishes with a cartilaginous skeleton and disc-shaped, sucker-like mouths. Pacific lamprey are predatory and anadromous, although landlocked (i.e., potamodromous) populations exist in some inland water bodies. The adult predatory, ocean-residing stage typically lasts three to four years and these fish rarely stray far from the mouths of their natal streams (Moyle 2002). Adult fish ranging from 30-76 cm total length typically move upstream to spawning streams from March to late June (Moyle 2002). After males and females excavate a redd, the female attaches to the substrate and releases 20,200 to 200,000 eggs that are fertilized by males. The majority of adult fish die following spawning, although a small proportion may survive to spawn the following year at a larger size. The fertilized eggs hatch after approximately 19 days at 15°C (Moyle 2002). The larval ammocoetes remain in the gravel for a short period before emerging and being swept downstream, where they burrow into soft sediments and filter organic material from the substrates. Following a five-- to seven-year residence period in freshwater, the ammocoetes undergo metamorphosis to an adult, predatory stage that is tolerant of saltwater and subsequently migrate downstream under high winter flows to the ocean.

This species has been documented in the Napa River near the Study Area (Blank and Koehler 2020) and, thus, is considered having the potential to occur.

River Lamprey

The river lamprey is a California Species of Special Concern. The abundance of this species in California is believed to be declining, primarily due to degradation and fragmentation of suitable spawning and rearing habitats and declines in salmonid prey species (Moyle et al. 2015).

The river lamprey is relatively small (averaging 17 cm) and highly predaceous (Moyle 2002). They are anadromous and will attack fish in both fresh and salt water (Moyle 2002). The river lamprey is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to the San Francisco Bay. It may have its greatest abundance in the Sacramento–San Joaquin River system, although it is not commonly observed in large numbers (Moyle et al. 2015). A great deal of what is known about the river lamprey is from information on populations in British Columbia. There, adults migrate from the Pacific Ocean into rivers and streams in the fall and spawn from February through May. Adults will excavate a saucer-shaped depression in sand or gravel riffles where the eggs are deposited. After spawning, the adults perish. Ammocoetes remain in backwaters for several years, where they feed on algae and microorganisms (Moyle et al. 2015). The metamorphosis from juvenile to adulthood begins in July and is complete by the following April. Following completion of metamorphosis, river lamprey congregate immediately upriver from salt water and emigrate into the ocean in late spring (Moyle 2002).

This species has been documented in the Napa River near the Study Area (Blank and Koehler 2020) and, thus, is considered having potential to occur in the Study Area.

Riffle Sculpin

Riffle sculpin (*Cottus gulosus)* is not listed pursuant to either the federal or California ESAs; however, it is designated by CDFW as a Species of Special Concern. The primary threats to riffle sculpin include increasing isolation between populations, thereby increasing vulnerability to local extirpation, and habitat changes that may reduce flows or increase water temperatures (Moyle et al. 2015).

Riffle sculpin are common in many clear and cold (i.e., maximum temperature <26°C) perennial streams predominated by riffle habitats with rock or gravel substrates and relatively high dissolved oxygen concentrations (Moyle 2002). They are benthic dwellers that typically co-occur with rainbow trout, but occupy different microhabitats and, therefore, interactions between the two species are not common. Riffle sculpin are opportunistic feeders that prey upon benthic macroinvertebrates, amphipods, and other small fish. Riffle sculpin typically have a four-year life span and reach sexual maturity at the end of their second year. Spawning typically occurs from late February through April in nests on the underside of rocks in riffles, or in cavities of submerged logs (Moyle 2002). Embryos hatch in 11-24 days at temperatures of 10-15°C, and adult males guard the embryos and fry during this period.

This species has been documented in the Napa River near the Study Area (Blank and Koehler 2020) and, thus, is considered having potential to occur in the Study Area.

Hardhead

Hardhead is not listed pursuant to either the federal or California ESAs; however, it is designated by CDFW as a Species of Special Concern due to declining numbers and small, isolated populations (Moyle et al. 2015). Primary threats to the species include dams and diversions, water quality degradation associated with agricultural activities, and invasive species (Moyle et al. 2015).

Hardhead occur in relatively undisturbed clear and cool (i.e., up to 20°C maximum summer temperature) low- to mid-elevation streams below approximately 1,500 meters (Moyle et al. 2015). Hardhead are primarily bottom-feeding fish that forage on aquatic invertebrates and aquatic vegetation, but will also prey on drifting invertebrates, plankton, and algae and terrestrial insects (Moyle et al. 2015). Hardhead reach maturity at age two and spawn primarily in April and May (Moyle 2002). Adult fish migrate into smaller tributary streams and aggregate in pools, returning to their home pools in larger rivers after spawning. Females produce over 20,000 eggs, which are deposited in sand or gravel substrates in riffles, runs, or heads of pools (Moyle 2002). After hatching, larval fish are believed to remain in near-shore areas with dense cover, gradually moving downstream and into deeper habitats with increased growth.

This species has been documented in the Napa River near the Study Area (Koehler 2007) and, thus, is considered having potential to occur in the Study Area.

Sacramento Splittail

Sacramento splittail is not listed pursuant to either the federal or California ESAs; however, it was previously listed as a threatened species by the USFWS in 1999 and was subsequently delisted in 2003 in light of new information regarding the biology and status of the species (Moyle et al. 2004). It is currently designated by CDFW as a Species of Special Concern due to declining abundance and distribution. Major factors that may threaten the abundance and distribution of Sacramento splittail include major dams, water quality degradation associated with agricultural activities, alteration of the Sacramento-San Joaquin River Estuary, and invasive species (Moyle et al. 2015).

Sacramento splittail are relatively large (i.e., 40 cm SL) and long-lived (i.e., seven-10 years) warm water fish typically found at water temperatures ranging from 5-24°C (Moyle 2002). When acclimated to elevated temperatures, splittail can tolerate temperatures up to 33°C (Moyle 2002). Adult splittail typically reach

sexual maturity in their second year. Upon reaching maturity, adult splittail migrate upstream from November through February (Moyle 2002). Adults spawn on floodplains or flooded edge habitats in March and April at water temperatures between 14-19°F (Moyle 2002) and then move back downstream. Eggs acquire adhesive properties following exposure to water and adhere to vegetation or other benthic substrates. Fertilized eggs generally hatch in three to five days and larvae begin feeding on plankton soon thereafter. Juvenile splittail inhabit shallow, low-velocity habitats with abundant vegetation as they migrate downstream to the Delta. Emigration through the lower Sacramento River occurs from February through August, with peak emigration occurring from March through June (Moyle 2002). Splittail are benthic foragers that feed primarily on aquatic invertebrates, although detritus may make up a substantial proportion of their diet (Moyle et al. 2015).

This species has been documented in the Napa River near the Study Area (Koehler 2007) and, thus, is considered having potential to occur in the Study Area.

Critical Habitat

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488) and includes all of lower Rector Creek from Rector Reservoir to its terminus at Conn Creek. As such, the Study Area is located within the designated critical habitat for CCC steelhead.

Essential Fish Habitat

Coho salmon (*Oncorhynchus kisutch*) and Chinook salmon (*Oncorhynchus tshawytscha*) were not included in the NMFS species list for the Yountville quadrangle, but EFH for these protected species was included. Coho salmon are considered extirpated from the Napa River, but Chinook salmon are occasionally found in the Napa River watershed (Stillwater Sciences 2018a).

4.6.4 Amphibians

Four special-status amphibians were identified as having potential to occur in the Study Area based on the literature review (Table 1). However, upon further analysis and after the site visit, two of these special-status species, red-bellied newt (*Taricha rivularis*) and California giant salamander (*Dicamptodon ensatus*) were considered absent from the site due to the lack of suitable habitat. No further discussion of these species is provided within this assessment. A brief description of the two remaining species that have the potential to occur within the Study Area is presented below.

California Red-legged Frog

The California red-legged frog (CRLF, *Rana draytonii*) is listed as threatened pursuant to the ESA and is a California SSC. The current range of most remaining populations occur along the coast from Marin County to Ventura County and in blue oak woodland, foothill pine/oak, and riparian deciduous forests in the foothills of the western slope of the Sierra Nevada (Barry and Fellers 2013). Breeding habitat includes coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, and ponded and backwater portions of streams. Creeks and ponds with dense growths of woody riparian vegetation, especially willows are preferred (Hayes and Jennings 1988). Adult CRLF use dense, shrubby or emergent

riparian vegetation near deep [≥ 0.6 to 0.9 meters (2 to 3 feet)], still or slow-moving water, especially where dense stands of overhanging willow and an intermixed fringe of cattail (*Typha* sp.) occur adjacent to open water. CRLF breed from November through April (Jennings and Hayes 1994), and larvae generally metamorphose by mid to late summer. Upland and riparian areas provide important sheltering habitat during summer when CRLF aestivate in dense vegetation, burrows, and leaf litter.

There are no documented CNDDB occurrences of CRLF within five miles of the Study Area (CDFW 2020a). The ponded area within Rector Creek provides potentially suitable breeding habitat for this species, while the streambed and banks provide potential dispersal and foraging habitat.

Foothill Yellow-legged Frog

The Northwest/North Coast Clade of foothill yellow-legged frog (FYLF, *Rana boylii*) is not listed under CESA, as other clades are, but is considered a CDFW SSC. The Northwest/North Coast clade of FYLF occurs in Colusa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Napa, Shasta, Solano, Sonoma, Tehama, Trinity, and Yolo counties, and portions of Butte, Lassen, Modoc, and Siskiyou counties. FYLFs occupy rocky streams in valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow plant communities. They are rarely found far from water and will often dive into water to take refuge under rocks or sediment when disturbed (Zeiner et al., 1988).

There are six documented CNDDB occurrences of FYLF within five miles of the Study Area (CDFW 2020a). Rector Creek within the Study Area provides potential habitat for this species.

4.6.5 Reptiles

One special-status reptile, northwestern pond turtle (*Actinemys marmorata*), was identified as having the potential to occur in the Study Area based on the literature review (Table 1). It was determined following the site visit that Rector Creek represents potentially suitable habitat.

Northwestern Pond Turtle

The northwestern pond turtle is not listed pursuant to either the California or federal ESAs; however, it is designated as a CDFW SSC. They can occur in a variety of waters including ponds, lakes, streams, reservoirs, rivers, settling ponds of wastewater treatment plants, and other permanent and ephemeral wetlands (Bury et al. 2012). However, in streams and other lotic features they generally require slack- or slow-water aquatic microhabitats (Jennings and Hayes 1994). Western pond turtles also require basking areas such as logs, rocks, banks, and brush piles for thermoregulation (Bury et al. 2012). They are typically active between March or April through October or November, the timing of which depends on variables such as latitude, elevation, local climate (Bury et al. 2012).

There is one documented CNDDB occurrences of northwestern pond turtle within five miles of the Study Area (CDFW 2020a). Rector Creek, within the Study Area, provides suitable habitat for this species. Northwestern pond turtle has potential to occur.

4.6.6 Birds

Twenty-four special-status bird species were identified as having the potential to occur within the Study Area based on the literature review (Table 1). However, upon further analysis and after the site visit, 21 of these species were considered absent from the site due to the lack of suitable habitat and/or the Study Area is outside the known range of the species. No further discussion of these species is provided in this analysis. A brief description of the remaining three species that have the potential to occur within the Study Area is presented below.

White-Tailed Kite

The white-tailed kite (*Elanus leucurus*) is not listed pursuant to either the California or federal ESAs; however, the species is fully protected pursuant to § 3511 of the California Fish and Game Code. This species is a common resident in the Central Valley and the entire length of the California coast, and all areas up to the Sierra Nevada foothills and southeastern deserts (Dunk 2020). In northern California, white-tailed kite nesting occurs from March through early August, with nesting activity peaking from March through June. Nesting occurs in trees within riparian, oak woodland, savannah, and agricultural communities that are near foraging areas such as low elevation grasslands, agricultural, meadows, farmlands, savannahs, and emergent wetlands (Dunk 2020).

There are two CNDDB occurrences of white-tailed kite reported within five miles of the Study Area (CDFW 2020a). The isolated oak trees in the ruderal/disturbed area onsite provides suitable nesting habitat for this species. However, the likelihood of existing human-related disturbances at this location reduces, but does not eliminate, the potential for nesting onsite. White-tailed kite has low potential to occur.

Nuttall's Woodpecker

The Nuttall's woodpecker (*Dryobates nuttallii*) is not listed under either state or federal ESAs, but is considered a USFWS BCC. They are resident from Siskiyou County south to Baja California. Nuttall's woodpeckers nest in tree cavities primarily within oak woodlands, but also can be found in riparian woodlands (Lowther et al. 2020). Breeding occurs during April through July.

There are no documented CNDDB occurrences of this species within five miles of the Study Area (CDFW 2020a). The isolated oak trees in the ruderal/disturbed area onsite provides suitable nesting habitat for this species. However, the likelihood of existing human-related disturbances at this location reduces, but does not eliminate, the potential for nesting onsite. Nuttall's woodpecker has low potential to occur.

Lawrence's Goldfinch

The Lawrence's goldfinch (*Spinus lawrencei*) is not listed pursuant to either the California or federal ESAs, but is currently a BCC according to the USFWS. Lawrence's goldfinch breed west of the Sierra Nevada-Cascade axis from Tehama, Shasta, and Trinity counties south into the foothills surrounding the Central Valley to Kern County; and on the Coast Range from Contra Costa County to Santa Barbara County (Watt et al. 2020). Lawrence's goldfinch nest in arid woodlands usually with brushy areas, tall annual weeds and a local water source (Watt et al. 2020). Nesting occurs during March through September.

While no occurrences of Lawrence's goldfinch have been reported within five miles of the Study Area (CDFW 2020a), the degraded riparian scrub community within the Study Area provides marginally suitable nesting habitat for this species. Lawrence's goldfinch has low potential to occur.

MBTA Birds

The Study Area supports potential nesting habitat for a variety of common birds protected under the MBTA and California Fish and Game Code § 3503, among others.

4.6.7 Mammals

Four special-status mammal species were identified as having the potential to occur within the Study Area based on the literature review (Table 1). However, upon further analysis and after the site visit, two of these species, Townsend's big-eared bat [*Corynorhinus townsendii*] and American badger [*Taxidea taxus*) were considered to be absent from the site due to the lack of suitable habitat. No further discussion of these species is provided within this assessment. A brief description of the remaining two species that have the potential to occur within the Study Area is presented below.

Pallid Bat

The pallid bat (*Antrozous pallidus*) is not listed pursuant to either the California or federal ESAs; however, this species is considered an SSC by CDFW. The pallid bat is a large, light-colored bat with long, prominent ears and pink, brown, or grey wing and tail membranes. This species ranges throughout North America from the interior of British Columbia, south to Mexico, and east to Texas. The pallid bat inhabits low elevation (below 6,000 feet) rocky arid deserts and canyonlands, shrub-steppe grasslands, karst formations, and higher elevation coniferous forest (above 7,000 feet). This species roosts alone or in groups in the crevices of rocky outcrops and cliffs, caves, mines, trees, and in various human structures such as bridges, and barns. Pallid bats are feeding generalists that glean a variety of arthropod prey from surfaces as well as capturing insects on the wing. Foraging occurs over grasslands, oak savannahs, ponderosa pine forests, talus slopes, gravel roads, lava flows, fruit orchards, and vineyards. Although this species utilizes echolocation to locate prey, often they use only passive acoustic cues. This species is not thought to migrate long distances between summer and winter sites (Western Bat Working Group [WBWG] 2020).

There are two CNDDB occurrences of pallid bat reported within five miles of the Study Area (CDFW 2020a). The isolated oak trees in the ruderal/disturbed area and the outfall structure onsite could support marginally suitable roosting habitat for this species. Pallid bat has low potential to occur.

Western Red Bat

The western red bat (*Lasiurus blossevillii*) is not listed pursuant to either the California or federal ESAs; however, this species is considered an SSC by CDFW. The western red bat is easily distinguished from other western bat species by its distinctive red coloration. This species is broadly distributed; its range extending from southern British Columbia in Canada through much of the western United States to Argentina and Chile in South America. This solitary species day-roosts primarily in the foliage of trees or

shrubs in edge habitats bordering streams or open fields, in orchards, and occasionally urban areas. They may be associated with intact riparian habitat, especially with willows, cottonwoods, and sycamores. This species may occasionally utilize caves for roosting as well. They feed on a variety of insects, and generally begin to forage one to two hours after sunset. This species is considered highly migratory; however, the timing of migration and the summer ranges of males and females may be different. Winter behavior of this species is poorly understood (WBWG 2020).

There are no CNDDB occurrences of western red bat reported within five miles of the Study Area (CDFW 2020a). The isolated oak trees in the ruderal/disturbed area onsite could support marginally suitable roosting habitat for this species. Western red bat has low potential to occur.

4.7 Sensitive Natural Communities

One sensitive natural community, Northern Vernal Pool, was identified as having the potential to occur within the vicinity of the Study Area based on the literature review (CDFW 2020a). During the field assessment, no sensitive natural communities were found onsite. No further discussion of sensitive natural communities is provided within this assessment.

5.0 IMPACTS AND MITIGATION MEASURES

This Section presents responses to the State CEQA Guidelines Appendix G Initial Study Checklist Questions for biological resources and related significance thresholds. The analysis is tailored to construction of the project's physical improvements. Project operational impacts will be addressed separately in the Project's Environmental Impact Report. Each checklist question is presented first as an impact statement followed by an impact determination. A supporting analysis narrative is then presented. When significant impacts are identified, mitigation measures are recommended to reduce impacts to less-than significant. If no feasible mitigation is available to reduce an impact to less than significant, the impact is identified as significant and unavoidable.

Impact BIO-1: Project construction activities could adversely affect, either directly or through habitat modifications, species identified as a candidate, sensitive, or special-status wildlife species in local or regional plans, policies or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
Impact Determination: *less than significant with mitigation incorporated*.

Threshold:	*Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS, and meets the definition of Section 15380 (b), (c), or (d) of the CEQA Guidelines.*

As discussed above in Table 1, there is potentially suitable habitat within the Study Area for one special-status fish species, two special-status amphibians, one special-status reptile, three special-status birds, and two special-status mammals. An analysis of potential impacts and recommended mitigation measures for these species is presented below.

5.1 Fish (CCC DPS steelhead)

One special-status fish species has been identified as potentially occurring within this reach of Rector Creek, the CCC DPS steelhead.

The only improvement with potential for direct effects to steelhead is construction of the proposed Outfall Structure and associated riprap. These facilities would not result in direct impacts to steelhead or it's essential habitat because construction would only occur during summer when Rector Creek flows and therefore steelhead are absent, and because the improvement site is not considered steelhead critical habitat. As such, direct impacts to steelhead are less than significant.

While no direct effects to steelhead would occur, if not properly implemented and controlled, proposed construction earthwork (grading, trenching, backfilling, and restoration) could result in erosion and silt-laden runoff entering surface waters of Rector Creek. This is considered a potentially significant impact to steelhead critical habitat. Implementation of Mitigation Measures **BIO-1.1, BIO-1.2,** and **BIO-1.3** would reduce this impact to less-than-significant.

BIO-1.1: Protect Water Quality and Minimize Sedimentation Runoff in Wetlands and Non-Wetland Waters

The Project will comply with all construction site BMPs specified in the Storm Water Pollution Prevention Plan (if required), and any other permit conditions to minimize the introduction of construction-related contaminants and mobilization of sediment in wetlands and non-wetland waters in and adjacent to the project area. These BMPs will address soil stabilization, sediment control, wind erosion control, vehicle tracking control, non-stormwater management, and waste management practices. The BMPs will be based on the best conventional and best available technology.

The Project may require a Section 404 Permit from the U.S. Army Corps of Engineers, a Section 401 Water Quality Certification from the Central Valley RWQCB and a Lake or Streambed Alteration Agreement from the California Department of Fish and Wildlife, which will contain BMPs and water quality measures to ensure the protection of water quality. These permit conditions and BMPs will be implemented as part of the project as well.

BIO-1.2: Install Fencing and/or Flagging to Protect Sensitive Biological Resources

Prior to construction, the Project contractor will install high-visibility orange construction fencing and/or flagging, as appropriate, along the perimeter of the work area adjacent to Environmentally Sensitive Areas (ESAs) (e.g., the riparian scrub and seasonal creek areas within and adjacent the project site's southern boundary as identified on Figure 9, and any special-status species habitat and/or active bird nests that may be identified during per-construction surveys). The county will ensure that the final construction plans show the locations where fencing will be installed. The plans also will define the fencing installation procedure. The county or contractor (at the discretion of the county) will

ensure that the fencing is maintained throughout the duration of the construction period. If the fencing is removed, damaged, or otherwise compromised during the construction period, construction activities will cease until the fencing is repaired or replaced. The project's special provisions package will provide clear language regarding acceptable fencing material and prohibited construction-related activities, vehicle operation, material and equipment storage, and other surface-disturbing activities within ESAs. All temporary fencing will be removed upon completion of construction.

BIO-1.3: Conduct Environmental Awareness Training for Construction Personnel

Before any work occurs within the project limits, including equipment staging, grading, and tree and/or vegetation removal (clear and grub), the Project will retain a qualified biologist (familiar with the resources in the area) to conduct a mandatory contractor/worker environmental awareness training for construction personnel. The awareness training will be provided to all construction personnel (contractors and subcontractors) prior to beginning construction to brief them on the need to avoid effects on sensitive biological resources adjacent to construction areas and the penalties for not complying with applicable state and federal laws and permit requirements. The biologist will inform all construction personnel about the life history and habitat requirements of special-status species with potential for occurrence onsite, the importance of maintaining habitat, and the terms and conditions of any permit, Biological Opinion or other authorizing document (e.g. letter of concurrence) that may be prepared for the project. The environmental training will also cover general restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on sensitive biological resources during project construction.

5.2 Amphibians (California Red-legged Frog and Foothill Yellow-legged Frog)

There are no documented CNDDB occurrences of CRLF within five miles of the Study Area (CDFW 2020a). However ponded area within Rector Creek provides potentially suitable breeding habitat for this species and the streambed and banks provide potential dispersal and foraging habitat.

Proposed construction of the Diversion Pipeline and Outfall Structure within and adjacent the riparian scrub and seasonal creek habitats (as identified in Figure 9) is considered a potentially significant impact to CRLF. Implementation of Mitigation Measures **BIO-1.1, BIO-1.2, BIO-1.3** and, **BIO-1.4** would reduce this impact to less-than-significant.

BIO-1.4: Conduct Preconstruction Survey for California Red-legged Frog

The CRLF assessment shall be performed according to the *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* (USFWS 2005). The USFWS will provide guidance, based on the initial assessment, whether field surveys are appropriate, where the field surveys should be conducted, and whether incidental take authorization should be obtained through Section 7 consultation or a Section 10 permit pursuant to the ESA.

There are six documented CNDDB occurrences of FYLF within five miles of the Study Area (CDFW 2020a). The Northwest/North Coast Clade of foothill yellow-legged frog (FYLF, *Rana boylii*) is not listed under CESA, as other clades are, but is considered a CDFW SSC. Rector Creek and associated riparian scrub within the Study Area provides potential habitat for this species. Proposed construction of the Diversion Pipeline and Outfall Structure within and adjacent riparian scrub and seasonal creek habitats (as identified in Figure 9) is considered a potentially significant impact to FYLF. Implementation of mitigation measures **BIO-1.1, BIO-1.2, BIO-1.3, BIO-1.5** would reduce this impact to ***less than significant***.

BIO-1.5: Conduct Preconstruction "Clearance" Surveys for Foothill Yellow-legged Frog

A qualified biologist shall perform a preconstruction survey within 24 hours prior to the initiation of construction to confirm the site is clear of FYLF. Should FYLF be detected during survey, a qualified biologist with a scientific collecting permit shall relocate frogs to suitable nearby habitat that won't be disturbed by Project construction.

5.3 Special-Status Raptors and Other Protected Raptors (White-tailed Kite, Nuttall's woodpecker, and Lawrence's goldfinch)

Construction and other ground-disturbing activities associated with the Bypass Pipeline, Bypass Valve and Flow Meter Station and the electric service line to the Outfall Structure could impact white-tailed kite, Nuttall's woodpecker, and Lawrence's goldfinch or other raptor nests if construction occurs within 500 feet of suitable habitat. This is a potentially significant impact. Implementation of Mitigation Measures **BIO-1.2, BIO-1.3** and **BIO-1.6** would reduce this impact to less than significant.

BIO-1.6: Conduct Vegetation Removal during the Non-breeding Season and Conduct Preconstruction Surveys for Nesting Migratory Birds and Raptors

Where vegetation removal is required to construct project features, this activity will be conducted during the non-breading season for migratory birds and raptors (generally between September 16 and January 31), to the extent feasible.

For Project activities that begin between February 1 and September 15, including tree and other vegetation removal, qualified biologists shall conduct preconstruction surveys for white-tailed kite and other raptors to identify active nests on and within 500 feet of the Project site. The surveys shall be conducted within 14 days before the beginning of any construction activities between February 1 and September 15.

Impacts to active raptor nests shall be avoided by establishing appropriate buffers around active raptor nests identified during preconstruction surveys; buffers shall be determined by a qualified biologist in consultation with CDFW. Project activity shall not commence within the buffer areas until a qualified biologist has determined, in coordination with CDFW, that the young have fledged, the nest is no longer active, or reducing the buffer would not result in nest abandonment. The size of the buffer may be adjusted if a qualified biologist and the applicant, in consultation with CDFW, determine that such an

adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during construction activities may be necessary.

If no active raptor nests are found during preconstruction surveys, no further measures relating to protected raptors is necessary.

5.4 Other Special-Status Birds and MBTA Birds

Project construction and other ground-disturbing activities that occur within 100 feet of a special-status bird or MBTA bird nest could disrupt nesting activity. This would be a potentially significant impact. Implementation of Mitigation Measures **BIO-1.2, BIO-1.3** and **BIO-1.7** would reduce this impact to less than significant.

BIO-1.7: Conduct Vegetation Removal during the Non-breeding Season and Conduct Preconstruction Surveys for Other Special Status Birds and/or other Nesting Migratory Birds

To the extent feasible, vegetation removal shall occur prior to the nesting season, September 16 through January 31.

For Project activities that begin between February 1 and September 15, including tree and other vegetation removal, qualified biologists shall conduct preconstruction nesting bird surveys on and within 100 feet of the Project site. The surveys shall be conducted within 14 days before the beginning of any construction activities between February 1 and September 15.

Impacts to special-status bird and MBTA bird nests shall be avoided by establishing appropriate buffers around active raptor nests identified during preconstruction surveys; buffers shall be determined by a qualified biologist in consultation with CDFW. Project activity shall not commence within the buffer areas until a qualified biologist has determined, in coordination with CDFW, that the young have fledged, the nest is no longer active, or reducing the buffer would not result in nest abandonment. The size of the buffer may be adjusted if a qualified biologist and the applicant, in consultation with CDFW, determine that such an adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during construction activities may be necessary.

If no active special-status bird and MBTA bird nests are found during preconstruction surveys, no further measures relating to protected birds is necessary.

This mitigation measure can be implemented in combination with Mitigation Measure **BIO-1.6**.

5.5 Special-Status Bats (Pallid Bat and Western Red Bat)

Project construction could affect the special-status pallid and western red bats including disruption of nesting activity. This is a potentially significant impact. Implementation of Mitigation Measures **BIO-1.2, BIO-1.3**, and **BIO-1.8** would reduce this impact to less than significant.

BIO-1.8: Conduct Preconstruction Special Status Mammal Surveys for Roosting Bats and Implement Protection Measures

Bat roost surveys shall be conducted by a qualified wildlife biologist within 14 days before any tree removal or clearing. Locations of vegetation and any required tree removal or excavation will be examined for potential bat roosts. Specific survey methodologies will be determined in coordination with CDFW, and may include visual surveys of bats (e.g., observation of bats during foraging period), inspection for suitable habitat, bat sign (e.g., guano), or use of ultrasonic detectors (e.g., SonoBat, Anabat).

Removal of any significant roost sites located will be avoided to the extent feasible.

If it is determined that an active roost site cannot be avoided and will be affected, bats will be excluded from the roost site before the site is removed. The biologist shall first notify and consult with CDFW on appropriate bat exclusion methods and roost removal procedures. Exclusion methods may include use of one-way doors at roost entrances (bats may leave, but not reenter), or sealing roost entrances when the site can be confirmed to contain no bats. Once it is confirmed that all bats have left the roost, crews will be allowed to continue work in the area.

If no active bat roosts are found during preconstruction surveys, no further measures relating to protected bats is necessary.

5.6 Reptiles (Northwestern Pond Turtle)

The project site is located within and adjacent suitable habitat for Northwestern pond turtle. While no in water construction activities are proposed, because the project site contains suitable habitat for the species, impacts to Northwestern pond turtle are potentially significant. Implementation of Mitigation Measures **BIO-1.1, BIO-1.2, BIO-1.3**, and **BIO-1.9** would reduce this impact to ***less than significant***.

BIO-1.9: Conduct Special Status Reptile Surveys

The following measure shall be implemented to minimize potential impacts to northwestern pond turtle.

Conduct a pre-construction Northwestern pond turtle survey within 24 hours prior to the initiation of construction activities and retain a qualified biologist to survey immediately prior ground-disturbing activities in suitable habitat. If Northwestern pond turtle is found, consultation with CDFW shall be required, as well as the development of a relocation plan for Northwestern pond turtle encountered during construction.

If no special status reptiles are detected during surveys, no further measures are needed.

Impact BIO-2: The Project could affect riparian habitat or sensitive natural communities. Impact Determination: *less than significant with mitigation incorporated.*

Threshold:	*Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS.*

The project site contains 0.1 acre of riparian scrub habitat (see Figure 9), and no other sensitive natural communities. Of the proposed facilities, only the Outfall Structure and Riprap would be located within this sensitive habitat. Construction of these facilities would result in the following permanent impacts to Riparian Scrub habitat:

- Outfall Headwall 6'x2' = 12 sq. ft.
- Riprap 10'x425' = 4,250 sq. ft.

Construction of these facilities would also require temporary ground disturbance in the surrounding areas. In addition, the southern segment of the Bypass Pipeline would extend through riparian scrub, however this pipeline would be placed underground, and the surface restored. As such, the Bypass Pipeline would not result in permanent impacts, but would contribute to riparian scrub temporary construction impacts.

All temporarily disturbed areas would be restored following construction. However, the permanent loss of riparian scrub habitat is a significant impact. With implementation of Mitigation Measure **BIO-2.1**, this impact would be ***less than significant with mitigation incorporated***.

BIO-2.1: Compensate for the Loss of Riparian Communities

To compensate for the total permanent loss of approximately 4,262 square feet of riparian scrub community, prior to construction the applicant shall purchase credits at an approved mitigation bank to ensure no net loss of riparian habitat functions and values. To account for temporal loss, the Project will purchase credits at a 3:1 ratio, which would require purchasing a total of approximately 0.29 acre of riparian habitat credits from an approved mitigation bank. The final mitigation ratio and acreage will be confirmed during review of final engineering drawings and may be modified during the CDFW Section 1602 permitting process (if actual increase or decrease) which will dictate the ultimate compensation. The applicant/county will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits. The amount to be paid will be the fee that is in effect at the time the fee is paid.

Impact BIO-3: The Project would require construction and fill within waters of the U.S. and waters of the State.
Impact Determination: *less than significant with mitigation incorporated*.

Threshold:	*Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.*

Based on the field assessment, as shown on Figure 9 the southern portion of the project site supports 0.1-acre of Riparian Scrub and 0.052-acre seasonal creek habitat. Portions of these habitats could be considered waters of the U.S. and waters of the State. An Aquatic Resources Delineation (ARD) has not yet been prepared for the Study Area and is required to accurately determine the amount of wetland impact subject to State and Federal jurisdiction. All temporarily disturbed areas would be restored following construction however permanent impacts to waters of the U.S. and waters of the State are considered potentially significant.

Any alterations of, or discharges into, waters of the U.S. and waters of the state, including wetlands as defined pursuant to Section 404 of the federal CWA, must be in conformance with the CWA. Compliance is achieved through conformance with Sections 404 and 401 permitting and certification requirements, respectively, prior to any grading or construction that may impact jurisdictional area(s), as applicable. The Project may require a Section 404 permit issued by the USACE for fill activities associated with the Outfall Structure and Riprap (and possibly a portion of the Diversion Pipeline). Implementation of Mitigation Measure **BIO-3.1** would reduce project wetland impacts to ***less than significant with mitigation incorporated***.

BIO-3.1: Compensate for the Permanent Loss of Waters of the United States/Waters of the State

Authorization to fill waters of the U.S. under the Section 404 and 401 of the federal CWA (Section 404 Permit and Section 401 Water Quality Certification) shall be obtained from USACE and RWQCB prior to discharging any dredged or fill materials into any waters of the U.S. Since the waters of the U.S. are likely also waters of the State, the 401 Water Quality Certification will authorize fill to waters of the State. Specific impact avoidance, minimization, and/or compensation measures shall be developed and implemented as part of the Section 404 Permit to ensure no-net-loss of wetland function and values. To facilitate such authorization, an application for a Section 404 Permit and an application for a 401 Water Quality Certification for the Project shall be prepared and submitted to USACE and RWQCB and will include direct, avoided, and preserved acreages to Waters of the U.S. Mitigation for impacts to Waters of the U.S. would consist of a minimum of a 1:1 replacement ratio for direct impacts; however final mitigation requirements shall be developed in consultation with USACE. These measures may include:

- Purchase of mitigation credits at an Agency-approved mitigation bank; and/or
- Permittee-responsible mitigation (e.g., preservation and creation) at an off-site mitigation property.

Impact BIO-4: The Project could affect wildlife movement and/or migration.
Impact Determination: *less than significant.*

Threshold:	*Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.*

The Study Area is located between Rector Dam and the Rector Reservoir operations facility. Undeveloped lands with oak woodland, oak savannah, and annual grassland is located to the south. The upland portions of the Study Area are largely disturbed, unvegetated, and/or subject to periodic disturbances, so wildlife use is expected to be minimal.

Rector Creek below Rector Dam adjacent the project site is accessible to anadromous fish and falls within Conservation Lands Network (CLN) "fragmented critical habitat" (Bay Area Open Space Council 2011, Stillwater Sciences 2018a). However, project construction would occur during summer when there is no flow in Rector Creek. Consequently, project construction is not expected to Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites. This impact is ***less than significant***, and no mitigation is required.

Impact BIO-5: The Project could conflict with local policies and ordinances associated with protection of biological resources.
Impact Determination: *less than significant with mitigation*.

Threshold:	*Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.*

Project construction activities are subject to goals and policies of applicable county plans specific to the protection of biological resources. Goals and policies applicable to the project are presented above. As discussed in Impacts BIO-1 through BIO-4, above, the Project could adversely impact animal species of special concern, sensitive natural communities, wetlands and other waters, posing a potential conflict with county policies pertaining to the protection of biological resources. With implementation of recommended Mitigation Measures **BIO-1.1** through **BIO-1.9**; **BIO-2.1**, and **BIO-3.1**, the Project would avoid significant impacts to biological resources and would not conflict with local plans or policies protecting biological resources. Therefore, this is impact would be ***less than significant with mitigation incorporated***.

Impact BIO-6: The Project would not conflict with HCPs, NCCPs, or other conservation plans.
Impact Determination: *less than significant.*

Threshold:	*Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.*

No habitat conservation plans have been prepared or approved in Napa County that specifically address the Project site. Therefore, the Project would not conflict with any such plan. The Project would not proceed until all required consultation under FESA Section 7 (if applicable) is completed.

Construction of the Project would not be initiated until all applicable USACE, USFWS, RWQCB, and CDFW permits and approvals are obtained. The Project would comply with all terms and conditions specified in the permits and approvals. There is no adopted habitat conservation plan, natural community conservation plan, or other approval local, regional, or state habitat conservation plan, recovery plan, or Biological Opinion that the Project would conflict with, therefore, the impact is ***less than significant***.

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LIST OF ATTACHMENTS

Attachment A – Results of Database Queries

Attachment B – Representative Site Photos

Attachment C – Plant List

ATTACHMENT A

Results of Database Queries

CNPS California Native Plant Society

*The database used to provide updates to the Online Inventory is under construction. View updates and changes made since May 2019 here.

Plant List

83 matches found. *Click on scientific name for details*

Search Criteria

Found in Quads 3812254, 3812253, 3812252, 3812244, 3812243, 3812242, 3812234 3812233 and 3812232;

Modify Search Criteria | Export to Excel | Modify Columns | Modify Sort | Display Photos

Scientific Name	Common Name	Family	Lifeform	Blooming Period	CA Rare Plant Rank	State Rank	Global Rank
Agrostis hendersonii	Henderson's bent grass	Poaceae	annual herb	Apr-Jun	3.2	S2	G2Q
Allium peninsulare var. franciscanum	Franciscan onion	Alliaceae	perennial bulbiferous herb	(Apr)May-Jun	1B.2	S2	G5T2
Amorpha californica var. napensis	Napa false indigo	Fabaceae	perennial deciduous shrub	Apr-Jul	1B.2	S2	G4T2
Amsinckia lunaris	bent-flowered fiddleneck	Boraginaceae	annual herb	Mar-Jun	1B.2	S3	G3
Antirrhinum virga	twig-like snapdragon	Plantaginaceae	perennial herb	Jun-Jul	4.3	S3?	G3?
Arabis modesta	modest rockcress	Brassicaceae	perennial herb	Mar-Jul	4.3	S3	G3
Arctostaphylos bakeri ssp. bakeri	Baker's manzanita	Ericaceae	perennial evergreen shrub	Feb-Apr	1B.1	S1	G2T1
Arctostaphylos stanfordiana ssp. decumbens	Rincon Ridge manzanita	Ericaceae	perennial evergreen shrub	Feb-Apr(May)	1B.1	S1	G3T1
Astragalus breweri	Brewer's milk-vetch	Fabaceae	annual herb	Apr-Jun	4.2	S3	G3
Astragalus claranus	Clara Hunt's milk-vetch	Fabaceae	annual herb	Mar-May	1B.1	S1	G1
Astragalus clevelandii	Cleveland's milk-vetch	Fabaceae	perennial herb	Jun-Sep	4.3	S4	G4
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	annual herb	Mar-Jun	1B.2	S1	G2T1
Balsamorhiza macrolepis	big-scale balsamroot	Asteraceae	perennial herb	Mar-Jun	1B.2	S2	G2
Blennosperma bakeri	Sonoma sunshine	Asteraceae	annual herb	Mar-May	1B.1	S1	G1
Brodiaea leptandra	narrow-anthered brodiaea	Themidaceae	perennial bulbiferous herb	May-Jul	1B.2	S3?	G3?
Calamagrostis ophitidis	serpentine reed grass	Poaceae	perennial herb	Apr-Jul	4.3	S3	G3
Calandrinia breweri	Brewer's calandrinia	Montiaceae	annual herb	(Jan)Mar-Jun	4.2	S4	G4

Calochortus pulchellus	Mt. Diablo fairy-lantern	Liliaceae	perennial bulbiferous herb	Apr-Jun	1B.2	S2	G2
Calycadenia micrantha	small-flowered calycadenia	Asteraceae	annual herb	Jun-Sep	1B.2	S2	G2
Calystegia collina ssp. oxyphylla	Mt. Saint Helena morning-glory	Convolvulaceae	perennial rhizomatous herb	Apr-Jun	4.2	S3	G4T3
Castilleja ambigua var. ambigua	johnny-nip	Orobanchaceae	annual herb (hemiparasitic)	Mar-Aug	4.2	S3S4	G4T4
Castilleja ambigua var. meadii	Mead's owl's-clover	Orobanchaceae	annual herb (hemiparasitic)	Apr-May	1B.1	S1	G4T1
Ceanothus confusus	Rincon Ridge ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Jun	1B.1	S1	G1
Ceanothus divergens	Calistoga ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Apr	1B.2	S2	G2
Ceanothus purpureus	holly-leaved ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Jun	1B.2	S2	G2
Ceanothus sonomensis	Sonoma ceanothus	Rhamnaceae	perennial evergreen shrub	Feb-Apr	1B.2	S2	G2
Centromadia parryi ssp. rudis	Parry's rough tarplant	Asteraceae	annual herb	May-Oct	4.2	S3	G3T3
Chorizanthe valida	Sonoma spineflower	Polygonaceae	annual herb	Jun-Aug	1B.1	S1	G1
Clarkia breweri	Brewer's clarkia	Onagraceae	annual herb	Apr-Jun	4.2	S4	G4
Clarkia gracilis ssp. tracyi	Tracy's clarkia	Onagraceae	annual herb	Apr-Jul	4.2	S3	G5T3
Collomia diversifolia	serpentine collomia	Polemoniaceae	annual herb	May-Jun	4.3	S4	G4
Cordylanthus tenuis ssp. brunneus	serpentine bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	Jul-Aug	4.3	S3	G4G5T3
Cryptantha dissita	serpentine cryptantha	Boraginaceae	annual herb	Apr-Jun	1B.2	S2	G2
Delphinium uliginosum	swamp larkspur	Ranunculaceae	perennial herb	May-Jun	4.2	S3	G3
Downingia pusilla	dwarf downingia	Campanulaceae	annual herb	Mar-May	2B.2	S2	GU
Erigeron biolettii	streamside daisy	Asteraceae	perennial herb	Jun-Oct	3	S3?	G3?
Erigeron greenei	Greene's narrow-leaved daisy	Asteraceae	perennial herb	May-Sep	1B.2	S3	G3
Eryngium jepsonii	Jepson's coyote thistle	Apiaceae	perennial herb	Apr-Aug	1B.2	S2?	G2?
Extriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S2	G2
Gilia capitata ssp. tomentosa	woolly-headed gilia	Polemoniaceae	annual herb	May-Jul	1B.1	S1	G5T1
Harmonia nutans	nodding harmonia	Asteraceae	annual herb	Mar-May	4.3	S3	G3
Hemizonia congesta ssp. congesta	congested-headed hayfield tarplant	Asteraceae	annual herb	Apr-Nov	1B.2	S2	G5T2
Hesperolinon bicarpellatum	two-carpellate western flax	Linaceae	annual herb	May-Jul	1B.2	S2	G2
Hesperolinon breweri	Brewer's western flax	Linaceae	annual herb	May-Jul	1B.2	S2	G2
Hesperolinon sharsmithiae	Sharsmith’s western flax	Linaceae	annual herb	May-Jul	1B.2	S2	G2Q
Horkelia tenuiloba	thin-lobed horkelia	Rosaceae	perennial herb	May-Jul(Aug)	1B.2	S2	G2
	Northern California	Juglandaceae	perennial deciduous	Apr-May	1B.1	S1	G1

Juglans hindsii	black walnut		tree				
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	annual herb	Mar-Jun	1B.1	S1	G1
Lathyrus jepsonii var. jepsonii	Delta tule pea	Fabaceae	perennial herb	May-Jul(Aug-Sep)	1B.2	S2	G5T2
Layia septentrionalis	Colusa layia	Asteraceae	annual herb	Apr-May	1B.2	S2	G2
Leptosiphon acicularis	bristly leptosiphon	Polemoniaceae	annual herb	Apr-Jul	4.2	S4?	G4?
Leptosiphon jepsonii	Jepson's leptosiphon	Polemoniaceae	annual herb	Mar-May	1B.2	S2S3	G2G3
Leptosiphon latisectus	broad-lobed leptosiphon	Polemoniaceae	annual herb	Apr-Jun	4.3	S4	G4
Lilaeopsis masonii	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	Apr-Nov	1B.1	S2	G2
Lilium rubescens	redwood lily	Liliaceae	perennial bulbiferous herb	Apr-Aug(Sep)	4.2	S3	G3
Limnanthes vinculans	Sebastopol meadowfoam	Limnanthaceae	annual herb	Apr-May	1B.1	S1	G1
Lomatium repostum	Napa lomatium	Apiaceae	perennial herb	Mar-Jun	4.3	S3	G3
Lupinus sericatus	Cobb Mountain lupine	Fabaceae	perennial herb	Mar-Jun	1B.2	S2?	G2?
Malacothamnus helleri	Heller's bush-mallow	Malvaceae	perennial deciduous shrub	May-Jul	3.3	S3	G3Q
Micropus amphibolus	Mt. Diablo cottonweed	Asteraceae	annual herb	Mar-May	3.2	S3S4	G3G4
Monardella viridis	green monardella	Lamiaceae	perennial rhizomatous herb	Jun-Sep	4.3	S3	G3
Navarretia cotulifolia	cotula navarretia	Polemoniaceae	annual herb	May-Jun	4.2	S4	G4
Navarretia heterandra	Tehama navarretia	Polemoniaceae	annual herb	Apr-Jun	4.3	S4	G4
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	annual herb	Apr-Jul	1B.1	S2	G4T2
Navarretia leucocephala ssp. pauciflora	few-flowered navarretia	Polemoniaceae	annual herb	May-Jun	1B.1	S1	G4T1
Navarretia rosulata	Marin County navarretia	Polemoniaceae	annual herb	May-Jul	1B.2	S2	G2
Penstemon newberryi var. sonomensis	Sonoma beardtongue	Plantaginaceae	perennial herb	Apr-Aug	1B.3	S2	G4T2
Ranunculus lobbii	Lobb's aquatic buttercup	Ranunculaceae	annual herb (aquatic)	Feb-May	4.2	S3	G4
Rhynchospora californica	California beaked-rush	Cyperaceae	perennial rhizomatous herb	May-Jul	1B.1	S1	G1
Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb (emergent)	May-Oct(Nov)	1B.2	S3	G3
Senecio clevelandii var. clevelandii	Cleveland's ragwort	Asteraceae	perennial herb	Jun-Jul	4.3	S3	G4?T3Q
Sidalcea hickmanii ssp. napensis	Napa checkerbloom	Malvaceae	perennial herb	Apr-Jun	1B.1	S1	G3T1
Sidalcea hickmanii ssp. viridis	Marin checkerbloom	Malvaceae	perennial herb	May-Jun	1B.1	SH	G3TH
Sidalcea keckii	Keck's checkerbloom	Malvaceae	annual herb	Apr-May(Jun)	1B.1	S2	G2

Sidalcea oregana ssp. hydrophila	marsh checkerbloom	Malvaceae	perennial herb	(Jun)Jul-Aug	1B.2	S2	G5T2
Streptanthus hesperidis	green jewelflower	Brassicaceae	annual herb	May-Jul	1B.2	S2	G2
Symphyotrichum lentum	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	(Apr)May-Nov	1B.2	S2	G2
Toxicoscordion fontanum	marsh zigadenus	Melanthiaceae	perennial bulbiferous herb	Apr-Jul	4.2	S3	G3
Trichostema ruygtii	Napa bluecurls	Lamiaceae	annual herb	Jun-Oct	1B.2	S1S2	G1G2
Trifolium amoenum	two-fork clover	Fabaceae	annual herb	Apr-Jun	1B.1	S1	G1
Trifolium hydrophilum	saline clover	Fabaceae	annual herb	Apr-Jun	1B.2	S2	G2
Triteleia lugens	dark-mouthed triteleia	Themidaceae	perennial bulbiferous herb	Apr-Jun	4.3	S4?	G4?
Viburnum ellipticum	oval-leaved viburnum	Adoxaceae	perennial deciduous shrub	May-Jun	2B.3	S3?	G4G5

Suggested Citation

California Native Plant Society, Rare Plant Program. 2020. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 16 November 2020].

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Selected Elements by Element Code

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (St. Helena (3812254) OR Chiles Valley (3812253) OR Lake Berryessa (3812252) OR Rutherford (3812244) OR Yountville (3812243) OR Capell Valley (3812242) OR Sonoma (3812234) OR Napa (3812233) OR Mt. George (3812232))

Element Code	Species	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
AAAAF02020	***Taricha rivularis*** red-bellied newt	None	None	G4	S2	SSC
AAAAH01020	***Dicamptodon ensatus*** California giant salamander	None	None	G3	S2S3	SSC
AAABH01022	***Rana draytonii*** California red-legged frog	Threatened	None	G2G3	S2S3	SSC
AAABH01050	***Rana boylii*** foothill yellow-legged frog	None	Endangered	G3	S3	SSC
ABNFD01020	***Phalacrocorax auritus*** double-crested cormorant	None	None	G5	S4	WL
ABNGA04010	***Ardea herodias*** great blue heron	None	None	G5	S4	
ABNGA04040	***Ardea alba*** great egret	None	None	G5	S4	
ABNGA11010	***Nycticorax nycticorax*** black-crowned night heron	None	None	G5	S4	
ABNKC01010	***Pandion haliaetus*** osprey	None	None	G5	S4	WL
ABNKC06010	***Elanus leucurus*** white-tailed kite	None	None	G5	S3S4	FP
ABNKC10010	***Haliaeetus leucocephalus*** bald eagle	Delisted	Endangered	G5	S3	FP
ABNKC19070	***Buteo swainsoni*** Swainson's hawk	None	Threatened	G5	S3	
ABNKC22010	***Aquila chrysaetos*** golden eagle	None	None	G5	S3	FP
ABNME01010	***Coturnicops noveboracensis*** yellow rail	None	None	G4	S1S2	SSC
ABNUA01010	***Cypseloides niger*** black swift	None	None	G4	S2	SSC
ABPAU01010	***Progne subis*** purple martin	None	None	G5	S3	SSC
ABPAU08010	***Riparia riparia*** bank swallow	None	Threatened	G5	S2	
ABPBX1201A	***Geothlypis trichas sinuosa*** saltmarsh common yellowthroat	None	None	G5T3	S3	SSC
ABPBXA301W	***Melospiza melodia samuelis*** San Pablo song sparrow	None	None	G5T2	S2	SSC

Element Code	Species	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
ABPBXB0020	***Agelaius tricolor*** tricolored blackbird	None	Threatened	G2G3	S1S2	SSC
AFCHA0209G	***Oncorhynchus mykiss irideus pop. 8*** steelhead - central California coast DPS	Threatened	None	G5T2T3Q	S2S3	
AFCHB03010	***Spirinchus thaleichthys*** longfin smelt	Candidate	Threatened	G5	S1	
AMACC01020	***Myotis yumanensis*** Yuma myotis	None	None	G5	S4	
AMACC01070	***Myotis evotis*** long-eared myotis	None	None	G5	S3	
AMACC05060	***Lasiurus blossevillii*** western red bat	None	None	G5	S3	SSC
AMACC08010	***Corynorhinus townsendii*** Townsend's big-eared bat	None	None	G3G4	S2	SSC
AMACC10010	***Antrozous pallidus*** pallid bat	None	None	G5	S3	SSC
AMAFJ01010	***Erethizon dorsatum*** North American porcupine	None	None	G5	S3	
AMAJF04010	***Taxidea taxus*** American badger	None	None	G5	S3	SSC
ARAAD02030	***Emys marmorata*** western pond turtle	None	None	G3G4	S3	SSC
CTT44100CA	***Northern Vernal Pool*** Northern Vernal Pool	None	None	G2	S2.1	
ICMAL05D70	***Stygobromus cowani*** Cowan's amphipod	None	None	G1	S1	
ICMAL27010	***Syncaris pacifica*** California freshwater shrimp	Endangered	Endangered	G2	S2	
ICMAL34010	***Calasellus californicus*** An isopod	None	None	G2	S2	
IICOL48011	***Desmocerus californicus dimorphus*** valley elderberry longhorn beetle	Threatened	None	G3T2	S3	
IIHYM24250	***Bombus occidentalis*** western bumble bee	None	Candidate Endangered	G2G3	S1	
IIHYM24380	***Bombus caliginosus*** obscure bumble bee	None	None	G4?	S1S2	
IIHYM80010	***Trachusa gummifera*** San Francisco Bay Area leaf-cutter bee	None	None	G1	S1	
IMBIV19010	***Gonidea angulata*** western ridged mussel	None	None	G3	S1S2	
PDAPI0Z130	***Eryngium jepsonii*** Jepson's coyote-thistle	None	None	G2	S2	1B.2

Element Code	Species	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
PDAPI19030	***Lilaeopsis masonii*** Mason's lilaeopsis	None	Rare	G2	S2	1B.1
PDAST11061	***Balsamorhiza macrolepis*** big-scale balsamroot	None	None	G2	S2	1B.2
PDAST1A010	***Blennosperma bakeri*** Sonoma sunshine	Endangered	Endangered	G1	S1	1B.1
PDAST3M5G0	***Erigeron greenei*** Greene's narrow-leaved daisy	None	None	G3	S3	1B.2
PDAST4R065	***Hemizonia congesta ssp. congesta*** congested-headed hayfield tarplant	None	None	G5T2	S2	1B.2
PDAST5L040	***Lasthenia conjugens*** Contra Costa goldfields	Endangered	None	G1	S1	1B.1
PDAST5N0F0	***Layia septentrionalis*** Colusa layia	None	None	G2	S2	1B.2
PDASTE8470	***Symphyotrichum lentum*** Suisun Marsh aster	None	None	G2	S2	1B.2
PDBOR01070	***Amsinckia lunaris*** bent-flowered fiddleneck	None	None	G3	S3	1B.2
PDBRA2G510	***Streptanthus hesperidis*** green jewelflower	None	None	G2G3	S2S3	1B.2
PDCAM060C0	***Downingia pusilla*** dwarf downingia	None	None	GU	S2	2B.2
PDCHE041F3	***Extriplex joaquinana*** San Joaquin spearscale	None	None	G2	S2	1B.2
PDCPR07080	***Viburnum ellipticum*** oval-leaved viburnum	None	None	G4G5	S3?	2B.3
PDERI041G4	***Arctostaphylos stanfordiana ssp. decumbens*** Rincon Ridge manzanita	None	None	G3T1	S1	1B.1
PDFAB08012	***Amorpha californica var. napensis*** Napa false indigo	None	None	G4T2	S2	1B.2
PDFAB0F240	***Astragalus claranus*** Clara Hunt's milk-vetch	Endangered	Threatened	G1	S1	1B.1
PDFAB0F8R1	***Astragalus tener var. tener*** alkali milk-vetch	None	None	G2T1	S1	1B.2
PDFAB250D2	***Lathyrus jepsonii var. jepsonii*** Delta tule pea	None	None	G5T2	S2	1B.2
PDFAB2B3J0	***Lupinus sericatus*** Cobb Mountain lupine	None	None	G2?	S2?	1B.2
PDFAB40040	***Trifolium amoenum*** two-fork clover	Endangered	None	G1	S1	1B.1
PDFAB400R5	***Trifolium hydrophilum*** saline clover	None	None	G2	S2	1B.2

Element Code	Species	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
PDLAM220H0	***Trichostema ruygtii*** Napa bluecurls	None	None	G1G2	S1S2	1B.2
PDLIM02090	***Limnanthes vinculans*** Sebastopol meadowfoam	Endangered	Endangered	G1	S1	1B.1
PDLIN01030	***Hesperolinon breweri*** Brewer's western flax	None	None	G2	S2	1B.2
PDLIN010E0	***Hesperolinon sharsmithiae*** Sharsmith's western flax	None	None	G2Q	S2	1B.2
PDMAL110A6	***Sidalcea hickmanii ssp. napensis*** Napa checkerbloom	None	None	G3T1	S1	1B.1
PDMAL110D0	***Sidalcea keckii*** Keck's checkerbloom	Endangered	None	G2	S2	1B.1
PDMAL110K2	***Sidalcea oregana ssp. hydrophila*** marsh checkerbloom	None	None	G5T2	S2	1B.2
PDPLM09140	***Leptosiphon jepsonii*** Jepson's leptosiphon	None	None	G2G3	S2S3	1B.2
PDPLM0C0E1	***Navarretia leucocephala ssp. bakeri*** Baker's navarretia	None	None	G4T2	S2	1B.1
PDPLM0C0E4	***Navarretia leucocephala ssp. pauciflora*** few-flowered navarretia	Endangered	Threatened	G4T1	S1	1B.1
PDPLM0C0Z0	***Navarretia rosulata*** Marin County navarretia	None	None	G2	S2	1B.2
PDRHA04160	***Ceanothus purpureus*** holly-leaved ceanothus	None	None	G2	S2	1B.2
PDRHA04220	***Ceanothus confusus*** Rincon Ridge ceanothus	None	None	G1	S1	1B.1
PDRHA04240	***Ceanothus divergens*** Calistoga ceanothus	None	None	G2	S2	1B.2
PDRHA04420	***Ceanothus sonomensis*** Sonoma ceanothus	None	None	G2	S2	1B.2
PDROS0W0E0	***Horkelia tenuiloba*** thin-lobed horkelia	None	None	G2	S2	1B.2
PDSCR0D404	***Castilleja ambigua var. meadii*** Mead's owls-clover	None	None	G4T1	S1	1B.1
PDSCR1L483	***Penstemon newberryi var. sonomensis*** Sonoma beardtongue	None	None	G4T3	S3	1B.3
PMALI040Q0	***Sagittaria sanfordii*** Sanford's arrowhead	None	None	G3	S3	1B.2
PMCYP0N060	***Rhynchospora californica*** California beaked-rush	None	None	G1	S1	1B.1
PMLIL021R1	***Allium peninsulare var. franciscanum*** Franciscan onion	None	None	G5T2	S2	1B.2

Element Code	Species	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
PMLIL0C022	***Brodiaea leptandra*** narrow-anthered brodiaea	None	None	G3?	S3?	1B.2
PMPOA040K0	***Agrostis hendersonii*** Henderson's bent grass	None	None	G2Q	S2	3.2

Record Count: 84

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Napa County, California



Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

Northern Spotted Owl Strix occidentalis caurina — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1123

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Crustaceans

NAME	STATUS
California Freshwater Shrimp Syncaris pacifica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7903	Endangered
Conservancy Fairy Shrimp Branchinecta conservatio There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8246	Endangered

Flowering Plants

NAME	STATUS
Contra Costa Goldfields Lasthenia conjugens There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/7058	Endangered
Few-flowered Navarretia Navarretia leucocephala ssp. pauciflora (=N. pauciflora) No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8242	Endangered

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Sebastopol Meadowfoam Limnanthes vinculans Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/404

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

NOT FOR CONSULTATION

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Lawrence's Goldfinch Carduelis lawrencei This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9464	Breeds Mar 20 to Sep 20
Long-billed Curlew Numenius americanus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere
Marbled Godwit Limosa fedoa This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere

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Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Willet Tringa semipalmata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

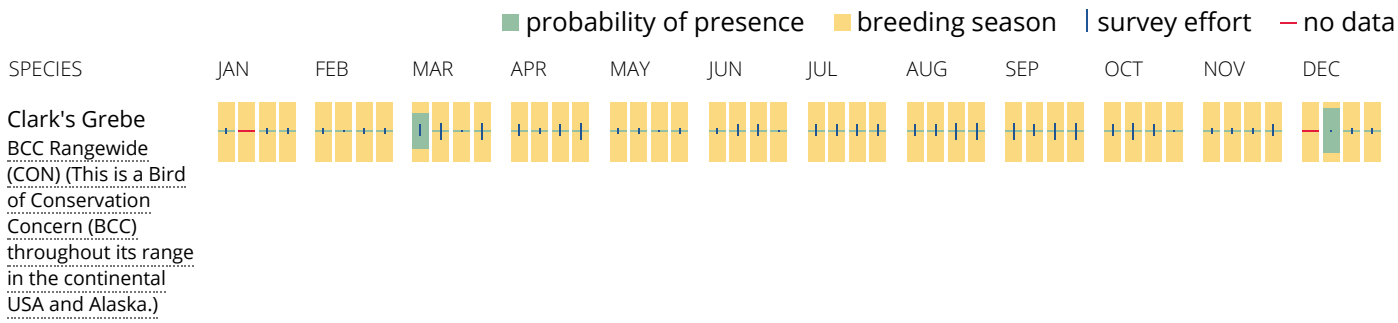
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

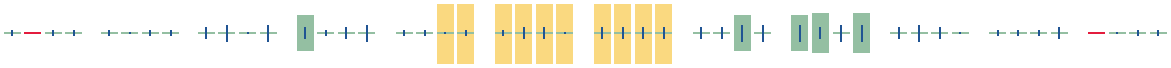
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

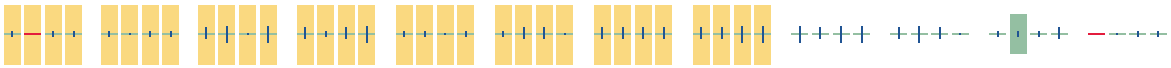


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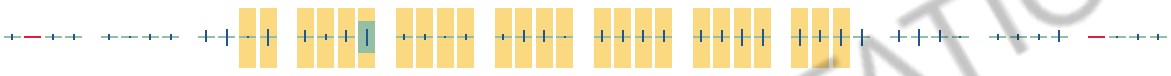
Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



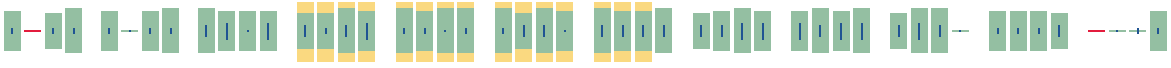
Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



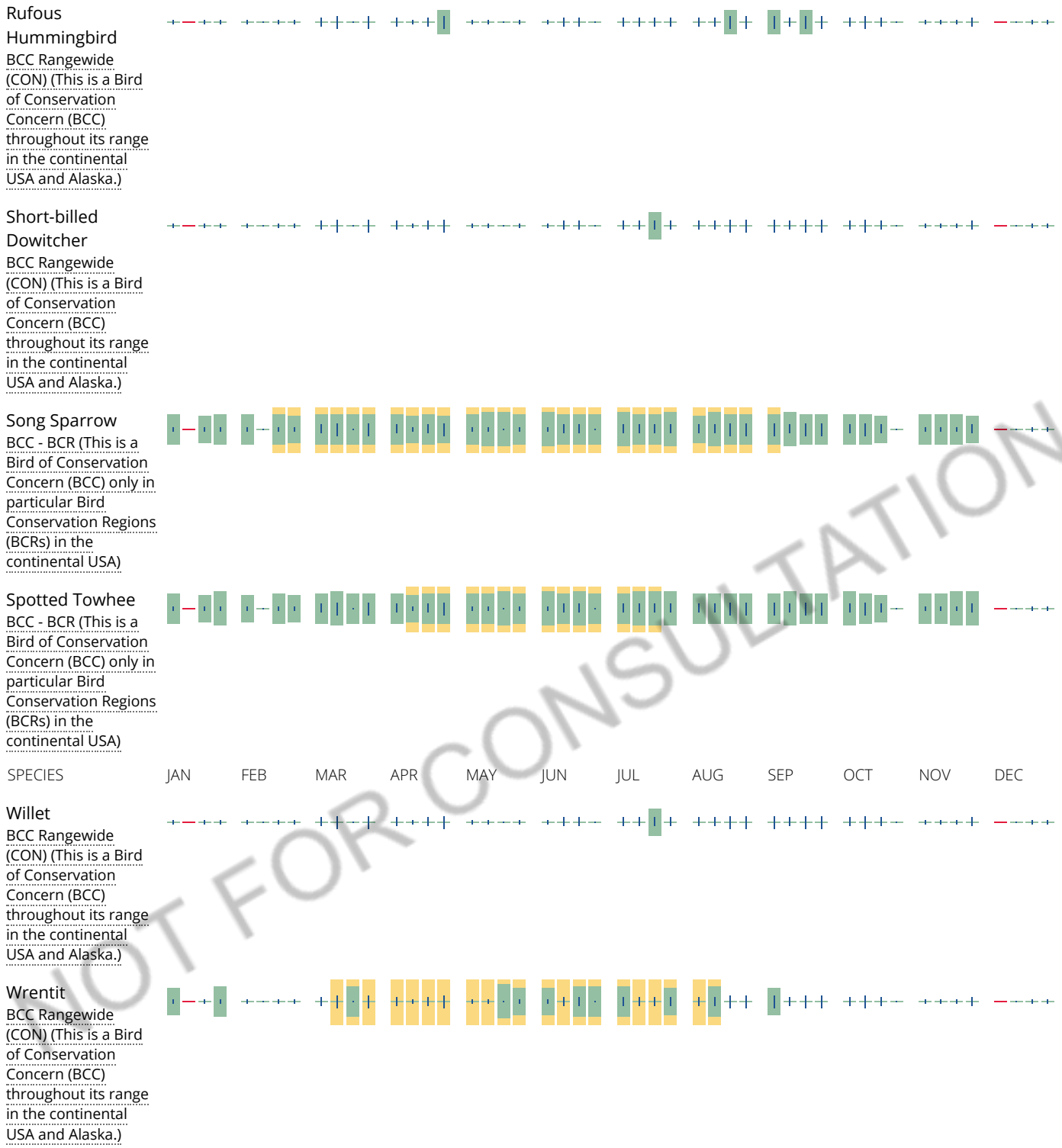
Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review.

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Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

RIVERINE

R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

NOAA Fisheries ESA Listed Species, Critical Habitat, Essential Fish Habitat, and MMPA Species Data

Yountville, CA Topographic Quadrangle (NOAA 2016)

ESA ANADROMOUS FISH

- CCC Steelhead (Threatened)

ESA ANADROMOUS FISH CRITICAL HABITAT

- CCC Steelhead

ESSENTIAL FISH HABITAT

- Coho Salmon
- Chinook Salmon

REFERENCE:

NOAA. 2016. California Species List Tools. Available online at: https://archive.fisheries.noaa.gov/wcr/maps_data/california_species_list_tools.html. Accessed November 2020

ATTACHMENT B

Representative Site Photos



Photo 1. Disturbed Ruderal Area, facing west, October 9, 2020.



Photo 2. Disturbed Ruderal Area, facing west, October 9, 2020.



Photo 3. Disturbed Developed Area, facing north, October 9, 2020.



Photo 4. Disturbed Ruderal Area, facing east, October 13, 2020.

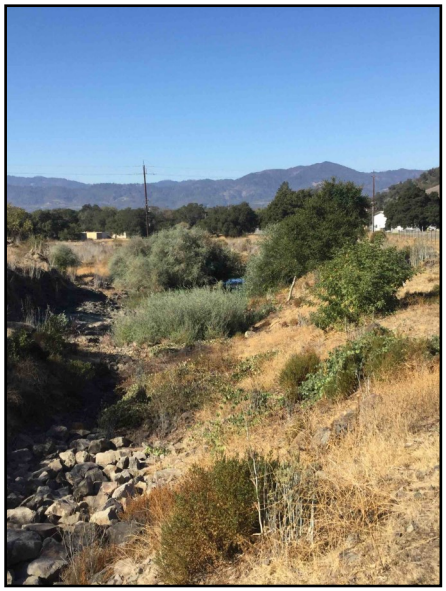


Photo 5. Rector Creek, facing downstream west, October 13, 2020.



Photo 6. Rector Creek, discharge hose in foreground, facing south, October 9, 2020.



Photo 7. Coast Live Oak in Disturbed Developed Area, facing north, October 13, 2020.



Photo 8. Developed Area, Outfall Structure, facing west, October 13, 2020.

ATTACHMENT C

Plant List

Attachment C

Plants Observed Onsite October 13, 2020

Scientific Name	Common Name
Abies concolor	White fir
Abies magnifica var. *magnifica*	Red fir
*Abutilon theophrasti**	Velvet leaf
*Acacia decurrens**	Green wattle
Acer macrophyllum	Big leaf maple
Acer negundo	Box-elder
*Acer saccharinum**	Silver maple
Achillea millefolium	Common yarrow
Achyrachaena mollis	Blowwives
Acmispon americanus	Spanish clover
Acmispon brachycarpus	Short-podded lotus
Acmispon glaber	Deerweed
Acmispon nevadensis	Sierra lotus
Acmispon nevadensis var. *nevadensis*	Nevada birdsfoot trefoil
Acmispon parviflorus	Hill lotus
Acmispon wrangelianus	Chilean trefoil
Aconitum columbianum	Columbian monkshood
Aconogonon phytolaccifolium	Pokeweed knotweed
Actaea rubra	Red baneberry
Adenocaulon bicolor	Trail plant
Adenostoma fasciculatum	Chamise
Adiantum jordanii	California maidenhair
*Aegilops triuncialis**	Barbed goatgrass
Aesculus californica	California buckeye
Agoseris grandiflora	Large-flowered agoseris
Agoseris heterophylla	Annual agoseris
Agoseris retrorsa	Spearleaf agoseris
*Agrostis avenacea**	Pacific bentgrass
Agrostis elliottiana	Elliott's bentgrass
Agrostis exarata	Spike bentgrass
*Ailanthus altissima**	Tree-of-heaven
*Aira caryophyllea**	Silvery hairgrass
*Alisma lanceolatum**	Lanceleaf water plantain
Alisma triviale	Northern water plantain
Allium amplectens	Narrowleaf onion

Scientific Name	Common Name
Allium campanulatum	Sierra onion
Allium hyalinum	Glassy onion
Allium sanbornii var. *sanbornii*	Sanborn's onion
*Allium triquetrum**	White-flowered onion
Allium unifolium	One leaf onion
Allophyllum divaricatum	Purple false gilia
Allophyllum divaricatum	Purple false gilia
Alnus incana ssp. *tenuifolia*	Mountain alder
Alnus rhombifolia	White alder
Alopecurus aequalis	Short awned foxtail
Alopecurus aequalis	Short awned foxtail
Alopecurus carolinianus	Carolina foxtail
*Alopecurus pratensis**	Meadow foxtail
Alopecurus saccatus	Pacific foxtail
*Amaranthus albus**	Pigweed amaranth
Amaranthus blitoides	Prostrate amaranth
*Amaranthus retroflexus**	Rough pigweed
Ambrosia acanthicarpa	Annual burweed
Ambrosia psilostachya	Western ragweed
Amelanchier alnifolia	Serviceberry
Amelanchier utahensis	Paleleaf serviceberry
Ammannia coccinea	Purple ammannia
Ammannia robusta	Grand ammannia
Amsinckia eastwoodiae	Eastwood's fiddleneck
Amsinckia intermedia	Common fiddleneck
Amsinckia menziesii	Small flowered fiddleneck
Anaphalis margaritacea	Pearly everlasting
Andropogon virginicus var. *virginicus**	Broomsedge bluestem
Angelica breweri	Brewer's angelica
Anisocarpus madioides	Woodland madia
*Anthemis cotula**	Mayweed
*Anthriscus caucalis**	Bur chervil
Antirrhinum cornutum	Spurred snapdragon
*Antirrhinum orontium**	Syrian snapdragon
Aphanes occidentalis	Western lady's mantle
Aphyllon fasiculatum	Clustered broomrape
Apocynum androsaemifolium	Spreading dogbane
Apocynum cannabinum	Indianhemp dogbane
Aquilegia formosa	Columbine
Arabis pycnocarpa var. *pycnocarpa*	Hairy fruit rock cress
Arbutus menziesii	Pacific madrone
Arceuthobium campylopodum	Western dwarf mistletoe
Arctostaphylos manzanita	Common manzanita
Arctostaphylos patula	Greenleaf manzanita
Arctostaphylos viscida	Whiteleaf manzanita
Aristida oligantha	Oldfield three-awn

Scientific Name	Common Name
Aristolochia californica	California pipevine
*Arrhenatherum elatius**	Tall oatgrass
Artemisia douglasiana	Mugwort
Artemisia dracunculus	Herbaceous sagewort
Artemisia ludoviciana	Silver wormwood
Artemisia ludoviciana	Silver wormwood
Artemisia tridentata	Big sagebrush
*Arundo donax**	Giant reed
Asarum hartwegii	Hartweg's wild ginger
Asarum lemmonii	Lemmon's wild ginger
Asclepias cordifolia	Purple milkweed
Asclepias eriocarpa	Woolypod milkweed
Asclepias fascicularis	Narrow-leaf milkweed
Asclepias speciosa	Showy milkweed
Asclepias vestita	Wooly milkweed
Asparagus officinalis ssp. *officinalis**	Asparagus
Aspidotis densa	Cliffbrake
Athyrium filix-femina	Common lady fern
Atriplex patula	Fat hen
*Atriplex rosea**	Tumbling oracle
*Avena barbata**	Slender wild oat
*Avena fatua**	Wild oat
*Avena sativa**	Cultivated oat
Azolla filiculoides	Mosquito fern
Baccharis glutinosa	Salt marsh baccharis
Baccharis pilularis	Coyote bush
Baccharis salicifolia	Mulefat
Bacopa eisenii	Gila River water hyssop
Balsamorhiza deltoidea	Deltoid Balsamroot
Barbarea orthoceras	Winter cress
*Bellardia trixago**	Mediterranean Lineseed
*Bellis perennis**	English lawn daisy
Berberis aquifolium	Oregon grape
Berberis aquifolium var. *repens*	Creeping oregon grape
Bidens frondosa	Sticktight
Blennosperma nanum	Yellow carpet
Boechera californica	California rockcress
Boechera pinetorum	Woodland rockcress
Bolboschoenus maritimus ssp. *paludosus*	Saltmarsh bulrush
Bolboschoenus robustus	Sturdy bulrush
Boykinia occidentalis	Western boykinia
Boykinia rotundifolia	Round-leaf brookfoam
*Brachypodium distachyon**	False brome
*Brassica species**	Mustard
*Brassica rapa**	Field mustard
Brickellia californica	California brickelbush

Scientific Name	Common Name
*Briza maxima**	Big quaking grass
*Briza minor**	Little quaking grass
Brodiaea appendiculata	Hoover's brodiaea
Brodiaea coronaria	Crown brodiaea
Brodiaea elegans	Harvest brodiaea
Brodiaea minor	Low brodiaea
Brodiaea nana	Dwarf brodiaea
*Bromus arenarius**	Australian brome
Bromus carinatus	California brome
Bromus caroli-henrici	Weedy brome
*Bromus catharticus**	Rescue grass
*Bromus diandrus**	Ripgut brome
*Bromus hordeaceus**	Soft brome
Bromus laevipes	Woodland brome
Bromus madritensis ssp. *rubens**	Red brome
Bromus orcuttianus	Orcutt's brome
*Bromus sterilis**	Poverty brome
*Bromus tectorum**	Cheatgrass
Calandrinia ciliata	Red maids
Calandrinia menziesii	Red maids
Callitriche heterophylla	Varied leaved water starwort
Callitriche marginata	Winged water-starwort
Calocedrus decurrens	Incense cedar
Calochortus albus	White globe lily
Calochortus amabilis	Golden fairy lantern
Calochortus amoenus	Purple fairy lantern
Calochortus invenustus	Plain mariposa lily
Calochortus leichtlinii	Lechtlin's Mariposa lily
Calochortus luteus	Golden bowl mariposa lily
Calochortus monophyllus	Yellow star tulip
Calochortus superbus	Yellow mariposa
Calochortus tolmiei	Hairy star tulip
Calochortus uniflorus	Large flowered star tulip
Calochortus venustus	Butterfly mariposa lily
Calycadenia fremontii	Fremont's calycadenia
Calycadenia multiglandulosa	Rosin weed
Calycadenia pauciflora	Small flowered calycadenia
Calycanthus occidentalis	Western spicebush
Calyptridium umbellatum	Pussy paws
Calystegia collina ssp. *collina*	Hillside morning glory
Calystegia collina ssp. *oxyphylla*	Mt. Saint Helena morning glory
Calystegia malacophylla ssp. *malacophylla*	Sierra morning glory
Calystegia occidentalis	Western morning glory
Calystegia purpurata ssp. *purpurata*	Purple western morning-glory
Calystegia stebbinsii	Stebbin's morning-glory
Camissonia contorta	Contorted sun cup

Scientific Name	Common Name
Camissonia tanacetifolia ssp. *tanacetifolia*	Tansy-leaf evening primrose
*Capsella bursa-pastoris**	Shepherd purse
Cardamine californica	California bitter-cress
*Cardamine hirsuta**	Hairy bittercress
Cardamine oligosperma	Few-seed bitter-cress
Cardamine pensylvanica	Pennsylvania bittercress
*Carduus pycnocephalus**	Italian thistle
Carex aquatilis	Water sedge
Carex barbarae	Santa Barbara sedge
Carex bolanderi	Bolander's sedge
Carex densa	Dense sedge
Carex inferminervia	Weak nerved sedge
Carex leptopoda	Slender-footed sedge
Carex praegracilis	Clustered field sedge
Carex senta	Rough sedge
Carex simulata	Short beaked sedge
Carex subfusca	Brown sedge
Carex xerophila	Chaparral sedge
*Carpobrotus edulis**	Freeway Iceplant
*Carthamus tinctorius**	Safflower
Castilleja affinis ssp. *affinis*	Wight's indian paintbrush
Castilleja applegatei ssp. *disticha*	Forked wavy leaf paintbrush
Castilleja applegatei ssp. *pinetorum*	Pine wavy leaf paintbrush
Castilleja attenuata	Narrow leaved owl's clover
Castilleja campestris ssp. *campestris*	Field owl's-clover
Castilleja campestris ssp. *succulenta*	Succulent owl's-clover
Castilleja exserta	Purple owl's-clover
Castilleja lacera	Cut-leaved owl's clover
Castilleja miniata ssp. *miniata*	Scarlet paintbrush
Castilleja tenuis	Hairy owl's clover
*Casuarina equisetifolia**	Beach she-oak
*Catalpa bignonioides**	Southern catalpa
Ceanothus cordulatus	Mountain whitethorn
Ceanothus cuneatus	Buck brush
Ceanothus integerrimus	Deer brush
Ceanothus lemmonii	Lemon's ceanothus
Ceanothus leucodermis	Chaparral whitethorn
Ceanothus parvifolius	Littleleaf ceanothus
Ceanothus prostratus	Pinemat ceanothus
Ceanothus roderickii	Pine Hill ceanothus
Ceanothus velutinus	Tobacco brush
*Cedrus deodara**	Deodar cedar
*Centaurea calcitrapa**	Purple star thistle
*Centaurea cyanus**	Bachelor buttons
*Centaurea melitensis**	Tocalote
*Centaurea solstitialis**	Yellow star-thistle

Scientific Name	Common Name
*Centaurea sulphurea**	Sulphur knapweed
Centaurium tenuiflorum	Slender centaury
Centromadia fitchii	Fitch's spikeweed
Centromadia pungens	Common tarweed
Cephalanthera austiniae	Phantom orchid
Cephalanthus occidentalis	Common buttonbush
*Cerastium fontanum**	Common mouse-ear chickweed
*Cerastium glomeratum**	Mouse-ear chickweed
Cercis occidentalis	Western redbud
Cercocarpus betuloides	Birch leaf mountain mahogany
Chaenactis douglasii var. *douglasii*	Hoary chaenactis
Chamaebatia foliolosa	Mountain misery
*Chamaesyce maculata**	Spotted spurge
Chamaesyce ocellata	Prostrate spurge
Chamaesyce serpyllifolia ssp. *serpyllifolia*	Thyme leaved spurge
Chamerion angustifolium ssp. *angustifolium*	Fireweed
*Chenopodium album**	White goosefoot
Chenopodium berlandieri	Pit seed goosefoot
*Chenopodium murale**	Nettle leaf goosefoot
Chilopsis linearis	Desert Willow
Chimaphila menziesii	Little prince's pine
Chlorogalum angustifolium	Narrowleaf soap plant
Chlorogalum pomeridianum	Wavyleaf soap plant
*Chondrilla juncea**	Skeleton weed
Chorizanthe membranacea	Pink spineflower
Chrysolepis sempervirens	Bush chinquapin
Cicendia quadrangularis	Oregon timwort
*Cichorium intybus**	Chicory
Cicuta maculata	Water hemlock
Circaea alpina ssp. *pacifica*	Pacific enchanter's nightshade
*Cirsium arvense**	Canada thistle
Cirsium occidentale	Cobweb thistle
*Cirsium vulgare**	Bull thistle
Cistus sp.*	Rock rose
*Citrus sinensis**	Orange
Clarkia biloba	Two-lobed clarkia
Clarkia biloba ssp. *biloba*	Two lobed clarkia
Clarkia biloba ssp. *brandageeae*	Brandagee's clarkia
Clarkia gracilis ssp. *gracilis*	Graceful clarkia
Clarkia gracilis ssp. *tracyi*	Tracy's clarkia
Clarkia heterandra	California gaura
Clarkia purpurea ssp. *purpurea*	Four-spot clarkia
Clarkia purpurea ssp. *quadrivulnera*	Winecup clarkia
Clarkia rhomboidea	Diamond clarkia
Clarkia unguiculata	Elegant clarkia
Claytonia exigua	Little spring beauty

Scientific Name	Common Name
Claytonia parviflora ssp. *parviflora*	Streambank springbeauty
Claytonia perfoliata	Miner's lettuce
Claytonia perfoliata	Miner's lettuce
Claytonia rubra	Redstem springbeauty
Clematis lasiantha	Chaparral clematis
Clematis ligusticifolia	Western virgin's-bower
Collinsia heterophylla	Purple Chinese houses
Collinsia parviflora	Few flowered blue eye mary
Collinsia sparsiflora	Few flowered collinsia
Collinsia tinctoria	Tincture plant
Collinsia torreyi	Torrey's collinsia
Collomia grandiflora	Grand collomia
Collomia heterophylla	Variable leafed collomia
Comandra umbellata ssp. *californica*	Bastard toadflax
*Conium maculatum**	Poison hemlock
*Convolvulus althaeoides**	Hollyhock bindweed
*Convolvulus arvensis**	Field bindweed
*Convolvulus arvensis**	Field bindweed
Corallorhiza maculata	Spotted coralroot
Cordylanthus pilosus ssp. *pilosus*	Hairy bird's beak
Cordylanthus rigidus ssp. *rigidus*	Rigid bird's beak
Cordylanthus tenuis ssp. *tenuis*	Slender bird's beak
Cornus glabrata	Brown dogwood
Cornus nuttallii	Pacific dogwood
Cornus sericea	American dogwood
*Cortaderia jubata**	Pampas grass
Corylus cornuta	Beaked hazelnut
*Cotula australis**	Australian brassbottons
*Cotula coronopifolia**	Brassbuttons
Crassula aquatica	Aquatic pygmy-weed
Crassula connata	Sand pygmy-weed
*Crassula tillaea**	Mediterranean pygmy-weed
*Crataegus monogyna**	Hawthorn
Cressa truxillensis	Spreading alkali-weed
Crocanthemum scoparium	Bisbee Peak rush-rose
Croton setiger	Turkey mullein
Crucianella angustifolia	Narrow leafed crucianella
*Crypsis schoenoides**	Swamp grass
*Crypsis vaginiflora**	Prickle grass
Cryptantha affinis	Common cryptantha
Cryptantha flaccida	Beaked cryptantha
Cryptantha micromeres	Minute-flowered cryptantha
Crystopteris fragilis	Bladder fern
*Cupressus sempervirens**	Italian cypress
Cuscuta californica	California dodder
Cuscuta californica var. *californica*	Short flowered dodder

Scientific Name	Common Name
Cuscuta campestris	Field dodder
Cuscuta howelliana	Vernal pool dodder
*Cylospermum leptophyllum**	Marsh parsley
Cynara cardunculus	Artichoke thistle
*Cynodon dactlyon**	Bermuda grass
*Cynodon dactylon**	Bermuda grass
Cynoglossum grande	Pacific hound's tongue
*Cynosurus echinatus**	Hedgehog dog-tail grass
*Cyperus difformis**	Variable flatsedge
Cyperus eragrostis	Tall flatsedge
Cyperus erythrorhizos	Redroot flatsedge
Cyperus esculentus	Nutsedge
Cyperus odoratus	Fragrant flatsedge
*Cyperus rotundus**	Purple flatsedge
Cyperus squarrosus	Bearded flatsedge
*Cytisus scoparius**	Scotch broom
*Dactylis glomerata**	Orchard grass
Damasonium californicum	California damasonium
Danthonia californica	California oatgrass
Darmera peltata	Indian rhubarb
*Datura stramonium**	Jimson weed
Datura wrightii	Sacred thornapple
*Daucus carota**	Queen Anne's lace
Daucus pusillus	American wild carrot
Deinandra kelloggii	Kellogg's tarweed
Deinandra minthornii	Santa Susana tarplant
*Delairea odorata**	Cape ivy
Delphinium depauperatum	Dwarf larkspur
Delphinium gracilentum	Meadow larkspur
Delphinium hansenii ssp. *hansenii*	Hanson's larkspur
Delphinium hansenii ssp. *kernense*	Kern larkspur
Delphinium hesperium	Western larkspur
Delphinium patens	Zigzag larkspur
Delphinium variegatum ssp. *variegatum*	Royal larkspur
Dendromecon rigida	Bush poppy
Deschampsia cespitosa	Tufted hairgrass
Deschampsia danthonioides	Annual hairgrass
Descurainia incana	Mountain tansy mustard
Dicentra formosa	Pacific bleeding heart
Dichelostemma capitatum	Blue dicks
Dichelostemma congestum	Fork toothed ookow
Dichelostemma multiflorum	Wild hyacinth
*Digitalis purpurea**	Foxglove
*Digitaria ciliaris**	Hairy crabgrass
*Digitaria ischaemum**	Smooth crabgrass
*Digitaria sanguinalis**	Hairy crabgrass

Scientific Name	Common Name
Diplacus angustatus	Narrow leaved pansy monkeyflower
Diplacus aurantiacus	Sticky monkeyflower
Diplacus kelloggii	Kellogg's monkeyflower
Diplacus layneae	Layne's monkeyflower
Diplacus tricolor	Tricolor monkeyflower
Diplacus viscidus	Viscid monkeyflower
*Dipsacus fullonum**	Wild teasel
Distichlis spicata	Saltgrass
*Dittrichia graveolens**	Stinkwort
Dodecatheon clevelandii	Padre's shootingstar
*Dodonaea viscosa**	Florida hopbush
Downingia bicornuta	Bristled downingia
Downingia cuspidata	Toothed downingia
Downingia insignis	Harlequin downingia
Downingia ornatissima	Horned downingia
Downingia pulchella	Flatface downingia
Downingia pusilla	Dwarf downingia
Draperia systyla	Violet draperia
Drymocallis glandulosa	Sticky cinquefoil
Dryopteris arguta	California wood fern
Dryopteris arguta	California wood fern
Dudleya cymosa	Canyon liveforever
*Dysphania ambrosioides**	Mexican tea
*Echinochloa colona**	Jungle grass
*Echinochloa crus-galli**	Barnyard grass
Echinodorus berteroi	Upright burhead
*Eichhornia crassipes**	Water hyacinth
Elatine brachysperma	Short-seed waterwort
Elatine californica	California waterwort
Elatine rubella	Southwestern waterwort
Eleocharis acicularis var. *acicularis*	Least spikerush
Eleocharis macrostachya	Creeping spikerush
Eleocharis obtusa	Broad spikerush
*Eleocharis pachycarpa**	Black-sand spikerush
Eleocharis palustris	Common spikerush
Eleocharis parishii	Parish's spikerush
Eleocharis parvula	Small spikerush
Elodea canadensis	Common water weed
*Elymus caput-medusae**	Medusahead grass
Elymus cinereus	Great Basin wildrye
Elymus elymoides	Squirreltail
Elymus glaucus	Blue wild-rye
*Elymus repens**	Quackgrass
Elymus triticoides	Creeping wild-rye
Emmenanthe penduliflora var. *penduliflora*	Whispering bells
Epilobium brachycarpum	Panicled willow-herb

Scientific Name	Common Name
Epilobium campestre	Smooth spike primrose
Epilobium canum	California fuchsia
Epilobium ciliatum	Hairy willow-herb
Epilobium cleistogamum	Cleistogamous spike primrose
Epilobium densiflorum	Dense-flower spike primrose
Epilobium foliosum	California willowherb
Epilobium pallidum	Large-flower spike primrose
Epilobium torreyi	Narrow leaved willowherb
Equisetum arvense	Field horsetail
Equisetum hyemale	Rough horsetail
Equisetum laevigatum	Smooth scouring-rush
*Eragrostis cilianensis**	Stinkgrass
*Eragrostis curvula**	Weeping lovegrass
Ericameria arborescens	Goldenfleece
Ericameria nauseosa	Rubber rabbitbrush
*Erigeron bonariensis**	Flax-leaved horseweed
Erigeron canadensis	Canada horseweed
Erigeron foliosis	Leafy daisy
Erigeron glacialis var. *glacialis*	Wandering daisy
Erigeron philadelphicus	Philadelphia fleabane
*Eriobotrya japonica**	Loquat
*Eriochloa contracta**	Dense cupgrass
Eriodictyon californicum	California yerba santa
Eriogonum fasciculatum var. *foliolosum*	California buckwheat
Eriogonum nudum	Naked buckwheat
Eriogonum nudum var. *pubiflorum*	Naked buckwheat
Eriogonum prattenianum	Pratten's buckwheat
Eriogonum umbellatum var. *furcosum*	Sulpher-flower buckwheat
Eriogonum wrightii	Wright's Buckwheat
Eriophyllum lanatum var. *achilleoides*	Yarrow leaved woolly sunflower
Eriophyllum lanatum var. *croceum*	Sierra woolly sunflower
Erodium species	Filaree
*Erodium brachycarpum**	Short fruited filaree
*Erodium cicutarium**	Red-stemmed filaree
*Erodium moschatum**	White-stemmed filaree
Eryngium castrense	Great Valley button-celery
Eryngium mathiasiae	Mathias' button-celery
Eryngium vaseyi	Vasey's coyote-thistle
Erysimum capitatum	Western wallflower
Erythranthe acutidens	Kings river monkeyflower
Erythranthe bicolor	Bicolor monkeyflower
Erythranthe cardinalis	Scarlet monkeyflower
Erythranthe guttata	Yellow monkeyflower
Erythranthe lewisii	Lewis' monkeyflower
Erythranthe microphyllus	Small leaved monkeyflower
Erythranthe primuloides	Primrose monkeyflower

Scientific Name	Common Name
Eschscholzia caespitosa	Foothill poppy
Eschscholzia californica	California poppy
Eschscholzia lobbii	Frying pan poppy
*Eucalyptus globulus**	Blue gum
*Euchiton sphaericus**	Tropical creeping cudweed
Euphorbia crenulata	Chinese caps
Euphorbia ocellata	Contura Creek spurge
Euphorbia serpens	Matted sandmat
Euphorbia serpyllifolia	Thyme-leafed spurge
*Euphorbia virgata**	Leafy spurge
Eurybia integrifolia	Thickstem aster
Eurybia radulina	Roughleaf aster
Euthamia occidentalis	Western goldenrod
*Festuca arundinacea**	Reed fescue
*Festuca bromoides**	Brome fescue
Festuca californica	California fescue
Festuca idahoensis	Blue fescue
Festuca microstachys	Small fescue
*Festuca myuros**	Rat-tail vulpia
Festuca occidentalis	Western fescue
Festuca octoflora	Six-weeks fescue
*Festuca perennis**	Italian Ryegrass
*Festuca pratensis**	Meadow fescue
Festuca rubra	Red fescue
*Ficus carica**	Common fig
Floerkea proserpinacoides	False mermaid
*Foeniculum vulgare**	Sweet fennel
Fragaria vesca	California strawberry
Fragaria virginiana	Mountain strawberry
Frangula californica	California coffeeberry
Frangula californica ssp. *tomentella*	Hoary coffeeberry
Frangula rubra	Red buckthorn
Frankenia salina	Alkali heath
Fraxinus latifolia	Oregon ash
Fraxinus velutina	Velvet ash
Fremontodendron californicum	California fannelbush
Fritillaria affinis	Checker lily
Fritillaria micrantha	Brown bells
*Fumaria capreolata**	White fumitory
Fumaria parviflora	Fine leaved fumitory
Galium ambiguum ssp. *ambiguum*	Yolla Bolly bedstraw
Galium aparine	Common bedstraw
Galium bolanderi	Bolander's bedstraw
Galium californicum ssp. *californicum*	California bedstraw
*Galium murale**	Yellow wall bedstraw
Galium parisiense	Wall bedstraw

Scientific Name	Common Name
Galium porrigens	Wall bedstraw
Gamochaeta ustulata	Featherweed
Garrya flavascens	Ashy silk tassel
Garrya fremontii	Fremont's silk tassel
Gastridium phleoides	Nit grass
Gayophytum diffusum ssp. *parviflorum*	Diffuse gayophytum
*Genista monspessulana**	French broom
Geranium carolinianum	Carolina geranium
*Geranium dissectum**	Cut-leaved geranium
*Geranium molle**	Dovefoot geranium
*Geranium palmatum**	Canary Island geranium
*Geranium pusillum**	Small flowered geranium
*Geranium retrorsum**	New Zealand geranium
Geranium richardsonii	Richardson's geranium
Geum macrophllum ssp. *perincisum*	Large leaf avens
Gilia capitata ssp. *capitata*	Blue field gilia
Gilia tricolor ssp. *diffusa*	Bird's eye gilia
Githopsis specularioides	Common bluecup
*Gleditsia triacanthos**	Honeylocust
Glyceria ×occidentalis	Western mannagrass
*Glyceria declinata**	Waxy mannagrass
Glyceria elata	Fowl mannagrass
Gnaphalium palustre	Western marsh cudweed
Goodyeara oblongifolia	Rattlesnake plantain
Gratiola ebracteata	Bractless hedgehyssop
Gratiola heterosepala	Boggs Lake hedgehyssop
Grindelia camporum	Common gumplant
Grindelia hirsutula	Hairy gumweed
Gymnocladus dioicus	Kentucky coffeetree
Hackelia nervosa	Sierra stickweed
Hackelia velutina	Velvety stickseed
*Hedera helix**	English ivy
Helenium bigelovii	Bigelow's sneezeweed
Helenium puberulum	Sneezeweed
Helianthella californica	California Helianthella
Helianthus annuus	Common sunflower
Heliotropium curassavicum	Seaside heliotrope
Heliotropium curassavicum	Seaside heliotrope
*Helminthotheca echioides**	Bristly oxtongue
Hemizonia congesta	Hayfield tarweed
Hemizonia congesta ssp. *clevelandii*	Cleveland's tarweed
Hemizonia congesta ssp. *luzulifolia*	Hayfield tarweed
Heracleum maximum	Cow parsnip
*Herniaria hirsuta**	Hairy rupturewort
Hesperevax caulescens	Hogwallow starfish
*Heteranthera limosa**	Blue mud plantain

Scientific Name	Common Name
Heterocodon rariflorum	Rareflower heterocodon
Heteromeles arbutifolia	Toyon
Heterotheca grandiflora	Telegraph weed
Heuchera micrantha	Alum root
Hieracium albiflorum	White flowered hawkweed
Hieracium horridum	Shaggy hawkweed
Hieracium scouleri	Hounds tongue hawkweed
*Hirschfeldia incana**	Shortpod mustard
Hoita macrostachya	Large leather root
Hoita orbicularis	Creeping leather root
*Holcus lanatus**	Velvet grass
Holocarpha virgata	Narrow tarplant
Holodiscus bicolor	Oceanspray
Holozonia filipes	Whitecrown
Hordeum brachyantherum	Meadow barley
Hordeum depressum	Dwarf barley
Hordeum jubatum	Foxtail barley
Hordeum marinum ssp. *gussoneanum**	Mediterranean barley
Hordeum murinum ssp. *glaucum**	Foxtail barley
*Hordeum murinum**	Foxtail barley
Horkelia californica	California horkelia
Horkelia californica var. *elata*	California horkelia
Hosackia crassifolia ssp. *crassifolia*	Big deervetch
Hosackia oblongifolia	Streambank lotus
Hydrophyllum occidentale	Western waterleaf
Hypericum anagalloides	Creeping St. Johnswort
*Hypericum calycinum**	Aaron's beard
Hypericum concinnum	Goldwire
*Hypericum perforatum**	Klamath weed
*Hypochaeris glabra**	Smooth cat's-ear
*Hypochaeris radicata**	Rough cat's-ear
Ipomopsis aggregata ssp. *aggregata*	Scarlet gilia
Iris fernaldii	Fernald's iris
Iris hartwegii ssp. *hartwegii*	Hartweg's iris
Iris macrosiphon	Ground iris
*Iris pseudacorus**	Yellow iris
Isoetes howellii	Howell’s quillwort
Isoetes nuttallii	Nuttall’s quillwort
Isoetes orcuttii	Orcutt’s quillwort
Isolepis cernua	Low bulrush
*Isolepis setacea**	Bristle leaf bulrush
Jensia rammii	Ramm's madia
Juglans californica	California black walnut
Juglans hindsii	Black walnut
*Juglans regia**	English walnut
Juncus acuminatus	Sharp fruited rush

Scientific Name	Common Name
Juncus balticus ssp. *ater*	Baltic rush
Juncus bryoides	Moss rush
Juncus bufonius	Toad rush
*Juncus capitatus**	Capped rush
Juncus effusus	Soft rush
Juncus leiospermus var. *ahartii*	Ahart's dwarf rush
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush
Juncus mexicanus	Mexican rush
Juncus oxymeris	Pointed rush
Juncus patens	Common rush
Juncus phaeocephalus var. *paniculatus*	Brown headed rush
Juncus tenuis	Poverty rush
Juncus uncialis	Inch-high rush
Juncus xiphioides	Iris-leaf rush
Keckiella breviflora	Bush beardtongue
Kelloggia galioides	Kelloggia
*Kickxia elatine**	Sharp-leaved fluellin
*Kniphofia uvaria**	Redhot poker
Koeleria macrantha	June grass
Kopsiopsis strobilacea	California groundcone
*Lactuca serriola**	Prickly lettuce
*Lagerstroemia indica**	Crape mytle
*Lamium amplexicaule**	Henbit
Lasthenia californica	California goldfields
Lasthenia chrysantha	Alkalai goldfields
Lasthenia fremontii	Fremont's goldfields
Lasthenia glaberrima	Smooth goldfields
*Lathyrus angulatus**	Angled pea
*Lathyrus hirsutus**	Rough pea
*Lathyrus latifolius**	Sweet pea
Lathyrus nevadensis	Sierra pea
Lathyrus sulphureus ssp. *sulphureus*	Sulphur pea
Lathyrus vestitus var. *vestitus*	Hillside pea
Layia fremontii	Fremont's tidy-tips
Layia pentachaeta ssp. *pentachaeta*	Sierra tidy-tips
Layia platyglossa	Common tidy-tips
Leersia oryzoides	Rice cutgrass
Legenere limosa	Legenere
Lemna sp.	Duckweed
*Leontodon saxatilis**	Hairy hawkbit
Lepechinia calycina	White pitcher sage
*Lepidium campestre**	Cow cress
*Lepidium didymum**	Lesser wartcress
*Lepidium draba**	Heart-podded hoary cress
*Lepidium latifolium**	Perennial pepperweed
Lepidium latipes	Dwarf pepper grass

Scientific Name	Common Name
Lepidium nitidum	Shining peppergrass
*Lepidium perfoliatum**	Clasping pepper grass
Lepidium strictum	Upright pepperweed
Lepidium virginicum ssp. *menziesii*	Hairy pepperweed
Leptochloa fusca subsp. *fascicularis*	Bearded sprangletop
Leptochloa fusca subsp. *uninervia*	Mexican sprangletop
Leptochloa panicea subsp. *brachiata*	Red sprangletop
Leptosiphon bicolor	True babystars
Leptosiphon bolanderi	Bolander's linanthus
Leptosiphon ciliatus	Whiskerbrush
Leptosiphon liniflorus	Flax-flowered linanthus
Leptosiphon montanus	Mustang clover
Lessingia nemaclada	Slender stemmed lessingia
Lessingia virgata	Slenderstem lessingia
Ligusticum grayi	Gray's lovage
*Ligustrum lucidum**	Glossy privet
Lilium humboldtii ssp. *humboldtii*	Humboldt's lily
Lilium pardalinum	California tiger lily
Lilium parvum	Sierra tiger lily
Limnanthes alba	White meadowfoam
Limnanthes alba ssp. *alba*	White meadowfoam
Limnanthes douglasii	Douglas' meadowfoam
Limnanthes douglasii ssp. *nivea*	Snow white meadowfoam
Limnanthes douglasii ssp. *rosea*	Rosy Douglas' meadowfoam
Limnanthes douglasii ssp. *striata*	Foothill meadowfoam
Limnanthes montana	Mountain meadowfoam
Limosella acaulis	Stemless mudwort
Limosella aquatica	Northern mudwort
*Linum bienne**	Narrow-leaved flax
*Linum usitatissimum**	Common flax
Lithophragma affine	Common woodland star
Lithophragma bolanderi	Bolander's woodland star
Lithophragma campanulatum	Siskiyou mountain woodland star
*Logfia gallica**	Narrowleaf cotton rose
Lomatium caruifolium var. *denticulatum*	Caraway-leaved lomatium
Lomatium dissectum	Fernleaf biscuitroot
Lomatium repostum	Napa lomatium
Lomatium utriculatum	Bladder parsnip
Lonicera conjugialis	Purpleflower honeysuckle
Lonicera hispidula	Pink honeysuckle
Lonicera interrupta	Chaparral honeysuckle
*Lonicera japonica**	Japanese honeysuckle
*Lonicera periclymenum**	European honeysuckle
*Lotus corniculatus**	Birdsfoot trefoil
Ludwigia palustris	Marsh seedbox
Ludwigia peploides	Water primrose

Scientific Name	Common Name
*Lunaria annua**	Annual honesty
Lupinus albifrons	Silver bush lupine
Lupinus bicolor	Bicolored lupine
Lupinus breweri var. *breweri*	Brewer's lupine
Lupinus latifolius var. *columbianus*	Broad leaved lupine
Lupinus microcarpus var. *densiflorus*	Chick lupine
Lupinus nanus	Sky lupine
Lupinus stiversii	Harlequin lupine
Lupinus succulentus	Succulent lupine
Luzula comosa	Hairy wood rush
Luzula subcongesta	Donner wood rush
Luzula subsessilis	Pacific woodrush
*Lychnis coronaria**	Rose campion
Lycopus americanus	Bugleweed
*Lysimachia arvensis**	Scarlet pimpernel
Lysimachia latifolia	Pacific starflower
Lysimachia minima	Chaffweed
*Lythrum hyssopifolia**	Hyssop loosestrife
*Lythrum portula**	Broad-leaved loosestrife
*Maclura pomifera**	Osage orange
Madia anomala	Plump seeded madia
Madia elegans	Common madia
Madia exigua	Little tarweed
Madia glomerata	Mountain tarweed
Madia gracilis	Slender tarweed
Madia subspicata	Slender tarweed
Maianthemum racemosum	Feathery false solomon seal
Maianthemum stellatum	Starry false solomon seal
Malacothrix floccifera	Wooly dandelion
*Malus pumila**	Apple (cultivated)
*Malva neglecta**	Common mallow
*Malva nicaeensis**	Bull mallow
*Malva parviflora**	Cheeseweed
*Malva sylvestris**	High mallow
Malvella leprosa	Alkali-mallow
Marah fabacea	California manroot
Marah horrida	Sierra man-root
*Marrubium vulgare**	Common horehound
Marsilea vestita	Hairy water fern
Matricaria discoidea	Pineapple weed
*Mauranthemum paludosum**	Paludosum daisy
*Medicago polymorpha**	Bur clover
*Medicago sativa**	Alfalfa
Melica californica	California melic
Melica imperfecta	Smallflower melica
Melica torreyana	Torry's melica

Scientific Name	Common Name
*Melilotus albus**	White sweetclover
*Melilotus indicus**	Annual yellow sweetclover
*Melilotus officinalis**	Yellow sweetclover
*Melissa officinalis**	Bee balm
Mentha arvensis	Field mint
*Mentha pulegium**	Pennyroyal
*Mentha spicata**	Spearmint
Mentha x. piperita --- ***See Note***	Peppermint
Micranthes californica	Greene's saxifrage
Micranthes integrifolia	Smooth leaf saxifrage
Micropus californicus	Slender cottonweed
Microseris acuminata	Needle microseris
Microseris douglasii ssp. *platycarpha*	Douglas' silverpuffs
Mimetanthe pilosa	False monkeyflower
Minuartia californica	Sandwort
Minuartia pusilla	Annual sandwort
*Mollugo verticillata**	Indian chickweed
Monardella brewerii	Brewer's monardella
Monardella odoratissima	Mountain monardella
Monardella sheltonii	Shelton's monardella
Monardella villosa	Coyote mint
Montia chamissoi	Spring beauty
Montia fontana	Fountain miner's-lettuce
Montia linearis	Narrow-leaved montia
*Morus alba**	White mulberry
Muhlenbergia asperifolia	Alkali muhly
Muhlenbergia filiformis	Slender muhly
Muhlenbergia rigens	Deergrass
*Musa basjoo** **-- See Note**	Banana
*Myosotis discolor**	Changing forget-me-not
*Myosotis latifolia**	Broadleaf forget-me-not
Myosotis laxa	Bay forget-me-not
Myosurus minimus	Tiny mouse-tail
*Myriophyllum aquaticum**	Parrot's feather
Myriopteris gricillima	Lace lip fern
Nasturtium officinale	Water cress
Navarretia filicaulis	Thin stemmed navaretia
Navarretia intertexta ssp. *intertexta*	Needle-leaf navarretia
Navarretia intertexta ssp. *propinqua*	Great Basin navarretia
Navarretia leptalea	Bridge's gilia
Navarretia leucocephala	White-head navarretia
Navarretia pubescens	Purple navarretia
Navarretia tagetina	Marigold navarretia
Nemophila heterophylla	Canyon nemophila
Nemophila heterophylla	Small baby blue eyes
Nemophila maculata	Five spot

Scientific Name	Common Name
Nemophila maculata	Fivespot
Nemophila menziesii	Baby blue eyes
Nemophila menziesii	Baby blue eyes
Nemophila parviflora	Small flowered nemophila
Nemophila pedunculata	Meadow nemophila
Nemophila pulchella	Eastwood's baby blue eyes
*Nerium oleander**	Oleander
Nicotiana attenuata	Coyote tobacco
Notholithocarpus densiflorus	Tanoak
Nuphar polysepala	Rocky mountain pond-lily
Odontostomum hartwegii	Hartweg's odontostomum
Oenothera elata	Hooker's evening-primrose
Oenothera elata ssp. *hirsutissima*	Hairy evening-primrose
*Olea europaea**	European olive
Opuntia sp.	Prickly pear cactus
Orcuttia inaequalis	San Joaquin Valley Orcutt grass
Orcuttia tenuis	Slender orcutt grass
Orcuttia viscida	Sacramento orcutt grass
Orobanche fasciculata	Clustered broom rape
Orobanche uniflora	Naked broomrape
*Oryza sativa**	Rice
Osmorhiza berteroi	Mountain sweetcicely
*Oxalis corniculata**	Creeping woodsorrel
*Oxalis micrantha**	Dwarf woodsorrel
Packera layneae	Layne's ragwort
Paeonia brownii	Mountain peony
Panicum acuminatum	Western panicgrass
Panicum capillare	Witchgrass
*Parentucellia viscosa**	Yellow parentucellia
*Parkinsonia aculeata**	Mexican palo verde
*Paspalum dilatatum**	Dallis grass
Paspalum distichum	Joint paspalum
Pectiantia breweri	Brewer's miterwort
Pedicularis densiflora	Warrior's plume
Pedicularis groenlandica	Elephant heads
Pedicularis semibarbata	Pine lousewort
Pellaeae mucronata	Bird's foot fern
Penstemon heterophyllus	Foothill penstemon
Penstemon roezlii	Regel's mountain penstemon
Pentagramma triangularis	Goldenback fern
Perideridia gairdneri	Gairdner's yampah
Perideridia kelloggii	Squawroot
Perideridia lemmonii	Lemmon's yampah
Persicaria amphibia	Water smartweed
Persicaria hydropiperoides	Water pepper
Persicaria lapathifolia	Common knotweed

Scientific Name	Common Name
Persicaria maculosa	Spotted lady's thumb
Persicaria punctata	Dotted smartweed
*Petrorhagia dubia**	Pink grass
Phacelia cicutaria var. *cicutaria*	Caterpillar phacelia
Phacelia hastata	Mountain phacelia
Phacelia hastata ssp. *hastata*	Mountain phacelia
Phacelia heterophylla	Varileaf phacelia
Phacelia humilis var. *dudleyi*	Dudley's phacelia
Phacelia hydrophylloides	Waterleaf phacelia
Phacelia mutabilis	Changeable phacelia
Phalaris angusta	Timothy grass
*Phalaris aquatica**	Harding grass
Phalaris arundinacea	Reed canary grass
*Phalaris canariensis**	Common canary grass
*Phalaris caroliniana**	Carolina canary grass
Phalaris lemmonii	Lemon's canary grass
*Phalaris minor**	Littleseed canary grass
*Phalaris paradoxa**	Paradox canary grass
Phaseolus lunatus ***-- See Note***	Lima bean (cultivated)
Philadelphus lewisii	Lewis' mock orange
*Phleum pratense**	Common Timothy
Phlox diffusa	Spreading phlox
Phoradendron leucarpum	American mistletoe
Phoradendron serotinum subsp. *macrophyllum*	Big-leaf mistletoe
Phoradendron serotinum subsp. *tomentosum*	Oak mistletoe
*Photinia serratifolia**	Taiwanese photinia
Phyla nodiflora	Common lippia
*Physalis lancifolia**	Narrow leaf tomatillo
Physocarpus capitatus	Western ninebark
*Phytolacca americana**	American pokweed
Pickeringia montana var. *montana*	Chaparral pea
Pilularia americana	American pillwort
Pinus contorta ssp. *murrayana*	Lodgepole pine
Pinus jeffreyi	Jeffrey pine
Pinus lambertiana	Sugar pine
*Pinus pinea**	Italian stone pine
Pinus ponderosa	Ponderosa pine
Pinus sabiniana	Gray pine
Piperia elongata	Dense flowered reinorchid
Piperia transversa	Royal rein orchid
Piperia unalascensis	Alaska rein orchid
*Pistacia chinensis**	Chinese pistache
Plagiobothrys bracteatus	Bracted popcorn-flower
Plagiobothrys canescens	Valley popcorn-flower
Plagiobothrys fulvus	Common popcorn flower
Plagiobothrys greenei	Greene's popcorn-flower

Scientific Name	Common Name
Plagiobothrys hispidus	Bristly popcorn flower
Plagiobothrys nothofulvus	Rusty popcorn-flower
Plagiobothrys stipitatus var. *micranthus*	Slender popcorn-flower
Plagiobothrys trachycarpus	Roughfruit popcornflower
Plagiobothrys undulatus	Coast popcorn-flower
Planodes virginica	Common rock cress
*Plantago coronopus**	Cut-leaf plantain
Plantago elongata	Coast annual plaintain
Plantago erecta	California plantain
*Plantago lanceolata**	English plantain
*Plantago major**	Broad-leaf plantain
Plantago truncata ssp. *firma**	Chilean plantago
Platanthera dilatata var. *leucostachys*	Sierra bog orchid
Platanus racemosa	California sycamore
Platanus x acerifolia	London planetree
Platystemon californicus	Cream cups
Plectritis ciliosa	Long spurred plectritis
Plectritis congesta	Shortspur seablush
Pleuropogon californicus	Semaphore grass
*Poa annua**	Annual bluegrass
*Poa bulbosa**	Bulbous bluegrass
Poa howellii	Howell's blue grass
*Poa nemoralis**	Wood bluegrass
*Poa pratensis**	Kentucky bluegrass
Poa secunda	Perennial bluegrass
Poa secunda ssp. *secunda*	Perennial bluegrass
*Poa trivialis**	Rough bluegrass
Pogogyne douglasii	Douglas' mesamint
Pogogyne zizyphoroides	Sacramento mesamint
Polemonium californicum	California polemonium
Polygala californicum ssp. *californicum*	California milkwort
Polygala cornuta var. *cornuta*	Sierra milkwort
Polygonum aviculare ssp. *depressum*	Prostrate knotweed
*Polygonum aviculare**	Prostrate knotweed
Polypodium californicum	California polypody
*Polypogon australis**	Chilean rabbitsfoot grass
*Polypogon interruptus**	Ditch beard grass
Polypogon maritimus	Mediterranean rabbitsfoot grass
*Polypogon monspeliensis**	Annual rabbit-foot grass
Polystichum imbricans	Cliff sword fern
Populus balsamifera ssp. *trichocarpa*	Black cottonwood
Populus fremontii	Fremont's cottonwood
Populus nigra var. *italica**	Lombardy poplar
Populus tremuloides	Aspen
Populus trichocarpa	Black cottonwood
*Portulaca oleracea**	Common purslane

Scientific Name	Common Name
Potamogeton nodosus	Long-leaved pondweed
Potentilla gracilis var. *fastigiata*	Slender cinquefoil
Poteridium annuum	Western burnet
*Poterium sanguisorba**	Garden burnet
Primula hendersonii	Mosquito bill
Primula hendersonii	Mosquito bill
*Proboscidea louisianica**	Devil's claw
Prosartes hookeri	Drops of gold
Prunella vulgaris	Common selfheal
*Prunus armeniaca**	Apricot (cultivated)
*Prunus avium**	Sweet cherry (cultivated)
*Prunus cerasifera**	Cherry plumb
*Prunus domestica**	Plum (cultivated)
*Prunus dulcis**	Almond (cultivated)
Prunus emarginata	Bitter cherry
*Prunus persica**	Peach (cultivated)
Prunus subcordata	Sierra plum
Prunus virginiana ssp. *demissa*	Western choke cherry
Pseudognaphalium beneolens	Cudweed
Pseudognaphalium californicum	California cudweed
Pseudognaphalium canescens	Wright's cudweed
*Pseudognaphalium luteoalbum**	Jersey cudweed
Pseudognaphalium thermale	Small headed cudweed
Pseudotsuga menziesii	Douglas-fir
Psilocarphus brevissimus	Short woolly-marbles
Psilocarphus chilensis	Round woolly marbles
Psilocarphus oregonus	Oregon woolly-heads
Psilocarphus tenellus	Slender woolly-heads
Ptelea crenulata	Hoptree
Pteridium aquilinum	Bracken fern
Pteridium aquilinum	Western brackenfern
Pterospora andromedea	Pinedrops
Pterostegia drymarioides	Woodland threadstem
Puccinellia nuttalliana	Nuttall's alkali grass
*Punica granatum**	Pomegranate (cultivated)
Purshia tridentata	Antelope bitterbush
Pyrola picta	White-veined shinleaf
Pyrrocoma racemosa	Cluster golden-weed
*Pyrus calleryana**	Callery pear
Quercus agrifolia	Coast live oak
Quercus berberidifolia	Inland scrub oak
Quercus chrysolepis	Canyon live oak
Quercus douglasii	Blue oak
Quercus dumosa	Scrub oak
Quercus durata	Leather oak
Quercus garryana	Oregon white oak

Scientific Name	Common Name
Quercus kelloggii	California black oak
Quercus lobata	Valley oak
*Quercus suber**	Cork oak
Quercus wislizeni	Interior live oak
Quercus x morehus	Oracle oak
Ranunculus aquatilis	White water buttercup
Ranunculus bonariensis var. *trisepalus*	Carter's buttercup
Ranunculus californicus	California buttercup
Ranunculus cymbalaria var. *saximontanus*	Alkali buttercup
Ranunculus flammula	Spearwort buttercup
*Ranunculus muricatus**	Spiny-fruit buttercup
Ranunculus occidentalis	Western buttercup
Ranunculus orthorhynchus var. *orthorhynchus*	Straight-beak buttercup
*Ranunculus repens**	Creeping buttercup
Ranunculus sceleratus	Cursed buttercup
*Raphanus raphanistrum**	Yellow wild radish
*Raphanus sativus**	Purple wild radish
Rhamnus crocea	Redberry buckthorn
Rhamnus ilicifolia	Holly-leaf redberry
Rhododendron occidentale	Western azalea
Rhus aromatica	Fragrant sumac
Ribes cereum	Wax currant
Ribes inerme var. *inerme*	Whitestem gooseberry
Ribes nevadense	Sierra currant
Ribes roezlii var. *roezlii*	Sierra gooseberry
Ribes viscosissimum	Sticky current
*Ricinus communis**	Castor bean
Rigiopappus leptocladus	Wire weed
*Robinia pseudoacacia**	Black locust
Rorippa curvipes	Bluntleaf yellow cress
Rorippa curvisiliqua	Curvepod yellow cress
Rorippa palustris	Bog yellow cress
Rosa bridgesii	Bridge's rose
Rosa californica	California rose
Rosa gymnocarpa	Dwarf rose
Rosa woodsii	Woods' rose
Rotala ramosior	Lowland rotala
*Rubus armeniacus**	Himalayan blackberry
*Rubus laciniatus**	Cut-leaved blackberry
Rubus leucodermis	Whitestem raspberry
Rubus parviflorus	Western thimbleberry
*Rubus pensilvanicus**	Pennsylvania blackberry
Rubus ursinus	California blackberry
*Rumex acetosella**	Sheep sorrel
*Rumex conglomeratus**	Clustered dock
*Rumex crispus**	Curly dock

Scientific Name	Common Name
Rumex occidentalis	Western dock
*Rumex pulcher**	Fiddle dock
Rumex salicifolius	Willow dock
Sagina decumbens	Western pearlwort
Sagittaria latifolia	Broad-leaf arrowhead
Sagittaria longiloba	Long-lobed arrowhead
Sagittaria montevidensis ssp. *calycina*	Giant arrowhead
Sagittaria sanfordii	Sanford's arrowhead
Salicornia pacifica	Pickleweed
*Salix babylonica**	Weeping willow
Salix eastwoodiae	Mountain willow
Salix exigua	Sandbar willow
Salix species	Willow
Salix laevigata	Red willow
Salix lasiandra	Pacific willow
Salix lasiolepis	Arroyo willow
Salix lucida	Pacific willow
*Salsola tragus**	Russian thistle
Salvia sonomensis	Creeping sage
Sambucus nigra subsp. *caerulea*	Blue elderberry
Sambucus racemosa	Red elderberry
*Sanguisorba minor**	Small burnet
Sanicula bipinnata	Poison sanicle
Sanicula bipinnatifida	Purple sanicle
Sanicula crassicaulis	Pacific sanicle
*Saponaria officianalis**	Bouncing Bet
Sarcodes sanguinea	Snow plant
*Scandix pecten-veneris**	Venus' needle
Sceptridium multifidum	Leather grape-fern
*Schinus molle**	Peruvian peppertree
*Schinus terebinthifolius**	Brazilian pepper tree
Schoenoplectus acutus var. *occidentalis*	Hard-stem bulrush
Schoenoplectus americanus	Olney bulrush
Schoenoplectus californicus	California bulrush
Schoenoplectus pungens var. *longispicatus*	Three-square bulrush
Scirpus microcarpus	Small fruited bulrush
Scleranthus annuus ssp. *annuus*	German knotgrass
Scrophularia californica	California figwort
Scutellaria californica	California skullcap
Scutellaria tuberosa	Danny's skullcap
*Secale cereale**	Rye
Sedella pumila	Sierra mock stonecrop
Sedum spathulifolium	Pacific stonecrop
Selaginella sp.	Spikemoss
Senecio integerrimus	Mountain butterweed
Senecio integerrimus var. *exaltatus*	Columbia ragwort

Scientific Name	Common Name
*Senecio sylvaticus**	Woodland groundsel
Senecio triangularis	Arrow-leaved ragwort
*Senecio vulgaris**	Common groundsel
Sequoia sempervirens	Coast redwood
Sequoia semprevirens	Coast redwood
Sequoiadendron giganteum	Giant sequoia
Sequoiadendron giganteum	Giant sequoia
Sericocarpus oregonensis	Oregon whitetop aster
*Sesbania punicea**	Rattlebox
Setaria parviflora	Bristley foxtail
*Setaria pumila**	Yellow bristlegrass
*Sherardia arvensis**	Field madder
*Sida rhombifolia**	Common jute
Sidalcea asprella	Harsh checker mallow
Sidalcea calycosa	Annual checker-mallow
Sidalcea gigantea	Giant checkerbloom
Sidalcea glaucescens	Waxy checkermallow
Sidalcea hartwegii	Hartweg's checkerbloom
Sidalcea hirsuta	Hairy checker-mallow
Sidalcea reptans	Sierra checker mallow
*Silene gallica**	Common catchfly
Silene laciniata	Indian pink
Silene occidentalis	Western campion
*Silybum marianum**	Milk thistle
*Sinapis arvensis**	Charlock
*Sisymbrium altissimum**	Tall tumble mustard
*Sisymbrium irio**	London rocket
*Sisymbrium officinale**	Hedge mustard
Sisyrinchium bellum	Western blue eyed grass
Sisyrinchium bellum	Western blue-eyed grass
Sisyrinchium halophilum	Nevada blue-eyed grass
Sisyrinchium idahoense	Idaho blue-eyed grass
Smilax californica	California greenbriar
Solanum americanum	Comon nightshade
*Solanum carolinense**	Carolina horsenettle
*Solanum elaeagnifolium**	Silverleaf nightshade
*Solanum nigrum**	Black nightshade
Solanum umbelliferum	Blue witch nightshade
Solidago velutina	Threenerve goldenrod
*Soliva sessilis**	Field burrweed
*Sonchus arvensis**	Perennial sowthistle
*Sonchus asper**	Prickly sowthistle
*Sonchus oleraceus**	Common sowthistle
*Sorghum bicolor**	Corn-broom
*Sorghum halepense**	Johnson grass
*Spartium junceum**	Spanish broom

Scientific Name	Common Name
*Spergula arvensis**	Corn spurry
Spergularia marina	Salt sandspurry
*Spergularia media**	Coast sand spurry
*Spergularia rubra**	Purple sandspurry
Spiraea splenden	Mountain spirea
Spiranthes romanzoffiana	Hooded ladies tresses
Spirodela polyrrhiza	Giant duckmeat
Sporobolus airoides	Alkali sacaton
Stachys ajugoides	Hedge-nettle
Stachys albens	White-stem hedgenettle
Stachys rigida	Rough Hedgenettle
Stachys stricta	Sonoma hedge-nettle
*Stellaria media**	Common chickweed
Stephanomeria virgata	Rod wirelettuce
Stephanomeria virgata ssp. *pleurocarpa*	Tall stephanomeria
Stipa cernua	Nodding needle grass
Stipa coronata	Crested needle grass
Stipa miliacea var. *miliacea**	Smilo grass
Stipa occidentalis	Western needlegrass
Stipa pulchra	Purple needle grass
Streptanthus tortuosus	Mountain jewel flower
Stuckenia pectinata	Fennel-leaf pondweed
Symphoricarpos albus var. *laevigatus*	Common snowberry
Symphoricarpos mollis	Creeping snowberry
Symphoricarpos rotundifolius	Round-leaf snowberry
Symphyotrichum chilense	Pacific aster
Symphyotrichum frondosum	Short rayed alkali aster
Symphyotrichum spathulatum var. *spathulatum*	Western mountain aster
*Syringa vulgaris**	Common lilac
*Tanacetum vulgare**	Common tansey
*Taraxacum officinale**	Common dandelion
Taraxia ovata	Sun cup
Tauschia kelloggii	Kellogg's umbrellawort
Thalictrum fendleri var. *fendleri*	Fendler's meadow-rue
Thysanocarpus curvipes	Common fringepod
Thysanocarpus radians	Showy fringepod
*Torilis arvensis**	Field hedge parsley
*Torilis nodosa**	Wild parsley
Torreya californica	California nutmeg
Toxicodendron diversilobum	Poison oak
Toxicoscordion exaltatum	Giant death camas
Toxicoscordion micranthum	Small flowered star lily
*Tragopogon dubius**	Yellow salsify
*Tragopogon porrifolius**	Purple salsify
*Triadica sebifera**	Chinese tallow
*Tribulus terrestris**	Puncture vine

Scientific Name	Common Name
Trichostema lanceolatum	Vinegar weed
Trichostema oblongum	Mountain bluecurls
Trifolium barbigerum	Bearded clover
Trifolium bifidum	Notch-leaf clover
Trifolium breweri	Brewer's clover
*Trifolium campestre**	Hop clover
*Trifolium campestre**	Hop clover
Trifolium ciliolatum	Foothill clover
Trifolium depauperatum	Dwarf sack clover
Trifolium dichotomum	Branched indian clover
*Trifolium dubium**	Shamrock clover
*Trifolium fragiferum**	Strawberry clover
Trifolium fucatum	Bull clover
*Trifolium glomeratum**	Clustered clover
Trifolium gracilentum	Graceful clover
*Trifolium hirtum**	Rose clover
*Trifolium hybridum**	Alsike clover
*Trifolium incarnatum**	Crimson clover
Trifolium microcephalum	Small-head clover
Trifolium microdon	Flat-bottom clover
Trifolium monanthum	Carpet clover
Trifolium olivaceum	Olive clover
*Trifolium pratense**	Red clover
*Trifolium repens**	White clover
*Trifolium subterraneum**	Subterranean clover
*Trifolium tomentosum**	Wooly clover
Trifolium variegatum	White-tip clover
Trifolium willdenovii	Tomcat clover
Triglochin maritimum	Seaside arrowgrass
Triglochin scilloides	Flowering quillwort
Triphysaria eriantha	Butter and eggs
Triphysaria versicolor ssp. *faucibarbata*	Yellow owl's clover
Triteleia bridgesii	Bridge's brodiaea
Triteleia hyacinthina	Hyacinth brodiaea
Triteleia ixioides ssp. *anilina*	Mountain prettyface
Triteleia ixioides ssp. *scabra*	Foothill prettyface
Triteleia laxa	Ithuriel's spear
*Triticum aestivum**	Cultivated wheat
Tsuga mertensiana	Mountain hemlock
Typha angustifolia	Narrow-leaf cattail
Typha domingensis	Southern cattail
Typha latifolia	Broad-leaf cattail
*Ulmus parvifolia**	Siberian Elm
Umbellularia californica	California bay
Uropappus lindleyi	Silver puffs
Urtica dioica	Stinging nettle

Scientific Name	Common Name
*Urtica urens**	Dwarf nettle
Valeriana californica	California valerian
Veratrum californicum	California corn lily
*Verbascum blattaria**	Moth mullein
*Verbascum thapsus**	Common mullein
*Verbena bonariensis**	Purpletop vervain
Verbena hastata	Blue vervain
Verbena lasiostachys	Common verbena
*Verbena litoralis**	Seashore vervain
Veronica americana	American speedwell
*Veronica anagallis-aquatica**	Water speedwell
Veronica peregrina ssp. *xalapensis*	Purslane speedwell
*Veronica persica**	Bird's eye speedwell
Vicia americana	American vetch
*Vicia benghalensis**	Purple vetch
*Vicia hirsuta**	Hairy vetch
*Vicia sativa**	Spring vetch
*Vicia villosa**	Hairy vetch
*Vinca major**	Periwinkle
Viola adunca ssp. *adunca*	Western dog violet
Viola bakeri	Baker's violet
Viola glabella	Stream violet
Viola lobata	Pine violet
Viola macloskeyi	Macloskey's violet
Viola purpurea	Mountain violet
*Vitex agnus-castus**	Lilac chastetree
Vitis californica	California wild grape
Vitis vinifera	Cultivated grape
Washingtonia robusta	Mexican fan
Woodwardia fimbriata	Western chain fern
Wyethia angustifolia	Narrow leaved mule ears
Wyethia bolanderi	Bolander's mule ears
Wyethia invenusta	Corville's mule ears
Wyethia mollis	Woolly mule ears
Wyethia reticulata	El Dorado County mule ears
Xanthium spinosum	Spiny cockle-bur
Xanthium strumarium	Rough cockle-bur
Yucca baccata	Spanish bayonette
Zantedeschia aethiopica	Calla lily
Zea mays **--- See Note**	Corn (cultivated)
*Zelkova serrata**	Japanese zelkova
Zeltnera muehlenbergii	Muehlenberg's centaury
Zeltnera venusta	Charming centaury

APPENDIX 3.3-B

Aquatic Resources Delineation
Rector Reservoir Bypass Valve Project



Map Features

- Survey Area (3.7 acres)
- Reference Coordinates
- Coast Live Oak
- OHWM Transects

Land Cover Type

- Riparian Scrub (0.2 acre)
- Disturbed/Ruderal (3.2 acres)
- Developed (0.1 acre)

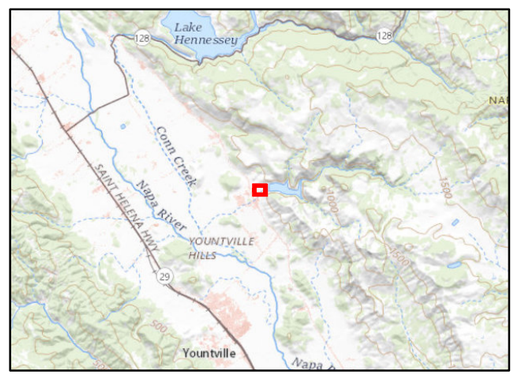
Aquatic Resources Assessment[1]

Wetland Type

- Seasonal Creek (0.161 acre)

Photo Source: USGS Topo; ESRI World Imagery
Delineator(s): E. Mecke (April 20, 2021)
Boundary Source: ECORP/Wood Rodgers
Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

[1] *Subject to U.S. Army Corps of Engineers verification. This exhibit depicts information and data produced in accord with the wetland delineation methods described in the 1987 Corps of Engineers Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region Version 2.0 as well as the Updated Map and Drawing Standards for the South Pacific Division Regulatory Program as amended on February 10, 2016, and conforms to Sacramento District specifications. However, feature boundaries have not been legally surveyed and may be subject to minor adjustments if more accurate locations are required.*
** The acreage value for each feature has been rounded to the nearest 1/1000 decimal. Summation of these values may not equal the total potential Waters of the U.S. acreage reported.*



ECORP: N:\2018\2018-116.011 Rector Reservoir Bypass Valve Project\MAPS\Jurisdictional_Delineation\Rector_ARD_20210421.mxd (CCH)-chinkelman 4/27/2021

Map Date: 4/27/2021

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Scale in Feet
0 100

DRAFT

Aquatic Resources Delineation

2018-116.011 Rector Reservoir Bypass Valve Project

APPENDIX 3.3-C

Rector Creek Preliminary Instream Flow and Stream Habitat Assessment
Rector Reservoir Bypass Valve Project

TECHNICAL MEMORANDUM ◦ JULY 2019

Rector Creek Preliminary Instream Flow and Stream Habitat Assessment









PREPARED FOR

California Department of Veteran Affairs
1227 O Street
Sacramento CA, 95814

PREPARED BY

Stillwater Sciences
279 Cousteau Place, Suite 400
Davis, CA 95618

Stillwater Sciences

Suggested citation:
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Cover photos (counter-clockwise): Aerial photo of Napa Valley and the Town of Yountville (Source: Yountville Chamber of Commerce, 2017); Rector Creek, April 2018, mid reach; Rector Creek, April 2018, mid-reach; Pacific chorus frog observed in Rector Creek.

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1 INTRODUCTION

Rector Dam is located on Rector Creek on east of the Silverado Trail in Napa Valley near the Town of Yountville, California. Rector Creek flows from the east side of Napa Valley and is a tributary to Conn Creek, which is a tributary to the Napa River. The State of California built Rector Dam in 1946, and the California Department of Veterans Affairs (CalVet) has operated the dam and reservoir since that time to supply drinking water to the Veterans Home of California in Yountville, Napa State Hospital, California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, Town of Yountville, and several local wineries. CalVet also supplies untreated water to the CDFW Silverado Fisheries Base (Fisheries Base) located along Rector Creek downstream of the dam, and to the Cal Fire training facility located near the base of Rector Dam. The Fisheries Base serves as a hatchery and CDFW's only fish quarantine station in the state. Water delivered to the Fisheries Base is returned to Rector Creek approximately 0.35 miles downstream of the spillway.

The License to operate Rector Dam[1] does not include specific instream flow release requirements; however, California Fish and Game Code Section 5937 requires the owner or operator of any dam to allow sufficient flow to pass through or over the dam to keep fish downstream of the dam in good condition.

The goals of this assessment are to:

1. Develop an interim instream flow release schedule for Rector Creek downstream of Rector Dam (lower Rector Creek) based on existing information and preliminary assessments that will benefit fish ("environmental flows") while more information is collected to evaluate whether the environmental flows are sufficient to keep fish downstream of the dam in good condition.
2. Identify whether there is (a) sufficient water available for the environmental flows, and (b) sufficient information to assess any potential effects on other uses ("water availability").
3. Identify additional data requirements needed to evaluate whether the environmental flows are sufficient to keep fish downstream of the dam in good condition and make additional recommendations for the environmental flow release schedule and project operations.

This Technical Memo includes (1) a preliminary assessment of existing fish populations and stream channel conditions in lower Rector Creek; (2) a preliminary assessment of available water storage for environmental flows; (3) recommended interim environmental flows; and (4) recommendations for additional data gathering needed to evaluate whether the environmental flows are sufficient to keep fish below the dam in good condition and to inform development of an Operations Plan for Rector Dam and Reservoir (Operations Plan).

2 BACKGROUND AND SUMMARY OF EXISTING INFORMATION

The Rector Creek watershed upstream of Rector Dam is approximately 10.7 square miles. Similar to most other storage reservoirs within California's Mediterranean climate, the reservoir generally fills in winter and spring and drains in summer and fall. Inflow to Rector Reservoir is primarily from the main stem of Rector Creek, which is historically perennial upstream of the reservoir but

[1] The State Water Resources Control Board issued CalVet a water rights license in 1970 (License No. 10911) that includes, as authorized places of use, the Veterans' Home, CDFW's Bay Delta Region office and Silverado Fisheries Base, Napa State Hospital, the Town of Yountville, and 670 irrigated acres.

intermittent downstream of the dam (Figure 2-1). Rector Creek extends approximately 1.7 miles downstream of Rector Dam to the confluence with Conn Creek, a tributary of the Napa River (Figure 2-1).



Figure 2-1. Rector Creek vicinity map.

Currently, water from Rector Reservoir is only able to pass downstream of the dam via the spillway, through emergency release valves at the base of the dam (which can only be operated as fully opened or closed), or as discharge from the Fisheries Base as part of its normal operations. The untreated water delivered to the Fisheries Base is discharged into Rector Creek approximately 0.35 miles downstream of the spillway. The Fisheries Base's operations are variable, and the facility is typically offline from the beginning of June to early October for maintenance (see Sections 2.5, *Current Water Usage* and 3.1.2, *Hydrologic Assessment* for additional information on stream hydrology). CalVet is exploring options to install an additional release valve near the base of the dam that will be used to make the environmental flows releases.

There have been numerous physical and biological surveys along lower Rector Creek. Existing information on the physical conditions and biological resources within lower Rector Creek are summarized below.

2.1 Channel Morphology and Stream Habitat

Rector Dam sits at the base of the Howell Mountains on the eastern edge of the Napa Valley floor. Lower Rector Creek is almost entirely within Napa Valley and has an average channel gradient of 1.2 percent, which is relatively low compared to the channel gradient upstream of the reservoir (ranging between 4% and 15%) (Figure 2-2). The Napa County Resource Conservation District (NCRCD) noted that the channel downstream of the dam is moderately entrenched with a high width-to-depth ratio (NCRCD 2005).

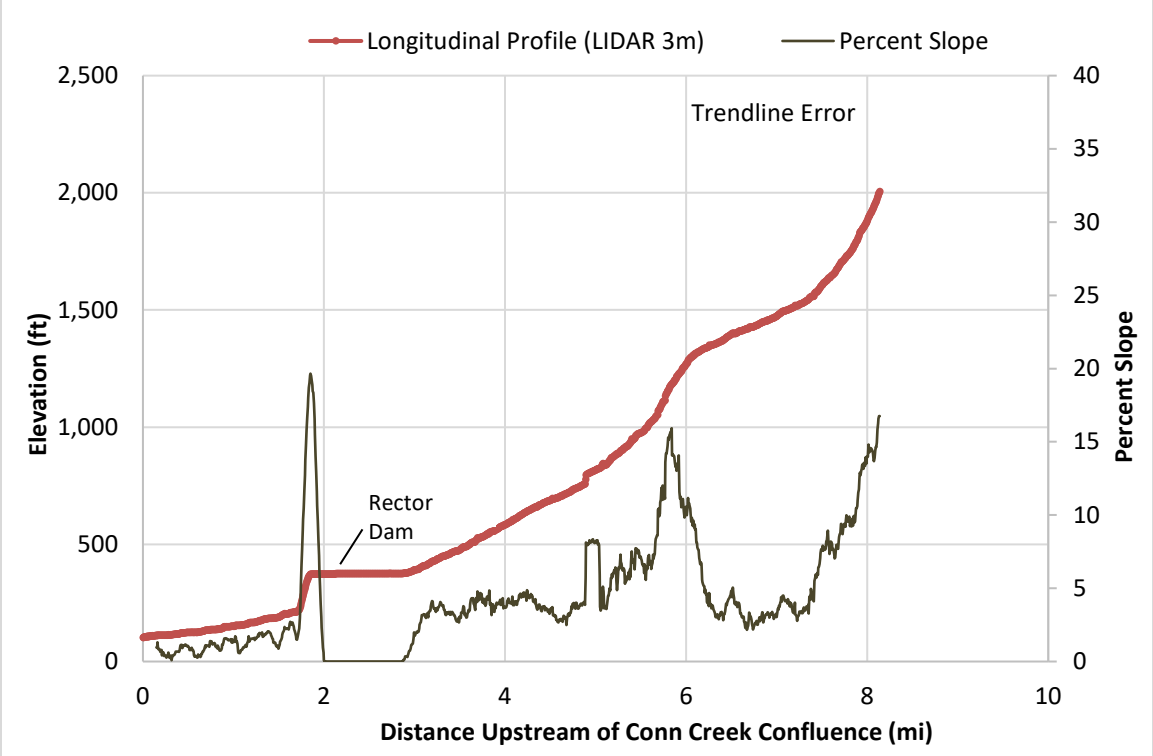


Figure 2-2. Rector Creek longitudinal profile and percent slope.

Soil types along lower Rector Creek tend to be coarse-grained within a relatively young alluvium with a high infiltration rate (Figure 2-3). Specifically, lower Rector Creek traverses a coarse-grained Holocene alluvial fan composed of sediments derived from tertiary Sonoma volcanic

andesite flow, or breccia, and Mesozoic Great Valley complex (Figure 2-3; LSCE and MBK 2013).

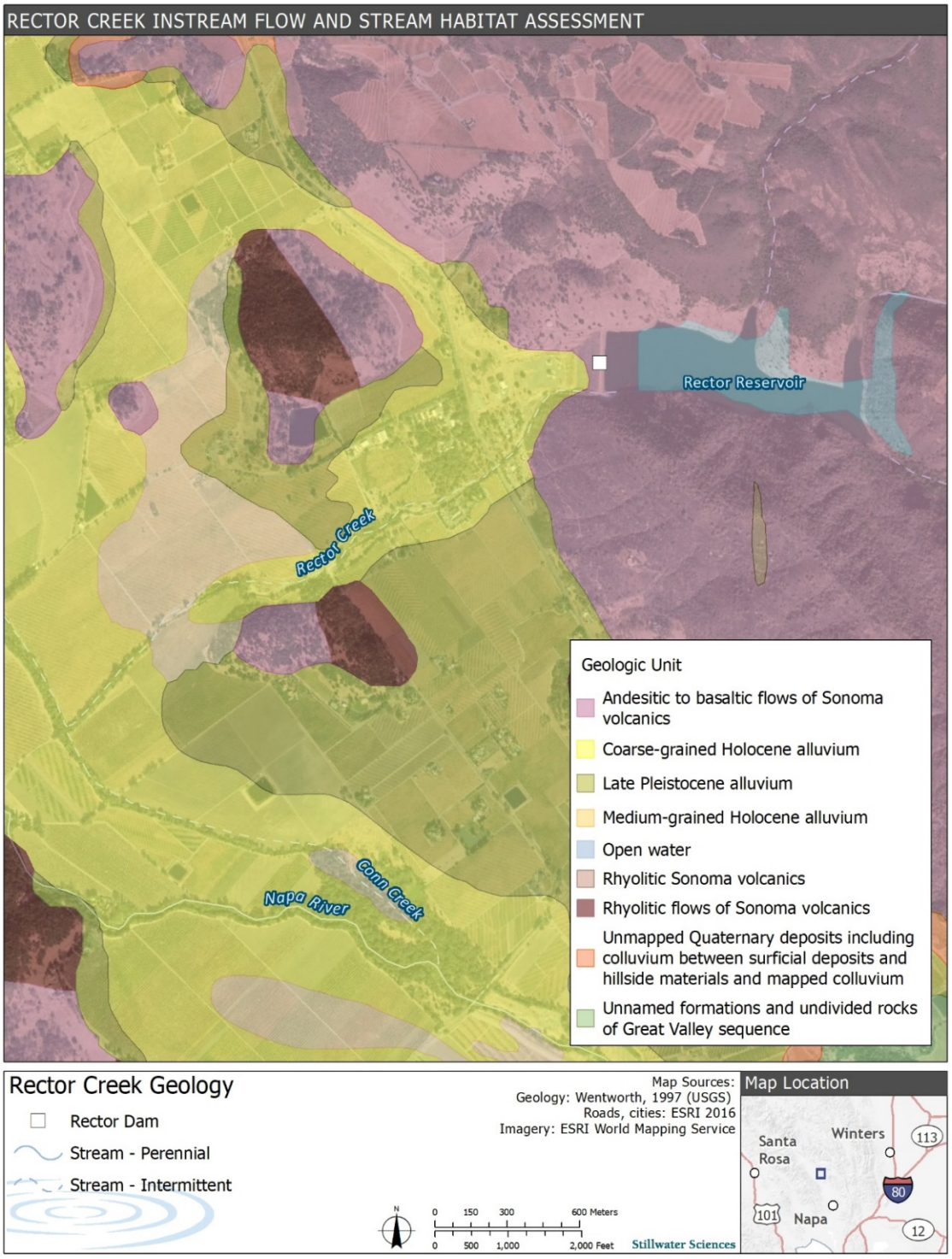


Figure 2-3. Geologic units surrounding Rector Creek downstream of Rector Dam.

Unlike Conn Creek and the Napa River, where the groundwater is near the water surface elevation of the stream, the water table along Rector Creek is between 12 and 131 feet below the valley floor (LSCE and MBK 2013). The combination of the coarse sediment with high infiltration rates along the channel bed and the disconnected water table results in an intermittent flow regime downstream of the dam, where portions of the channel would be dry during some summer and fall months even in the absence of the dam.

During an August 2003 survey conducted by NCRCD when there was little to no inflow or releases downstream of the dam, 79 percent of the stream contained flowing water, with 21 percent dry.[2] The wetted channel was composed of low-gradient riffle (28%), flatwater (28%), and pool (23%) habitats (NCRCD 2005). Although surface flow was intermittent, a majority (71%) of pools had a maximum residual depth greater than 2 feet during the NCRCD survey.

2.2 Water Quality

Water quality within lower Rector Creek varies seasonally and is highly correlated with in-channel flow. *In situ* dissolved oxygen measurements varied from a low of ~4 mg/L (September) to a high of ~12 mg/L (February) during surveys in 2004. Mean water temperature between August 21, 2003 and October 25, 2004 was 15.8°C, and the maximum weekly average temperature was 18.1°C. Portions of the reach dewater during the summer and fall months, but several deep, perennial pools persist throughout the year (NCRCD 2005).

Water quality in Rector Reservoir is good. Of the water discharged into lower Rector Creek, there are two constituents that exceed EPA Maximum Contaminant Levels for source drinking water: iron and manganese. Both minerals occur naturally in high concentrations within the watershed and may affect drinking water aesthetics and/or odor (iron may cause orange or brown staining, and manganese may cause gray staining); however, both are considered nutritionally beneficial (Barber 2017).

Turbidity, sedimentation, and nutrient contamination are a growing concern within the watershed as adjacent lands are developed into agricultural fields, and anecdotal evidence suggests algal blooms in the reservoir have increased in recent years (Birkas et al. 2009, Barber 2017). CalVet occasionally treats the reservoir water with the algaecide copper sulfate to control algae and remove undesirable odors from drinking water. Copper and sulfate quickly disassociate in water; the disassociated copper ions quickly bind to organic matter or remain dissolved in water (Saar and Weber 1982, as cited in NPIC 2018). Copper sulfate can be toxic to fish and other aquatic life, including mollusks and crustaceans (Jaensson and Olsén 2010, and Chapman 1978, as cited in NPIC 2018). However, Rector Reservoir water has been tested for sulfate and copper since 1987 with sulfate commonly detected at low concentrations and no detections of copper (Barber 2017). Additionally, the Fisheries Base regularly tests the water as part of their operations and has not detected elevated levels of copper (Russell Liebig and Stephen Puccini [CDFW], personal communication, November 30, 2018).

Water is drawn from the reservoir via a variable-depth intake that is manually set by the operator to optimize water quality for the treatment plant. During summer months when thermal stratification occurs within the water column, turbidity increases with depth. During these times, water of lower turbidity is drawn near the top of the water column.

[2] Although the Fisheries Base discharge records are not available for 2003, the average Fisheries Base discharge in August (2008–2015) was approximately 0.03 cfs (see Sections 2.5, *Current Water Usage* and 3.1.2, *Hydrologic Assessment* for additional information on stream hydrology).

Benthic macroinvertebrate (BMI) sampling in lower Rector Creek indicates that aquatic insect biodiversity varies greatly from year to year and is dependent on spill event timing. Surveys performed in 2003 and 2004 produced Modified Hilsenhoff Index values ranging from 4.24 to 6.06, indicating stream condition (including water quality based on BMI assessments) varied from "very good" to "fairly poor" (Dewberry 2005). Although not a direct indicator of food availability for fish in lower Rector Creek, BMI are a food source for fish and therefore can affect fish condition.

2.3 Fish Populations

The nearby Napa River fish assemblage is composed of 27 species in total — 14 native and 13 introduced/non-native species (Stillwater Sciences 2002; NCRCD 2005). Three species of anadromous salmonids have historically utilized the basin as spawning grounds: Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*). Although coho are considered extirpated in the basin, both Chinook and steelhead populations are thought to be self-sustaining; Chinook returns are variable between years and it is not known what proportion of the Chinook salmon observed in the Napa River are of direct hatchery origin or Napa River stock (NCRCD 2005), whereas steelhead have been consistently documented within the Napa River watershed (Stillwater Sciences 2002, NCRCD 2006). Spawning activity for Chinook salmon and steelhead is concentrated in the western tributaries of the Napa River with limited numbers of anadromous salmonids utilizing eastern tributaries (e.g., Conn and Rector creeks) of the Napa River.

In June 2004, NCRCD conducted a snorkel survey of isolated pools in Rector Creek and observed five native species and no non-native species. Native species included California roach (*Lavinia symmetricus*), threespine stickleback (*Gasterosteus aculeatus*), Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), and three steelhead (located approximately 460 meters upstream of the State Lane road crossing, or approximately 150 meters downstream of the Fisheries Base discharge location) (unpublished data).

Both resident rainbow trout and steelhead (collectively referred to as *O. mykiss*, or where the observer did not distinguish between the two) have been observed in lower Rector Creek in limited numbers, and resident rainbow trout have been observed upstream of Rector Reservoir. The dam is a complete passage barrier to upstream migration. Fish surveys conducted in lower Rector Creek in the 1980s found *O. mykiss* with fork lengths ranging from 52–400 mm (Emig 1986, as cited in Leidy et al. 2005), indicating utilization by spawning adults and rearing juveniles. Rector Creek joins Conn Creek one mile upstream of the Napa River. Conn Creek also has both resident and anadromous *O. mykiss* populations, which have historically ranged from the confluence with the Napa River to Linda Falls at approximately river mile 16; however, construction of Lake Hennessey in 1945 curtailed upstream migration above river mile 7.5. Population densities in both creeks were low to moderate, on the order of 5–10 juveniles per 30 meters (Leidy et al. 2005).

NCRCD (2005) noted that in 2003, at least 87 percent of measured pool tail-outs had substrates suitable for salmonid spawning; however, they also noted that only 21 percent of the pool tail-outs were composed of gravel and that over 65 percent of the pool tail-outs were composed of small to large cobble. Regardless, given the availability of spawning gravel and pools with sub-surface flow, the habitat in Rector Creek was deemed suitable for *O. mykiss* spawning and rearing, with flow being the limiting factor in productivity (NCRCD 2005). Following the 2003 surveys, high flows during flood-flow conditions partially altered the stream channel. Additional

information on current stream habitat conditions and fish observations is located in Section 3.2.1, *Stream Habitat Assessment*.

2.4 Hydrology and Reservoir Operations

The Rector Creek watershed upstream of Rector Reservoir has a drainage area of approximately 10.7 square miles with a mixture of land-uses (Figure 2-4). Inflow to Rector Reservoir is primarily from the main stem of Rector Creek, which is perennial upstream of the reservoir (Figure 2-4). Additional inflow into Rector Reservoir is provided by North Fork Rector Creek and South Fork Rector Creek (also known as Lorette Creek). The main stem, North Fork, and South Fork contain about 77, 10, and 13 percent of the Rector Creek drainage area, respectively. The average annual precipitation in the watershed is approximately 36 inches, and the average annual inflow to Rector Reservoir is estimated at 14,240 acre-feet. The reservoir typically fills and spills during the winter and spring months when most of the precipitation falls (DWR 2013).

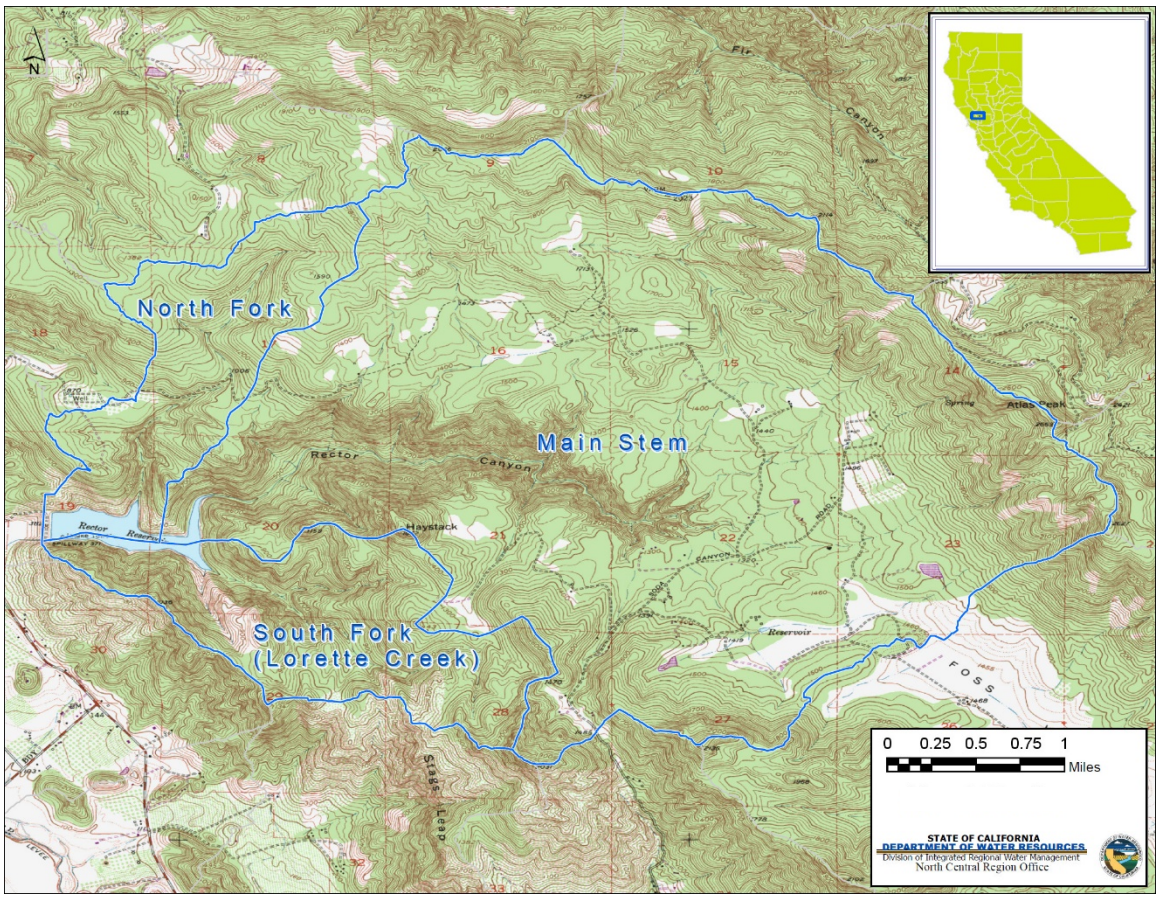


Figure 2-4. Map of the Rector Creek watershed (adapted from DWR 2013).

Rector Dam is a 164-foot-high earth-fill structure with a crest elevation of 381.5 feet above Mean Sea Level (MSL). As built in 1946, the spillway crest elevation was 370.0 feet above MSL, but the spillway elevation was raised 2.5 feet in 1989 to increase water storage. The ogee spillway currently has a crest elevation of 372.5 feet above MSL and a curvilinear crest length of 141.5 feet (DWR 2013).

Water is withdrawn from the reservoir by a tower with intake invert elevations of 270, 291, 307, 323, 335, and 339 feet above MSL. A 2000 bathymetric survey of Rector Reservoir conducted by California Department of Water Resources (DWR) determined that the lowest intake at 270 feet above MSL was buried by sediment, so the lowest operational intake is at 291 feet above MSL (DWR 2000). The 2000 bathymetric survey also calculated stage-surface area and stage-storage volume curves for Rector Reservoir from 245 feet above MSL to 375 feet above MSL (DWR 2013). According to the stage-storage volume relationship, the minimum pool storage which is inaccessible below the lowest operational intake (291 feet above MSL) is approximately 478 acre-feet. At the spillway crest elevation (372.5 feet above MSL), the reservoir storage capacity is approximately 4,535 acre-feet (DWR 2013).

The 2000 bathymetric survey showed that approximately 245 acre-feet of sediment has accumulated in Rector Reservoir during the 54 years since the dam was constructed, with an average sediment accumulation of 4.5 acre-feet/year (DWR 2000). While the sedimentation rate estimated in 2000 was consistent with the small deltas observed in 2011 at the three stream inlets to the reservoir, DWR (2013) noted that a comparison of the full pool surface areas estimates from the Division of Safety of Dams, aerial photography, and full pool elevation contours suggested that sedimentation in the reservoir near the three stream inlets may be creating some uncertainty in the upper range of the stage-surface area and stage-storage volume relationships for Rector Reservoir. The largest volume of sediment input to the reservoir occurred during a period of high runoff following a fire, but the development of vineyards in the Rector Creek watershed above the dam since the early 1990s may also be contributing to the sediment entering the reservoir (DWR 2013).

2.5 Current Water Usage

The current water users include the Veterans Home of California, the Town of Yountville, CDFW's Bay-Delta Region office and Fisheries Base, and local wineries. Untreated water from the reservoir that is diverted to the Fisheries Base is discharged back into Rector Creek approximately 0.35 miles downstream of the spillway. The Fisheries Base's operations are variable, but the facility is typically offline from the beginning of June to early October, during which time CDFW performs needed maintenance. The Fisheries Base may also be offline at other times as needed, for example, to perform emergency maintenance work or to eradicate fish pathogens. Water from the reservoir is also diverted to a nearby small training facility operated by CalFire, though recorded draw is negligible. Additional information on water-use rates is included in Sections 3.1.2.2, *Diversions* and 3.2.2, *Hydrologic Assessment*.

3 ADDITIONAL DATA AND ANALYSIS

To develop interim minimum environmental flow release recommendations, additional data were gathered and assessed. A pedestrian survey of lower Rector Creek was completed during a period when Rector Dam was spilling <0.5 cubic feet per second (cfs) and when the Fisheries Base releases were near the normal maximum levels (approximately 2 cfs). Additionally, existing hydrologic records were compiled and used to develop a water-balance model of releases and reservoir storage. The methods and results of these assessments are described below.

3.1 Methods

3.1.1 Stream Habitat Assessment

Stillwater Sciences conducted a limited survey of existing stream channel conditions in lower Rector Creek on April 27, 2018 with an initial focus on characterizing: (1) salmonid spawning

habitat availability and distribution, (2) rearing habitat availability and distribution, and (3) migration conditions and any passage barrier locations.

Surveyors walked the stream channel from the spillway to the confluence with Conn Creek noting general habitat conditions, estimated flow, residual pool depths, substrate types, spawning gravel availability and distribution, and observations of aquatic biota. Water chemistry (water temperature, dissolved oxygen, and conductivity) data were recorded below the Fisheries Base discharge location. In addition to general observations, channel condition measurements were collected at three locations between Rector Dam and the confluence with Conn Creek, including:

- discharge (cfs),
- active channel width, and
- wetted channel width.

3.1.2 Hydrologic Assessment

Stillwater Sciences compiled and reviewed existing relevant Rector Creek watershed data for use in developing a daily time-scale water-balance model of Rector Reservoir, including:

- reservoir stage and bathymetric data,
- reservoir outflow and spill records,
- water-use records from the water treatment plant (WTP),
- water-use records of the Fisheries Base and Cal Fire training facilities,
- precipitation and evaporation data,
- water quality and temperature data, and
- general physical and biological study reports.

3.1.2.1 Stage, area, and volume

Variations in the stage, area, and volume of Rector Reservoir were evaluated via water balance. A water balance method is a form of mass balance that accounts for inflows, outflows, and changes in water stored in the reservoir over time (Hornberger et al. 1998). The change in water volume stored over a certain time can be expressed by the equation:

$$\frac{dV}{dt} = I - O \qquad \text{(Eqn. 3-1)}$$

where V is the reservoir volume, t is time, I is the volume of water inflow for the time step dt, and O is the volume of water outflow for the time step dt. The volume of water stored at a given point in time can then be expressed by the equation:

$$V(t+1) = V(t) + \frac{dV}{dt} \qquad \text{(Eqn. 3-2)}$$

The reservoir volume at any time is equal to the reservoir volume from the previous time step plus the amount of inflow minus the outflow during that time step. When the reservoir volume is a measured quantity, the volume difference between successive time steps represents the total water volume gained or lost. Combining this information with measured water inflow rates and/or

measured outflow rates between successive time steps may be used to constrain the water inflow and/or outflow rates when limited data are available. Compiling these data over longer periods (i.e., many successive time steps) allows for determining average seasonal and annual contributions of individual water-balance components.

The inflows to Rector Reservoir are composed of many different components (Figure 3-1), including:

- stream discharge into Rector Reservoir from Rector Creek, North Fork Rector Creek, and South Fork Rector Creek;
- runoff from the surrounding subwatershed directly into Rector Reservoir;
- direct precipitation onto Rector Reservoir; and
- groundwater inflow.

Water outflows from Rector Reservoir including the following:

- direct evaporation from the surface of Rector Reservoir;
- diversion to the water treatment plant to supply drinking water to the Veterans Home of California, the Town of Yountville, CDFW's Bay Delta Region office, and several local wineries;
- diversion of untreated water to the Fisheries Base;
- diversion of untreated water to the Cal Fire training facility;
- spillway outflows; and
- groundwater outflow.

A complete dataset of hydrologic records was not available. Data were available for precipitation, evaporation, diversion to the WTP, diversion to the Fisheries Base, and diversion to the Cal Fire training facility. Data were not available for stream discharge entering Rector Reservoir, runoff from the surrounding subwatersheds into Rector Reservoir, groundwater inflows, or groundwater outflows. While the time when spillway outflows occurred was documented, spillway outflow volume data were unavailable for most years, as discussed further below.

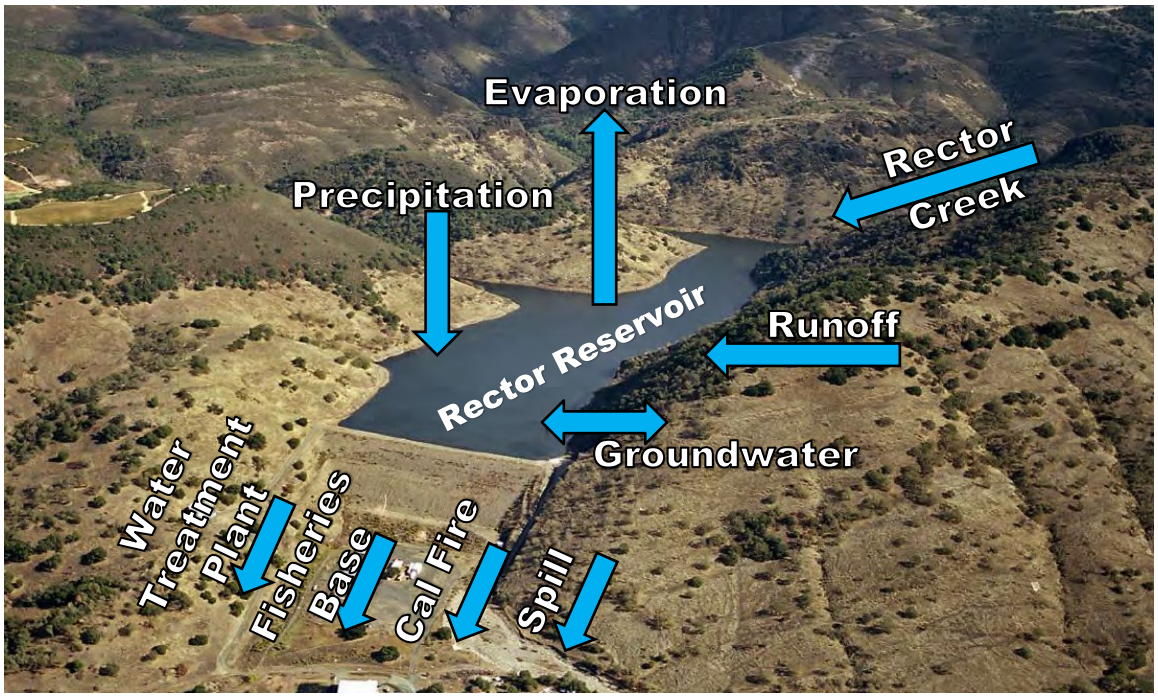


Figure 3-1. Conceptual model diagram of the current dominant Rector Reservoir inflows and outflows.

Rector Reservoir stage and spill timing has been recorded at irregular intervals with 3,253 measurements between January 1, 2003 and April 30, 2018. A QA/QC review of the stage data was performed to identify recorded reservoir stages which were below the minimum elevation in the reservoir, above the dam crest, or anomalous. The QA/QC review also transformed reservoir stage recordings of "spilling" or "overflowing" into a numerical reservoir stage that can be used in calculations. The minimum reservoir stage from the 2000 bathymetric survey was 245 feet above MSL (DWR 2013), so recorded stages below this elevation were excluded from further analysis. Decreases in the recorded stage greater than approximately 100 feet within 7 days were considered anomalous and excluded from further analysis. For example, several stage measurements from December 2016 were excluded, since they showed this anomalous decrease when the recorded stage changed from 366.12 feet above MSL to 266.24 feet above MSL after 4 days. During spill events, stage was often not quantified for Rector Reservoir with the stage usually being listed as "spilling" or "overflowing" though there were occasional recordings of stage above the spillway elevation suggesting spill would have been occurring. Since 2003, the spillway elevation for Rector Reservoir has been 372.5 feet above MSL, so it was assumed that any stage greater than or equal to 372.6 feet above MSL was a spill event. When spilling or overflowing was noted in the data without a measurement of stage, the stage was noted as 372.6 feet above MSL for analysis purposes. When stage was recorded as greater than 372.6 feet above MSL, it was kept and used in the analysis, except a few stage recordings in 2005 that were greater than the dam crest (381.5 feet above MSL). Stages greater than the dam crest were assumed to be equal to the dam crest height. As a result of these assumptions, reservoir stage is conservatively estimated as 372.6 feet above MSL for most spill events in this analysis, but stage is occasionally greater than 372.6 feet above MSL. After the QA/QC review, the 3,218 remaining measurements of reservoir stage were used (approximately 99% of the data) to estimate daily reservoir stage for all days during the analysis period by linearly interpolation between the measured stage data points (Figure 3-2).

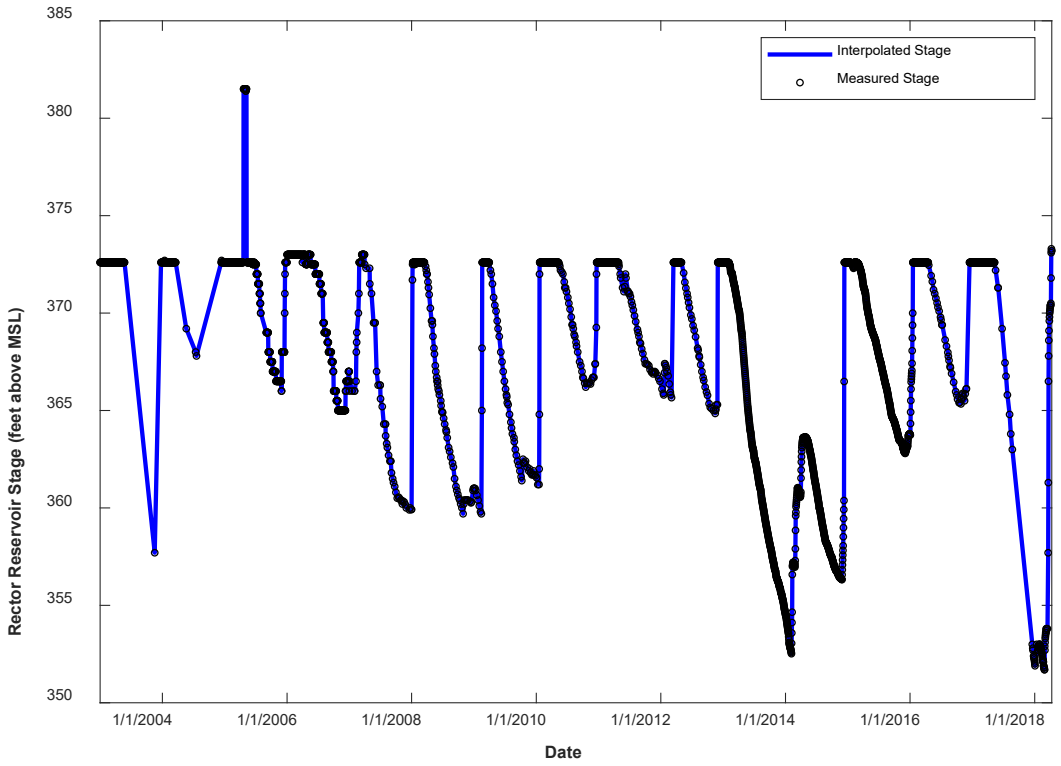


Figure 3-2. Rector Reservoir measured and interpolated stage after QA/QC review. The lowest operational intake occurs at 291 feet above MSL.

The volume of water passing over the Rector Reservoir spillway during spill events (as opposed to the simple occurrence of spill events) was generally not known because stage was not typically recorded during spill events, there are no upstream or downstream flow gages on Rector Creek, and sufficient data to estimate the flow during spill events were unavailable for most years. There were not sufficient data to estimate the flow or volume of the spill events in 2003 or 2005-2018. While DWR (2013) presents the computed spillway flows from recorded or interpolated daily reservoir elevations for the water years when sufficient data were available to estimate the flow during spill events, sufficient data were only available for three years after the spillway elevation was raised (1990, 1991, and 2004). The limited number of spillway flow estimates prevented the development of a daily estimate of spillway flows or volumes for additional years due to the high uncertainty associated with any estimate. While the spillway flows or volumes could not be determined for most of the data record, it was possible to evaluate the frequency, timing, and probability of spill events occurring during the year because the occurrence of spill events was well documented in the stage data with Rector Reservoir listed as spilling on 1,361 days between January 1, 2003 and April 30, 2018.

The Rector Reservoir surface area associated with a measured stage was determined from the Rector Reservoir stage-surface area relationship developed by DWR from the 2000 bathymetric survey results for stages from 375 feet above MSL to 245 feet above MSL (DWR 2013) (Figure 3-3). Similarly, the Rector Reservoir storage volume associated with a measured stage was determined from stage-volume relationships for Rector Reservoir developed by DWR from the 2000 bathymetric survey results for stages from 375 feet above MSL to 245 feet above MSL (DWR 2013) (Figure 3-4).

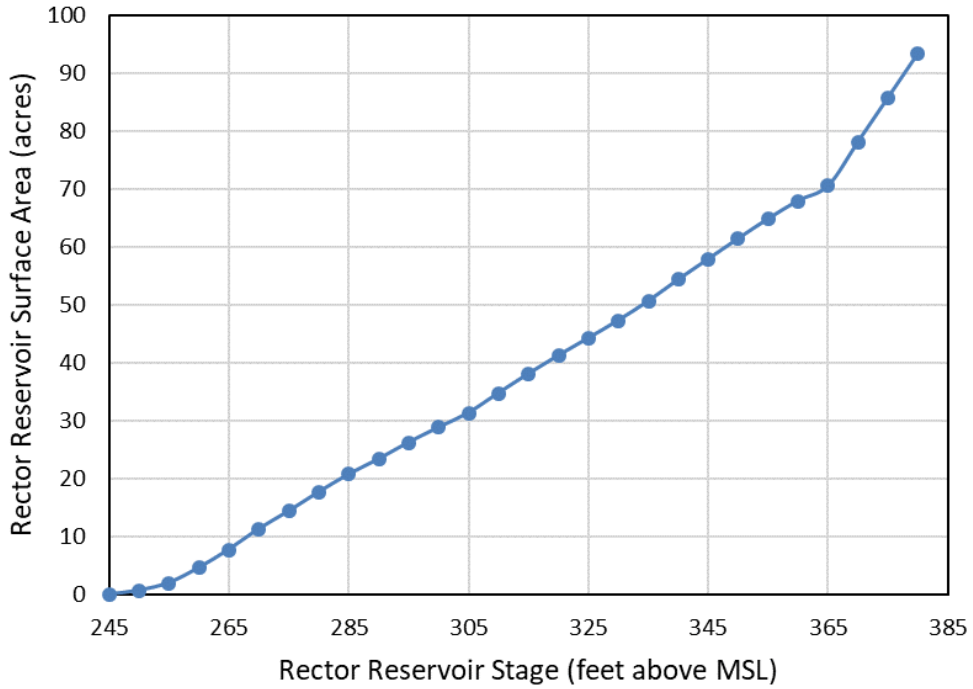


Figure 3-3. Rector Reservoir stage-surface area relationship.

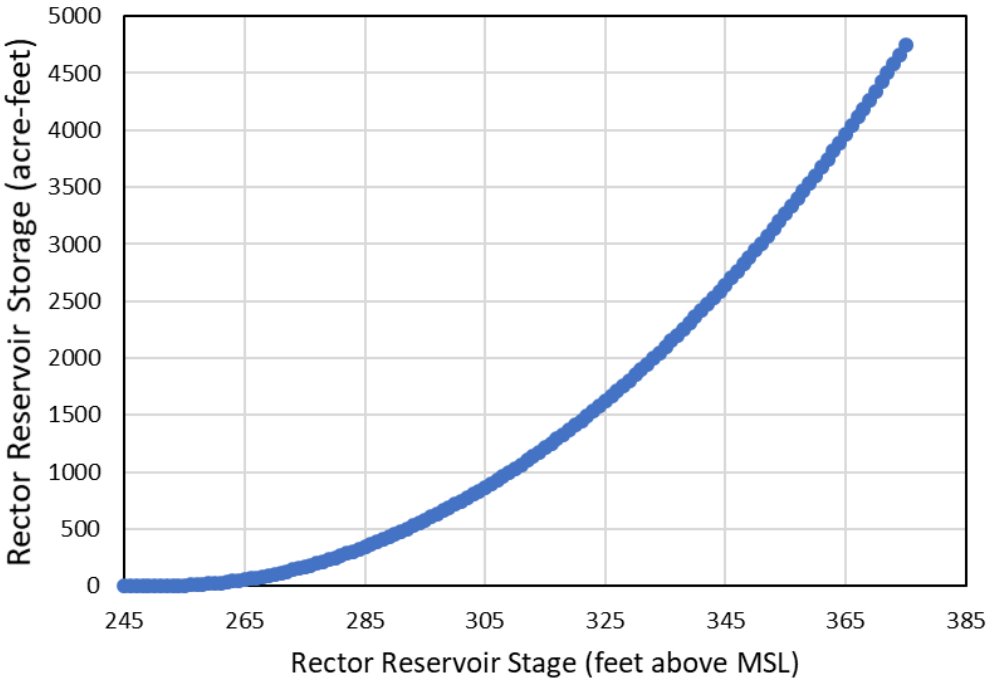


Figure 3-4. Rector Reservoir stage-storage volume relationship.

3.1.2.2 Diversions

The flow diverted from Rector Reservoir to the WTP, the Fisheries Base, and Cal Fire training facility was recorded daily from January 1, 2008 to March 26, 2016 (Figure 3-5). No flow was diverted to the Cal Fire training facility between January 1, 2008 and March 26, 2016, so it is not presented in Figure 3-5.

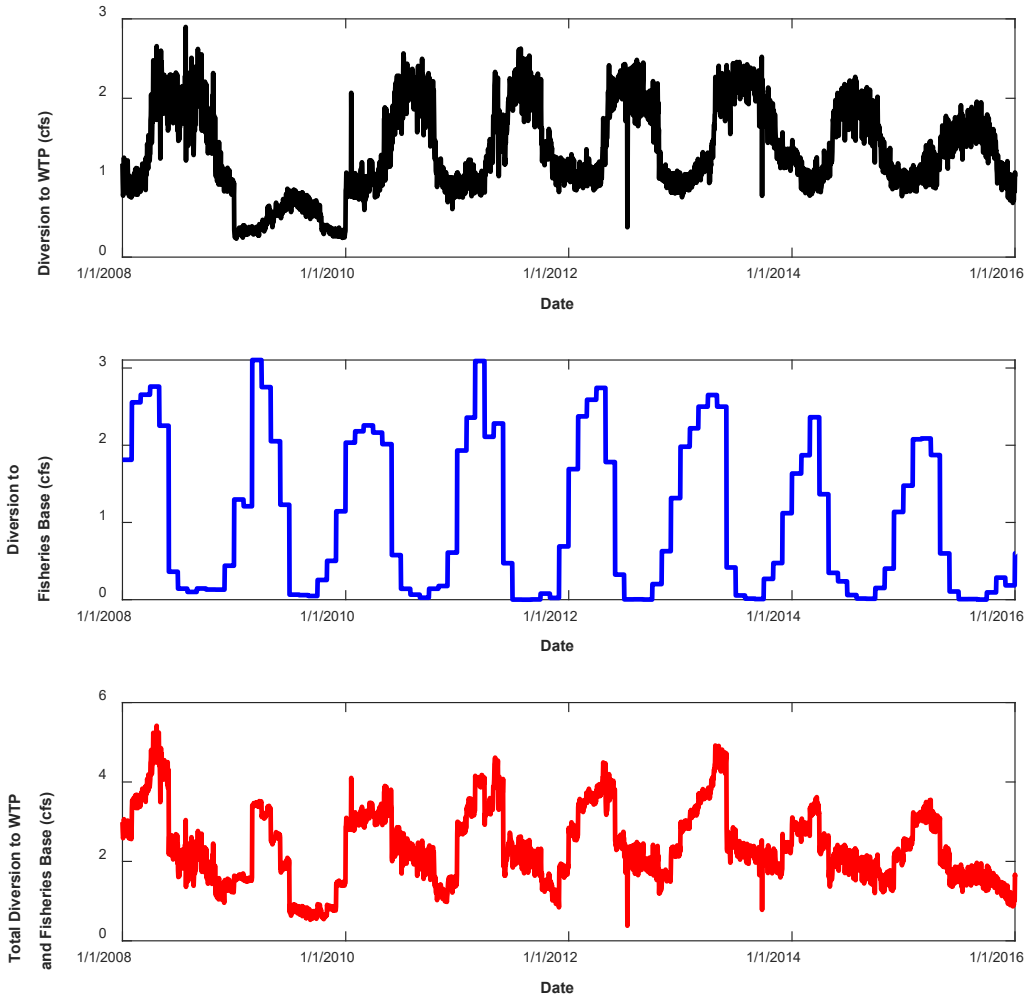


Figure 3-5. Rector Reservoir diversion to the water treatment plant (WTP), diversion to the CDFW Silverado Fisheries Base, and total diversion to both the WTP and Fisheries Base.

3.1.2.3 Precipitation

Precipitation rates for the Rector Creek watershed were estimated from an existing California Irrigation Management Information System (CIMIS) atmospheric monitoring station near Yountville, California (Oakville CIMIS Station No. 77), located approximately 3.5 miles west of Rector Reservoir. Precipitation rates from this CIMIS station were used because it was the nearest CIMIS station to Rector Reservoir with a complete record during the time period being analyzed.

The gage is located on the floor of the Napa Valley, but is still considered representative of precipitation in the Rector Creek watershed. Analysis of data from multiple precipitation gages at different elevations in the Napa Valley documented only a limited orographic effect from the mountains in the Rector Creek watershed (DWR 2013). The CIMIS station recorded precipitation in inches on an hourly time-scale and provides the precipitation rates on either hourly or daily time-scales. In this study, daily precipitation rates were used from CIMIS for 2008 to 2016 to match the time-scale of other data sources (Figure 3-6).

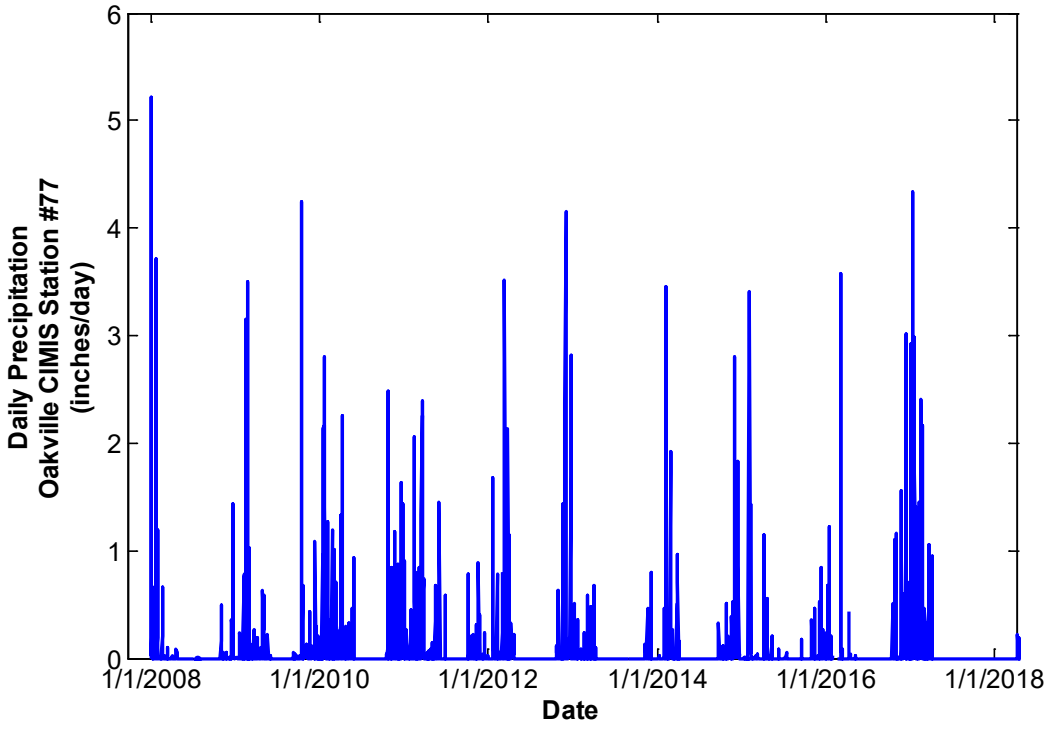


Figure 3-6. Daily precipitation recorded at the Oakville CIMIS Station No. 77.

Precipitation and runoff vary from year to year, so the annual precipitation was sub-divided into water-year types (e.g., a Dry year versus a Wet year). Water-year types are often used to guide flow releases, since higher precipitation in a Wet water year would typically correspond to higher natural stream flows in a Wet water year. However, water-year types for the Rector Creek watershed during the analysis period from January 1, 2008 to March 26, 2016 had not been determined previously, so the water-year types from the Sacramento Valley Index were used for this analysis (Table 3-1). A "water year" (WY) is defined as beginning on October 1 of the preceding year and ending on September 30 of the water year (e.g., WY 2008 started on October 1, 2007 and ended on September 30, 2008). The water-year classification can be calculated from either runoff or precipitation and it is typically sub-divided into either "Dry", "Average", and "Wet" water-year types, or "Critical", "Dry", "Below Normal", "Above Normal", and "Wet" water-year types. The Sacramento Valley Index water year is determined by the DWR annually and it provides a best estimate of the water-year type for the region until the specific Rector Creek water-year types can be determined.

Table 3-1. Sacramento Valley Index water-year type.

Year	Water-Year Type
2003	Above Normal
2004	Below Normal
2005	Above Normal
2006	Wet
2007	Dry
2008	Critical
2009	Dry
2010	Below Normal
2011	Wet
2012	Below Normal
2013	Dry
2014	Critical
2015	Critical
2016	Below Normal
2017	Wet

3.1.2.4 Evaporation

Evaporation rates for Rector Reservoir were determined from the Oakville CIMIS Station No. 77 near Yountville, California to estimate the evaporative losses from the reservoir surface in the water balance analysis. Evaporation rates from this CIMIS station were used because it was the nearest CIMIS station with a complete record during the time period being analyzed. The CIMIS station computed the hourly evapotranspiration for grass and also provided the evapotranspiration rates on average daily time-scales. In this analysis, average daily evapotranspiration rates (inches/day) were retrieved from CIMIS for 2008 to 2016, to match other data sources. Daily average evaporation rates for Rector Reservoir (inches/day) were calculated by multiplying the CIMIS station evapotranspiration for grass by an open water adjustment factor of 1.1 because water losses by evapotranspiration from open water are greater than water losses by evaporation from grass (Figure 3-7) (UC DANR 1994). The volume of water lost to evaporation from the surface of Rector Reservoir can then be calculated by multiplying the daily average evaporation rate by the daily reservoir surface area.

3.1.2.5 Effective inflow

While measured inflow to Rector Reservoir was not available during the time period being analyzed, the available measured data and relationships between the stage-surface area and stage-volume for Rector Reservoir were combined to estimate the effective inflow to Rector Reservoir from Rector Creek discharge, local runoff from the subwatershed hills adjacent to Rector Reservoir, and any potential inflows or outflows from groundwater. The effective inflow, I_{eff} (acre-feet/day), to Rector Reservoir was calculated by rearranging and expanding Equation 3.1:

$$I_{eff} = \frac{dV}{dt} + O_{WTP} + O_{Hatchery} + O_{Cal\ Fire} + O_{evap} - I_{ppt} \qquad \text{(Eqn. 3.3)}$$

where V is the reservoir volume (acre-feet), t is time (day), O_{WTP} is the volume of water diverted to the water treatment plant for the time step dt (acre-feet/day), $O_{Hatchery}$ is the volume of water diverted to the Fisheries Base for the time step dt (acre-feet/day), $O_{Cal\ Fire}$ is the volume of water diverted to the Cal Fire facility at the base of Rector Dam for the time step dt (acre-feet/day),

O_{evap} is the volume of water outflow from evaporation for the time step *dt* (acre-feet/day), and I_{ppt} is the volume of water inflow from precipitation for the time step *dt* (acre-feet/day). As previously mentioned, the volume of water diverted to the Cal Fire facility was 0 cfs in historical records from 2008 to 2016, so it was assumed to be 0 cfs for all time steps.

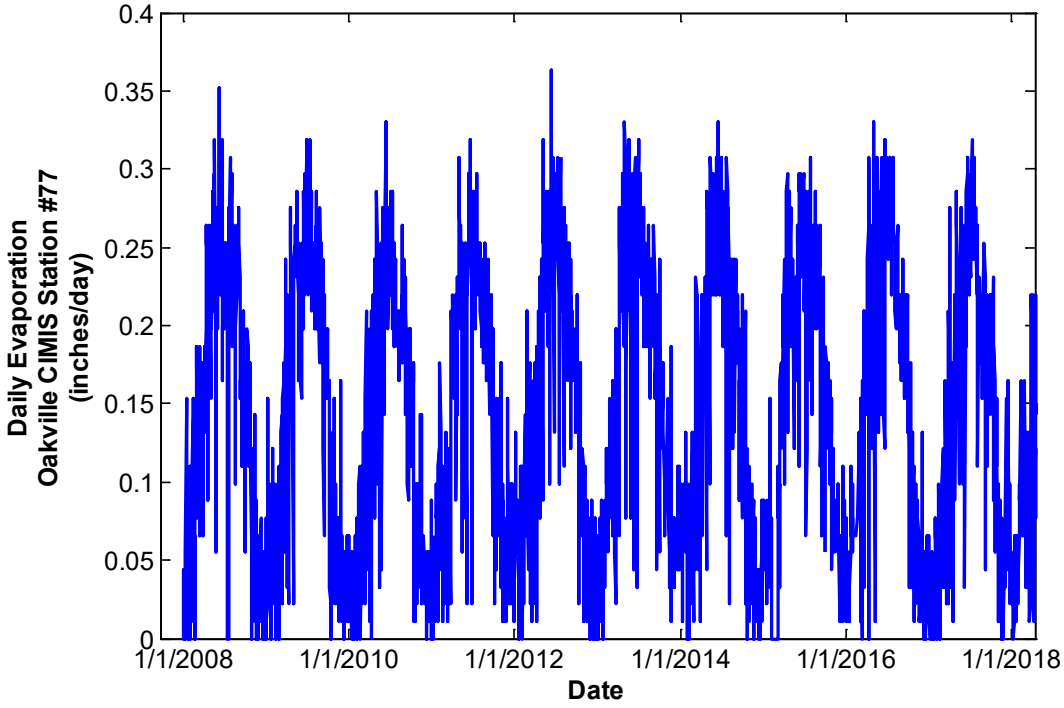


Figure 3-7. Daily evaporation calculated from the daily evapotranspiration record at the Oakville CIMIS Station No. 77.

The effective inflow is an estimate of the net inflow to Rector Reservoir from Rector Creek (upstream of the reservoir), North Fork Rector Creek, and South Fork Rector Creek, local runoff to Rector Reservoir, and any potential inflows or outflows from groundwater. The effective inflow must be used cautiously and treated as only an initial estimate due to the high degree of uncertainty associated with it. One of the largest sources of uncertainty in the estimate of effective inflow to the reservoir was the volume of spill events. During spill events, stage data were generally not recorded between 2008 and 2016, so changes in reservoir volume above the spillway elevation or flows over the spillway could not be included in the estimate of effective inflow. The effective inflow underestimated the actual daily net inflow into Rector Reservoir during spill events, since the effective inflow was equal to only the net flow from diversions, evaporation, and precipitation when the change in reservoir volume was zero. Additionally, error associated with the (1) interpolation of daily stage between measured values of daily stage, (2) stage-surface area or stage-volume relationships, (3) spatial variations in the evaporation or precipitation between the Oakville CIMIS station and Rector Reservoir, and (4) potential groundwater inflows or outflows all contribute to the uncertainty in the estimate of effective inflow.

Estimates of negative effective inflow indicated either an additional unaccounted outflow occurred during that day or one or more of the uncertainties described above caused sufficient error to result in the negative effective total inflow. While a negative inflow is physically not

possible, a negative effective inflow is possible. A time-step with a negative effective inflow actually represented a time-step with a net outflow due to either an unaccounted outflow or error associated with the uncertainties previously described (e.g., reservoir surface evaporation estimated from the CIMIS station evaporation rate was greater than from the actual reservoir surface evaporation). Negative effective inflows were preserved in the analysis to maintain the mass balance of the water balance analysis.

3.1.2.6 Reservoir Water Balance Modeling

A daily time-scale water-balance model of Rector Reservoir was developed to estimate reservoir storage following implementation of an interim environmental flow release schedule for lower Rector Creek and to evaluate the effect of the interim environmental flow release schedule on water availability for diversion. The model calculated the reservoir storage volume utilizing the measured diversion flows, precipitation rates, and evaporation rates along with the calculated effective inflow and the stage-surface area and stage-volume relationships. Because estimates of spill volume were highly uncertain, spill was assumed to be zero. Estimated reservoir storage would represent a minimum reservoir storage under the assumption spill was zero, since spill volumes were not included in the water balance. The reservoir storage volume for the next time-step, V_{t+1} (acre-feet), was calculated by using:

$$V_{t+1} = V_t + I_{eff,t}dt + I_{ppt,t}dt - O_{release,t}dt - O_{Hatchery,t}dt - O_{evap,t}dt - O_{WTP,t}dt - O_{Cal\ Fire,t}\,dt \quad \text{(Eqn. 3.4)}$$

where the values of all the variables on the right of the equal sign are for the current time step, t, and V_t is the reservoir storage volume (acre-feet); $I_{eff,t}$ (acre-feet/day) is the effective inflow to Rector Reservoir calculated from historical data using Equation 3.3; dt (day) is the time-step of the model set equal to one day for the entire modeling period; $I_{ppt,t}$ (acre-feet/day) is the inflow from precipitation; $O_{release}$ (acre-feet/day) is the water released to Rector Creek downstream of the dam for interim flows; $O_{Hatchery}$ (acre-feet/day) is the water diverted to the Fisheries Base before being released to Rector Creek approximately 0.35 miles downstream of the dam; O_{evap} (acre-feet/day) is the water outflow from evaporation; $O_{WTP,t}$ (acre-feet/day) is the water diverted to the water treatment plant; and $O_{Cal\ Fire}$ (acre-feet/day) is the water diverted to the Cal Fire facility at the base of Rector Dam.

An interim environmental flow release schedule was developed to meet the objectives of Goal 1, to benefit fish while more information is collected to evaluate whether the environmental flows are sufficient to keep fish downstream of the dam in good condition (see Section 4.1, *Interim Environmental Flow Release Recommendations*, for more details). While there were not sufficient flow data to quantify the natural hydrograph of Rector Creek at the dam location, an interim environmental flow release schedule was designed to enhance habitat for native fishes present within the stream and to replicate the variability of a natural hydrograph by varying release flows both between water-year types and seasons. For example, wetter water-year types would have higher flow releases than drier water-year types. Similarly, higher flows would be released during the winter and spring wet period than during the summer and fall dry period.

The interim environmental flow release recommendations assume an additional release valve that can accommodate the full range of flows in the schedule will be added downstream of the dam.

Also, because water diverted to the Fisheries Base is discharged into lower Rector Creek approximately 0.35 miles downstream of the spillway, the Fisheries Base discharge is included in the minimum environmental flow release schedule, where releases from the dam are adjusted by CalVet to sum to the minimum environmental flow schedule. However, a minimum release of 0.2 cfs downstream of the dam was included in the water-balance model to ensure some water is always released into the 0.35-mile reach between the dam and the Fisheries Base discharge point, should the discharge exceed the minimum environmental flow release schedule requirement. The water-balance model was then used to assess the water availability (1) to meet the interim environmental flow release schedule, and (2) for diversion to the water treatment plant and the CalFire training facility.

Reservoir storage volume was modeled from January 1, 2008 to February 29, 2016, since that was the time period when data were available for all variables in Equation 3.4. In the initial time-step of the model (e.g., January 1, 2008), the values of all the model parameters were set to the initial values recorded on that date. In each subsequent time-step (i.e., day) of the model simulation, the model parameter values were determined from the available data (e.g., Fisheries Base diversion flow), calculated from the available data using the previously defined relationships (e.g., effective inflow), or set based on the interim environmental flow release schedule. The effective inflow for each time-step was equal to the effective inflow associated with that specific time-step previously calculated from the data. The interim environmental flow release for each time-step was determined by identifying the water-year type for the time-step based on the DWR Sacramento Valley Index and setting the interim environmental flow release equal to the flow associated with the water-year type for the time of year of the time-step. The variability of releases between water-year types is summarized in Section 4.1, *Interim Environmental Flow Release Recommendations*. After determining the interim environmental flow release for the time-step, the release outflow for each time-step was calculated as the interim environmental flow release for that time-step minus the Fisheries Base outflow for that time-step, with the minimum dam release outflow being set to 0.2 cfs. The flow diverted to the water treatment plant and the Cal Fire training facility for each time-step was equal to the amount of flow diverted for that specific time-step in the data. Outflow from evaporation in the current time-step was estimated by multiplying the surface area for the current time-step by the daily average evaporation rate for Rector Reservoir for the current time-step. Inflow from precipitation in the current time-step was determined similarly with the surface area for Rector Reservoir associated with the volume at the current time-step multiplied by the daily precipitation rate for the current time-step. The surface area of the reservoir was calculated for each time-step by using the stage-volume and stage-surface area relationships. Once all the model parameter values were determined for a time-step, the model simulated the reservoir storage volume for the next time-step and repeated the process until the end of the modeling period.

Model performance was evaluated by simulating the reservoir storage volume with a dam release flow of 0 cfs before simulating the reservoir storage volume with the interim environmental flow release schedule. There was no calibration or validation of the model, since the model required all of the observed diversion data to simulate the reservoir storage volume. Additionally, inflow data limitations necessitated calculating the effective inflow from the available diversion, evaporation, and precipitation data, so the effective inflow was not an independently calibrated model parameter. However, model performance statistics were calculated for the modeled reservoir storage simulation with a dam release flow of 0 cfs to verify model performance was acceptable and mass balance was maintained during the modeling. The Nash-Sutcliffe Efficiency (NSE), percent bias, and root mean square error-observations standard deviation ratio (RSR) were used to

evaluate the model performance, due to their wide usage and acceptance for assessing surface runoff and streamflow models (Moriasi et al. 2007).

3.1.3 Interim Environmental Flow Schedule Development

Minimum interim environmental flow release recommendations were developed for existing native species within lower Rector Creek based on several factors, including:

- fish community composition and abundance information,
- existing stream habitat and streamflow conditions,
- unimpaired hydrology, and
- hydrologic conditions in other Napa River tributaries.

The current fish assemblage, which includes a native-dominant composition that relies on perennial pool and run habitat in the summer and fall months, would be affected by any changes in flows downstream of Rector Dam. The environmental flow schedule considered the existing population as well as other species in the Napa River that may migrate into lower Rector Creek during periods of connected flow and the potential effect that would have on the condition of the fishery.



Lower Rector Creek, downstream of the Fisheries Base discharge point, estimated surface flow < 1 cfs, with 2.0 cfs total upstream releases, April 27, 2018.

To identify the lower bound of the interim environmental flow release recommendation, the minimum flow that provides stream connectivity within portions of the reach with surface flow was identified during the 2018 field survey. Comparisons were made between stream habitat conditions in lower Rector Creek during periods with no instream flow release (NCRCD 2005), an approximately 0.25 cfs release, and an approximately 2.0 cfs streamflow release. The 2018 survey was conducted with approximately 0.23 cfs flow over the spillway and 1.8 cfs discharged from the Fisheries Base, allowing for a comparison of conditions within the reach (see Section 3.2.1, *Stream Habitat Assessment* for additional details on streamflow releases). The minimum interim environmental flow recommendations also considered the unimpaired base flows into Rector Reservoir. Both summer and winter base flows were calculated and used in conjunction with field observations to form upper and lower bounds of the streamflow release schedule.

The recommended interim environmental flows were then evaluated with a hydrologic water-balance model to ensure sufficient water availability to meet the release schedule (see Sections 3.1.2, *Hydrologic Assessment* and 4.1.1, *Reservoir Water Balance Modeling*), and the expected stream conditions were compared to the hydrologic conditions in other Napa River tributaries.

3.2 Results

3.2.1 Stream Habitat Assessment

As summarized in Section 2.1, *Stream Habitat and Channel Morphology*, lower Rector Creek is a low-gradient stream within the Napa Valley that traverses a coarse-grained alluvial fan. The

coarseness of the sediment within and adjacent to the stream channel results in high infiltration rates, and subsequently, intermittent streamflow between Rector Dam and the confluence with Conn Creek. During the April 2018 survey, the total streamflow released to the stream channel downstream of Rector Dam was 2.0 cfs: approximately 0.23 cfs measured downstream of the spillway and 1.8 cfs released from the Fisheries Base. However, measured streamflow in lower Rector Creek ranged between 0 and 1.2 cfs, with the highest flow measurement immediately downstream of the Fisheries Base discharge point (Table 3-2). Between the spillway and Fisheries Base discharge point, surface flow varied spatially due to water exchange between groundwater and the stream. A similar pattern was repeated numerous times downstream of the Fisheries Base discharge point, where portions of the channel contained flow, and others were dry; generally, flow ranged between 0 cfs (dry) and 1 cfs, based on visual estimates.

Table 3-2. Rector Creek discharge, April 27, 2018.

Transect	Location	Measured Flow (cfs)
Downstream of Rector Dam		
1	Downstream of spillway	0.23
Downstream of Fisheries Base Discharge		
2	Downstream of Fisheries Base discharge	1.28
3	Mid-reach	0.00
4	Upstream of Conn Creek	0.87

Water quality downstream of the Fisheries Base discharge point reflected a cool, highly oxygenated stream: water temperature was 13.5°C, dissolved oxygen was 11.86 mg/L, conductivity was 106.9 µS/cm (adjusted for water temperature), and pH was 7.92.

Unlike prior surveys (NCRCD 2005), the April 2018 survey did not identify much *O. mykiss* spawning habitat. Specifically, there were very few gravel deposits observed, and only one that was large enough for spawning. Additionally, the single spawnable gravel patch observed was near the confluence with Conn Creek, which is very low gradient (<1%). The cobble-gravel stream banks typically act as the sediment source for the channel downstream of Rector Dam. Most recently, high flows during the 2016–2017 (Wet) water year, eroded the banks downstream of the spillway, recruiting and distributing material downstream. The channel substrate is currently composed of predominantly cobble substrate with some gravel, which is similar to, but slightly more coarse than observations in 2005.



Rector Stream Channel, upstream of State Lane, with 2.0 cfs total upstream releases, April 27, 2018.



Lower Rector Creek, downstream of the Fisheries Base discharge point, 1.28 cfs measured flow with 2.0 cfs total upstream releases, April 27, 2018.

There are limited channel-shaping obstructions within the channel, such as boulders and large woody material. In steeper sections (e.g., low gradient riffles), the low-flow wetted channel meanders within the straight banks forming braids. Without large structures or bends in the channel, the channel tends to be broad, forming shallow riffles or run habitats.



Riparian canopy and isolated pool habitat, Rector Creek downstream of State Lane, April 27, 2018.

The reach contains numerous pools, some of which are isolated, but most were connected to long shallow runs during the April 2018 surveys. The deepest pool (approximately 8 ft deep) was observed upstream of the Silverado Trail overcrossing. Downstream of Silverado Trail, the maximum pool depths ranged between 1 and 3.5 feet, but maximum pool depths were typically between 2 and 2.5 ft deep.

The riparian canopy and habitat conditions vary throughout the reach. In some locations, the channel has almost no overstory. In other locations, the riparian canopy includes both dense understories and overstories.



Mollusk within Rector Creek downstream of State Lane, April 27, 2018.

Fish were observed in isolated pool and run habitats throughout the reach. As mentioned earlier, lower Rector Creek supports mostly native species; the NCRCD conducted snorkel surveys in 2004 and observed California roach, threespine stickleback, Sacramento sucker, Sacramento pikeminnow, and *O. mykiss* (three *O. mykiss* were observed between the Fisheries Base and State Lane) (NCRCD 2004). Fish observations during the April 2018 pedestrian survey included larval/juvenile Sacramento suckers, minnow species (unidentified cyprinid species), sunfish/bass species, and threespine stickleback. The suckers and stickleback were sometimes abundant between State Lane and the confluence with Conn Creek, whereas the sunfish/bass were limited to two locations, including the deep pool upstream of the Silverado Trail Bridge. Other observations included salamanders, snails, Pacific chorus frogs (also known as Pacific tree frogs [*Pseudacris regilla*]), and Pacific chorus frog tadpoles.



Pacific chorus (tree) frog within Rector Creek upstream of Conn Creek, April 27, 2018.

Based on observations during the pedestrian survey and prior surveys (see Section 2.3, *Fish Populations*), fish in lower Rector Creek are distributed throughout the reach but are restricted to isolated sections in the summer–fall months. The fish community is composed primarily of native species; however, little is known about species abundance, condition factors, and age-class distribution, which are necessary to evaluate fish condition for the stream.

3.2.2 Hydrologic Assessment

3.2.2.1 Effective inflow and spill frequency

The effective inflow for Rector Reservoir was calculated from January 1, 2008 to February 29, 2016 when reservoir stage, WTP outflows, Fisheries Base outflows, evaporation, and precipitation data were available for Rector Reservoir (Figure 3-8). The effective inflow could not be calculated beyond this period because diversion flow data were not available. The effective inflow usually ranged from approximately 3 to 4 cfs during winter periods to less than 1 cfs during summer periods, but there were substantial variations in the minimum and maximum effective inflow between years. Negative effective inflows were occasionally calculated, but there was no clear trend in when the negative effective inflows occurred. As previously discussed, negative effective inflows are due to an unaccounted outflow or error introduced by either uncertainty in the data or relationships used to calculate the effective inflow. The largest negative effective inflows tended to occur when there were abrupt changes in effective inflow (i.e., due to rapid reservoir filling and spilling). The frequency and magnitude of the peak calculated effective inflows did not completely represent the actual peak inflows to Rector Reservoir. Peak effective inflows captured actual inflows when the reservoir storage was rapidly filling up to spill levels, but the effective inflow did not represent actual inflows once the reservoir spilled. The calculated effective inflow could not include the flow over the spillway once the reservoir was full because no data were available to quantify the actual flow over the reservoir spillway. Since the flow over the spillway was unknown, the peak effective inflows only represented the actual inflow when the reservoir was filling. The calculated effective inflow therefore under-estimated the actual inflows during periods when the reservoir was spilling.

There was not a strong trend in average effective inflow with water-year type, because the difference in the average effective inflow was usually smaller between water-year types than the variations in average effective inflow within a water year (Figure 3-9). No average effective inflow was determined for Above Normal water years since no Above Normal water years occurred between January 1, 2008 and February 29, 2016 in the Sacramento Valley Index. During multiple periods, the average effective inflow was higher in a drier water year than a wetter water year, because more frequent reservoir spilling in wetter years resulted in the average effective inflow more frequently underestimating the actual inflow. In January, the average effective inflow during Dry water years was lower than during Critical water years, but the difference between the Dry and Critical average effective inflow was usually less than 0.5 cfs, excluding periods when the average effective inflow peaked. Peak effective inflows occurred more frequently during drier water-year types than wetter water-year types since the reservoir refilled more before spilling during drier water-year types. During wetter water years, the effective inflow was equal to the outflows to the water treatment plant, the Fisheries Base, and evaporation minus any inflow from precipitation when the reservoir was full.

During summer periods when spilling did not occur, the calculated effective inflow better characterized the actual inflow to Rector Reservoir and the patterns of the natural hydrograph in Rector Creek at the dam location (Figure 3-10). The range of average effective inflows provides an initial estimate of the range of flows that would occur in the natural hydrograph in Rector Creek downstream of the Rector Dam during the summer period. The average effective inflow in August across all water years was typically around 1 cfs; the average effective inflow for a Wet water year in August ranged from approximately 0.25 cfs to 2 cfs, whereas the average effective inflow for a Critical water year in August ranged from approximately 0.5 cfs to 1.5 cfs. There was not a strong trend in the summer average effective inflow with water-year type, but this may be

due to natural hydrologic variability or uncertainty from using the Sacramento Valley Index water-year types in the Rector Creek watershed.

Stage data were analyzed to quantify the frequency of spill events per water-year type for Rector Reservoir. While sufficient data did not exist to quantify flows over the spillway, the frequency, timing, and probability of spill events at Rector Reservoir could be quantified from available stage data. The average number of days with spill for each water year (Figure 3-11) and the average number of days with spill per water-year type (Figure 3-12) were calculated from stage data and associated recordings of spill events from WY 2004 to WY 2017 (Figure 3-12). The average number of days spilling occurred ranged from 0 days in WY 2014 to 189 days in WY 2005. The average number of days spilling occurred generally increased as the water-year type became wetter, but the average number of days with spill was greater for Above Normal water years than Wet water years. The higher frequency of spilling during Above Normal water years than Wet water years is likely due to an exceptionally high number of days with spill in the single Above Normal water year in the data record (WY 2005) rather than an actual trend for Above Normal years to have more days with spill. While the average number of days with spill was greater than 0 for all water-year types, one Critical year in the data record (WY 2014) had no days with spill.

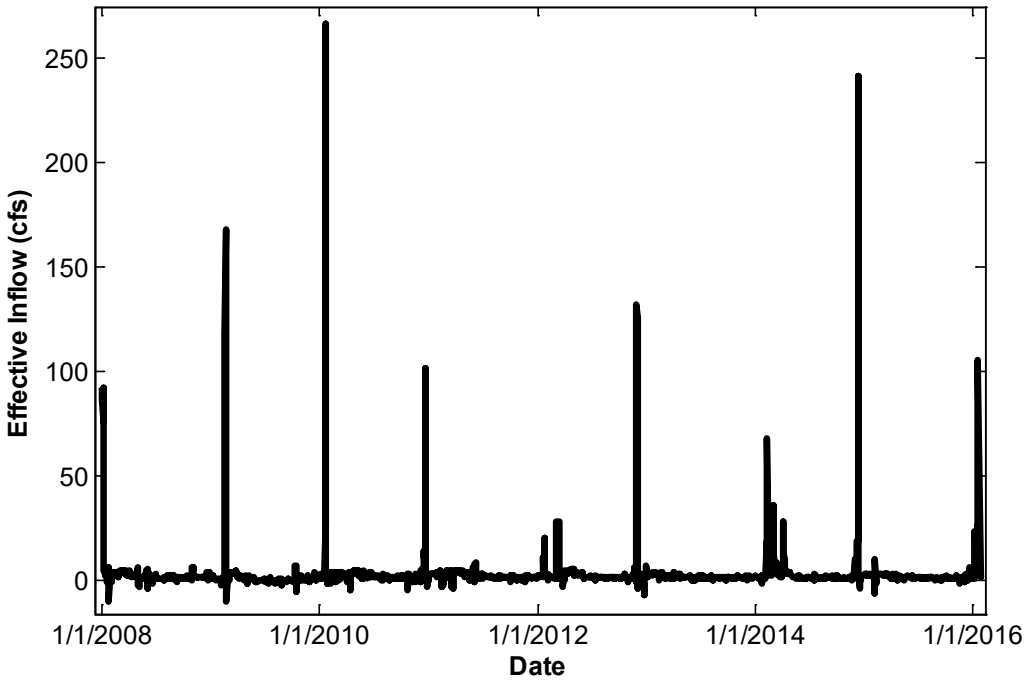


Figure 3-8. Calculated effective inflow to Rector Reservoir.

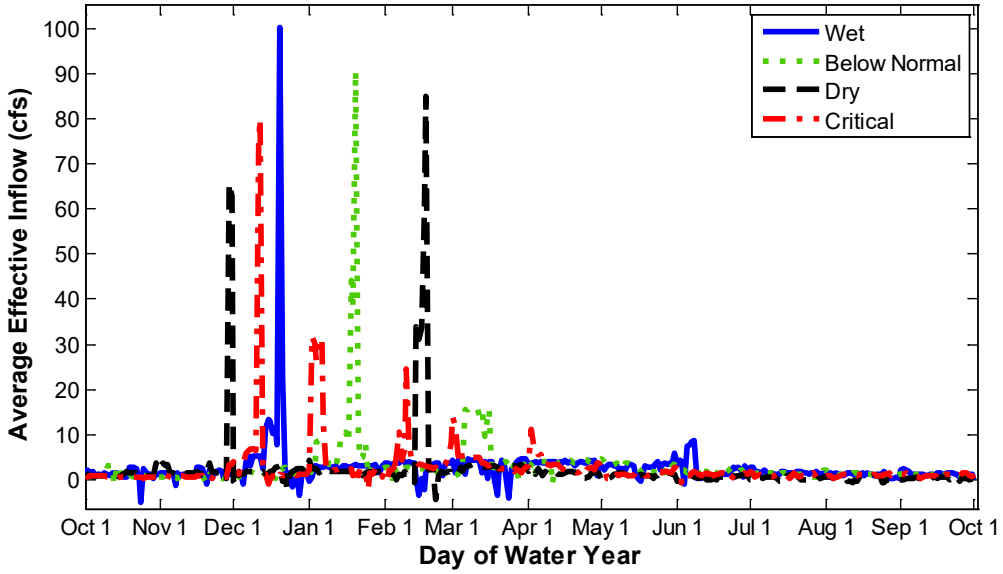


Figure 3-9. Average effective inflow to Rector Reservoir per water-year type (No Above Normal water years existed for the analysis period from January 1, 2008 to February 29, 2016).

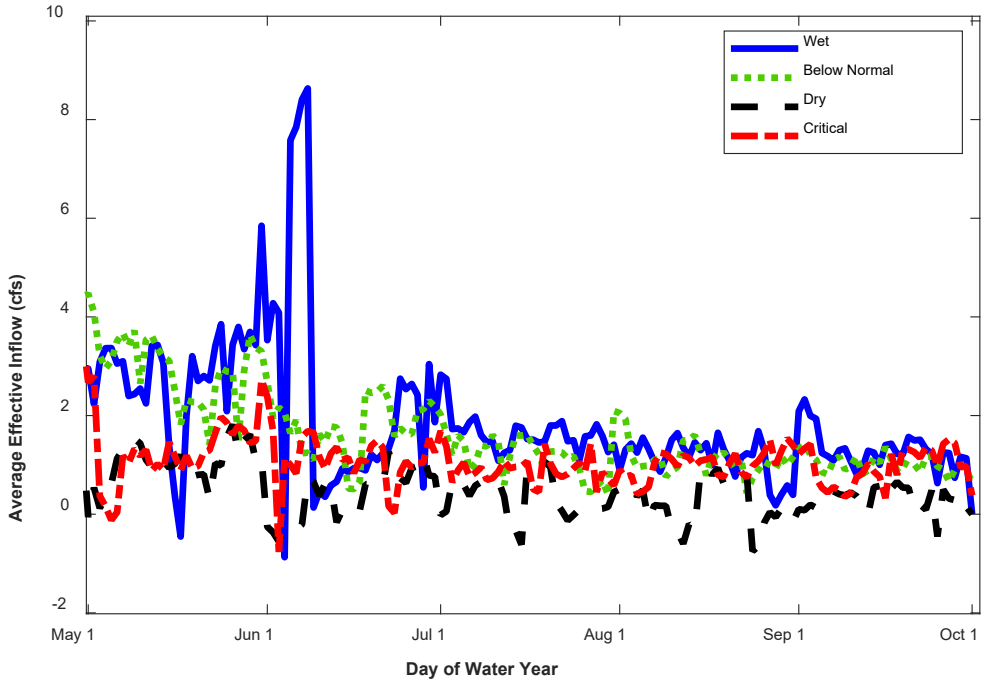


Figure 3-10. Average effective inflow to Rector Reservoir between May 1 and October 1 per water-year type (No Above Normal water years existed for the analysis period from January 1, 2008 to February 29, 2016).

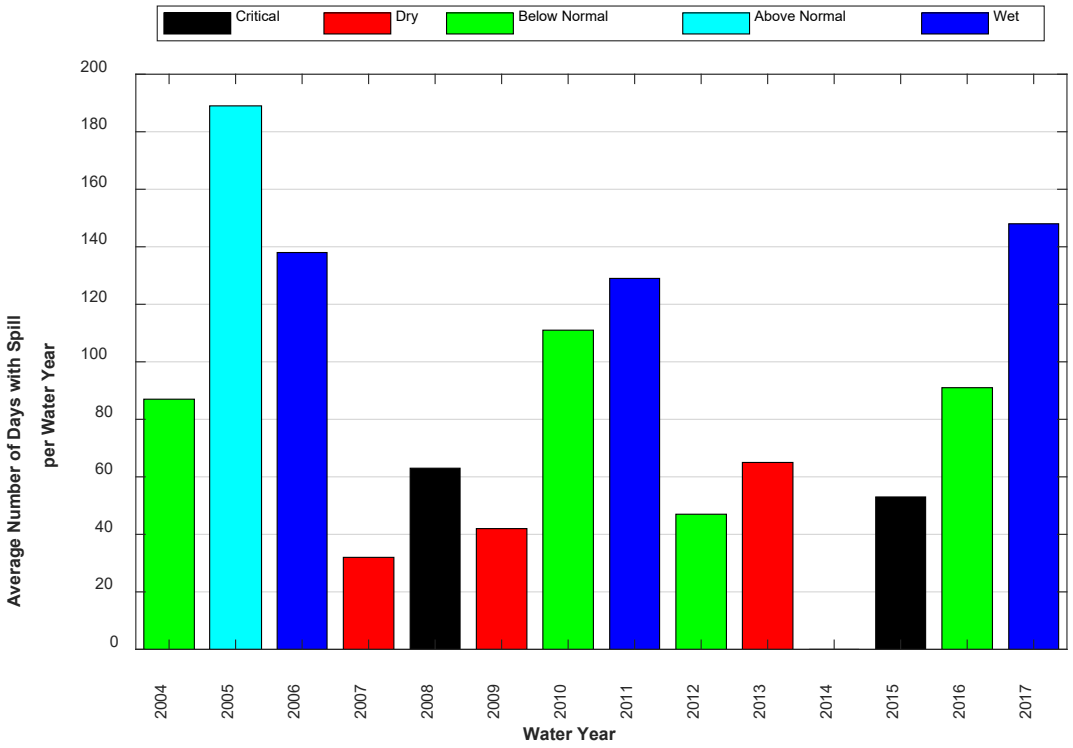


Figure 3-11. Average number of days with spill per water year from WY 2004 to WY 2017.

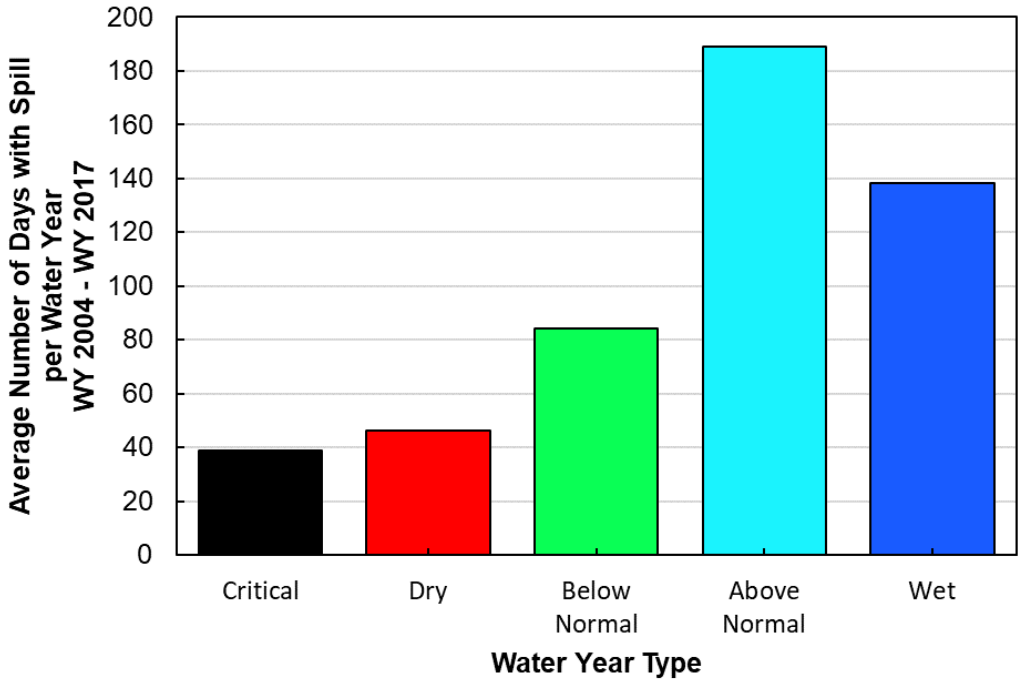


Figure 3-12. Average number of days with spill per water-year type from WY 2004 to WY 2017.

The timing and probability that spilling would occur per water-year type were calculated from the stage data and associated recordings of spill events, specifically for the period when the effective inflow was calculated from January 1, 2008 to February 29, 2016 (Figure 3-13). While the timing and probability were determined from a limited dataset of only two to three years per water-year type, it provides an assessment of spill trends to understand when and how likely spill is during different water-year types. Probability of spill was not determined for Above Normal water years because no Above Normal water years occurred between January 1, 2008 and February 29, 2016 in the Sacramento Valley Index (the Above Normal water year in Figures 3-10 and 3-11 was 2005). The probability of spill was highest from December to mid-May, depending on water-year type (Figure 3-13).

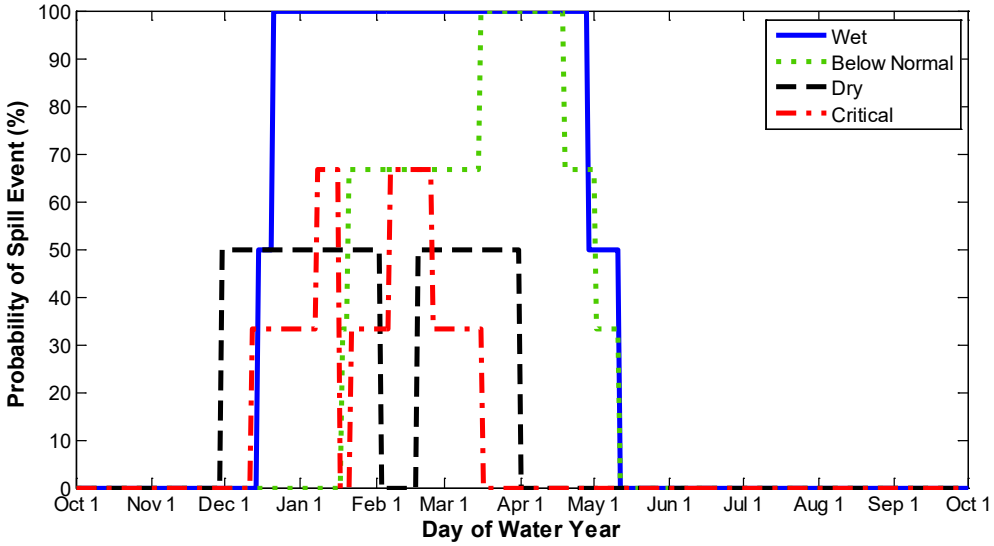


Figure 3-13. Daily probability of a spill event occurring per water year based on spill events from January 1, 2008 to February 29, 2016 (No Above Normal water years existed for the analysis period from January 1, 2008 to February 29, 2016).

Overall, the calculated effective inflow would underestimate the actual inflow to Rector Reservoir, since the flows over the spillway are not included in the effective inflow. However, it provided a useful minimum inflow that can be used for modeling potential release flows downstream of Rector Dam. Analysis of the frequency, timing, and probability of spill events indicated the calculated effective inflow underestimated the actual inflow to Rector Reservoir between approximately 40 days in Critical water years to around 140 days in Wet water years. The effective inflow was most likely to underestimate the actual inflow during Wet and Below Normal water-year types. While the frequency of underestimating the actual inflow was lower during Dry or Critical water-year types, there was still a more than 50 percent chance of underestimating the actual inflow for several weeks to months during the winter period when spilling occurred. While the magnitude of the flow during spill events may be significant and an important component of the total water yield of the Rector Creek watershed, the effective inflow still represents the minimum inflow during spill events and all of the actual net inflow during other time periods. Since the volume of spill cannot be included with the data available, the effective inflow provides a conservative estimate of the total water yield of the Rector Creek watershed, and the actual inflow to Rector Reservoir would be expected to be higher.

3.2.2.2 Reservoir Water Balance Modeling

Rector Reservoir storage from January 1, 2008 to February 29, 2016 was simulated using the calculated effective inflow with a zero dam release flow (i.e., existing conditions) to evaluate the model performance and to verify that mass balance was maintained during the modeling. The optimum value for the NSE is one, percent bias is zero, and RSR is zero with acceptable values varying depending on the time-scale of the model and the parameter being modeled for percent bias. Moriasi et al. (2007) classified model performance as "very good" (the highest performance category) when NSE was greater than 0.75, percent bias was +/- 10 percent for streamflow, and RSR was less than 0.5. The final model performance statistics for the entire water balance period were 1.0 for the NSE, 0.14 percent for the percent bias, and 0.12 for the RSR. Model performance statistics were different from the optimum values due to slight variations between modeled and observed reservoir storage introduced by observed storage occurring at a less frequent time-scale than the daily time-scale of the model and the resulting interpolation needed for a daily time-scale model. While calibration or validation of the model could not be performed since all observed data were necessary to simulate the reservoir storage, the NSE, percent bias, and RSR statistics still provided a check that the model performance was acceptable. Reservoir water balance modeling using the calculated effective inflow is discussed below (Section 4.1.1, *Reservoir Water Balance Modeling*) after a discussion of the interim environmental flow release recommendations (Section 4.1, *Interim Environmental Flow Release Recommendations*).

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Interim Environmental Flow Release Recommendations

Lower Rector Creek is intermittent on the Napa Valley floor with isolated pools. Year-round connected surface flow is unlikely under natural conditions, particularly in the summer–fall months, given: (1) the coarseness of the sediment and subsequent high infiltration rates, (2) low summertime flows into Rector Reservoir, and (3) low bank strength and high coarse sediment supply during peak flows that form broad/shallow wetted channel meanders (i.e., braids) within the straight banks.

The existing spill flows, Fisheries Base discharge, and surface water-groundwater exchange in lower Rector Creek provide higher flows in the winter–spring and isolated pool and run habitat throughout most of the reach in the summer–fall that support a predominantly native fishery. The isolated reaches may limit the establishment of other non-native fishes in lower Rector Creek that are present in the Napa River.

The intermittent flow conditions in lower Rector Creek are similar to other Napa River tributaries where steelhead are supported with intermittent flow (Stillwater Sciences 2007); however, the majority of these tributaries occur on the cooler western side of the valley, whereas Rector Creek is on the sunnier, more arid eastern side of the valley. Lower Rector Creek would not be a productive steelhead stream, given its low gradient channel and limited spawning area, even with modified streamflow releases. Adult *O. mykiss* have been observed in the reach, and juveniles have been observed near the dam, indicating some limited successful spawning has occurred in the past. The stream may contain rearing habitat for juveniles in isolated pools and connected run habitats; however, water temperature and dissolved oxygen conditions are not well understood. Juvenile steelhead in other Napa River tributaries typically rear through the summer and fall, then out-migrate opportunistically in the winter–spring, prior to May, during the wet season (Stillwater Sciences 2007).

Based on the fish species composition and limited spawning habitat for salmonids, our recommendation for interim environmental flows focused on native resident species and maintaining flow within isolated pool and run habitats in the dry months, which would also benefit any rearing steelhead. We recommend an environmental flow release schedule that includes:

- water-year types to reflect variation in the natural hydrograph;
- seasonal releases based on the natural runoff patterns, including increased flow in winter and spring in Critical, Dry, Below Normal, Above Normal, and Wet water-year types; and
- minimum releases in all months to maintain habitat for native fish populations.

Based on these findings, and the approach described in Section 3.1.3, *Interim Environmental Flow Schedule Development*, the recommended interim environmental flow regime is presented in Table 4-1. This flow regime generally recommends winter releases that reflect the base winter inflow to Rector Reservoir (i.e., excluding storm peaks) of 3 to 4 cfs during the winter–spring months, and the base summer inflow to Rector Reservoir of 0.25 to 1 cfs during the summer–fall months. This flow regime also encompasses the minimum flow below the dam that resulted in stream connectivity within portions of the reach with surface flow (approximately 0.25 cfs). The release schedule was then scaled across multiple water-year types to reflect the variability of flows and water availability across water-year types using 0.25 cfs and 4.5 cfs as "book-ends," where releases include 0.25 cfs in the summer–fall months of the Critical and Dry water years and range up to 4.5 cfs in the winter–spring months of the wetter years (Above Normal and Wet).

This environmental flow schedule would enhance existing conditions in lower Rector Creek by: (1) connecting and/or lengthening the isolated habitats in the summer and fall, (2) extending periods of continuous surface flow in the winter and spring, and (3) potentially buffering the magnitude and duration of spill flows, although the degree that this would be beneficial is uncertain. This schedule uses the unimpaired hydrology for the summer and winter base flows and maintains the shape of the natural hydrograph by aligning the higher flows with periods when Rector Dam is typically spilling (see shaded blue cells in Table 4-1 and Figure 3-13).

The Fisheries Base discharge was included as part of the environmental flow recommendations since the majority of lower Rector Creek will benefit from the release. Specifically, the recommended environmental flow releases are intended to be met using a combination of releases from Rector Dam and the Fisheries Base discharge. Coordinated releases would achieve the environmental flows goal while conserving water. Table 4-2 describes average Fisheries Base discharges, and Table 4-3 provides a rough approximation of required releases from Rector Dam needed to achieve the recommended flows.

The interim environmental flow release schedule was evaluated using the water balance model to simulate Rector Reservoir storage to assess the availability of storage to meet the interim environmental flow releases. However, the simulated reservoir storage represents the minimum storage available for interim environmental flow releases, since the volume of water over the spillway during spill events is generally unknown, and this volume is not included as "recharge" in simulating reservoir storage. We anticipate that with this release schedule, there will still be additional flows from spill events. Unfortunately, sufficient data are not available at this time to estimate this volume.

Table 4-1. Proposed interim environmental flow release schedule for outflows below Rector Creek Dam (flows shaded blue represent the increased flow levels for winter and spring migration and spawning).

Water-Year Type[1]	Minimum Environmental Flow Releases[2] (cfs)														
	Oct	Nov	Dec 1-15	Dec 16-31	Jan	Feb 1-15	Feb 16-30	Mar 1-15	Mar 16-31	Apr	May	Jun	Jul	Aug	Sep
Wet	0.8	0.8	1.5	2.5	3.5	4.0	4.0	4.5	4.5	2.5	2.5	1.0	0.8	0.8	0.8
Above Normal	0.7	0.7	1.3	1.3	3.5	4.0	4.0	4.5	3.0	2.5	2.5	1.0	0.5	0.5	0.5
Below Normal	0.7	0.7	1.3	1.3	2.5	2.5	4.0	3.5	3.0	2.5	2.5	1.0	0.5	0.5	0.5
Dry	0.25	0.50	1.0	1.0	2.0	2.5	2.5	3.0	3.0	2.5	1.5	1.0	0.25	0.25	0.25
Critical	0.25	0.50	1.0	1.0	2.0	2.2	2.2	2.8	2.8	2.5	1.0	0.5	0.25	0.25	0.25

[1] Water-Year Type based on the DWR Sacramento Valley Index.
[2] Rector Dam minimum environmental flow releases consider the Fisheries Base discharge releases for stream habitat; however, compliance is met by releases from Rector Dam.

Table 4-2. Average Fisheries Base discharge (2008–2016).

Water-Year Type[1]	Average Fisheries Base Discharge[2] (cfs)														
	Oct	Nov	Dec 1-15	Dec 16-31	Jan	Feb 1-15	Feb 16-30	Mar 1-15	Mar 16-31	Apr	May	Jun	Jul	Aug	Sep
--	0.2	0.3	0.8	0.8	1.6	2.0	2.0	2.6	2.6	2.3	1.7	0.5	0.0	0.0	0.0

[1] Water-Year Type based on the DWR Sacramento Valley Index.
[2] The Fisheries Base discharges are variable. Based on analysis of available Fisheries Base diversion data from January 1, 2008 to February 29, 2016.

Table 4-3. Approximate releases from Rector Dam considering average Fisheries Base discharges.

Water-Year Type[1]	Approximate Releases from Dam[2] (cfs)														
	Oct	Nov	Dec 1-15	Dec 16-31	Jan	Feb 1-15	Feb 16-30	Mar 1-15	Mar 16-31	Apr	May	Jun	Jul	Aug	Sep
Wet	0.6	0.5	0.7	1.7	1.9	2.0	2.0	1.9	1.9	0.2	0.8	0.5	0.8	0.8	0.8
Above Normal	0.5	0.4	0.5	0.5	1.9	2.0	2.0	1.9	0.4	0.2	0.8	0.5	0.5	0.5	0.5
Below Normal	0.5	0.4	0.5	0.5	0.9	0.5	2.0	0.9	0.4	0.2	0.8	0.5	0.5	0.5	0.5
Dry	**0.2**	0.2	0.2	0.2	0.4	0.5	0.5	0.4	0.4	0.2	**0.2**	0.5	0.25	0.25	0.25
Critical	**0.2**	0.2	0.2	0.2	0.4	0.2	0.2	0.2	0.2	0.2	**0.2**	**0.2**	0.25	0.25	0.25

[1] Water-Year Type based on the DWR Sacramento Valley Index.
[2] Approximate releases from Rector Dam were calculated as the difference between the (a) minimum environmental flow release schedule, and (b) the approximate Fisheries Base discharge. The minimum environmental flow release at the dam shall be no less than 0.2 cfs (see **bold blue text** for example).

4.1.1 Reservoir Water Balance Modeling

Rector Reservoir storage was modeled from January 1, 2008 to February 29, 2016 under the recommended interim environmental flow release schedule to (1) evaluate the availability of reservoir storage for environmental flow releases (including Fisheries Base releases) and (2) to identify the remaining water available for diversion by the WTP and CalFire training facility (Figure 4-1). Simulated reservoir storage from 2008 to 2016 was typically near full conditions under only the recommended interim environmental flow releases (i.e., dam and Fisheries Base releases, but no WTP or CalFire diversion flows), indicating sufficient reservoir storage is available to meet the recommended interim environmental flow releases, even without being able to account for reservoir refilling from historical spill volumes. The minimum reservoir storage under the recommended interim environmental flow releases was approximately 3,843 acre-feet and occurred at the beginning of October 2009 after a Dry water year (WY 2009) ended. Similar decreases in simulated reservoir storage also occurred during or immediately following Dry (WY 2013) or Critical (WY 2008 and WY 2015) water years.

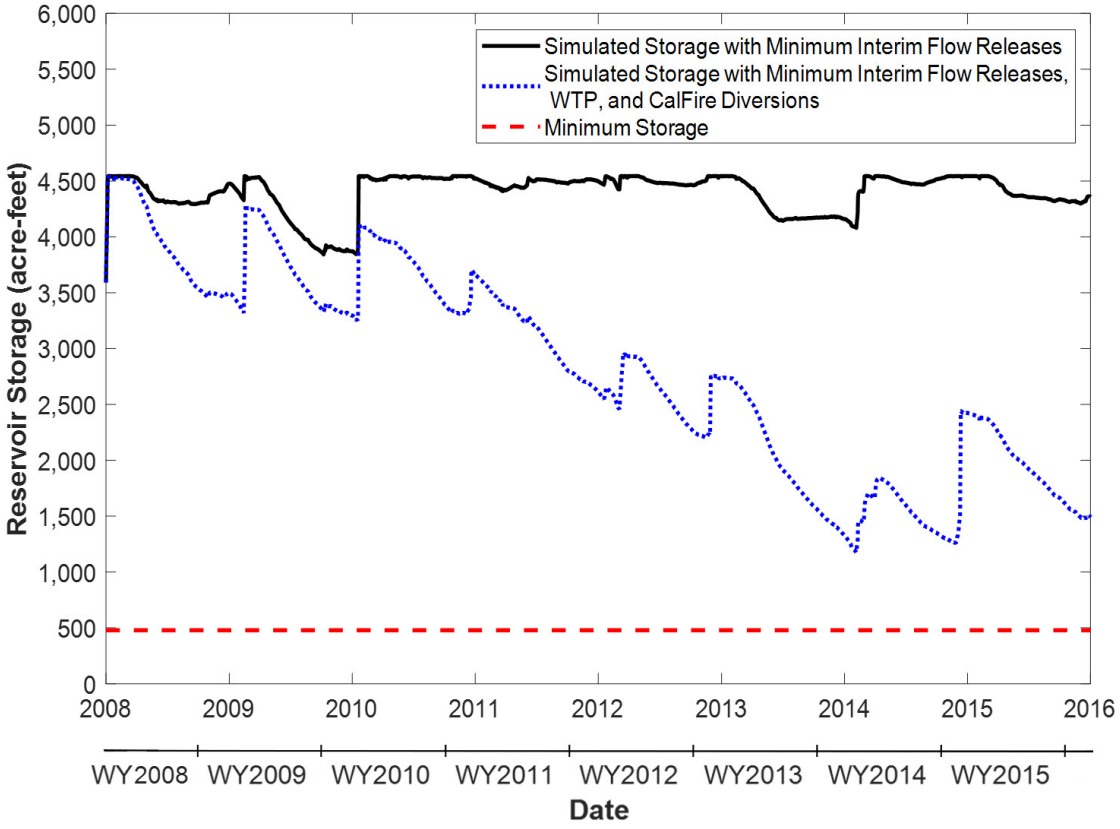


Figure 4-1. Simulated Rector Reservoir storage volume with the interim environmental flow release schedule and with both the interim environmental flow release schedule and historical diversions to the water treatment plant (WTP) and CalFire, but without refilling from historical spill volumes.

Simulated reservoir storage was also modeled from January 1, 2008 to February 29, 2016 with the recommended interim environmental flow releases, along with the measured historical diversions to the WTP and the CalFire training facility (Figure 4-1), but without the historical spill volumes. Even without the inclusion of historical spill flows, the reservoir maintained

storage levels over 696 acre-feet for 8 years, although showed a consistently decreasing trend until WY 2014 before slightly increasing until the end of the modeling in 2016 (the minimum simulated reservoir storage of approximately 1,174 acre-feet results in a minimum usable storage of approximately 696 acre-feet after accounting for the inaccessible storage below the lowest operational intake). The decrease in modeled reservoir storage between 2008 and 2014 was likely due to the exceptional drought conditions during that time and the effective inflow underestimating the actual inflow during spill events.

Much of the inflow to Rector Reservoir flows over the spillway based on the analysis of the frequency, timing, and probability of spill events, but the lack of data for quantifying flows over the reservoir spillway prevented its inclusion in this analysis. The potentially substantial volume of inflow that went over the spillway from 2008 to 2016 could not be included in the model simulation, so the simulated storage represents the minimum reservoir storage. The actual reservoir storage volume with the interim environmental flow release schedule implemented would be consistently greater than the simulated reservoir storage. However, the magnitude of the storage difference between the actual and simulated reservoir storage is unknown, since data are not available to better quantify of the volume of flow over the spillway during spill events. Overall, the minimum reservoir storage simulated by the model shows there was always sufficient storage available between 2008 and 2016 to meet both the interim environmental flow releases and historical WTP and CalFire diversions; however, storage diminished annually, especially in dry and critically dry years, and may have been exaggerated by drought conditions in 2011–2014.

The interim environmental flow schedule enhances the existing Fisheries Base discharge flows (Figure 4-2). The calculated effective inflow indicated the minimum natural flow in Rector Creek flowing past the dam location from August to October ranges from approximately 0.2 cfs to 0.5 cfs, depending on water-year type. During the modeling period, 55 percent of the water years (5 of 9) were either Dry or Critical. A minimum flow of 0.25 cfs to 0.5 cfs was used for the interim environmental flow releases downstream of Rector Dam during the summer and fall for these water-year types. The interim environmental flow release schedule was able to replicate some of the variability of a natural hydrograph by variations in Rector Creek flows based on the water-year type and seasons. While the model simulated the Rector Creek flow downstream of the Rector Dam spillway and at the Fisheries Base discharge point 0.35 miles downstream of the dam, the actual flow in Rector Creek is unknown, since there was no flow gage on Rector Creek during the modeling period; the flow over the spillway during spill events is unknown; and the amount of surface water-groundwater exchange in lower Rector Creek also is unknown. The actual hydrograph and flow in lower Rector Creek under the interim environmental flow release schedule could not be assessed with available data.

4.2 Additional Information Needed for the Development of the Draft Operations Plan

Multiple data limitations related to hydrology, fish condition, and instream flow conditions were encountered in the modeling of the reservoir storage and the development of the interim release schedule flows. These data limitations need to be addressed to better quantify the available water for releases downstream of Rector Reservoir.

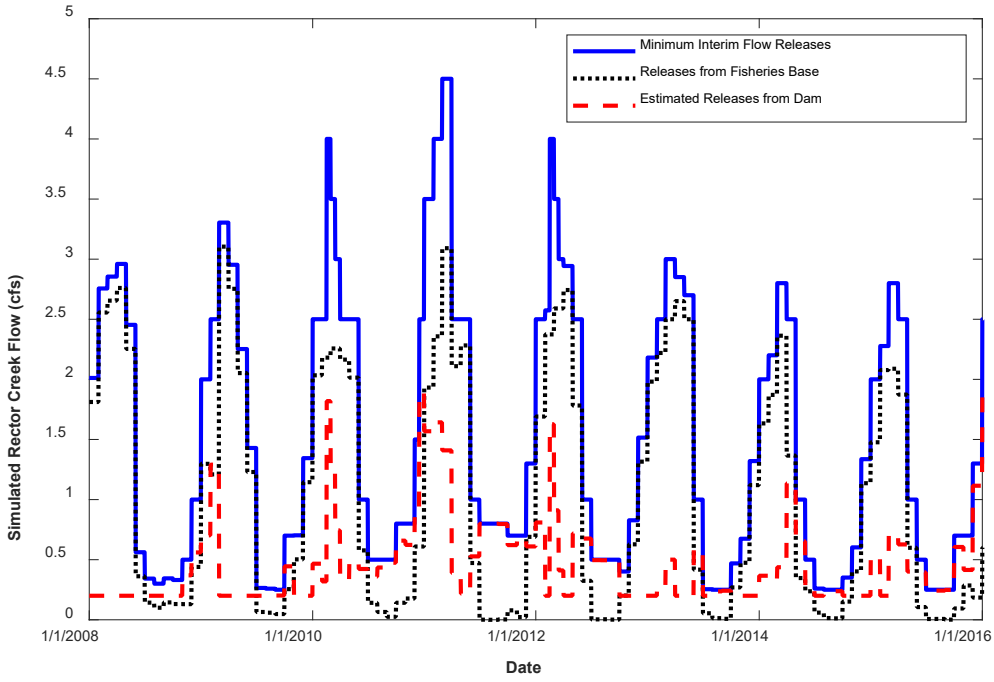


Figure 4-2. Simulated lower Rector Creek flow under the interim minimum flow release schedule with approximated releases from the Fisheries Base and dam.

4.2.1 Hydrology and Reservoir Operations

The most significant data limitation of the hydrologic assessment was the absence of sufficient data to determine the magnitude of flows over the Rector Reservoir spillway during spill events. A potentially significant portion of the total water yield from the Rector Creek watershed is unknown because there were simply no data to quantify it. It is important to determine spillway flows in order to calculate the actual reservoir storage changes under release schedule flows and to assess the available water for releases downstream of Rector Reservoir. The following recommendations address the data limitations for the Rector Creek watershed and would improve estimates of the available volume of water for releases downstream of Rector Reservoir:

- Development of a total watershed runoff model (upstream of the reservoir) to estimate total reservoir inflow with a reasonable margin of error. The model could be refined and reused in the future, as additional stage/flow data are collected.
- Installation of a reservoir elevation gage in Rector Reservoir to automatically record the reservoir elevation on at least a daily basis. More frequent measurements of the reservoir stage would reduce the uncertainty and error of water balance modeling and provide a better estimate of the available water for releases downstream.
- Installation of a flow gage at the new release valve at the base of Rector dam, or in lower Rector Creek, to assess flow in Rector Creek (note that due to the variability in surface flow downstream of the dam, flow gages within the creek may have inherent challenges).

- If a gage is installed at a new valve, rather than in the channel, installation of a gage to measure flow over the Rector Dam spillway.
- Development of a stage/flow rating curve for streamflow releases and for water passing over the spillway.
- Calculation of the water-year type for the Napa River watershed based on precipitation data from gages located in the Napa Valley. Determining the water-year type specifically for the Napa River watershed would ensure the appropriate release schedule is selected and higher releases would only occur during water years when the water yield from Rector Creek watershed is higher.
- Installation of a precipitation gage in the Rector Creek watershed to ensure that sufficient data are available to determine the specific water-year type for the watershed.

4.2.2 Fish Populations and Condition

A preliminary assessment of existing Rector Creek stream channel conditions and fish populations downstream of Rector Dam identified additional information needed to assess the condition of the fishery and to develop an Operations Plan. The following recommendations address the data needed to assess the condition of fish in lower Rector Creek:

- Collection of contemporary BMI data using Surface Water Ambient Monitoring Program (SWAMP; Ode 2007) protocols, with one additional baseline site located upstream of Rector Reservoir.
- Collection of current fish population data and evaluations of:
    - species composition, distribution, and abundance, and comparisons to historical conditions,
    - age-class distribution,
    - individual fish condition (e.g., size, growth rates, and presence of disease, parasites, or lesions), and
    - fish community condition (e.g., community structure, food availability, resilience, habitat conditions).



Rector Creek Stream Channel downstream of State Lane, intermittent flow, isolated pool habitat, April 2018.

- Collection of continuous water temperature data at three to four pools between Rector Dam and the confluence with Conn Creek.
- Collection of a water temperature and dissolved oxygen profile near the intake structure in the reservoir.

4.2.3 Long-Term Environmental Flow Releases

A Physical Habitat Simulation (PHABSIM) Model approach to an instream flow assessment would likely be unsuccessful due to the coarseness and varying infiltration rates throughout the reach; the driving factors behind instream flow release schedules are likely to be fish passage (upstream and downstream), stream continuity, and water availability, rather than nuanced depth

and velocity relationships that would be assessed with a PHABSIM model. Therefore, we recommend an assessment of streamflow to:

- identify releases necessary to connect habitats throughout the stream reach for migrating fishes,
- identify releases necessary to maintain adequate stream habitat conditions to keep native fish in good condition, and
- identify flows necessary to provide suitable spawning habitat for native fishes present in lower Rector Creek.

Following additional data collection and synthesis, we recommend re-evaluation/refinement of the timing, magnitude, and conditions of the Rector Creek environmental flow release schedule based on the condition of the fishery and updated hydrology of Rector Creek.

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APPENDIX 3.3-D

Operations Simulation Modeling
Rector Reservoir Bypass Valve Project

WESTERN HYDROLOGICS
WATER & HYDROPOWER CONSULTING

TECHNICAL MEMORANDUM

TO: Chris Stabenfeldt / Rick Hanson

FROM: Jeff Meyer

DATE: April 2021

RE: ***Rector Reservoir Operations Simulation modeling***

The purpose of the operations simulation model is to test the ability of the Rector Reservoir System to meet current and future (build out) demand under various minimum instream flow regimes. These scenarios were tested over the 2008-2019 study period to include the hydrologic variability which occurs in the basin. To meet CEQA requirements, these scenarios were tested with both historic and climate change hydrology. The table below provides a guide to the studies performed for this effort.

Table 1. Model Scenario Summary Table

Scenario	Hydrology	Study Period	Demand	Environmental Flows
Current Conditions	Historic	2008-2019	Current	Existing
Current Conditions with Project	Historic	2008-2019	Current	Interim Environmental Flow Release Recommendations
Future Conditions No Project	2070 Climate Change	2008-2019 modified by climate change factors	Build Out[1]	Existing
Future Conditions with Project	2070 Climate Change	2008-2019 modified by climate change factors	Build Out[1]	Interim Environmental Flow Release Recommendations

Hydrology

As part of the model development, two hydrology datasets were evaluated. The first data set was developed by the California Department of Water Resources as part of a Yield Study of Rector Reservoir in 2013. The hydrology developed for the Yield Study used a monthly timestep with a 1916 – 2011 period of record. The second dataset was developed by Stillwater

[1] Build out demands in the Future condition were evaluated both with and without the Napa State Hospital demand of 500 AF per year. The DWR Yield study states the Napa State Hospital has not received Rector Water since the Atlas Peak fire in 1981. The hospital could opt for future Rector deliveries if the price of water, including wheeling charges, becomes less than the price the hospital now pays to the City of Napa. According to Section 14715 of California Government Code, the Veterans Home shall have the first and prior right to water stored at Rector Dam.

Sciences to support the determination of minimum instream flows to support the Rector Reservoir Valve Replacement Project. The Stillwater hydrology dataset uses a daily time step with a 2008 – 2019 period of record.

To thoroughly test the proposed flow regime, daily unimpaired Rector Reservoir inflow hydrology was developed from 1917-2011 monthly hydrology presented in the Rector Reservoir Yield Study by DWR dated May 2013. The monthly data was disaggregated to daily data using nearby gage records and statistical methods. The Original plan was to append Stillwater's 2008-2016 daily hydrology to the DWR hydrology. As a check on the performance of the two data sets, a comparison of the overlapping 2008 – 2011 period was conducted. Figure 1, below, illustrates the differences in inflow timeseries for this period.

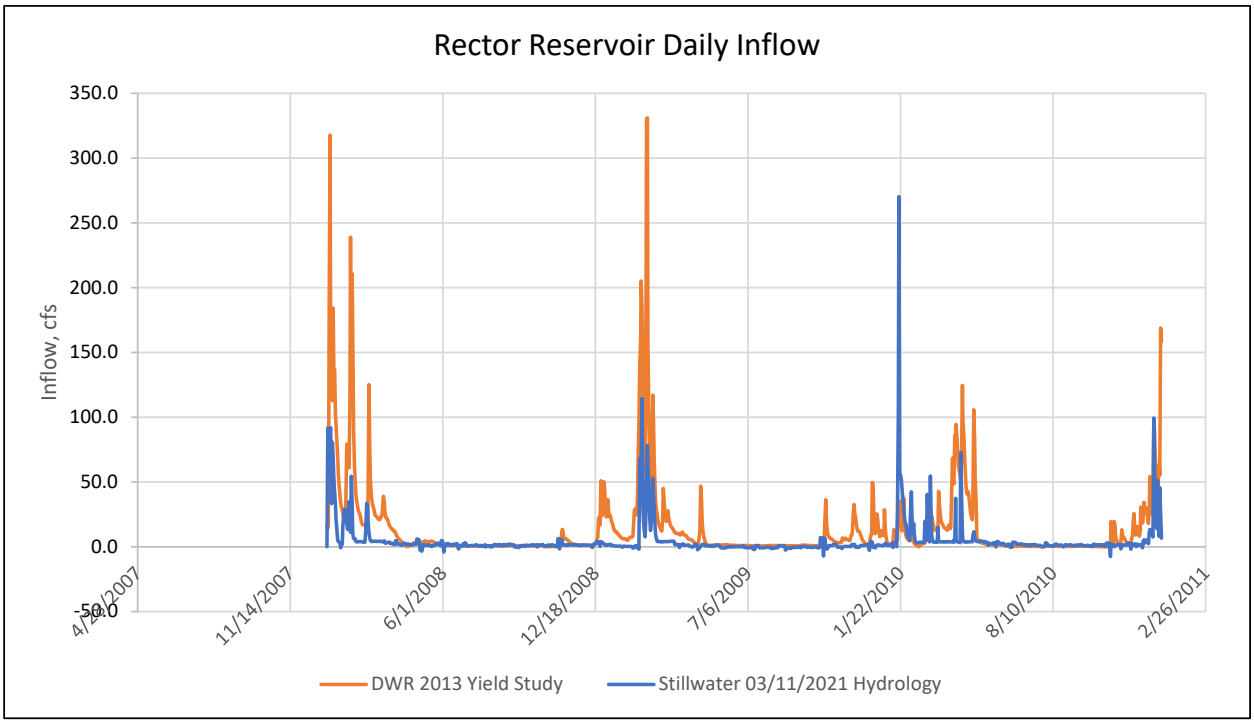


Figure 1. Rector Reservoir Inflow Comparison

Figure 1 illustrates significant differences in magnitude and pattern. Following this discovery, annual volumes of the two datasets were compared and shown in Figure 2.

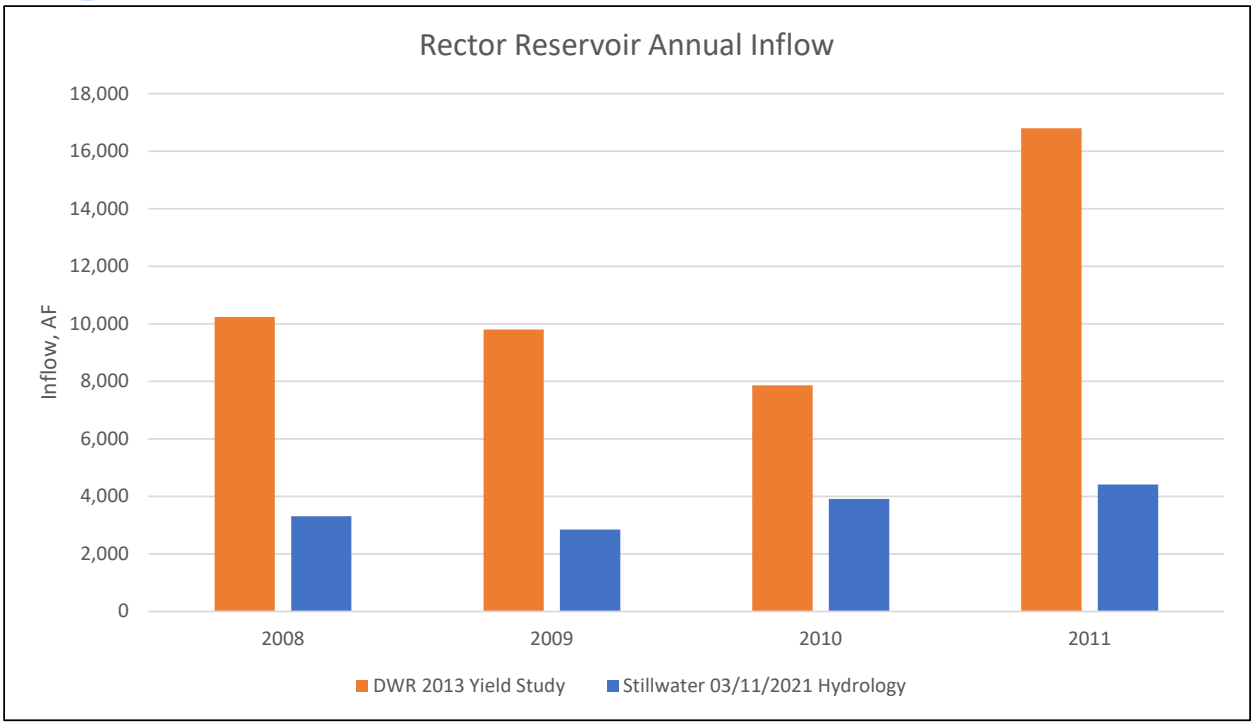


Figure 2. Rector Reservoir Annual Inflow

Figure 2 illustrates the magnitude of differences between the DWR dataset and the Stillwater dataset. Note the DWR volumes are about 2 – 4 times greater than the Stillwater volumes. Given the magnitude of these differences, a comparison of Rector Reservoir System modeled output compared to the historic storage data was performed. Figure 3 illustrates the differences in the results. Use of the Stillwater hydrology results in a very close reproduction of the historic storage. Use of the DWR hydrology results in a significant overestimate of storage and spills from Rector Reservoir.

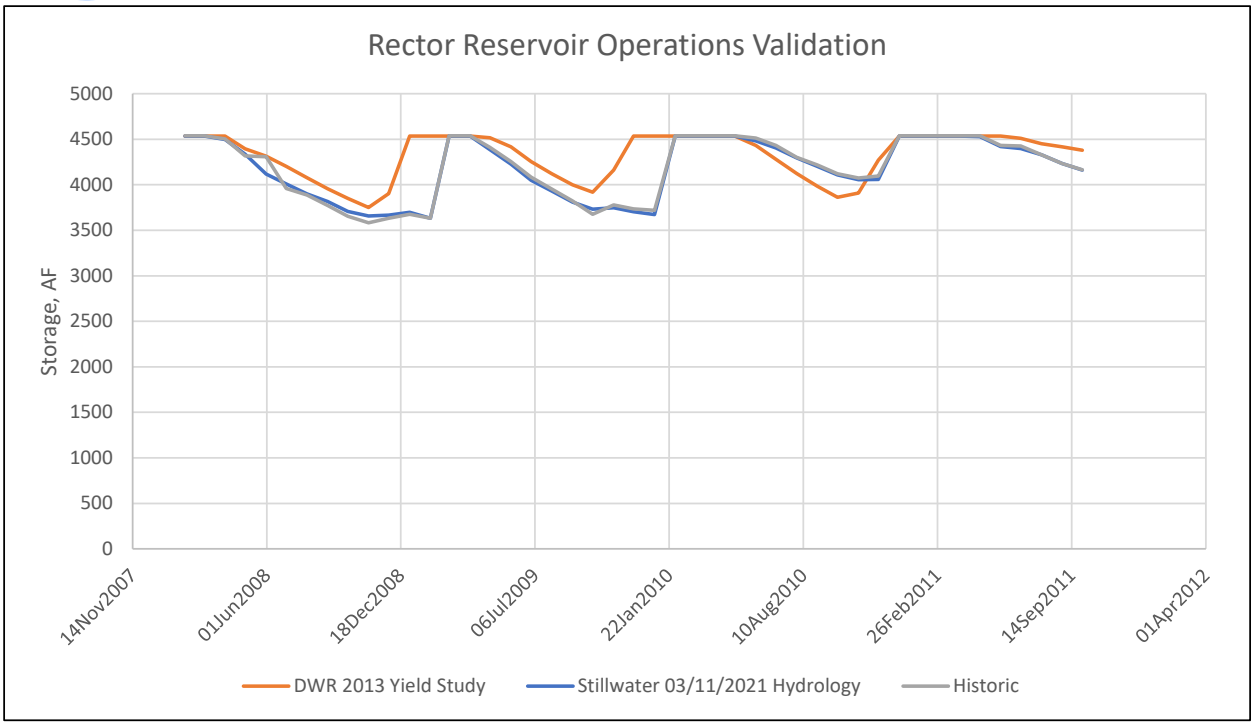


Figure 3. Rector Reservoir Hydrology Development

Based on these comparisons, the Stillwater hydrology was selected as the best available data and was chosen for the analysis of this project. Results of the review of the hydrology indicates the methods used by Stillwater produced a dataset more representative of the Rector Creek watershed than the DWR dataset. Although the record is short there is significant hydrologic variability within the record enabling testing of the full range of the Interim Environmental Flow Release Recommendations (IEFR).

Climate Change Hydrology

Climate change adjusted hydrology was developed using the data products from the California Water Commission's dataset for Water Storage Investment Program applications. These data products include the results from statewide Variable Infiltration Capacity (VIC) watershed runoff models performed with historical meteorology and climate change adjusted meteorology using climate change assumptions centered at the year 2070. These VIC models are better suited to be used in a comparative manner rather than predictive, and for this reason a ratio is taken of climate change adjusted VIC model output to historic meteorology VIC model output. These ratios are applied to historical hydrology for the 2008 – 2019 period to estimate the climate change adjusted hydrology. For the 2012 – 2019 period, similar years from the 1916 – 2011 record were selected and applied climate change factors from those similar years to 2012 – 2019 historic unimpaired flow data. The hydrology dataset was developed for the Rector Creek watershed and is consistent with Commission methods on a daily time step.

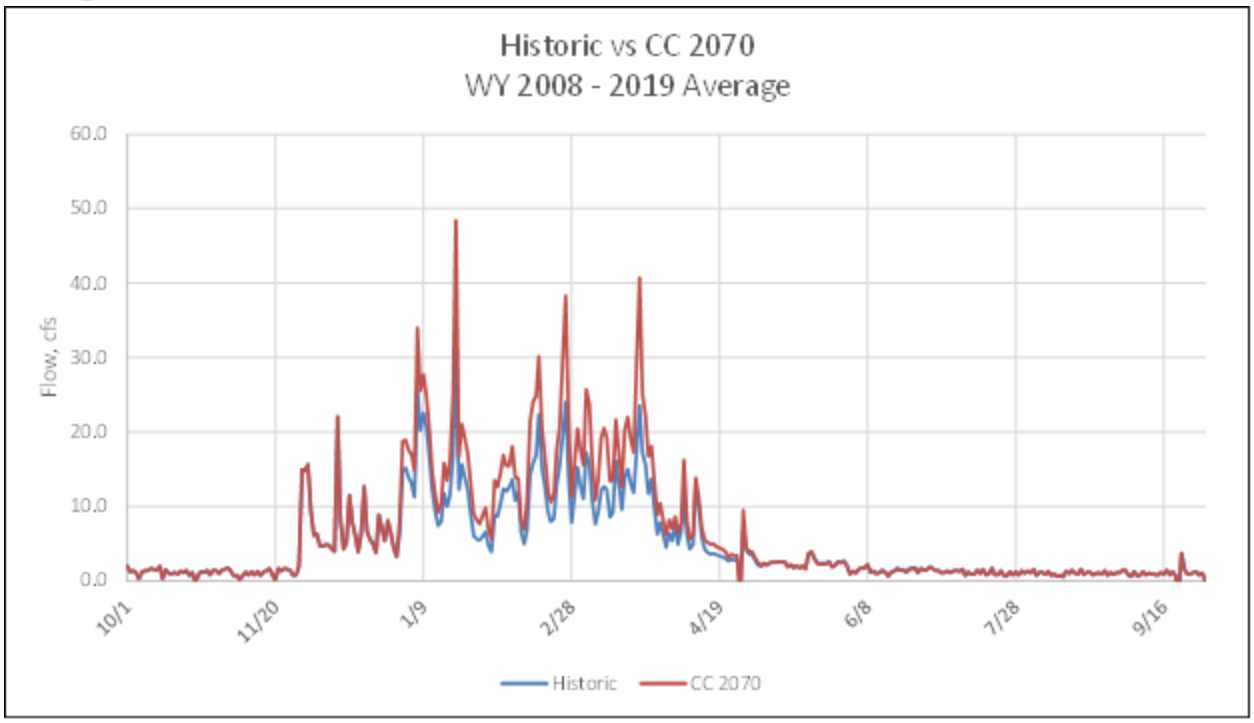


Figure 4. Unimpaired Rector Reservoir Inflow

Figure 4 illustrates the Historic unimpaired inflow to Rector Reservoir compared to the 2070 level of Climate Change Hydrology. Annual volumes are roughly 14% higher than historic hydrology.

These CWC data products contain watershed runoff modeling results for two climate conditions as shown in table 2, below.

Table 2. Climate Conditions

Condition	**Description**
Historical	Historical temperature detrended conditions for a thirty-year period centered on 1995 (1981-2010)
2070 Future Conditions	Future conditions projected climate for a thirty-year period centered on 2070 (2056-2085)

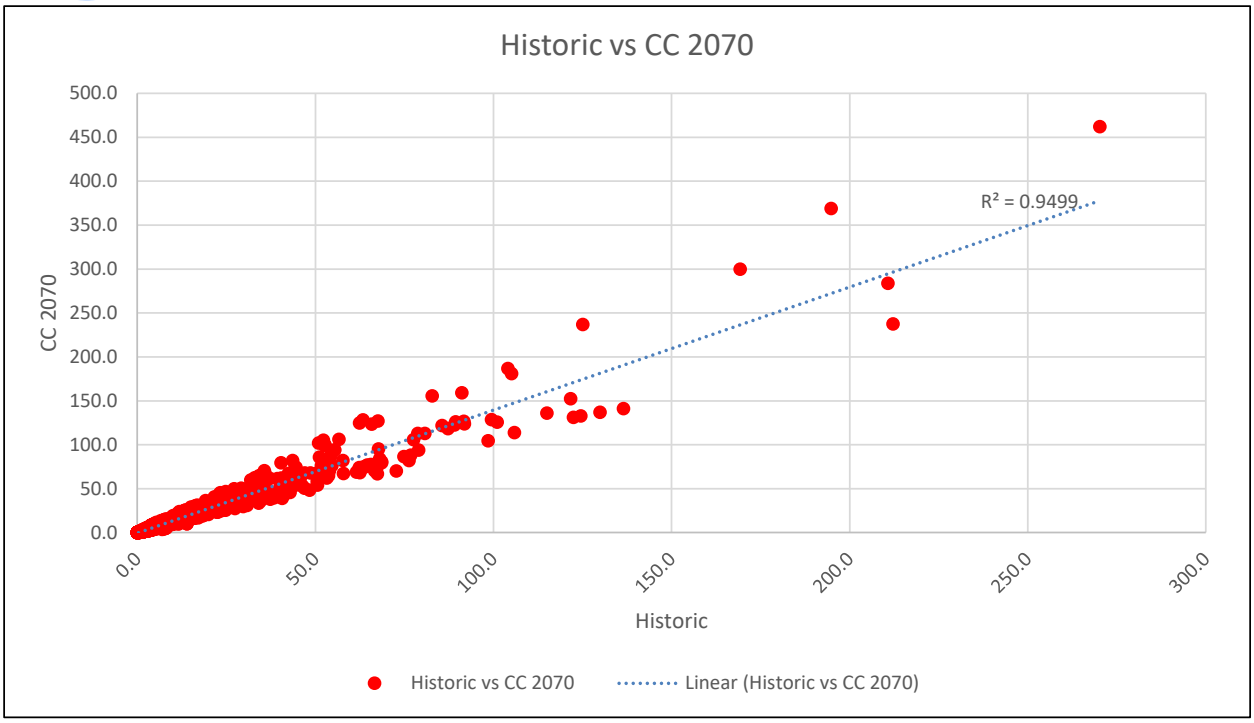


Figure 5. Historic vs CC 2070

Figure 5 shows a how the two datasets compare. The Climate change scenario tends to be wetter than the historic hydrology. This seems to be common among the more coastal watersheds.

Water Year Types

The water year types and associated minimum instream flow regime proposed by the Stillwater team was tested over a range of hydrologic conditions using the 2008-2019 period at both the historic and 2070 climate conditions.

Water years types used by the model are determined using cumulative precipitation as measured by the Atlas Peak Gage. The method for determining the water year type is as follows:

1) October is automatically assigned the same water year type as the previous month (September).

2) At the beginning of each month (except October), the total monthly precipitation and the current water year cumulative precipitation are calculated.

3) The current water year cumulative precipitation is compared with the average cumulative precipitation thresholds for the previous month for the very dry, dry, average, wet, and very wet water years. The current water year for the upcoming month is equal to highest average cumulative precipitation threshold exceeded by

the current water year cumulative precipitation. For example, if the current water year cumulative precipitation on November 1 is 1.5 inches, it is compared with the average cumulative precipitation thresholds for October (Very Dry = 0.99, Dry = 1.21, Average = 1.87, Wet = 2.52, Very Wet = 2.85), and the current water year for the upcoming month is equal to "Dry" since the current water cumulative precipitation exceeds the "Dry" threshold for October.

Table 3. Average Cumulative Precipitation (Inches)

Month	Very Dry	Dry	Average	Wet	Very Wet
Oct	0.99	1.21	1.87	2.52	2.85
Nov	2.12	3.99	6.55	7.85	8.21
Dec	5.27	7.77	12.89	17.29	19.39
Jan	7.44	13.39	19.45	28.92	32.50
Feb	11.56	17.95	25.37	37.46	43.29
Mar	14.41	21.57	30.30	42.86	49.85
Apr	15.86	22.82	32.62	44.95	54.86
May	16.33	23.73	33.41	46.02	55.69
Jun	16.69	23.96	33.60	46.31	56.17
Jul	16.69	23.97	33.62	46.38	56.18
Aug	16.93	24.02	33.68	46.39	56.27
Sep	17.52	24.53	33.91	46.91	56.65

4) Total monthly precipitation is compared with the water month exceedance probabilities thresholds for that month to estimate the water year type for the upcoming month. The water month type for the upcoming month is equal to highest water month exceedance probabilities threshold exceeded by the total monthly precipitation for the previous month. For example, if the total monthly precipitation for October is 1.5 inches, it is compared with the water month exceedance probabilities thresholds for October (Very Dry < 0, Dry < 0.44, Average < 2,16, Wet < 4.97, Very Wet > 4.97), and the water year type for the upcoming month is equal to "Average" since the total monthly precipitation for October was greater than the "Dry" threshold, but less than the "Average" threshold.

Table 4. Monthly Precipitation Exceedance Probability

Month	90%	66%	33%	10%
Oct	0.00	0.44	2.16	4.97
Nov	0.00	1.51	4.81	9.79
Dec	0.76	3.26	8.12	14.04
Jan	0.47	4.44	8.55	16.85

Feb	0.60	3.22	8.29	15.47
Mar	0.07	2.65	5.45	9.82
Apr	0.00	0.81	2.32	5.88
May	0.00	0.00	0.83	2.60
Jun	0.00	0.00	0.02	0.80
Jul	0.00	0.00	0.00	0.00
Aug	0.00	0.00	0.00	0.22
Sep	0.00	0.00	0.11	1.15

5) The water year type estimated using the current water year cumulative precipitation and the total monthly precipitation are compared and the drier water year type is chosen as the overall water year type for the upcoming month. For example, cumulative precipitation predicted a "Dry" water year and total monthly precipitation estimated an "Average" water year, so the overall is estimated to be "Dry".

Minimum Flow Requirements

The minimum release requirements for all year types used for the studies without the Valve Replacement project are an average of the 2008 – 2016 historical releases shown in *Table 5 – Average Minimum Flow Requirement*. These releases are used for all year types in the no project scenarios delivered through the CDF&W hatchery, then released to Rector Creek. For the Future condition scenarios, in addition to the deliveries to the CDF&W hatchery, the "with

Table 5. Average Minimum Flow Requirement

Water Year Type	Historic Average Fisheries Base Discharge (cfs)													
	Oct	**Nov**	**Dec 1-15**	**Dec 16-31**	**Jan**	**Feb 1-15**	**Feb 16-28**	**Mar 1-15**	**Mar 16-31**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
All	0.2	0.3	0.8	0.8	1.6	2.0	2.0	2.6	2.6	2.3	1.7	0.5	0.0	0.0	0.0

Table 6. Proposed Environmental Release Schedule

Water Year Type	Minimum Environmental Flow Releases (cfs)														
	Oct	**Nov**	**Dec 1-15**	**Dec 16-31**	**Jan**	**Feb 1-14**	**Feb 16-28**	**Mar 1-15**	**Mar 16-31**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Very Wet	0.6	0.5	0.7	1.7	1.9	2.0	2.0	1.9	1.9	0.2	0.8	0.5	0.8	0.8	0.8
Wet	0.5	0.4	0.5	0.5	1.9	2.0	2.0	1.9	0.4	0.2	0.8	0.5	0.5	0.5	0.5
Average	0.5	0.4	0.5	0.5	0.9	0.5	2.0	0.9	0.4	0.2	0.8	0.5	0.5	0.5	0.5
Dry	0.2	0.2	0.2	0.2	0.4	0.5	0.5	0.4	0.4	0.2	0.2	0.5	0.25	0.25	0.25
Very Dry	0.2	0.2	0.2	0.2	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.25	0.25	0.25

Table 7. Total release (Hatchery + Environmental Releases)

Water Year Type	Total Minimum Environmental Flow Releases (cfs)														
	Oct	**Nov**	**Dec 1-15**	**Dec 16-31**	**Jan**	**Feb 1-14**	**Feb 16-28**	**Mar 1-15**	**Mar 16-31**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Very Wet	0.8	0.8	1.5	2.5	3.5	4.0	4.0	4.5	4.5	2.5	2.5	1.0	0.8	0.8	0.8
Wet	0.7	0.7	1.3	1.3	3.5	4.0	4.0	4.5	3.0	2.5	2.5	1.0	0.5	0.5	0.5
Average	0.7	0.7	1.3	1.3	2.5	2.5	4.0	3.5	3.0	2.5	2.5	1.0	0.5	0.5	0.5
Dry	0.25	0.5	1.0	1.0	2.0	2.5	2.5	3.0	3.0	2.5	1.5	1.0	0.25	0.25	0.25
Very Dry	0.25	0.50	1.0	1.0	2.0	2.2	2.2	2.8	2.8	2.5	1.0	0.5	0.25	0.25	0.25

project" studies include the year type based interim flow proposal shown in *Table 6 – Proposed Environmental Release Schedule*. These releases will be made through the new valve directly to the creek at the base of the Rector Dam Spillway. Approximate total releases from Rector Reservoir to the creek is shown in *Table 7 – Total Release (Hatchery + Environmental Releases).* Converted to volumes, the releases to the creek are shown in Table 8 below.

Table 8. Summary of Hatchery and Environmental Releases

Water Year Type	Existing Releases (AF)	Proposed Interim Releases (AF)
Very Wet	720	1,444
Wet	720	1,285
Average	720	1,152
Dry	720	900
Very Dry	720	810

Consumptive Demands

Another stressor on the Rector Reservoir water supply is the Build out consumptive demands, shown in Table 9, below. Build out demands are expected to be 590 AF/Yr more than the existing demand.

Table 9. Consumptive Demands[2]

Contractor	Existing	Build out
CDF&W Potable	1.9	10
WTP Process Water	113	167
Vyborny	3.6	5
Duckhorn	3.7	5
Napa County Corp Yard	1.9	3
Town of Yountville	500	500
Museum	1	1
Veterans Home	600	650
Golf Course	2.5	3
Napa State Hospital	0	500/0
Total Potable Water Demand	**1,228**	**1,841[3]/1,341[4]**

The hydrologic variability contained in the hydrology dataset is sufficient to test the system's ability to meet all water supply needs while observing the limitations of the CalVet water rights and the proposed minimum interim flow regime.

[2] Existing and Buildout demands derived from 2013 DWR Yield Study with guidance from a Rector Reservoir Operator. Buildout scenarios were evaluated with and without Napa State Hospital demand. Although Napa State Hospital can take water from Rector Reservoir, no diversions have been made since 1981.
[3] Full Build out demands.
[4] Build out demands without Napa State Hospital.

Model Schematic

The model schematic shown in Figure 6 illustrates the model facilities and linkage. The modeled facilities are overlayed on the watershed features to approximate the geographic location of the facilities. The schematic is made up of three node types and two link types, described below.

Nodes

- Rector Reservoir Storage
- Consumptive demands
- Junctions or points of interest

Arcs

- Natural channel
- Canal or Pipelines

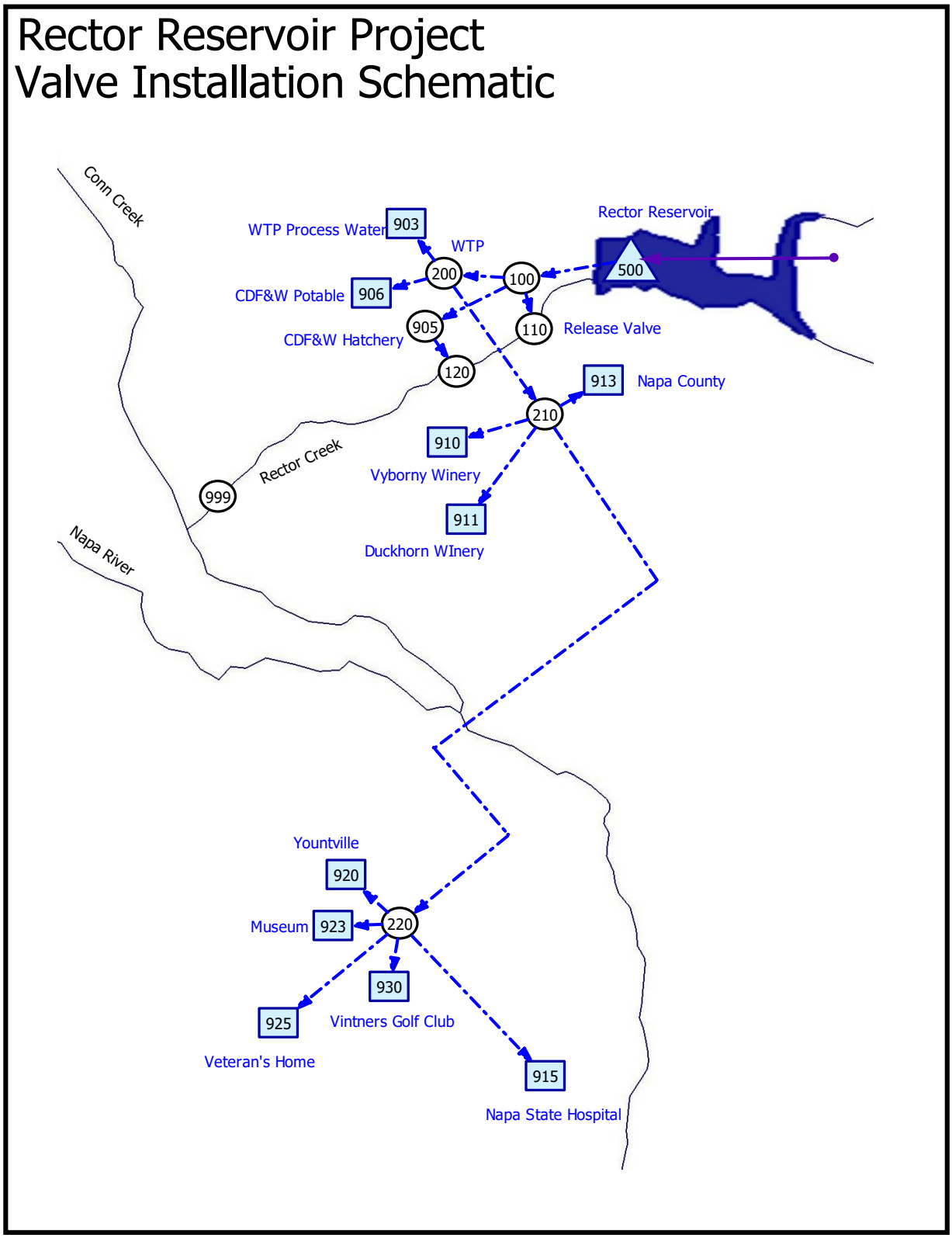


Figure 6. Rector Reservoir System Schematic

The schematic is constructed to include all facilities needed to represent the proposed minimum instream flow down the Rector Creek natural channel through the new release structure, spills through the dam spillway, deliveries to the CDF&W fish hatchery, and diversions to the water treatment plant for treated water delivery to the CalVet contractors. As flow requirements and consumptive demands increase, the water supply developed by the Rector Reservoir system are tested. Results from these studies identify water supply impacts that may occur. These results could help shape the minimum instream flow regime to balance water supply with environmental needs.

Results

The results of these studies are split into Existing Conditions and Future Conditions.

Existing Condition

Existing condition studies represent current historic hydrology and existing demands. Table 10, below, summarizes the assumptions for both studies.

Table 10. Current Level Studies

Scenario	Hydrology	Study Period	Demand	Environmental Flows
Current Conditions	Historic	2008-2019	Current	Existing (2008-2016 Average Minimum Flow Requirement)
Current Conditions with Project	Historic	2008-2019	Current	Interim Environmental Flow Release Recommendations

The only difference between these studies is the addition of the Interim Environmental Flow Release (IEFR). All differences in the results of these studies are due to the IEFR.

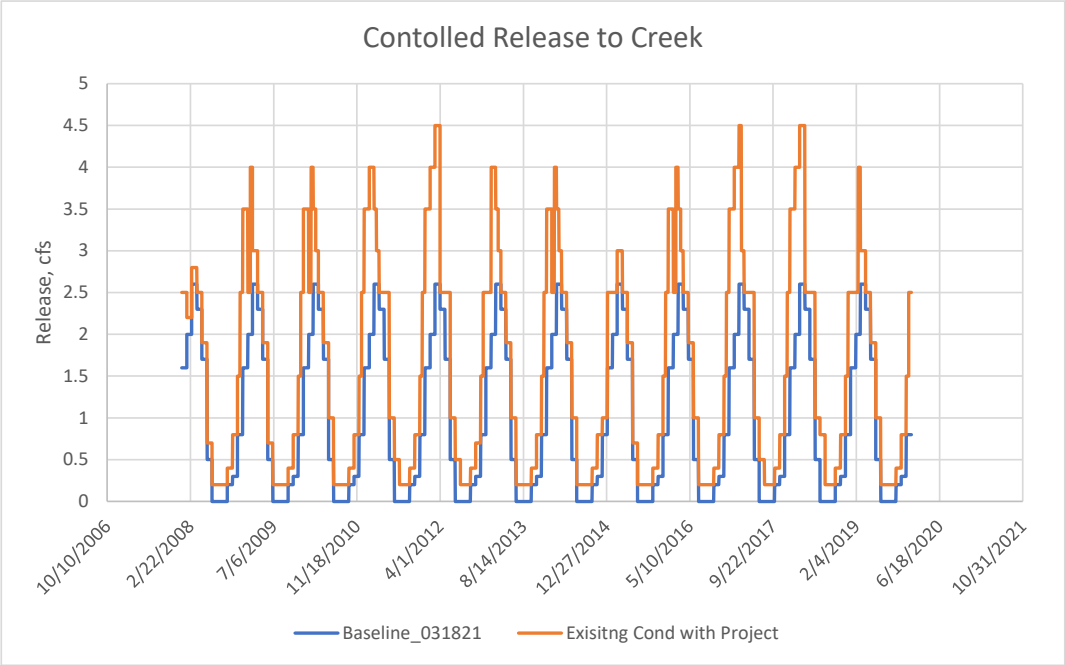


Figure 7. Controlled Release to Creek

Figure 7 shows the increased releases to the creek as prescribed by the Interim Environmental Flow Release (IEFR) Recommendations. The additional releases have an impact on Rector Reservoir storage as shown in Figure 8. The storage deficit accumulates over the 3-year drought period from 2014 – 2016. Once the reservoir fills and spills the storage deficit resets.

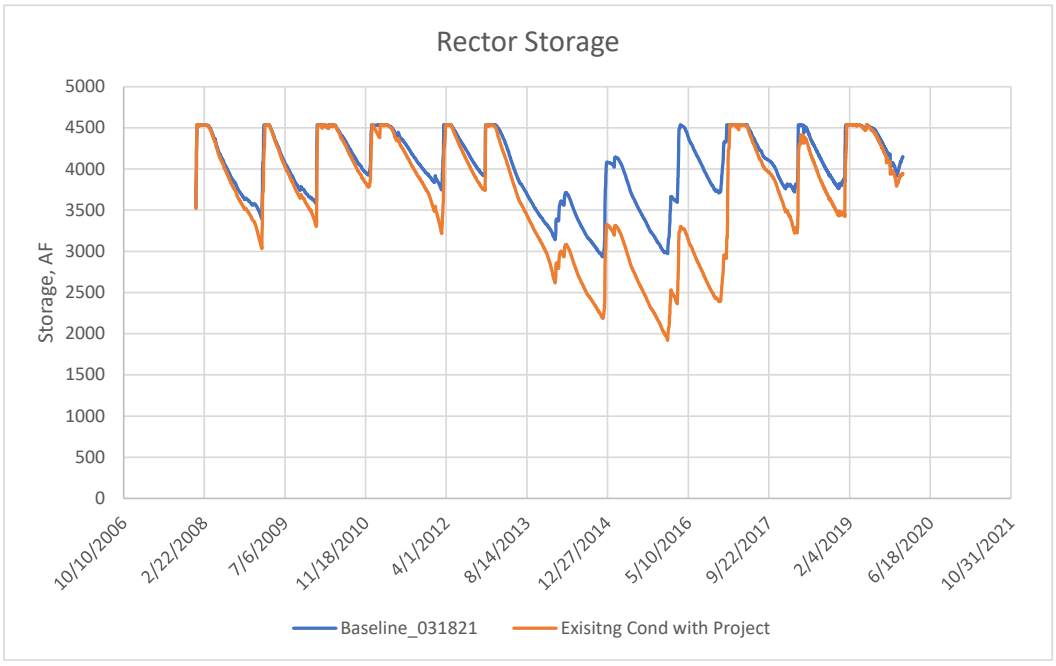


Figure 8. Existing Condition Rector Storage Comparison

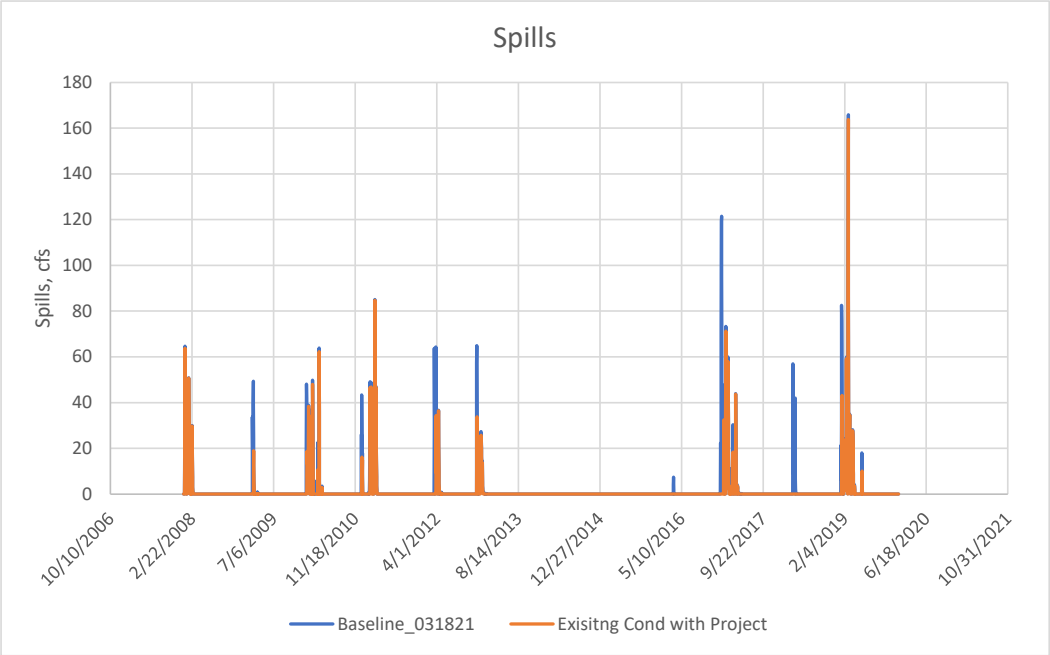


Figure 9. Existing Condition spill comparison

The increased releases also cause a slight change to spills. As the reservoir is drawn down to accommodate the IEFR, spills during the next fill cycle are generally reduced. Figure 9 shows the comparison of spills. Full treated water deliveries of 1,228 AF were made in each year of the simulation as shown in Figure 10.

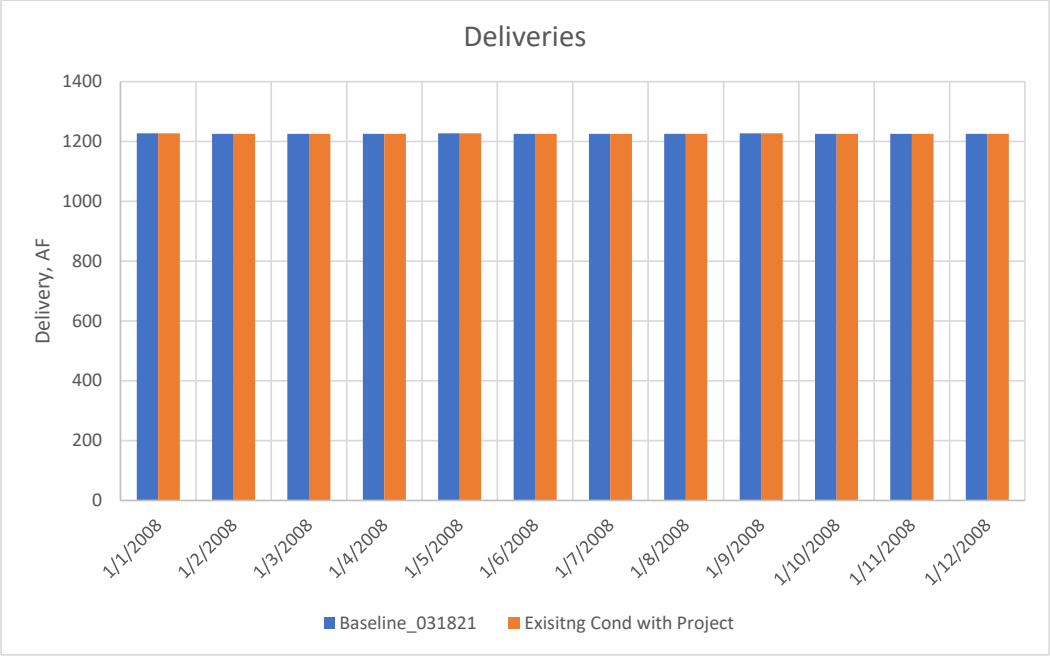


Figure 10. Deliveries

Future Condition

The Future Condition studies evaluate impacts to the Rector Reservoir operation using climate change hydrology. These studies also assume that consumptive demands have increased to a Build out level. This set of assumptions increases stress on the system. Results indicate that the Rector Reservoir System cannot meet the IEFR and Build out demands. Since Napa State Hospital has not requested water from Rector Reservoir since 1981 and they have another reliable source from the City of Napa, a second set of Future Condition studies were performed eliminating the 500 AF Napa State Hospital future demand. Table 11 illustrates key assumptions for each study.

Table 11. Future Level Studies

Scenario	Hydrology	Study Period	Demand	Environmental Flows
Future Conditions No Project	2070 Climate Change	2008-2019 modified by climate change factors	Build Out	Existing
Future Conditions No Project no NSH	2070 Climate Change	2008-2019 modified by climate change factors	Build Out without NSH Demand	Existing
Future Conditions with Project	2070 Climate Change	2008-2019 modified by climate change factors	Build Out	Interim Environmental Flow Release Recommendations
Future Conditions with Project no NSH	2070 Climate Change	2008-2019 modified by climate change factors	Build Out without NSH Demand	Interim Environmental Flow Release Recommendations

Future Condition - Build Out Demands

The first set of Future condition studies performed include full build out demands with climate change hydrology. These scenarios are known as the Future Condition No Project and the Future Condition with Project. Basic assumptions are listed in Table 11. The key difference between these two studies is the environmental releases. Figure 11 illustrates the difference between the existing releases and the IEFR releases.

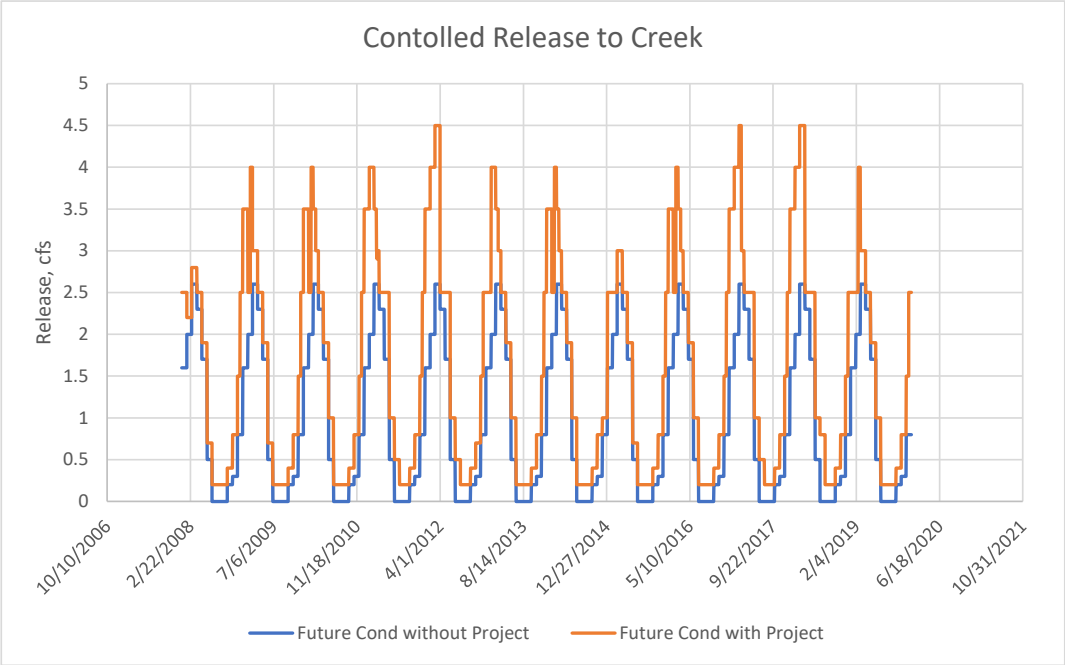


Figure 11. Future Condition Controlled Releases

Figure 12 illustrates the change in storage due to the change in releases. The additional delivery to meet build out demands and the increased IEFR releases cause Rector storage to drop to dead storage as shown by the Future Condition with Project study in orange. In addition, this operation violates the water right by drawing down the reservoir by more than 1,767 AF in a one-year period during 2013.

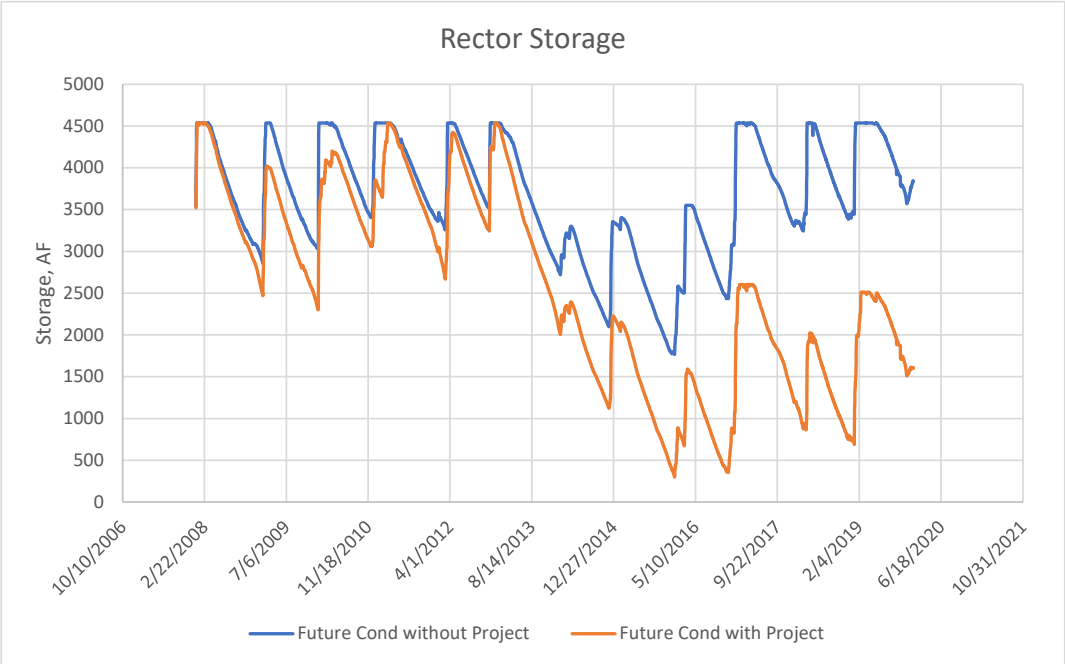


Figure 12. Rector Storage Comparison

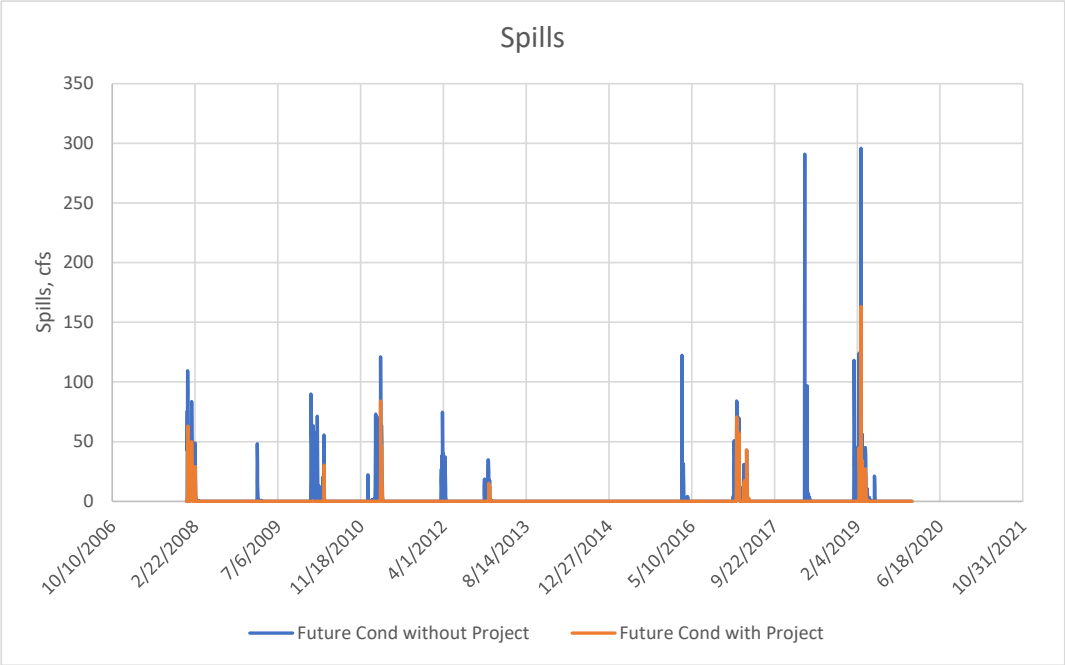


Figure 13. Spill Comparison

As the system becomes increasingly stressed, spills are further reduced in the Future Cond with Project study. See Figure 13. Full treated water deliveries of 1,841 AF are made in each year of the simulation as shown in Figure 14.

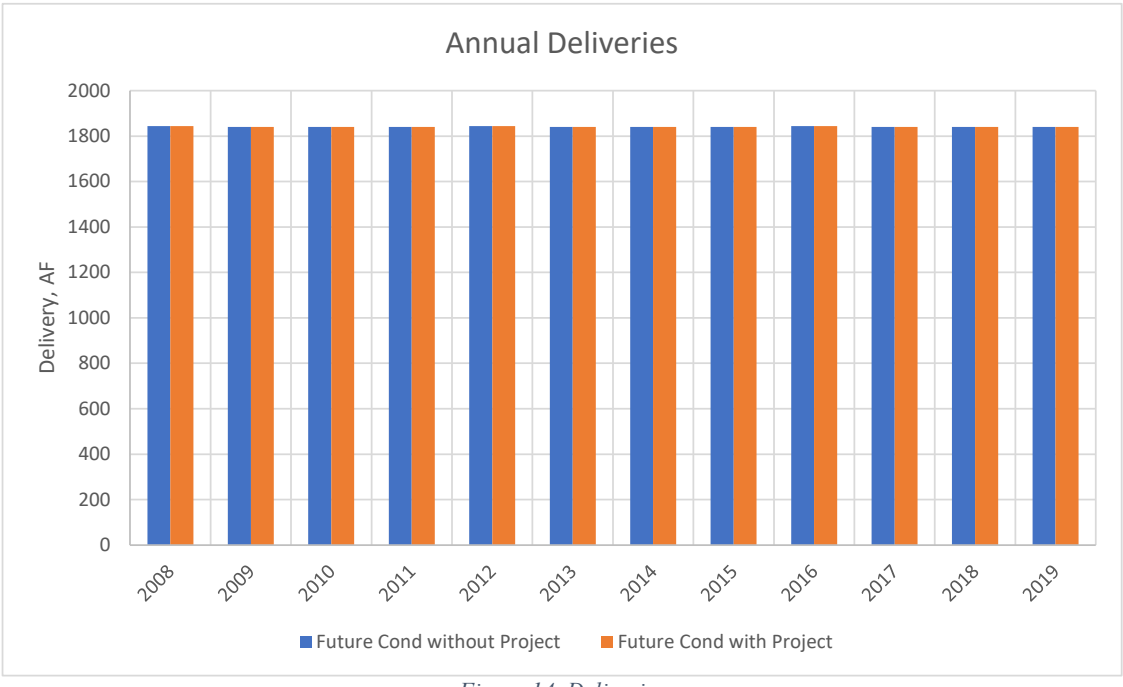


Figure 14. Deliveries

Future Condition - No Napa State Hospital Demand

This second set of Future Condition studies are identical to the first set with one exception. The Napa State Hospital demand of 500 AF has been removed from the Build out demand. This reduces the total future consumptive demand from 1,841 AF to 1,341 AF, annually.

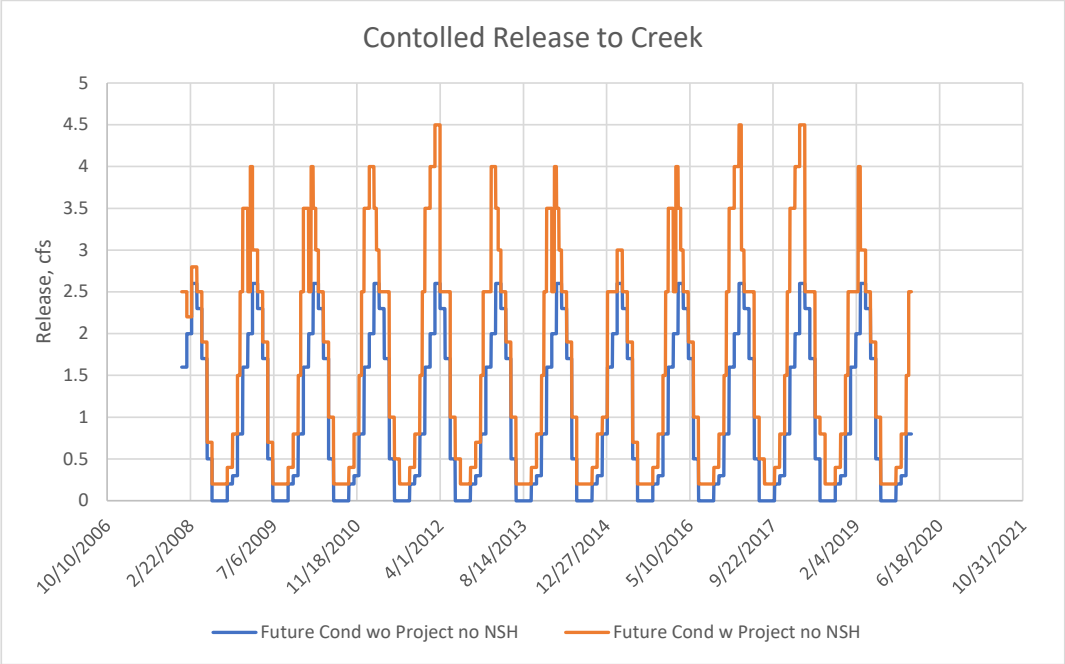


Figure 15. Controlled Releases

Figure 15 illustrates the difference in releases to the creek. Those differences result in an additional draw down of Rector Reservoir as shown in Figure 16.

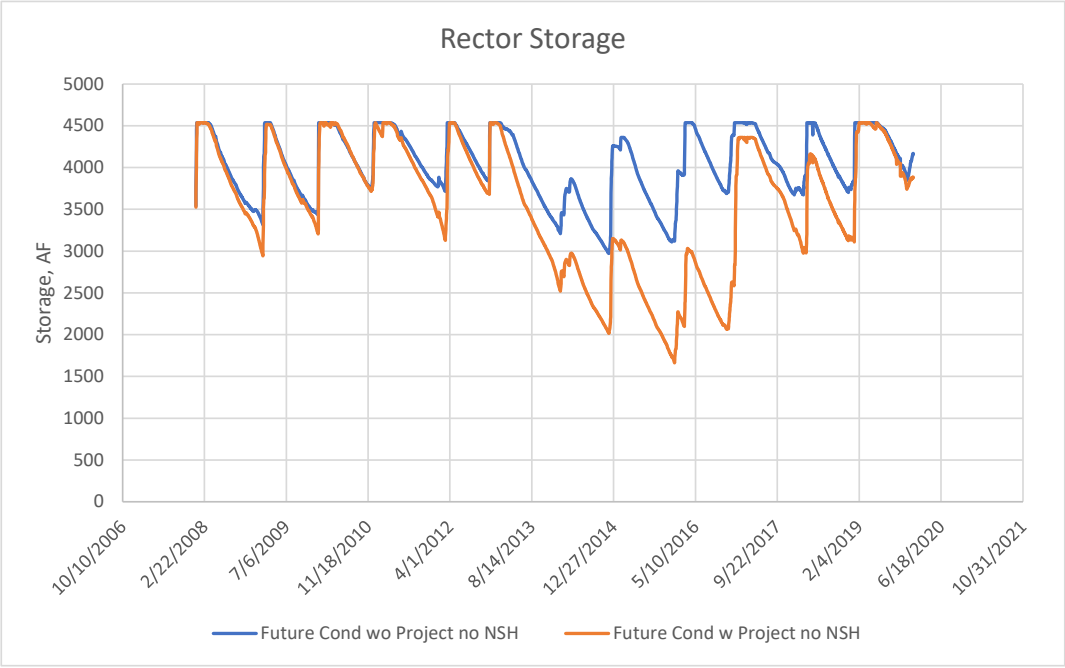


Figure 16. Storage Comparison

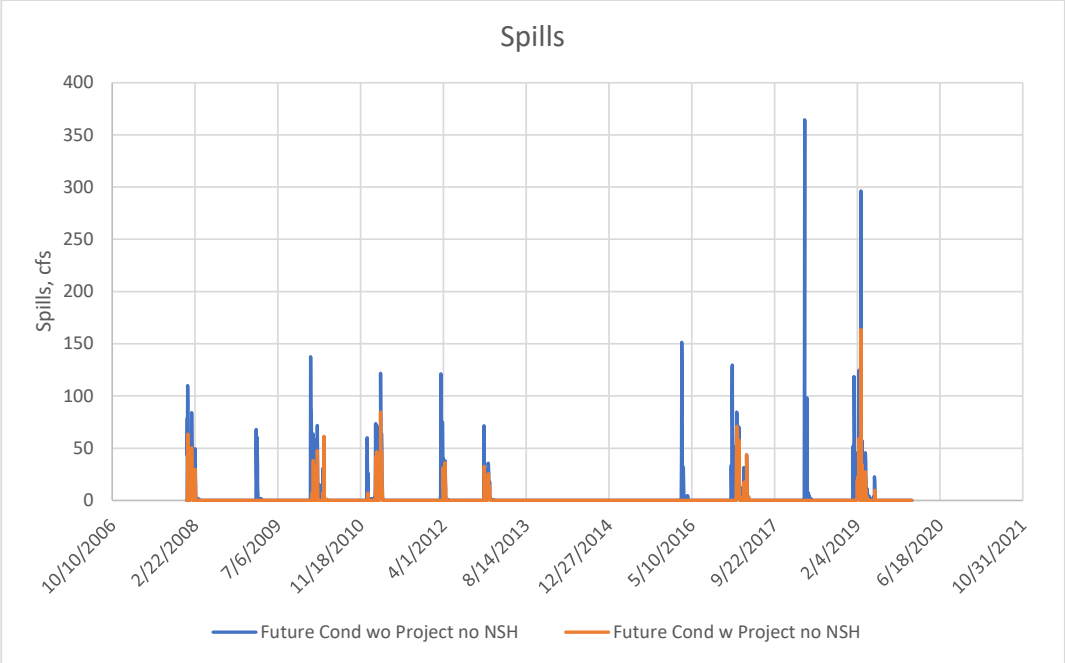


Figure 17. Spills

As in the other studies, the spills, shown in Figure 17, are reduced in the Future Condition with Project no NSH scenario. Deliveries of 1341 AF are made in each year of the simulation as shown in Figure 18 and do not include any delivery to Napa State Hospital.

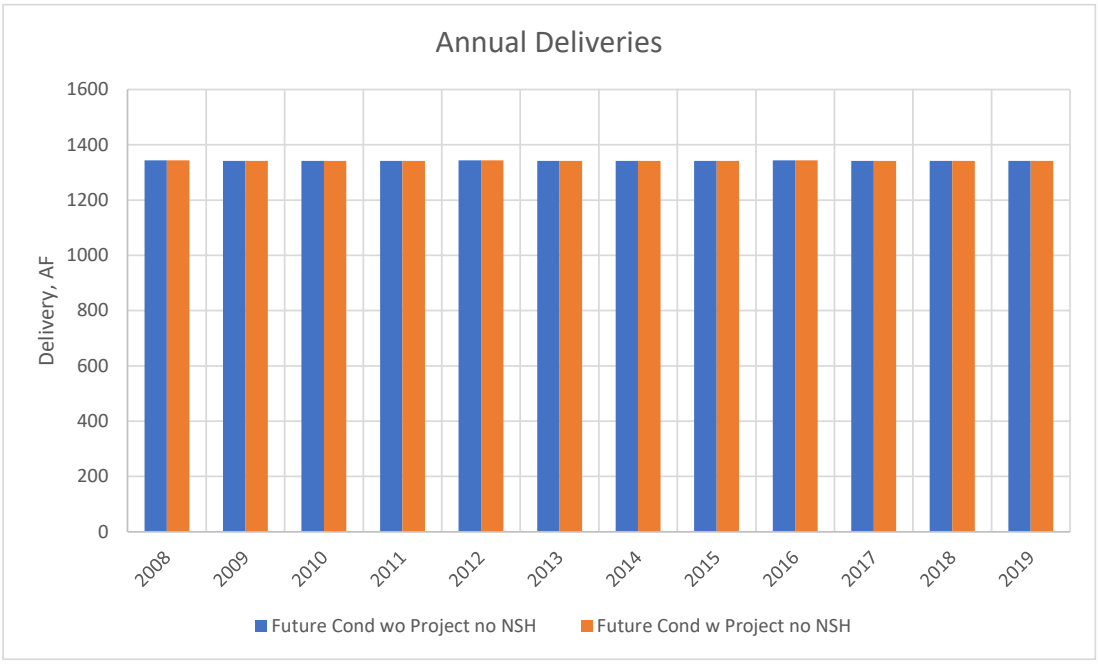


Figure 18. Deliveries

Conclusions

Based on the results of these studies, it appears the Rector Reservoir System can accommodate the proposed IEFR at the existing level of demand. Under these conditions, the system can operate within the normal storage range while meeting the existing system demand.

The system begins to run into water supply problems at the Future Condition. The combination of full build out demand and the IEFR cause too much stress on the system. Water right limitations are violated and the reservoir storage is drawn down to dead storage during the 2013 -2015 drought. Eliminating the Napa State Hospital demand can ease the stress on the system, allowing the reservoir to operate within a normal range.

APPENDIX 3.3-E

Rector Creek Stream Fish Population Technical Memorandum

TECHNICAL MEMORANDUM ◦ JUNE 2021

Rector Creek Stream Fish Population Technical Memorandum









PREPARED FOR

California Department of Veteran Affairs
1227 O Street
Sacramento CA, 95814

PREPARED BY

Stillwater Sciences
279 Cousteau Place, Suite 400
Davis, CA 95618

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Cover photos (clockwise from upper left): Rector Creek, April 2020, mid reach; California roach; Rector Creek, October 2020, upper reach; Riffle Sculpin.

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1 INTRODUCTION

Lower Rector Creek is located below Rector Dam in the Napa Valley near the Town of Yountville. It extends approximately 1.7 miles (mi) downstream of Rector Dam to the confluence with Conn Creek, a tributary to the Napa River. Rector Dam was built in 1946 and has been operated by the California Department of Veterans Affairs (CalVet) to supply drinking water to the Veterans Home of California in Yountville, Napa State Hospital, California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, Town of Yountville, and several local wineries. CalVet also supplies untreated water to the California Department of Forestry and Fire Protection (Cal Fire) training facility located near the base of Rector Dam, as well as the CDFW Silverado Fisheries Base (Fisheries Base) located along Rector Creek downstream of the dam. The untreated water delivered to the Fisheries Base is returned to Rector Creek approximately 0.35 mi downstream of the spillway. Water in lower Rector Creek is also supplied by the Rector Reservoir spillway, through emergency release valves at the base of the dam (which can only be operated as fully opened or closed), or as discharge from the Fisheries Base as part of its normal operations.

The License to operate Rector Dam[1] does not include specific instream flow release requirements; however, California Fish and Game Code Section 5937 requires the owner or operator of any dam to allow sufficient flow to pass through or over the dam to keep fish downstream of the dam in good condition. A preliminary assessment of existing Rector Creek stream channel conditions and fish populations downstream of Rector Dam identified an interim instream flow release schedule and additional information needed to assess the condition of the fish community and to develop a Rector Dam Operations Plan (Operations Plan) (Stillwater Sciences 2019). Studies, including this Stream Fish Population assessment, are being conducted under the interim environmental flow release schedule from Rector Dam and/or the CDFW Fisheries Base to identify whether the flows are sufficient to keep fish in good condition.

Previous studies suggest lower Rector Creek supports mostly native fish species. The Napa County Resource Conservation District (NCRCD) conducted snorkel surveys in 2004 and observed California roach (*Hesperoleucus symmetricus*), threespine stickleback (*Gasterosteus aculeatus*), Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), and steelhead (*Oncorhynchus mykiss*) (NCRCD 2004). Fish observations during a 2018 pedestrian survey included larval/juvenile Sacramento suckers, minnow species (unidentified Cyprinidae), sunfish/bass species (Centrarchidae), and threespine stickleback (Stillwater Sciences 2019). Fish surveys conducted in lower Rector Creek in the 1980s found steelhead with fork lengths ranging from 52–400 millimeters (mm), indicating utilization by spawning adults and rearing juveniles (Emig 1986, as cited in Leidy et al. 2005).

This technical memo summarizes the methods and results of the Rector Creek Stream Fish Population Study (Study) conducted in 2020 to inform the development of the Operations Plan.

2 STUDY GOALS AND OBJECTIVES

The goal of this Study is to inform the development of the Operations Plan by identifying potential effects of facility operations on fish populations in lower Rector Creek. The objective is

[1] The State Water Resources Control Board issued CalVet a water rights license in 1970 (License No. 10911) that includes, as authorized places of use, the Veterans' Home, CDFW's Bay Delta Region office and Silverado Fisheries Base, Napa State Hospital, the Town of Yountville, and 670 irrigated acres.

to collect fish population data through the collection of individual fish and direct observation via snorkel surveys to evaluate the current condition of the fish community in lower Rector Creek. The collected data will be used to evaluate:

- The current composition, distribution, and abundance of species within lower Rector Creek and comparisons to historical conditions;
- Age-class distribution of species; and
- Individual fish and fish community conditions.

3 STUDY AREA AND SITES

The Study area includes an approximately 1.7-mi section of lower Rector Creek that extends from Rector Dam to the confluence with Conn Creek. Four subreaches were selected within lower Rector Creek for the Study based on the preliminary survey data (Figure 3-1. ; Stillwater Sciences 2019). Within each subreach, one to three habitat units were sampled and were selected based on the likelihood of fish habitat persistence during intermittent streamflow during the summer and fall. Individual sample locations are summarized in Table 3-1.

Table 3-1. Rector Creek stream fish population survey site locations.

Stream Fish (SF) Subreach	Habitat Unit	Unit Type	Dates Surveyed	UTM Coordinates[1]			
				Downstream End		Upstream End	
				North	East	North	East
SF-1	1	Pool/Run/Riffle	04/15/20; 10/22/20	4254630	556666	4254675	556714
	2	Pool	04/15/20; 10/22/20	4254684	556724	4254699	556743
	3	Pool	04/15/20; 10/22/20	4254732	556769	4254741	556762
SF-2	1	Pool	04/17/20; 10/22/20	4254364	556163	4254383	556189
	2	Pool	04/17/20; 10/22/20	4254456	556248	4254468	556259
SF-3	1	Run/Pool	04/16/20; 10/22/20	4254138	555519	4254149	555567
	2	Pool	04/16/20; 10/22/20	4254158	555573	4254170	555632
SF-4	1	Pool	04/16/20; 10/22/20	4253584	554941	4253614	554974

[1] Universal Transverse Mercator (UTM) coordinates, North American Datum 1983 (NAD 83)

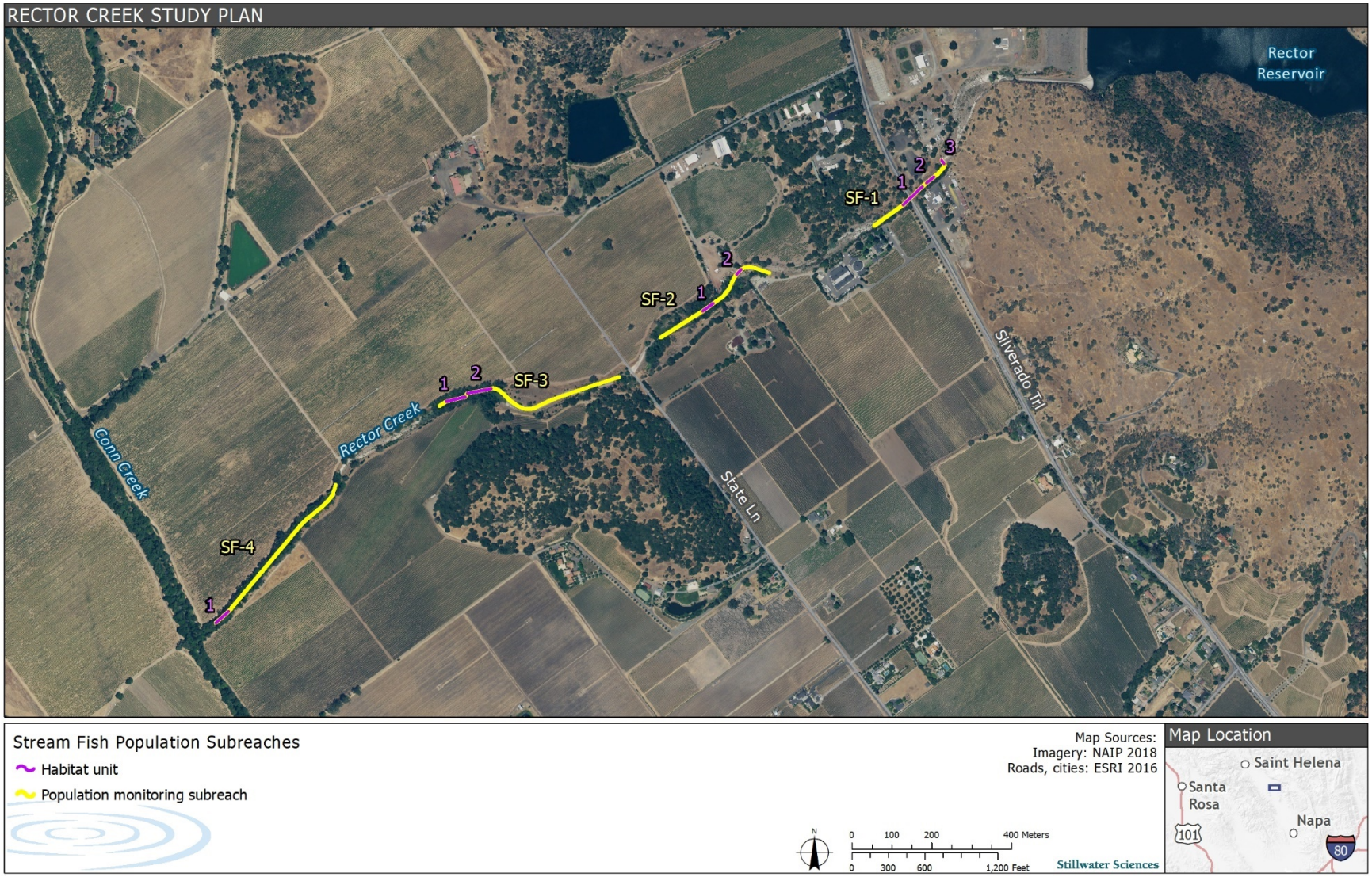


Figure 3-1. Rector Creek stream fish population subreaches and habitat units.

4 METHODS

4.1 Field surveys

Habitat units within each of the four subreaches were surveyed in the spring and fall of 2020 to evaluate: (1) species composition, distribution, and abundance; (2) age-class distribution; and (3) individual fish condition (e.g., size, nutritional state, and presence of disease, parasites, or lesions). Species distribution, composition, and abundance were assessed by direct observation using multi-pass snorkeling methods during the spring, and species distribution and composition was assessed using single-pass electrofishing and direct observation during the fall, when snorkeling was not effective due to large amounts of aquatic vegetation. At Subreach SF-3, aquatic vegetation was so dense during the fall that electrofishing was confined to a small area of the subreach. Age-class distribution and fish condition were assessed using single-pass electrofishing during both seasons.

4.1.1 Stream Habitat

Stream habitat conditions were recorded for each site, including:

- Average wetted width (feet [ft]) (based on 6–10 measurements spaced equally along the length of the site);
- Site length (ft);
- Percent habitat type (e.g., run, riffle, pool);
- Maximum depth (ft);
- Average depth (ft) (based on 10 measurements spaced equally along the length of the site);
- Substrate type (e.g., bedrock, boulder, cobble, gravel, sand, silt, organic) and estimated percent composition;
- Riparian community type; and
- Percent cover available from aquatic vegetation, overhanging vegetation, large boulders, large woody debris (LWD; including number of pieces), surface turbulence, and undercut bank (total length [ft] of both sides of the creek).

In addition, water quality conditions were recorded at each subreach, including water temperature (°C), dissolved oxygen (milligrams per liter [mg/L]), and conductivity (microSiemens per centimeter [µS/cm]) using a YSI Pro Plus multi-parameter meter, calibrated at the beginning of each survey day. Discharge (cubic feet per second [cfs]) was estimated at each site and measured once during each survey using a Marsh-McBirney flow meter and topset rod at a suitable location near the upstream end of the reach.

4.1.2 Direct Observation

Three repeat snorkel passes were made through each habitat unit during the spring to allow for bounded count population estimates (Routledge 1982) as well as to account for variability between observations. Specifically, divers entered the creek downstream of the area to be sampled and paused for a moment to allow the fish to become accustomed to the divers' presence before surveying each site. Field crews consisted of two biologists snorkeling across established lanes. Snorkelers identified, counted, and made visual total length (TL) estimates of 25-mm size classes while moving at a slow, uniform pace. Prior to sampling, snorkelers calibrated estimated

fish lengths by viewing variably sized objects of known lengths underwater. Fish were counted as they passed beneath or to the side of each observer, with surveyors communicating as best as possible to avoid potential double-counting. Each surveyor recorded data on dive slates and data were transcribed to pre-printed data sheets following each pass. Some visual observations were made from above the creek surface where water was very shallow and snorkeling and electrofishing were less effective due to the presence of aquatic vegetation.

Direct observation was limited in the fall by aquatic vegetation and algal mats; visual observations in the vicinity of the electrofishing area were recorded where small clearings of vegetation permitted.

4.1.3 Fish Capture

At sites where fish were observed, a portion of fish were captured by electrofishing to assess fish condition during both the spring and fall. Fish capture was conducted by single-pass electrofishing using a Smith-Root LR-24 backpack electrofisher. Due to the presence of large boulders and aquatic vegetation, beach seining methods were not effective and therefore not used. Captured fish were transferred to aerated 5-gallon buckets for processing. Captured fish were identified to species, measured (fork length [FL] or TL in mm, depending on the species), and weighed (grams [g]). Where applicable, notes on general condition (presence of disease, parasites, and/or lesions) were recorded. After measurements were completed, fish were released back into the creek to the unit in which they were captured.

4.2 Analysis

Data collected during the Study were entered into a database for data reduction, tabulation, and summary.

Species abundance and density were calculated from spring snorkel survey data using the bounded counts estimator (Robson and Whitlock 1964, Regier and Robson 1966, Overton 1971, Routledge 1982; as cited in Mohr and Hankin 2005):

$$\tilde{y}_B = d_{[m]} + (d_{[m]} - d_{[m-1]})$$

where $d_{[m]}$ is the maximum number of fish counted during any of the passes and $d_{[m-1]}$ is the 2nd highest count; counts will be arranged in ascending order as:
$d_{[1]} \le d_{[2]} \le d_{[3]} \le \cdots \le d_{[m-1]} \le d_{[m]}$

The 95 percent confidence intervals will be calculated based on Robson and Whitlock (1964) and Routledge (1982), as cited in Mohr and Hankin 2005. The lower bound (N_L) will be calculated as:

$$N_L = d_{[m]}$$

The upper bound (N_U) will be calculated as:

$$N_U = d_{[m]} + [(1-\alpha)/\alpha] \cdot [d_{[m]} - d_{[m-1]}]$$

Relative species abundance was calculated from fall single-pass electrofishing and observational data.

Additionally, length-frequency histograms were generated using bounded count estimates of each size class from multiple-pass snorkeling in the spring and data from single-pass electrofishing in the fall, which were used in combination with available length-at-age information to assess age-class distribution for fish species captured (Table 4-1).

Table 4-1. Fish length ranges by age for species observed in Rector Creek, 2020.

Species	Length-at-Age (mm)[1]			
	YOY[2]	1+	2+	3+
California roach *Hesperoleucus symmetricus*	<60	60–75	80–95	100+
Sacramento sucker *Catostomus occidentalis*	<100	112–187	NA	NA
Sacramento pikeminnow *Ptychocheilus grandis*	50–85	100–150	170–250	240–270
Riffle sculpin *Cottus gulosus*	25–45	40–50	75–100	NA
Steelhead *Oncorhynchus mykiss*	<100	130–170	NA	NA
Bluegill *Lepomis macrochirus*	40–60	60–110	80–160	NA
Green sunfish *Lepomis cyanellus*	30–50	50–100	80–130	130+
Redear sunfish *Lepomis microlophus*	0–69	70–128	NA	NA

[1] Source: Moyle 2002
[2] Young-Of-Year
NA = not applicable

To assess fish condition (k), the weight-to-length relationship of individual fish were assessed as a method of identifying the nutritional state or health of the fish related to size and growth. Condition factor (Ricker 1975), a measure of nutritional state, was calculated for each fish. Mean fish condition was calculated from individual condition values for each species. Condition is dependent on the time of sampling, the species, state of sexual maturity, and particularly the way the fish is measured (e.g., FL vs. TL).

5 RESULTS

5.1 Stream Habitat

Rector Creek was not contiguously wetted during the 2020 fish surveys (i.e., the creek flow was intermittent). Surface water was only found within the four subreaches, which were isolated from each other by long stretches of dry creek bed. The vegetative community surrounding each of the four subreaches was valley foothill riparian. Complete habitat data are provided in Appendix A and habitat photos are provided in Appendix B.

5.1.1 Subreach SF-1

Subreach SF-1 began at a deep pool approximately 1/4 mi downstream of the base of Rector Dam and ended just downstream of the Silverado Highway Bridge. The subreach consisted of three habitat units containing pool, riffle, and run habitat. The habitat units were connected during the spring survey, when approximate flow was 1 cfs, and isolated during the fall survey, when no surface flow was observed. Water quality included high dissolved oxygen (9.8 mg/L) during the spring survey, and lower levels during the fall survey (1.1 to 5.2 mg/L). Water temperature was moderate during both surveys (14.8–18.2°C).

Habitat Unit #1 was a run, pool, and riffle complex which began at the downstream terminus of the subreach and extended to the beginning of a low-gradient riffle upstream of the Silverado Highway Bridge. The habitat unit was completely dry during the fall survey. A small amount of cover was provided during the spring survey by large boulders (10%) and instream vegetation (5%), and substrate consisted primarily of large boulder (65%) with lesser amounts of cobble (30%) and gravel (5%).

Habitat Unit #2 was a pool located in the middle of the subreach. Depending on the season, substrate consisted of boulder (30–50%) and cobble (40–45%)) with small amounts of gravel (5–20%) and silt (0–10%). Depending on the season, a moderate amount of cover was provided by instream vegetation (20–90%), overhanging vegetation (0–5%), undercut bank (0–5%), and large boulders (0–5%). During the fall survey, when no flow was observed within the subreach, this unit was a standing, isolated pool which was almost completely covered in surface algae (90%).

Habitat Unit #3 was a large pool located at the top of the subreach. During the spring and fall surveys, large boulder (75–80%) was the primary substrate, with small amounts of bedrock (10%) and cobble (10–15%). Cover was provided a dense vegetation mat (10–20%), undercut bank (0–5%), and large boulders (0–5%). The vegetation mat had doubled in size by the fall survey and provided excellent cover for larger fish.

5.1.2 Subreach SF-2

Subreach SF-2 was located between State Lane and Silverado Trail and included two isolated pools that were sampled during both the spring and fall surveys. Within this subreach, a riparian canopy contains both dense understories and overstories.

Habitat Unit #1 was a long pool. There was no measurable surface flow during the spring survey; during the fall survey, a small amount of flow (< 0.1 cfs) was provided by hyporheic flow coming to the surface. The substrate was primarily cobble (50–85%) a lesser amount of boulder (15–50%). Cover was provided by overhanging vegetation (15–25%), instream vegetation (0–25%),

and large boulders (0–10%). A large amount of algal growth was present during both surveys. The water temperature was cool (13.5°C) and dissolved oxygen was high (6.8 mg/L) during the spring survey, but the water temperature warmed, and dissolved oxygen decreased by the fall survey (18.5°C and 2.9 mg/L, respectively).

Habitat Unit #2 was located approximately 0.15 mi downstream of the CDFW Fisheries Base outfall. No measurable surface flow was present during either survey. The pool was completely covered in instream vegetation during both surveys. Substrate was estimated to be a combination of boulder and cobble (50% each). Dissolved oxygen was very low during both spring and fall surveys (1.1 mg/L and 2.8 mg/L, respectively).

5.1.3 Subreach SF-3

Subreach SF-3 was located approximately 0.25 mi downstream of State Lane and was isolated from other subreaches during both surveys. It consisted of two long pools that were connected by a short, low-gradient riffle during the spring survey, when flow was <1 cfs, but isolated during the fall survey when there was no measurable surface flow at the site. There was a large amount of surface algae present in both habitat units during the fall survey. Water temperatures were moderate during both surveys (15.7–17.8°C), and dissolved oxygen was high during the spring survey (7.7 mg/L), but low during the fall survey (1.9–2.8 mg/L).

Depending on water levels, Habitat Unit #1 contained boulder (10–40%) and cobble (50–65%) substrates, with a small amount of gravel (10%). Cover was provided by instream (20–90%) and overhanging vegetation (0–10%), with a limited amount of LWD (5%), and a small section of undercut bank (0–5%). Habitat Unit #2 had primarily cobble substrate (70–80%) with lesser amounts of boulder (10–30%) and gravel (0–10%). Seasonally, cover was present in the form of overhanging (0–25%) and instream vegetation (15–100%) with a small section of undercut bank (0–5%).

5.1.4 Subreach SF-4

Subreach SF-4 contained an isolated pool located approximately 200 ft upstream from Rector Creek's confluence with Conn Creek. It consisted of a single habitat unit that was wetted during the spring survey and dry during the fall survey. The substrate consisted primarily of organic material (70%) with lesser amounts of cobble (15%) and gravel (15%). Cover was provided by instream (25%) and overhanging (10%) vegetation and LWD (10%). During the spring, the water temperature was 15.1°C and dissolved oxygen measured 4.7 mg/L.

5.2 Fish Populations

5.2.1 Species Composition and Distribution

Six native species, California roach, Sacramento pikeminnow, Sacramento sucker, riffle sculpin, threespine stickleback, and steelhead, and three non-native species, including green sunfish, redear sunfish, and bluegill, were either observed or captured during the 2020 stream fish population surveys in Rector Creek (Table 5-1). Overall, threespine stickleback was the most abundant species in lower Rector Creek with California roach the second most abundant (Figures 5-1 and 5-2). However, composition varied by subreach. Subreach SF-1 contained a centrarchid (sunfish) assemblage, whereas Subreach SF-3 contained primarily native fishes with a small number of centrarchids, and no fish were observed in subreaches SF-2 or SF-4 during either

season. Individual fish photos are provided in Appendix B and complete fish data are provided in Appendix C.

5.2.1.1 Subreach SF-1

In Subreach SF-1, redear sunfish had the highest estimated abundance during the spring snorkel survey, followed by green sunfish. In the fall, only green sunfish were captured during single-pass electrofishing (Table 5-1, Figure 5-2).

5.2.1.2 Subreach SF-2

No fish were observed or captured during either season at Subreach SF-2 (Table 5-1), despite isolated pool habitat.

5.2.1.3 Subreach SF-3

During the spring snorkel survey, threespine stickleback had the highest estimated density in Subreach SF-3, followed by California roach, Sacramento sucker, Sacramento pikeminnow, steelhead, and bluegill. Species density was not able to be calculated during the fall, however a similar composition and relative abundance of species was present during single-pass electrofishing. Threespine stickleback was the most abundant species observed or captured in the fall, followed by California roach, Sacramento sucker, Sacramento pikeminnow, riffle sculpin, and green sunfish (Table 5-1, Figure 5-4).

5.2.1.4 Subreach SF-4

No fish were observed or captured during either season at Subreach SF-4 (Table 5-1). Pool habitat was present in spring, but the subreach was dry in the fall.

Table 5-1. Fish species composition during the 2020 Rector Creek stream fish population assessment.

Species	Bounded Count Estimated Abundance (Spring) or Number Captured/Observed (Fall; %)[1,2]									
	Subreach SF-1			Subreach SF-2		Subreach SF-3			Subreach SF-4	
	Spring	Spring 95% C.I.	Fall	Spring	Fall	Spring	Spring 95% C.I.	Fall	Spring	Fall
Native species										
California roach	--	--	--	--	--	225 (10%)	182–999	54 (12%)	--	--
Riffle sculpin	--	--	--	--	--	--	--	1 (<1%)	--	--
Sacramento pikeminnow	--	--	--	--	--	26 (1%)	18–170	5 (1%)	--	--
Sacramento sucker	--	--	--	--	--	74 (3%)	69–164	10 (2%)	--	--
Steelhead[3]	--	--	--	--	--	2 (<1%)	1–20	--	--	--
Threespine stickleback	--	--	--	--	--	1,859 (85%)	1,555–7,331	400 (85%)[4]		
Non-native Species										
Bluegill	--	--	--	--	--	1 (<1%)	1–1	--	--	--
Green sunfish	14 (45%)	14 – 14	41 (100%)	--	--	--	--	1 (<1%)	--	--
Redear sunfish	17 (55%)	11 – 125	--	--	--	--	--	--	--	--

[1] Comparisons of estimated abundance and number captured/observed between the spring and the fall surveys cannot be made due to the variance in methods between the two surveys.

[2] Estimated abundance is the bounded count estimate for the spring three-pass snorkel surveys. Number captured/observed is the number captured or observed during fall single-pass surveys.

[3] The single steelhead observed appeared to be wild in origin due to the presence of an adipose fin.

[4] Fall abundance estimated based on visual observations in the vicinity of the electrofishing area (i.e., not the entire unit).

C.I. = Confidence Interval

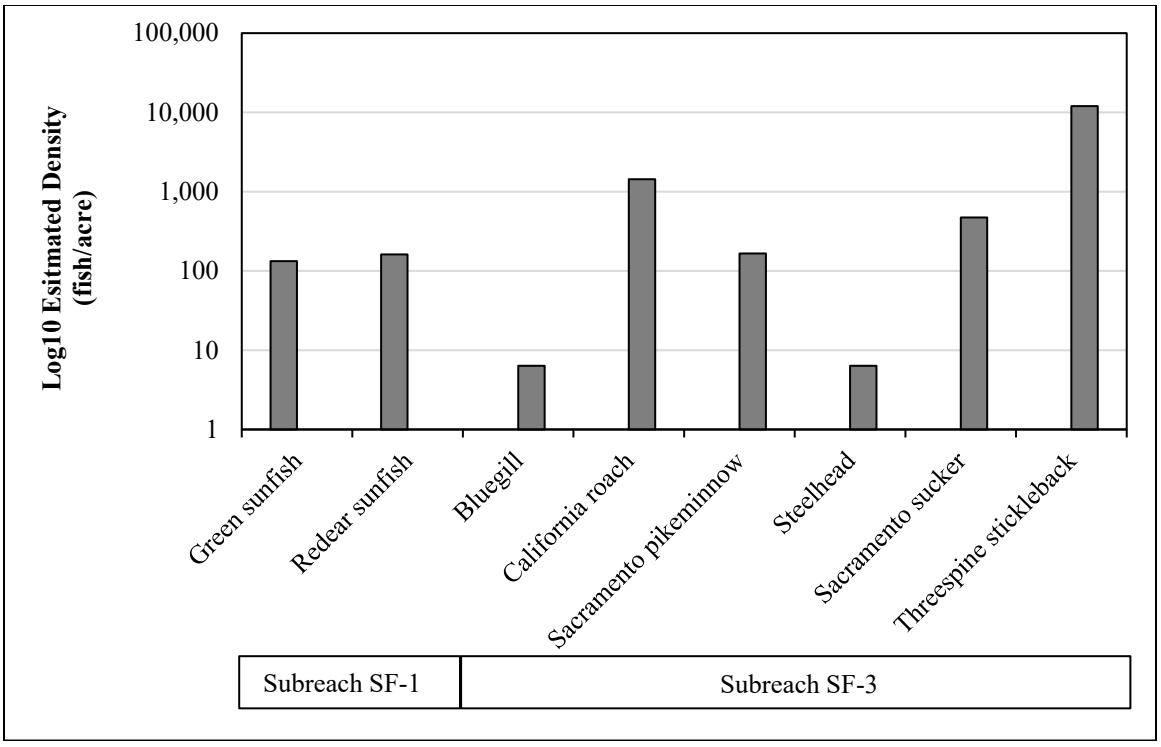


Figure 5-1. Bounded count estimated species densities during the spring 2020 Rector Creek stream fish survey.

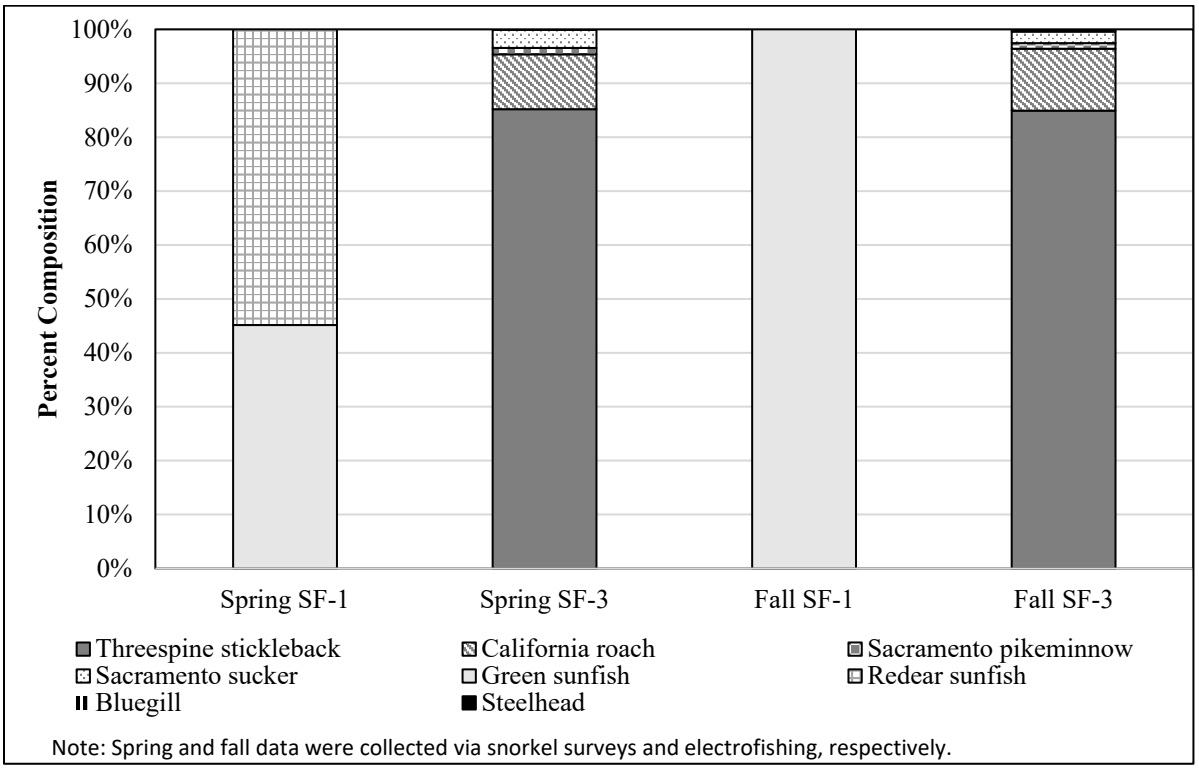


Figure 5-2. Relative abundance of fishes observed or captured during the spring and fall 2020 Rector Creek stream fish population surveys.

5.2.2 Age-class Distribution

California roach ranged from YOY through age 1+, with most belonging to the YOY age-class, during the spring (Figure 5-3). In the fall, California roach ranged from YOY through age 3+, with a majority of fish belonging to the 1+ age-class (Figure 5-4) and fewer fish belonging to each subsequent age class. These distributions suggest that spawning occurred in 2020 and that there was successful survival of older age classes.

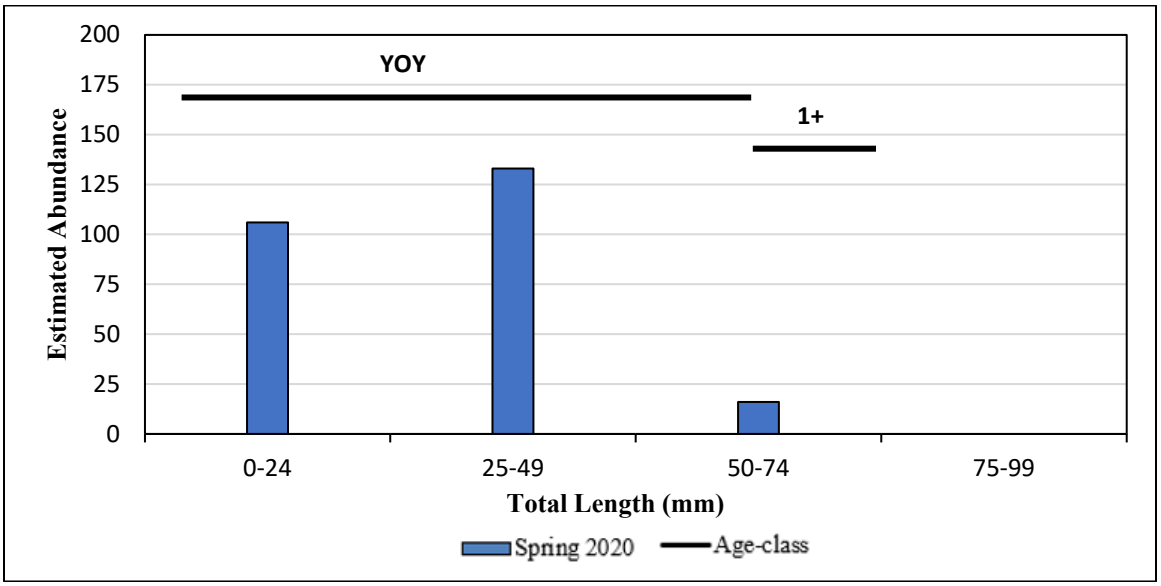


Figure 5-3. Age-class distribution of California roach using bounded count estimated abundance by age-class observed during the spring 2020 spring Rector Creek snorkel survey.

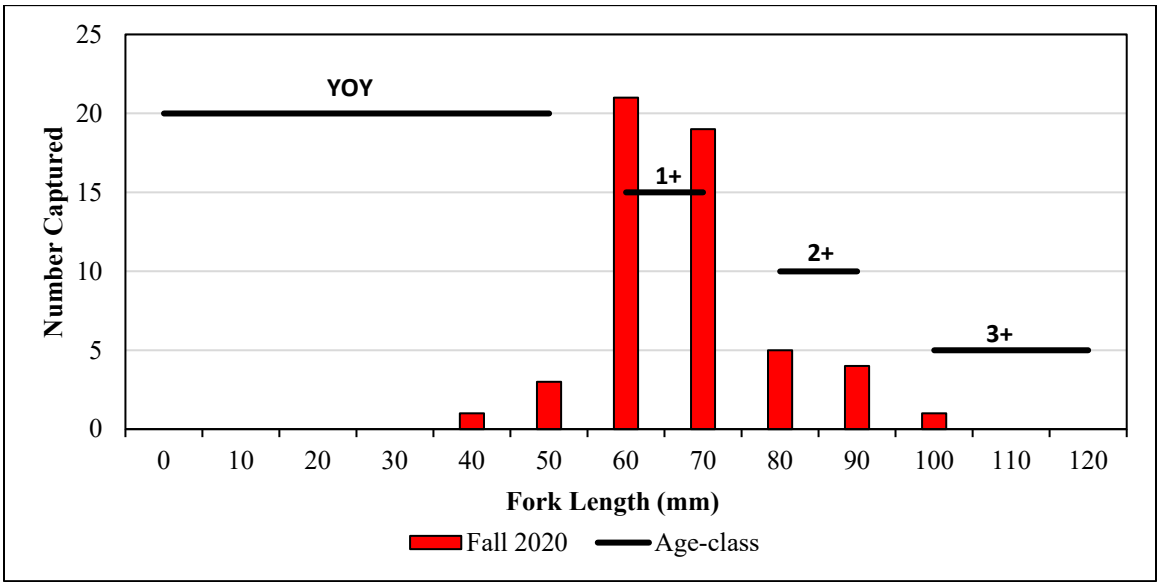


Figure 5-4. Age-class distribution of California roach captured during the fall 2020 Rector Creek electrofishing survey.

Riffle sculpin ranged in age from YOY through age 2+ and had an atypical age-class distribution in spring, where low numbers of YOY fish were followed by high numbers of 1+ fish and less in the subsequent age classes (Figure 5-5). It is presumed that riffle sculpin rarely live beyond four years (Moyle 2002).

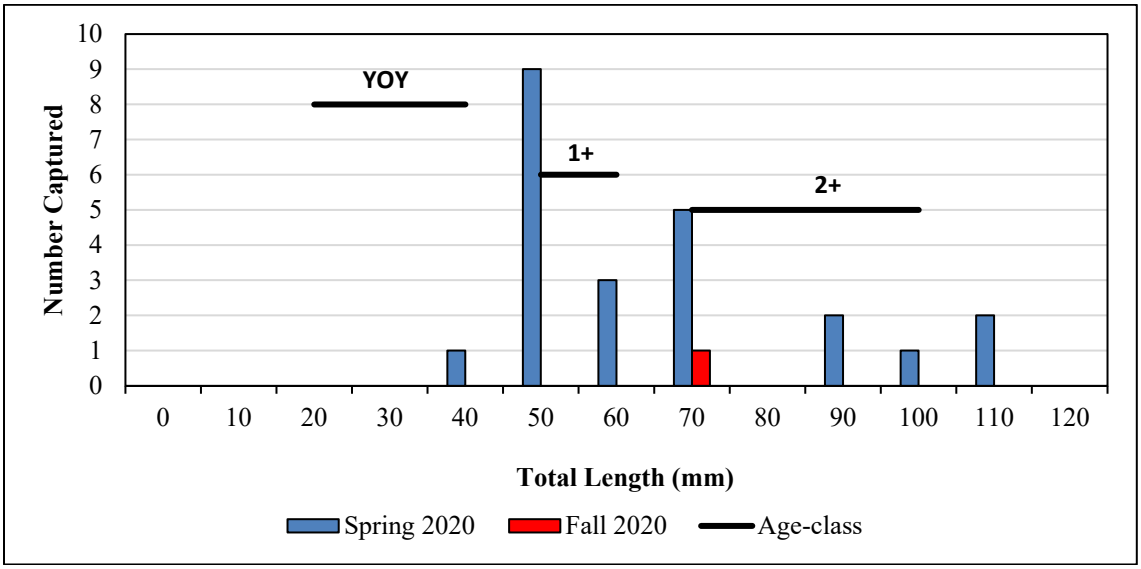


Figure 5-5. Age-class distribution of riffle sculpin captured during the spring and fall 2020 electrofishing surveys in Rector Creek.

Sacramento pikeminnow included YOY and 1+ age classes (Figures 5-6 and 5-7). The presence of YOY individuals in spring indicates successful spawning in 2020, and the presence of 100+ mm FL fish in the fall indicates survival from 2019.

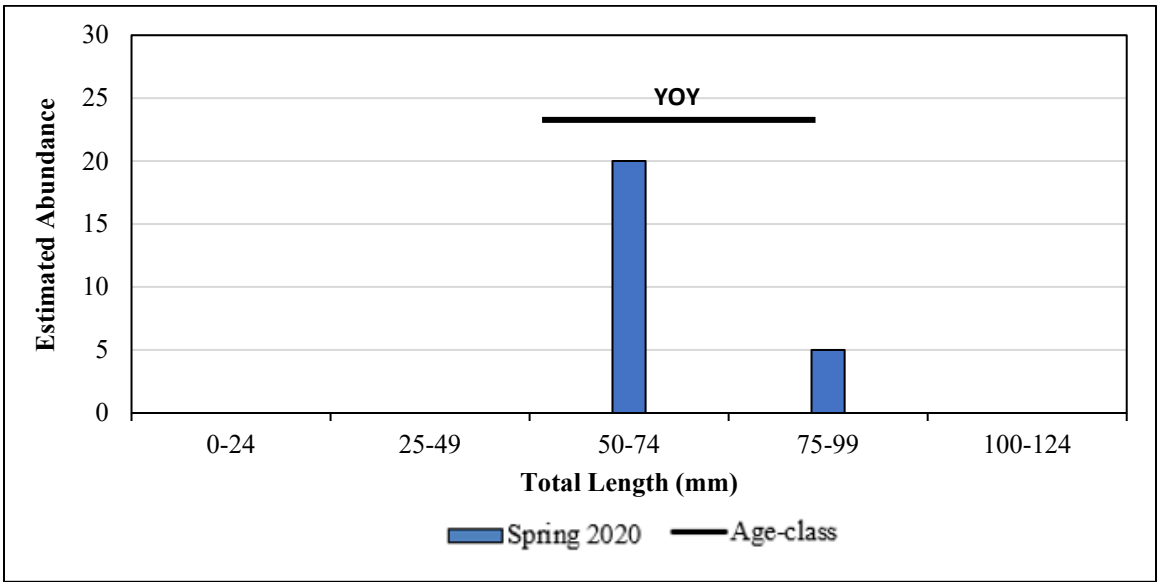


Figure 5-6. Age-class distribution of Sacramento pikeminnow using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

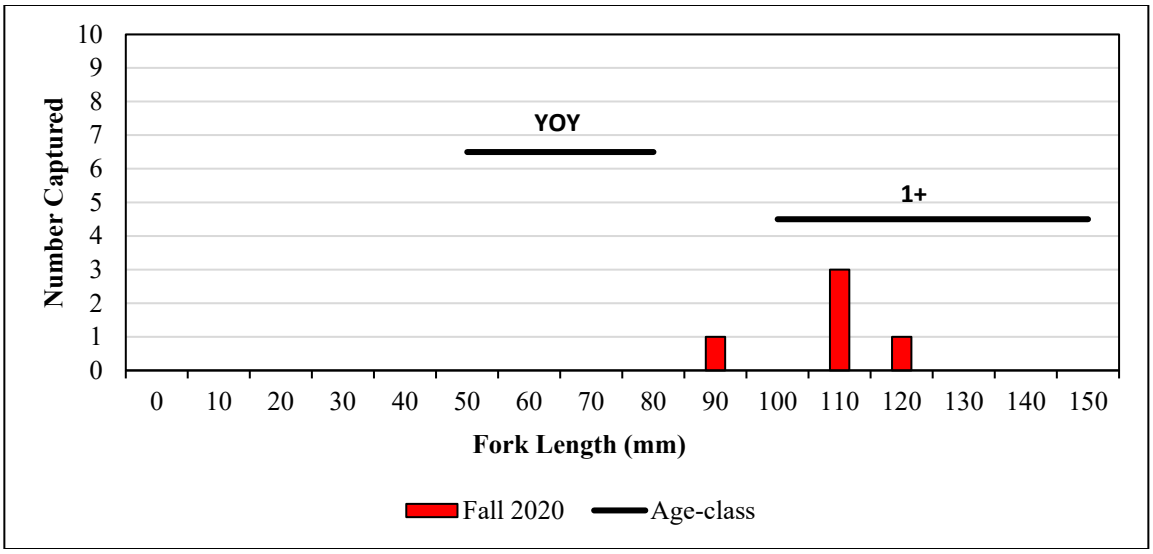


Figure 5-7. Age-class distribution of Sacramento pikeminnow captured during the fall 2020 Rector Creek electrofishing survey.

Sacramento sucker included primarily YOY and age 1+ fish during the spring and fall surveys (Figures 5-8 and 5-9), although growth in Sacramento suckers is variable by habitat and age ranges are hard to predict (Moyle 2002). Sacramento suckers spawn between late February and June (Moyle 2002), so the presence of YOY and Age 1+ fish suggests that there was successful recruitment in 2020 and survival from 2019.

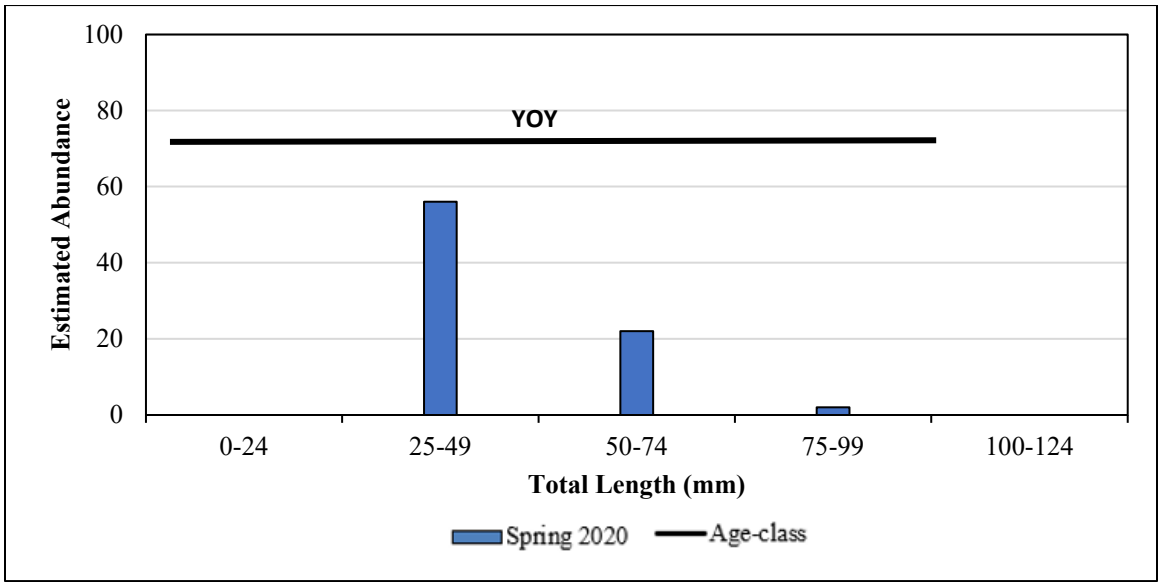


Figure 5-8. Age-class distribution of Sacramento sucker using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

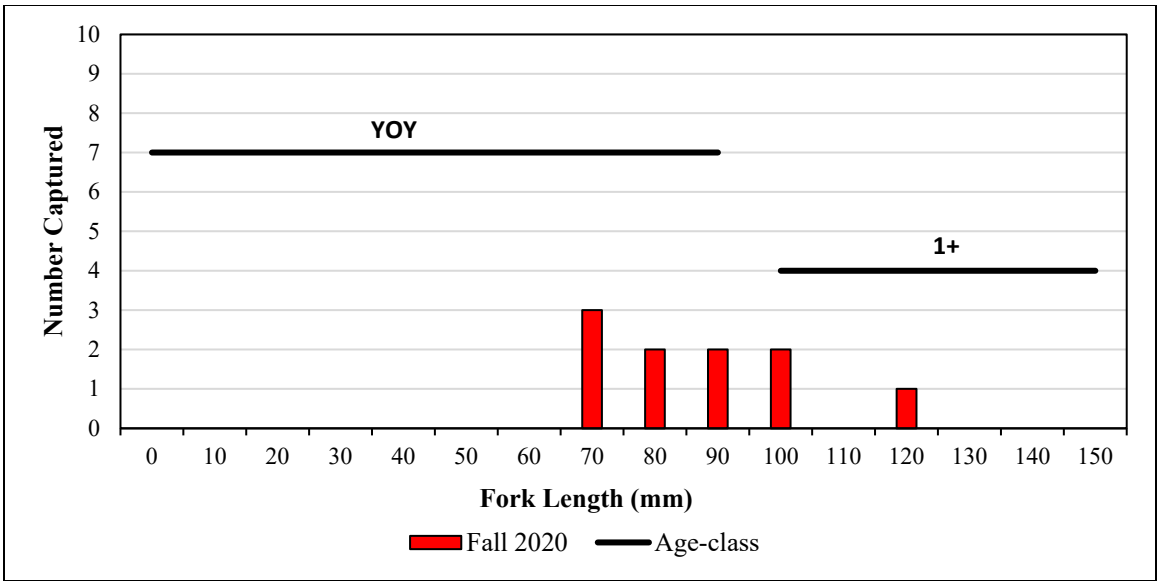


Figure 5-9. Age-class distribution of Sacramento sucker captured during the fall 2020 Rector Creek electrofishing survey.

Steelhead ranged between 125- and 150-mm FL during the spring snorkel survey and belonged to the 1+ age class (Figure 5-10).

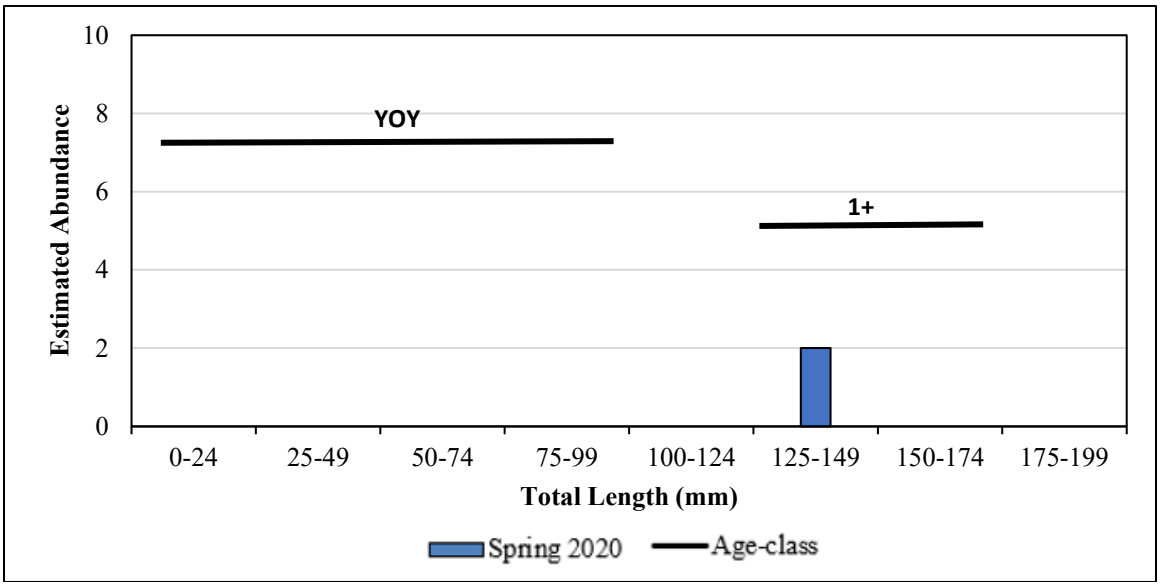


Figure 5-10. Age-class distribution of steelhead using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

During the spring snorkel survey, threespine stickleback ranged in size up to 49 mm TL, with a majority of fish <24 mm TL (Figure 5-11). In the fall, four sticklebacks were captured via electrofishing and lengths ranged from 31–56 mm TL (note: approximately 400 stickleback of a similar size range were observed from the surface in the vicinity of where the electrofishing took place) (Figure 5-12). Most threespine stickleback complete their life cycle in one year (Moyle

2002); however, sticklebacks in the 25–49 mm TL length range may have survived into their second year.

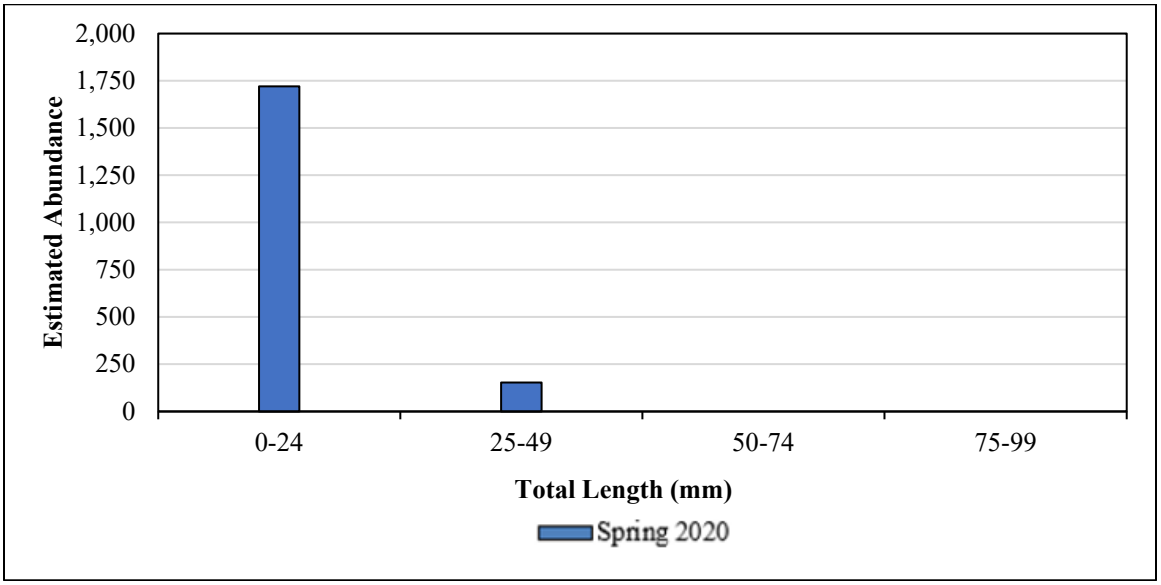


Figure 5-11. Age-class distribution of threespine stickleback using bounded count estimated abundance by size-class observed during the spring 2020 Rector Creek snorkel survey.

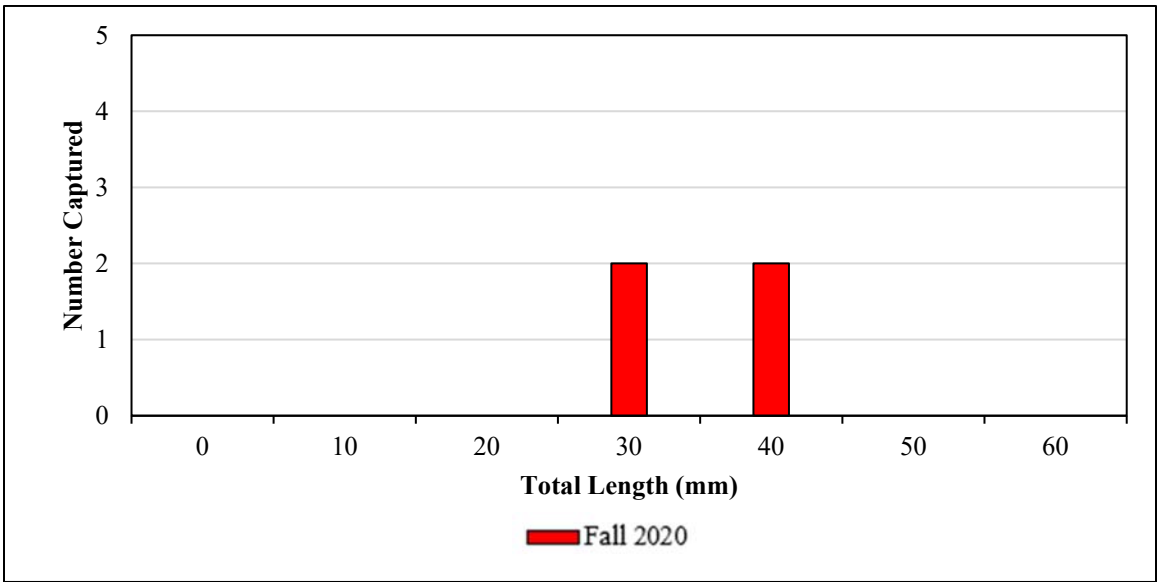


Figure 5-12. Age-class distribution of threespine stickleback captured during the fall 2020 Rector Creek electrofishing survey.

Bluegill observed during the spring snorkel survey belonged to the YOY and 1+ age classes (Figure 5-13); no bluegill were captured during the fall electrofishing survey.

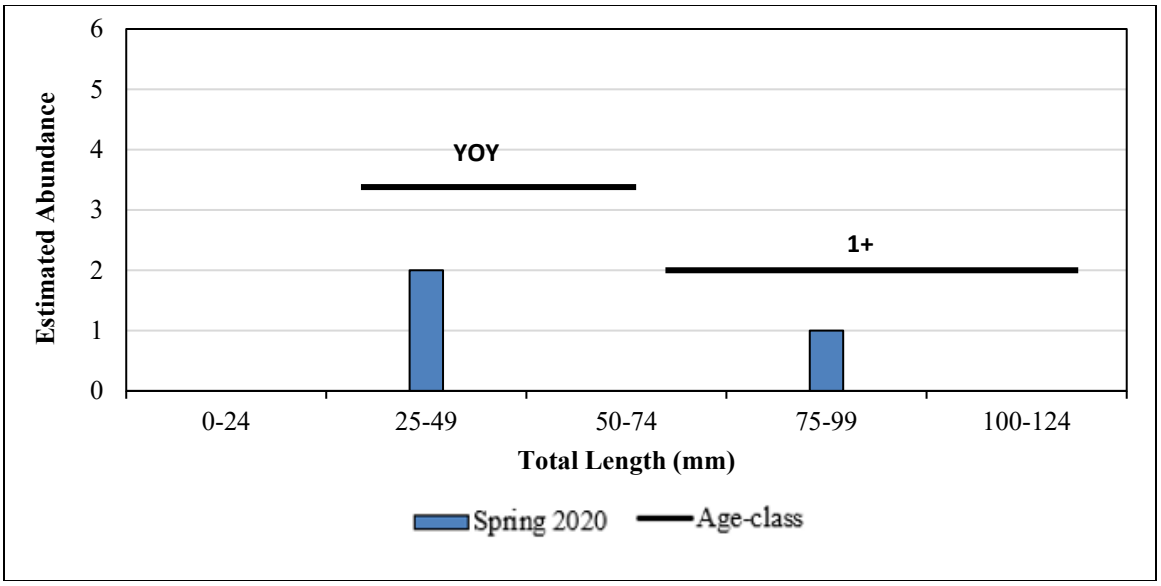


Figure 5-13. Age-class distribution of bluegill using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

Green sunfish belonged to the YOY through 3+ age classes during the spring and fall surveys (Figures 5-14 and 5-15). There was a typical age-class distribution of age 1+ and older fish, but a low number of YOY, indicating limited recruitment in 2020 but otherwise normal year-to-year survival (Figure 5-15).

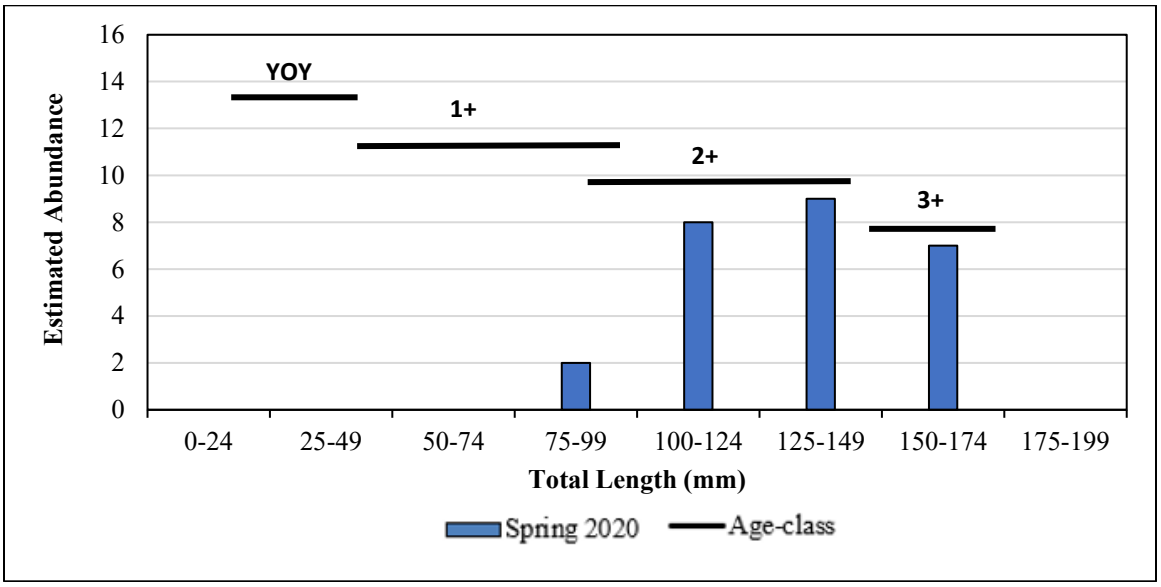


Figure 5-14. Age-class distribution of green sunfish using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

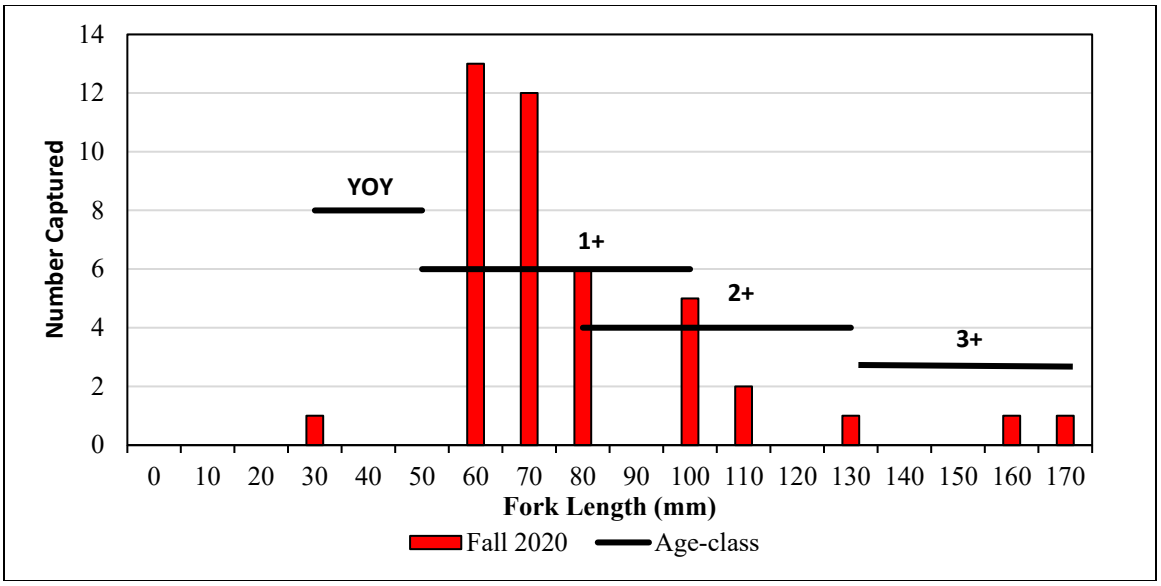


Figure 5-15. Age-class distribution of green sunfish captured during the fall 2020 Rector Creek electrofishing survey.

Redear sunfish observed in the spring belonged to the YOY and 1+ age classes, suggesting successful recruitment in 2020 but limited survival from previous years (Figure 5-16). No redear sunfish were captured in the fall.

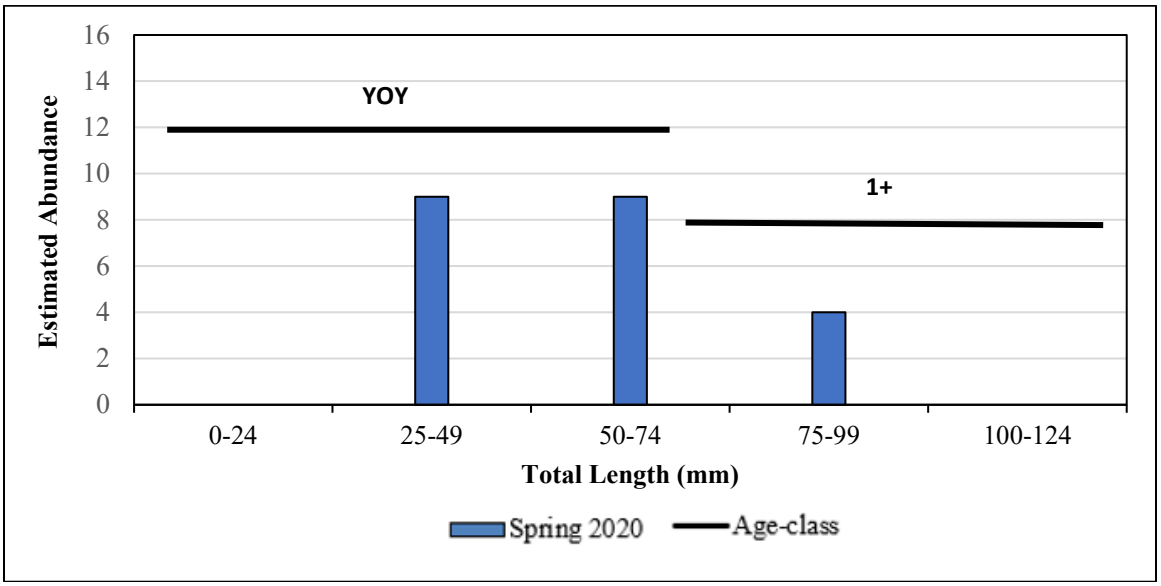


Figure 5-16. Age-class distribution of redear sunfish using bounded count estimated abundance by age-class observed during the spring 2020 Rector Creek snorkel survey.

5.2.3 Fish Condition

Fish captured during the Study appeared generally of good condition based on physical appearance, length-to-weight ratio (k), and lack of any noticeable diseases, parasites, or lesions. Condition factors are often used as a descriptor of nutritional state; however, comparable values

for non-salmonids in the region are not readily available. Photos of representative fish captured during the Study are included in Appendix B (Figures B-8 through B-12). Condition factors for captured species is included in Table 5-2.

Table 5-2. Condition factors (k) of fish captured during the 2020 Rector Creek stream fish population assessment.

Species	Minimum k	Maximum k	Mean k
Bluegill	1.77	1.77	1.77
California roach	0.56	1.18	0.87
Green sunfish	1.27	2.50	1.64
Sacramento pikeminnow	0.52	0.83	0.73
Sacramento sucker	0.67	1.49	0.98
Redear sunfish	1.64	1.95	1.81
Riffle sculpin	1.06	1.52	1.31
Threespine stickleback	0.46	1.28	0.84

5.3 Incidental Observations

Other aquatic species observed during the 2020 fish population surveys are listed in Table 5-3.

Table 5-3. Incidental observations of aquatic species during the 2020 Rector Creek stream fish population assessment.

Species Name		Location	Date	Number Observed
rough-skinned newt	*Taricha granulosa*	subreach 1	4/15	2
		subreach 2	4/17	10

6 DISCUSSION

The primary objective of this Study was to collect fish population data through the capture of individual fish and direct observation to evaluate the current condition of the fish community in lower Rector Creek. Additional studies to assess the condition of the fishery in lower Rector Creek are ongoing and are scheduled to be completed in 2022, including the collection of benthic macroinvertebrate (BMI) data, continuous water temperature data at three to four pools between Rector Dam and the confluence of Conn Creek, the collection of a water temperature and dissolved oxygen profile near the intake structure in Rector Reservoir, and an instream flow study to develop a stage/flow rating curve for streamflow releases. Following the completion of these studies, a synthesis report will be developed intended to evaluate combined results of all technical studies for re-evaluation/refinement of the timing, magnitude, and conditions of the Rector Creek environmental flow release schedule.

Despite dry field conditions in 2020, which limited the effectiveness of some fish population sampling methods, sufficient data were collected to describe and evaluate the current condition of the fish community in the creek, discussed below.

6.1 Stream Conditions

The Rector Creek watershed upstream of Rector Dam is relatively small (approximately 10.7 square miles) and the stream is historically intermittent downstream of the dam; soil types along lower Rector Creek tend to be coarse-grained within a relatively young alluvium with a high infiltration rate (Stillwater Sciences 2019). Unlike Conn Creek and the Napa River, where the groundwater is near the water surface elevation of the stream, the water table along Rector Creek is between 12 and 131 feet below the valley floor (LSCE and MBK 2013). The combination of the coarse sediment with high infiltration rates along the channel bed and the disconnected water table results in an intermittent flow regime downstream of the dam, where portions of the channel would be dry during some summer and fall months even in the absence of the dam.

Additionally, the Napa River basin experienced a Very Dy water year in 2020. Flow in 2020 in the Napa River, where flow is measured continuously, was well below the 25th percentile of annual mean daily flows (1990–2020; Figure 6-1; Stillwater Sciences 2021). Low precipitation and inflow in 2020 prevented Rector Reservoir from spilling, and thus, flows in lower Rector Creek were limited to those provided by CalVet per the interim instream flow release schedule (Stillwater Sciences 2019) at the base of Rector Dam and CDFW Fisheries Base pass-through flows discharge point, which are not sufficient to connect isolated pools in Lower Rector Creek.

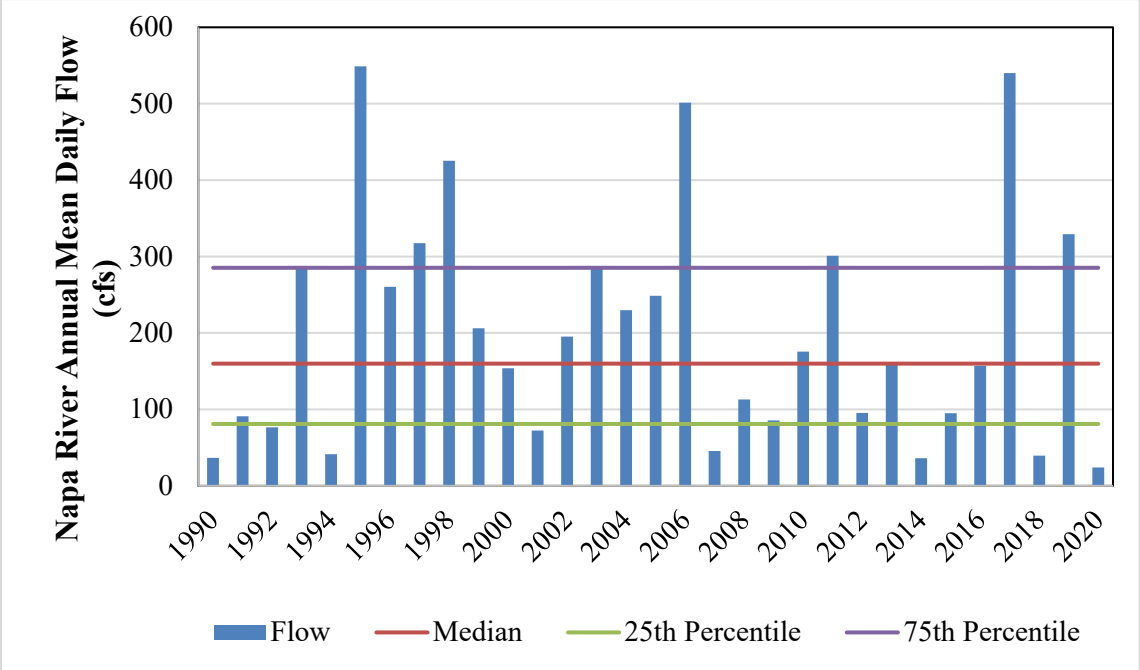


Figure 6-1. Napa River annual mean daily flow measured near Napa, CA (USGS gage 11458000; Source: USGS 2021), for water years 1990 through 2020, shown in blue. The 1990 through 2020 median of annual mean daily flows is shown in red; 25th percentile of flows in green; 75th percentile of flows in purple.

The interim environmental flow schedule focused on native resident fish species and maintaining suitable water quality conditions within isolated pool and run habitats in the dry months, while providing for higher flows in winter and spring for migration. Given the Very Dry conditions, stream flows in lower Rector Creek only ranged from 0.2 cfs to 2.7 cfs, which included full Fisheries Base releases (approximately 2.5 cfs). Although releases varied by month, the size and distribution of isolated pools appear more closely related to ground-water levels and water year type than upstream releases, as increased releases upstream did not increase water levels within isolated pools downstream. Comparatively, during an August 2003 survey conducted by NCRCD in a Wet water year when there was little to no inflow or releases downstream of the dam, 79 percent of the stream contained flowing water, with 21 percent dry. Although surface flow was intermittent, a majority (71%) of pools had a maximum residual depth greater than 2 feet during the NCRCD survey.

6.2 Fish Assemblage and Condition

The existing spill flows, Fisheries Base discharge, and surface water-groundwater exchange in lower Rector Creek provide higher flows in the winter–spring and isolated pool and run habitat in the summer–fall that support a predominantly native fishery. Despite the lack of connected surface flow, fish populations persisted in lower Rector Creek in 2020 by utilizing isolated pools fed by hyporheic flow. The native species observed in 2020, which predominantly included threespine stickleback, California roach, Sacramento sucker, and Sacramento pikeminnow were also present during a Napa County Resource Conservation District snorkel study in 2004 and reflect the native fish assemblage historically present in the nearby Napa River (NCRCD 2004, 2005). Additionally, the isolated reaches may limit the establishment of other non-native fishes in lower Rector Creek that are present in the Napa River; the majority of non-native sunfish species (Centrarchidae) within lower Rector Creek are currently restricted to one perennial pool upstream of Silverado Trail, which also received surface flow from the 0.2 cfs release near the spillway in 2020.

The flow conditions in lower Rector Creek are similar to other Napa River tributaries where steelhead are supported with intermittent flow (Stillwater Sciences 2007); however, the majority of these tributaries occur on the cooler western side of the valley, whereas Rector Creek is on the sunnier, more arid eastern side of the valley. Lower Rector Creek was considered to not be a productive steelhead stream, given its low gradient channel and limited spawning area, even with modified streamflow releases. Additionally, water quality within lower Rector Creek varies seasonally and is highly correlated to in-channel flow with increased water temperatures and decreased dissolved oxygen levels in the summer months (Stillwater Sciences 2019). One steelhead, which appeared to be wild in origin and was estimated to be an age 1+ fish, was observed in Subreach SF-3 during the spring snorkel survey. The Napa River steelhead population is composed of California Central Coast (CCC) steelhead. CCC steelhead are winter-run fish who enter freshwater as mature adults during the highest flows of the year, typically between late December and February. Juveniles begin to smolt and migrate downstream to seek out foraging opportunities when they reach about 100 mm in length (NOAA 2016, Moyle 2002). Prior to the 2020 spring fish population survey, Rector Dam spills occurred from mid-January through mid-July of 2019. The presence of an age 1+ steelhead in lower Rector Creek in the spring of 2020 may indicate that steelhead spawning occurred in the creek during the period of reservoir spilling in winter 2018–2019, and sufficient habitat was present to allow for survival into the spring of 2020. Alternatively, although flow is not recorded in Conn Creek continuously, high flows of up to 450 cfs in the Napa River during December 2019 (USGS 2021) suggest that

sufficient flow may have also been present in Conn Creek during the same winter period causing backwater effect into Rector Creek, potentially allowing upstream passage into Rector Creek across the 0.6 mi between Conn Creek and SF-3. If steelhead were able to move between Conn Creek and SF-3 in late 2019 or early 2020, the age 1+ steelhead observed may only have been present in the pool for 3–4 months rather than 9 – 12 months if passage were only possible during spill events. Steelhead would be unlikely to survive in a dry year such as 2020 where dissolved oxygen was less than 3 mg/L in fall. Additionally, the single steelhead observed in SF-3 during spring 2020 was not captured in fall 2020, suggesting it may not have survived the summer. Three steelhead were observed between the Fisheries Base and State Lane during NRCD snorkel surveys in 2004, a year, like 2019, in which the Napa River experienced annual mean daily flows above the 1990–2020 median flow (NRCD 2004, Figure 6-1). This suggests that the presence and longitudinal extent of steelhead within Rector Creek may be correlated with the amount of flow within the Napa River as well as spilling from Rector Dam.

Even with the dry conditions in 2020, fish persisted in two of the survey reaches. Fish species present did show signs of successful reproduction and survival, with a range of age classes present and successful recruitment of many native species (especially with threespine stickleback), although recruitment and survival in 2020 were likely affected by the dry water year. Length-frequency distributions of native species in Subreach SF-3 also show positive signs of growth through the summer, and individual fish appeared to be in good condition with limited signs of stress due to poor water quality conditions. Fish abundance and distribution within Rector Creek is expected to vary by water year type based on the availability of aquatic habitat; preliminary hydrologic data suggests a substantial hyporheic contribution to residual pool depths and surface area. It is anticipated that larger pool areas would sustain larger fish populations. Because water year types and annual runoff patterns vary widely in the watershed (Stillwater Sciences 2021), it is anticipated that the abundance of both aquatic habitat and fish populations will also vary annually. Additional information gathered as part of the Instream Flow Assessment, scheduled to be completed in 2022, will be used to inform this discussion.

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Appendix A

Site Conditions

Table A-1. Survey site conditions at Rector Creek Stream Fish Population Monitoring Locations, 2020.

Reach	Habitat Unit	Date	Site Length (ft)	Avg. Width (ft)	Avg. Depth (ft)	Max Depth (ft)	Water Temperature (°C)	Dissolved Oxygen		Conductivity (uS/cm)	Approximate Flow in Unit (cfs)	Releases into Rector Creek (cfs)[1]
								mg/L	% Saturation			
SF-1	1	4/15	210.0	10.5	0.8	1.5	--	--	--	--	1.0	1.75
		10/22	*	*	*	*	*	*	*	*	*	1.0
	2	4/15	75.5	15.7	2.5	4.0	--	--	--	--	1.0	1.75
		10/22	54.0	9.2	1.1	2.3	14.8	1.1	10.7	153	0	1.0
	3	4/15	45.9	26.1	4.0	5.0	18.2	9.8	104.2	98	1.0	1.75
		10/22	26.8	24.6	2.5	4.0	16.0	5.2	53.3	119	0	1.0
SF-2	1	4/17	102.0	9.9	0.7	1.0	13.5	6.8	65.6	101	0	1.75
		10/22	85.0	17.8	1.2	2.1	18.5	2.9	30.8	142	<0.1	1.0
	2	4/17	47.5	10.8	2.0	3.5	14.4	1.1	11.2	105	0	1.75
		10/22	65.0	12.9	2.0	3.7	18.2	2.8	30.4	129	0	1.0
SF-3	1	4/16	162.0	15.4	1.6	2.6	15.7	7.7	78	107	<1	1.75
		10/22	115.0	9.3	0.7	1.6	17.8	1.9	19.9	1.9	0	1.0
	2	4/16	201.0	21.6	1.7	3.8	--	--	--	--	<1	1.75
		10/22	98.0	15.5	1.0	1.4	17.3	2.8	29.5	137	0	1.0
SF-4	1	4/17	150.0	16.3	2.1	4.5	15.1	4.7	47.4	125	0	1.75
		10/22	*	*	*	*	*	*	*	*	*	1.0

* Dry

[1] Combined releases from the Rector Dam near the spillway and from CDFW's Fisheries Base. Note: October 2021 flow through the Fisheries Base (1 cfs) went sub-surface prior to the discharge point along the stream (whereas flow would typically go sub-surface approximately 100 meters downstream of the discharge point).

Table A-2. Substrate, Cover, and Habitat Type at Rector Creek Stream Fish Population Monitoring Survey Locations, 2020.

			Percent Cover							Percent Substrate							Percent Habitat Type			
Reach	Unit	Date	Undercut Bank	Instream Vegetation	Overhanging Vegetation	LWD (no.)	Bubble	Large Boulder	No Cover	Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Organic	Pool	Riffle	Run	Glide
SF-1	1	4/15	0	5	0	0	0	10	75	0	65	30	5	0	0	0	30	20	50	0
		10/22	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	2	4/15	5	20	5	0	0	5	65	0	50	45	5	0	0	0	100	0	0	0
		10/22	0	90	0	0	0	0	10	0	30	40	20	0	10	0	100	0	0	0
	3	4/15	5	10		0	5	5	65	10	75	15	0	0	0	0	100	0	0	0
		10/22	0	20	0	0	0	0	80	10	80	10	0	0	0	0	100	0	0	0
SF-2	1	4/17	0	0	15	0	0	10	75	0	15	85	0	0	0	0	100	0	0	0
		10/22	0	25	25	0	0	0	50	0	50	50	0	0	0	0	100	0	0	0
	2	4/17	0	100	20	0	0	0	0	0	50	50	0	0	0	0	100	0	0	0
		10/22	0	100	0	0	0	0	0	--	--	--	--	--	--	--	100	0	0	0
SF-3	1	4/16	5	20	10	5	0	0	60	0	10	65	10	0	0	0	30	0	70	0
		10/22	0	90	0	5	0	0	5	0	40	50	10	0	0	0	100	0	0	0
	2	4/16	5	15	25	0	0	0	55	0	10	80	10	0	0	0	40	0	60	0
		10/22	0	100	0	0	0	0	0	0	30	70	0	0	0	0	100	0	0	0
SF-4	1	4/17	0	25	10	10 (1)	0	0	55	0	0	15	15	0	0	70	100	0	0	0
		10/22	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

*Dry
LWD = Large woody debris

Appendix B

Survey Site and Representative Fish Photographs



Figure B-1. Subreach SF-1, Rector Creek, Spring, 2020. Counter-clockwise from top: Habitat Unit #1, Habitat Unit #2, Habitat Unit #3.



Figure B-2. Subreach SF-1, Rector Creek, Fall, 2020. Counter-clockwise from top: Habitat Unit #1, Habitat Unit #2, Habitat Unit #3.



Figure B-3. Subreach F-2, Rector Creek, 2020. Clockwise from top: Habitat Unit #2, Spring; Habitat Unit #1, Spring; Habitat Unit #1, Fall; Habitat Unit #2, Fall.



Figure B-4. Subreach SF-3, Rector Creek, 2020. Clockwise from top: Habitat Unit #1, Spring; Habitat Unit #2, Spring; Habitat Unit #2, Fall; Habitat Unit #1, Fall.



Figure B-5. Subreach SF-4, Rector Creek, Spring (top) and Fall (bottom), 2020.



Figure B-6. Green sunfish, Rector Creek, 2020.



Figure B-7. Bluegill, Rector Creek, 2020.

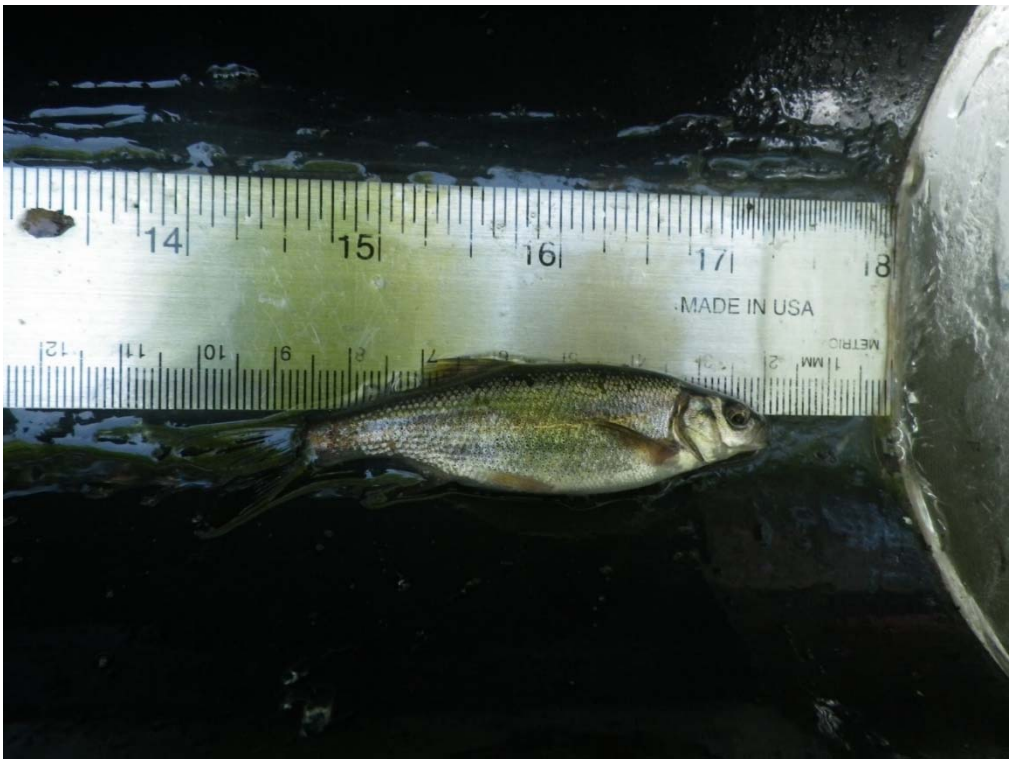


Figure B-8. California roach, Rector Creek, 2020.

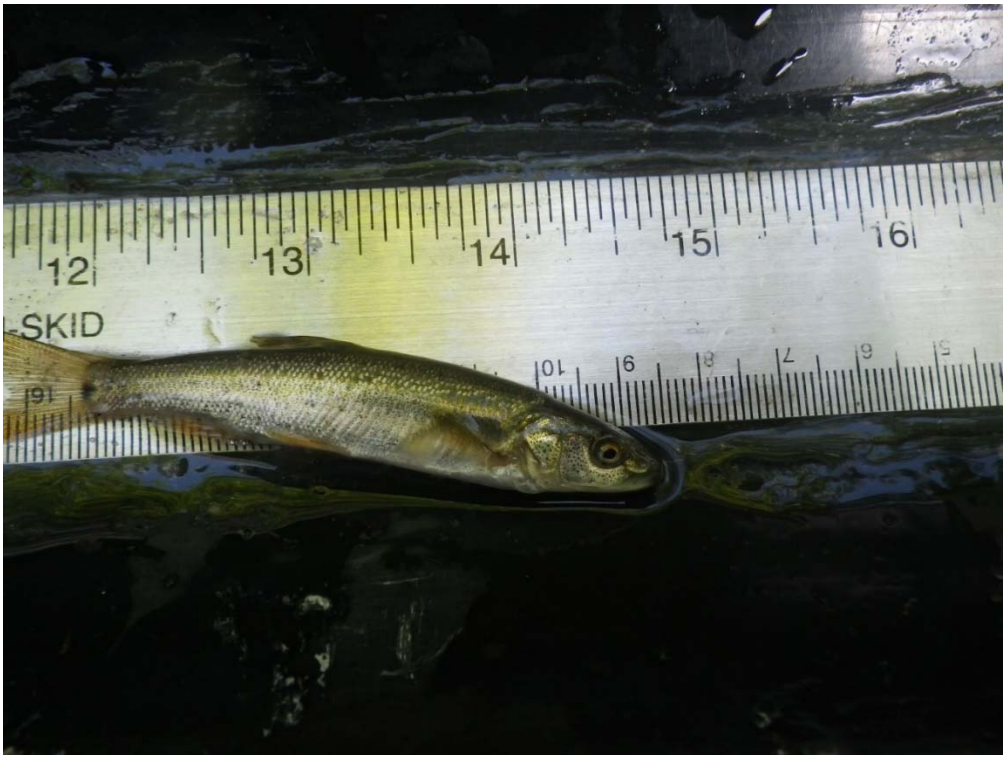


Figure B-9. Sacramento pikeminnow, Rector Creek, 2020.



Figure B-10. Sacramento sucker, Rector Creek, 2020.

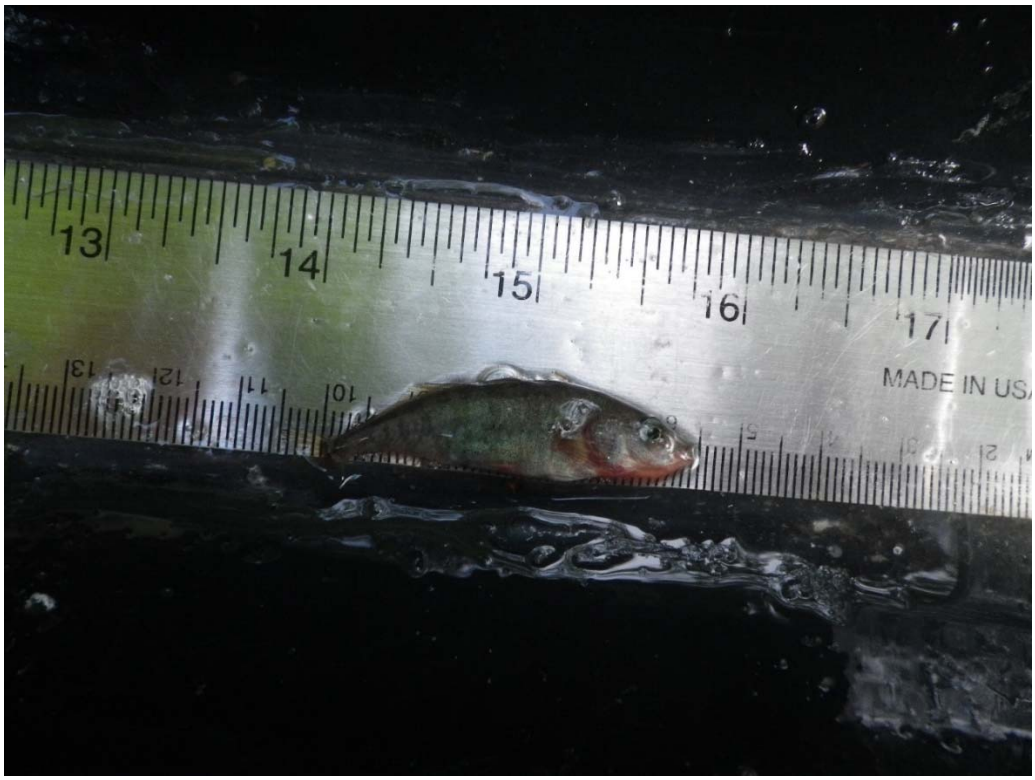


Figure B-11. Threespine stickleback, Rector Creek, 2020.



Figure B-12. Riffle sculpin, Rector Creek, 2020.



Figure B-13. Rough-skinned newt, Rector Creek, April 2020.

Appendix C

Fish Data

Table C-1. Snorkel survey data, Rector Creek Stream Fish Population Study, 2020.

Reach	Date	Habitat Unit	Pass	Species	Total Length Range (mm)	Count
SF-1	4/15/20	3	1	Green sunfish	100-125	6
SF-1	4/15/20	3	1	Green sunfish	125-150	3
SF-1	4/15/20	3	1	Green sunfish	150-175	4
SF-1	4/15/20	3	1	Redear sunfish	50-75	3
SF-1	4/15/20	3	1	Redear sunfish	75-100	2
SF-1	4/15/20	3	2	Green sunfish	100-125	3
SF-1	4/15/20	3	2	Green sunfish	125-150	6
SF-1	4/15/20	3	2	Green sunfish	150-175	5
SF-1	4/15/20	3	2	Redear sunfish	25-50	1
SF-1	4/15/20	3	2	Redear sunfish	50-75	2
SF-1	4/15/20	3	3	Green sunfish	75-100	1
SF-1	4/15/20	3	3	Green sunfish	100-125	4
SF-1	4/15/20	3	3	Green sunfish	125-150	3
SF-1	4/15/20	3	3	Green sunfish	150-175	6
SF-1	4/15/20	3	3	Redear sunfish	25-50	5
SF-1	4/15/20	3	3	Redear sunfish	50-75	6
SF-3	4/16/20	1	1	Bluegill	75-100	1
SF-3	4/16/20	1	1	California roach	25-50	125
SF-3	4/16/20	1	1	California roach	50-75	14
SF-3	4/16/20	1	1	Sacramento pikeminnow	50-75	10
SF-3	4/16/20	1	1	Steelhead	125-150	1

Reach	Date	Habitat Unit	Pass	Species	Total Length Range (mm)	Count
SF-3	4/16/20	1	1	Sacramento sucker	25-50	52
SF-3	4/16/20	1	1	Sacramento sucker	50-75	16
SF-3	4/16/20	1	1	Sacramento sucker	75-100	1
SF-3	4/16/20	1	1	Threespine stickleback	0-25	605
SF-3	4/16/20	1	1	Threespine stickleback	25-50	75
SF-3	4/16/20	1	2	Bluegill	25-50	1
SF-3	4/16/20	1	2	California roach	0-25	53
SF-3	4/16/20	1	2	California roach	25-50	117
SF-3	4/16/20	1	2	California roach	50-75	12
SF-3	4/16/20	1	2	Sacramento pikeminnow	50-75	6
SF-3	4/16/20	1	2	Sacramento pikeminnow	75-100	4
SF-3	4/16/20	1	2	Sacramento sucker	25-50	54
SF-3	4/16/20	1	2	Sacramento sucker	50-75	10
SF-3	4/16/20	1	2	Threespine stickleback	0-25	540
SF-3	4/16/20	1	2	Threespine stickleback	25-50	47
SF-3	4/16/20	1	3	Bluegill	75-100	1
SF-3	4/16/20	1	3	California roach	25-50	105
SF-3	4/16/20	1	3	Sacramento pikeminnow	50-75	12
SF-3	4/16/20	1	3	Sacramento pikeminnow	75-100	3
SF-3	4/16/20	1	3	Sacramento sucker	25-50	28
SF-3	4/16/20	1	3	Sacramento sucker	50-75	10
SF-3	4/16/20	1	3	Threespine stickleback	0-25	430

Reach	Date	Habitat Unit	Pass	Species	Total Length Range (mm)	Count
SF-3	4/16/20	1	3	Threespine stickleback	25-50	17
SF-3	4/16/20	2	1	Threespine stickleback	0-25	845
SF-3	4/16/20	2	1	Threespine stickleback	25-50	30
SF-3	4/16/20	2	1	Sacramento pikeminnow	50-75	3
SF-3	4/16/20	2	2	Threespine stickleback	0-25	605
SF-3	4/16/20	2	2	Threespine stickleback	25-50	40
SF-3	4/16/20	2	3	Threespine stickleback	0-25	640
SF-3	4/16/20	2	3	Threespine stickleback	25-50	24

Table C-2. Electrofishing survey data, Rector Creek Stream Fish Population Study, 2020.

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	10/22/20	California roach	49	0.9	0.76
SF-3	10/22/20	California roach	53	1.2	0.81
SF-3	10/22/20	California roach	56	1.2	0.68
SF-3	10/22/20	California roach	58	1.5	0.77
SF-3	10/22/20	California roach	60	1.9	0.88
SF-3	10/22/20	California roach	62	2.2	0.92
SF-3	10/22/20	California roach	62	1.8	0.76
SF-3	10/22/20	California roach	62	1.9	0.80
SF-3	10/22/20	California roach	63	1.9	0.76
SF-3	10/22/20	California roach	63	1.7	0.68
SF-3	10/22/20	California roach	64	2	0.76
SF-3	10/22/20	California roach	65	2.3	0.84
SF-3	10/22/20	California roach	65	2.3	0.84
SF-3	10/22/20	California roach	65	2.4	0.87
SF-3	10/22/20	California roach	65	2.2	0.80
SF-3	10/22/20	California roach	65	2.6	0.95
SF-3	10/22/20	California roach	66	2.5	0.87
SF-3	10/22/20	California roach	66	2.4	0.83
SF-3	10/22/20	California roach	67	2.6	0.86
SF-3	10/22/20	California roach	68	2.7	0.86
SF-3	10/22/20	California roach	68	2.5	0.80

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	10/22/20	California roach	68	2.6	0.83
SF-3	10/22/20	California roach	68	2.7	0.86
SF-3	10/22/20	California roach	69	2.6	0.79
SF-3	10/22/20	California roach	69	2.8	0.85
SF-3	10/22/20	California roach	70	2.6	0.76
SF-3	10/22/20	California roach	70	3.1	0.90
SF-3	10/22/20	California roach	70	2.9	0.85
SF-3	10/22/20	California roach	71	3.2	0.89
SF-3	10/22/20	California roach	72	2.7	0.72
SF-3	10/22/20	California roach	72	2.8	0.75
SF-3	10/22/20	California roach	73	3	0.77
SF-3	10/22/20	California roach	73	3.2	0.82
SF-3	10/22/20	California roach	73	3.3	0.85
SF-3	10/22/20	California roach	73	3.1	0.80
SF-3	10/22/20	California roach	73	3.3	0.85
SF-3	10/22/20	California roach	74	3.2	0.79
SF-3	10/22/20	California roach	75	3.5	0.83
SF-3	10/22/20	California roach	76	3.7	0.84
SF-3	10/22/20	California roach	77	3.8	0.83
SF-3	10/22/20	California roach	78	3.8	0.80
SF-3	10/22/20	California roach	78	4	0.84
SF-3	10/22/20	California roach	78	4.6	0.97

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	10/22/20	California roach	78	4.1	0.86
SF-3	10/22/20	California roach	81	5.5	1.03
SF-3	10/22/20	California roach	83	4.6	0.80
SF-3	10/22/20	California roach	85	5.4	0.88
SF-3	10/22/20	California roach	86	4.8	0.75
SF-3	10/22/20	California roach	87	5.6	0.85
SF-3	10/22/20	California roach	91	6.1	0.81
SF-3	10/22/20	California roach	91	6.1	0.81
SF-3	10/22/20	California roach	93	7.1	0.88
SF-3	10/22/20	California roach	96	6.4	0.72
SF-3	10/22/20	California roach	108	10.7	0.85
SF-1	10/22/20	Green sunfish	38	0.9	1.64
SF-1	10/22/20	Green sunfish	60	3.3	1.53
SF-1	10/22/20	Green sunfish	61	4	1.76
SF-1	10/22/20	Green sunfish	64	4.2	1.60
SF-1	10/22/20	Green sunfish	64	4	1.53
SF-1	10/22/20	Green sunfish	65	4.5	1.64
SF-1	10/22/20	Green sunfish	66	4.3	1.50
SF-1	10/22/20	Green sunfish	66	7	2.43
SF-1	10/22/20	Green sunfish	66	7.2	2.50
SF-1	10/22/20	Green sunfish	68	5	1.59
SF-1	10/22/20	Green sunfish	69	5.6	1.70

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-1	10/22/20	Green sunfish	69	5.3	1.61
SF-1	10/22/20	Green sunfish	69	4.9	1.49
SF-1	10/22/20	Green sunfish	69	5.5	1.67
SF-1	10/22/20	Green sunfish	70	6.1	1.78
SF-1	10/22/20	Green sunfish	70	5.2	1.52
SF-1	10/22/20	Green sunfish	71	6.3	1.76
SF-1	10/22/20	Green sunfish	71	5.8	1.62
SF-1	10/22/20	Green sunfish	71	5.4	1.51
SF-1	10/22/20	Green sunfish	72	6.4	1.71
SF-1	10/22/20	Green sunfish	72	6.3	1.69
SF-1	10/22/20	Green sunfish	72	6.2	1.66
SF-1	10/22/20	Green sunfish	74	6.2	1.53
SF-1	10/22/20	Green sunfish	76	6.5	1.48
SF-1	10/22/20	Green sunfish	77	7.1	1.56
SF-1	10/22/20	Green sunfish	79	8.7	1.76
SF-1	10/22/20	Green sunfish	80	8	1.56
SF-1	10/22/20	Green sunfish	80	7.9	1.54
SF-3	10/22/20	Green sunfish	80	8.9	1.74
SF-1	10/22/20	Green sunfish	81	8.4	1.58
SF-1	10/22/20	Green sunfish	82	9	1.63
SF-1	10/22/20	Green sunfish	87	10.5	1.59
SF-1	10/22/20	Green sunfish	101	17	1.65

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-1	10/22/20	Green sunfish	102	17	1.60
SF-1	10/22/20	Green sunfish	102	16.4	1.55
SF-1	10/22/20	Green sunfish	106	16.8	1.41
SF-1	10/22/20	Green sunfish	109	18.7	1.44
SF-1	10/22/20	Green sunfish	111	25	1.83
SF-1	10/22/20	Green sunfish	112	17.8	1.27
SF-1	10/22/20	Green sunfish	130	38	1.73
SF-1	10/22/20	Green sunfish	167	77.9	1.67
SF-1	10/22/20	Green sunfish	177	79	1.42
SF-3	10/22/20	Sacramento pikeminnow	97	6.5	0.71
SF-3	10/22/20	Sacramento pikeminnow	111	9.1	0.67
SF-3	10/22/20	Sacramento pikeminnow	117	11.6	0.72
SF-3	10/22/20	Sacramento pikeminnow	119	8.7	0.52
SF-3	10/22/20	Sacramento pikeminnow	125	12.5	0.64
SF-3	10/22/20	Riffle sculpin	73	4.7	1.21
SF-3	10/22/20	Sacramento sucker	70	5.1	1.49
SF-3	10/22/20	Sacramento sucker	73	3.9	1.00
SF-3	10/22/20	Sacramento sucker	78	4.5	0.95
SF-3	10/22/20	Sacramento sucker	80	4.4	0.86
SF-3	10/22/20	Sacramento sucker	87	5.6	0.85
SF-3	10/22/20	Sacramento sucker	91	7.2	0.96
SF-3	10/22/20	Sacramento sucker	97	9.9	1.08

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	10/22/20	Sacramento sucker	108	11.7	0.93
SF-3	10/22/20	Sacramento sucker	109	11.4	0.88
SF-3	10/22/20	Sacramento sucker	125	17.2	0.88
SF-3	10/22/20	Threespine stickleback	31	0.3	1.01
SF-3	10/22/20	Threespine stickleback	34	0.3	0.76
SF-3	10/22/20	Threespine stickleback	40	0.3	0.47
SF-3	10/22/20	Threespine stickleback	40	0.7	1.09
SF-3	4/16/20	Bluegill	123	32.9	1.77
SF-3	4/16/20	California roach	50	1.1	0.88
SF-3	4/16/20	California roach	52	1.3	0.92
SF-3	4/16/20	California roach	53	1.6	1.07
SF-3	4/16/20	California roach	53	1.5	1.01
SF-3	4/16/20	California roach	56	1.7	0.97
SF-3	4/16/20	California roach	57	2	1.08
SF-3	4/16/20	California roach	60	2	0.93
SF-3	4/16/20	California roach	60	2	0.93
SF-3	4/16/20	California roach	61	2.3	1.01
SF-3	4/16/20	California roach	62	2.2	0.92
SF-3	4/16/20	California roach	63	2.4	0.96
SF-3	4/16/20	California roach	66	1.6	0.56
SF-3	4/16/20	California roach	70	3.7	1.08
SF-3	4/16/20	California roach	73	4.6	1.18

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	4/16/20	California roach	78	5.1	1.07
SF-3	4/16/20	California roach	79	5.8	1.18
SF-3	4/16/20	California roach	82	6.5	1.18
SF-1	4/15/20	Green sunfish	105	21.8	1.88
SF-1	4/15/20	Green sunfish	107	19.0	1.55
SF-3	4/16/20	Sacramento pikeminnow	79	4.1	0.83
SF-3	4/16/20	Sacramento pikeminnow	81	3.8	0.72
SF-3	4/16/20	Sacramento pikeminnow	81	4.2	0.79
SF-3	4/16/20	Sacramento pikeminnow	86	5.0	0.79
SF-3	4/16/20	Sacramento pikeminnow	87	4.8	0.73
SF-3	4/16/20	Sacramento pikeminnow	90	5.6	0.77
SF-3	4/16/20	Sacramento pikeminnow	92	5.9	0.76
SF-3	4/16/20	Sacramento pikeminnow	97	7.5	0.82
SF-3	4/16/20	Sacramento pikeminnow	111	10.4	0.76
SF-3	4/16/20	Sacramento pikeminnow	112	10.6	0.75
SF-1	4/15/20	Redear sunfish	43	1.3	1.64
SF-1	4/15/20	Redear sunfish	49	2.3	1.95
SF-1	4/15/20	Redear sunfish	51	2.4	1.81
SF-1	4/15/20	Redear sunfish	54	2.9	1.84
SF-1	4/15/20	Redear sunfish	54	2.7	1.71
SF-1	4/15/20	Redear sunfish	57	3.3	1.78
SF-1	4/15/20	Redear sunfish	58	3.7	1.90

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-1	4/15/20	Redear sunfish	61	4.3	1.89
SF-1	4/15/20	Redear sunfish	119	30.2	1.79
SF-3	4/16/20	Riffle sculpin	47	1.1	1.06
SF-3	4/16/20	Riffle sculpin	50	1.5	1.20
SF-3	4/16/20	Riffle sculpin	50	1.7	1.36
SF-3	4/16/20	Riffle sculpin	51	1.6	1.21
SF-3	4/16/20	Riffle sculpin	52	1.8	1.28
SF-3	4/16/20	Riffle sculpin	55	2.1	1.26
SF-3	4/16/20	Riffle sculpin	56	2.1	1.20
SF-3	4/16/20	Riffle sculpin	57	2.2	1.19
SF-3	4/16/20	Riffle sculpin	58	2.4	1.23
SF-3	4/16/20	Riffle sculpin	59	2.6	1.27
SF-3	4/16/20	Riffle sculpin	60	2.7	1.25
SF-3	4/16/20	Riffle sculpin	63	3.4	1.36
SF-3	4/16/20	Riffle sculpin	69	5.0	1.52
SF-3	4/16/20	Riffle sculpin	71	5.0	1.40
SF-3	4/16/20	Riffle sculpin	71	4.6	1.29
SF-3	4/16/20	Riffle sculpin	75	5.8	1.37
SF-3	4/16/20	Riffle sculpin	77	6.1	1.34
SF-3	4/16/20	Riffle sculpin	79	7.0	1.42
SF-3	4/16/20	Riffle sculpin	91	10.9	1.45
SF-3	4/16/20	Riffle sculpin	92	10.3	1.32

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	4/16/20	Riffle sculpin	106	17.5	1.47
SF-3	4/16/20	Riffle sculpin	117	19.2	1.20
SF-3	4/16/20	Riffle sculpin	119	25.3	1.50
SF-3	4/16/20	Sacramento sucker	50	1.3	1.04
SF-3	4/16/20	Sacramento sucker	53	1.5	1.01
SF-3	4/16/20	Sacramento sucker	58	1.9	0.97
SF-3	4/16/20	Sacramento sucker	62	1.6	0.67
SF-3	4/16/20	Sacramento sucker	65	2.6	0.95
SF-3	4/16/20	Sacramento sucker	67	2.9	0.96
SF-3	4/16/20	Sacramento sucker	70	3.5	1.02
SF-3	4/16/20	Sacramento sucker	70	3.4	0.99
SF-3	4/16/20	Sacramento sucker	71	3.3	0.92
SF-3	4/16/20	Sacramento sucker	71	3.6	1.01
SF-3	4/16/20	Sacramento sucker	76	4.3	0.98
SF-3	4/16/20	Sacramento sucker	84	6.0	1.01
SF-3	4/16/20	Sacramento sucker	90	7.0	0.96
SF-3	4/16/20	Sacramento sucker	95	9.2	1.07
SF-3	4/16/20	Sacramento sucker	100	9.7	0.97
SF-3	4/16/20	Sacramento sucker	105	12.6	1.09
SF-3	4/16/20	Sacramento sucker	111	12.7	0.93
SF-3	4/16/20	Threespine stickleback	21	0.1	1.08
SF-3	4/16/20	Threespine stickleback	24	0.1	0.72

Reach	Date	Species	FL/TL (mm)[1]	Weight (grams)	Condition (k-value)
SF-3	4/16/20	Threespine stickleback	26	0.1	0.57
SF-3	4/16/20	Threespine stickleback	27	0.1	0.51
SF-3	4/16/20	Threespine stickleback	28	0.1	0.46
SF-3	4/16/20	Threespine stickleback	32	0.2	0.61
SF-3	4/16/20	Threespine stickleback	34	0.3	0.76
SF-3	4/16/20	Threespine stickleback	36	0.4	0.86
SF-3	4/16/20	Threespine stickleback	36	0.4	0.86
SF-3	4/16/20	Threespine stickleback	48	1.1	0.99
SF-3	4/16/20	Threespine stickleback	49	1.3	1.10
SF-3	4/16/20	Threespine stickleback	50	1.3	1.04
SF-3	4/16/20	Threespine stickleback	50	1.6	1.28
SF-3	4/16/20	Threespine stickleback	55	1.9	1.14
SF-3	4/16/20	Threespine stickleback	56	1.0	0.57

[1] FL for fishes with forked tails (e.g., California roach, Sacramento sucker, Sacramento pikeminnow, and sunfish) and TL for fishes without forked tails (e.g., riffle sculpin and threespine stickleback).

APPENDIX 3.5-A

Greenhouse Gas CalEEMod Emissions Model
Rector Reservoir Bypass Valve Project

Pipeline Construction

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.65	1000sqft	0.11	4,650.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Pipeline Construction - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construction Phase and Timing updated to mathcin information in the project description and Project Detail (Wood Rodgers)

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by wood rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Off-road Equipment - Construcion equipment provided by Wood Rodgers

Grading - Material imported and exported porvided by Wood Rodgers

Trips and VMT - Worker trips provided by Wood Rodgers.

Construction Off-road Equipment Mitigation - Mitigation imposed to account for best management practices

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	2.00
tblConstructionPhase	NumDays	1.00	2.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	5.00	2.00
tblConstructionPhase	PhaseEndDate	9/1/2021	2/16/2022
tblConstructionPhase	PhaseEndDate	8/18/2021	2/10/2022
tblConstructionPhase	PhaseEndDate	3/31/2021	2/8/2022
tblConstructionPhase	PhaseEndDate	8/25/2021	2/14/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/7/2022
tblConstructionPhase	PhaseStartDate	8/26/2021	2/15/2022

Pipeline Construction - Napa County, Annual

tblConstructionPhase	PhaseStartDate	4/1/2021	2/9/2022
tblConstructionPhase	PhaseStartDate	3/30/2021	2/8/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/11/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/1/2022
tblGrading	AcresOfGrading	0.00	1.00
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialExported	0.00	10.00
tblGrading	MaterialExported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblGrading	MaterialImported	0.00	80.00
tblOffRoadEquipment	HorsePower	402.00	16.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.44	0.44
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Tractors
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00

tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	20.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	1.00	0.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	6.6200e-003	0.0588	0.0586	1.7000e-004	1.6700e-003	2.1600e-003	3.8300e-003	3.2000e-004	2.0000e-003	2.3200e-003	0.0000	15.2003	15.2003	4.1400e-003	0.0000	15.3039
Maximum	**6.6200e-003**	**0.0588**	**0.0586**	**1.7000e-004**	**1.6700e-003**	**2.1600e-003**	**3.8300e-003**	**3.2000e-004**	**2.0000e-003**	**2.3200e-003**	**0.0000**	**15.2003**	**15.2003**	**4.1400e-003**	**0.0000**	**15.3039**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	6.6200e-003	0.0588	0.0586	1.7000e-004	1.2100e-003	2.1600e-003	3.3800e-003	2.7000e-004	2.0000e-003	2.2700e-003	0.0000	15.2003	15.2003	4.1400e-003	0.0000	15.3039
Maximum	**6.6200e-003**	**0.0588**	**0.0586**	**1.7000e-004**	**1.2100e-003**	**2.1600e-003**	**3.3800e-003**	**2.7000e-004**	**2.0000e-003**	**2.2700e-003**	**0.0000**	**15.2003**	**15.2003**	**4.1400e-003**	**0.0000**	**15.3039**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**27.54**	**0.00**	**11.75**	**15.63**	**0.00**	**2.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
4	12-15-2021	3-14-2022	0.0630	0.0630
		Highest	0.0630	0.0630

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Pipeline Construction - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Hot Tap Connection-Site Preparation	Site Preparation	2/1/2022	2/7/2022	5	5	
2	Hot Tap to Existing Pipeline	Trenching	2/8/2022	2/8/2022	5	1	
3	Pipeline Install- Utility Location	Site Preparation	2/9/2022	2/10/2022	5	2	
4	Pipeline Install- Trenching	Trenching	2/11/2022	2/14/2022	5	2	
5	Pipeline Install- Base and Pipe Install	Building Construction	2/15/2022	2/16/2022	5	2	
6	Pipeline Install- Backfill	Grading	2/17/2022	2/18/2022	5	2	
7	Pipeline Install- Testing	Paving	2/19/2022	2/22/2022	5	2	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.11

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline Install- Base and Pipe Install	Air Compressors	0	6.00	78	0.48
Pipeline Install- Trenching	Cement and Mortar Mixers	0	6.00	9	0.56
Pipeline Install- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Hot Tap to Existing Pipeline	Concrete/Industrial Saws	0	8.00	81	0.73
Pipeline Install- Utility Location	Cranes	0	4.00	231	0.29
Pipeline Install- Utility Location	Forklifts	0	6.00	89	0.20
Hot Tap Connection-Site Preparation	Graders	0	8.00	187	0.41
Pipeline Install- Trenching	Pavers	0	7.00	130	0.42
Pipeline Install- Trenching	Rollers	0	7.00	80	0.38

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Pipeline Install- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Hot Tap to Existing Pipeline	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Utility Location	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Cranes	0	4.00	231	0.29
Hot Tap to Existing Pipeline	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Base and Pipe Install	Forklifts	0	6.00	89	0.20
Pipeline Install- Utility Location	Graders	0	8.00	187	0.41
Pipeline Install- Testing	Pavers	0	7.00	130	0.42
Pipeline Install- Testing	Rollers	0	7.00	80	0.38
Pipeline Install- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Pipeline Install- Base and Pipe Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Pipeline Install- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Pipeline Install- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Hot Tap Connection-Site Preparation	Off-Highway Trucks	2	8.00	16	0.38
Hot Tap Connection-Site Preparation	Excavators	1	8.00	158	0.38
Hot Tap Connection-Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Excavators	1	8.00	158	0.38
Hot Tap to Existing Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Hot Tap to Existing Pipeline	Off-Highway Trucks	1	8.00	402	0.38
Pipeline Install- Utility Location	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Utility Location	Excavators	1	7.00	158	0.38
Pipeline Install- Trenching	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Pipeline Install- Trenching	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Pipeline Install- Trenching	Excavators	1	7.00	158	0.38

Pipeline Install- Base and Pipe Install	Off-Highway Trucks	2	7.00	402	0.38
Pipeline Install- Base and Pipe Install	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Dumpers/Tenders	1	7.00	16	0.38
Pipeline Install- Backfill	Off-Highway Trucks	1	7.00	402	0.38
Pipeline Install- Testing	Off-Highway Tractors	1	7.00	124	0.44

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline Install- Backfill	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap Connection- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Hot Tap to Existing Pipeline	4	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Utility Location	3	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Trenching	5	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Base and Pipe Install	4	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pipeline Install- Testing	1	5.00	0.00	12.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Hot Tap Connection-Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-003	9.8200e-003	0.0144	2.0000e-005		4.8000e-004	4.8000e-004		4.5000e-004	4.5000e-004	0.0000	1.9611	1.9611	6.0000e-004	0.0000	1.9762
Total	**1.1000e-003**	**9.8200e-003**	**0.0144**	**2.0000e-005**	**2.7000e-004**	**4.8000e-004**	**7.5000e-004**	**3.0000e-005**	**4.5000e-004**	**4.8000e-004**	**0.0000**	**1.9611**	**1.9611**	**6.0000e-004**	**0.0000**	**1.9762**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**5.0000e-005**	**2.8000e-004**	**3.5000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1536**	**0.1536**	**0.0000**	**0.0000**	**0.1538**

3.2 Hot Tap Connection-Site Preparation - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1000e-003	9.8200e-003	0.0144	2.0000e-005		4.8000e-004	4.8000e-004		4.5000e-004	4.5000e-004	0.0000	1.9611	1.9611	6.0000e-004	0.0000	1.9762
Total	**1.1000e-003**	**9.8200e-003**	**0.0144**	**2.0000e-005**	**1.2000e-004**	**4.8000e-004**	**6.0000e-004**	**1.0000e-005**	**4.5000e-004**	**4.6000e-004**	**0.0000**	**1.9611**	**1.9611**	**6.0000e-004**	**0.0000**	**1.9762**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**5.0000e-005**	**2.8000e-004**	**3.5000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1536**	**0.1536**	**0.0000**	**0.0000**	**0.1538**

3.3 Hot Tap to Existing Pipeline - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7000e-004	3.7700e-003	4.2900e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.5000e-004	1.5000e-004	0.0000	0.9411	0.9411	3.0000e-004	0.0000	0.9486
Total	**4.7000e-004**	**3.7700e-003**	**4.2900e-003**	**1.0000e-005**		**1.6000e-004**	**1.6000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**0.9411**	**0.9411**	**3.0000e-004**	**0.0000**	**0.9486**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	6.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0159	0.0159	0.0000	0.0000	0.0159
Total	**1.0000e-005**	**1.0000e-005**	**6.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0159**	**0.0159**	**0.0000**	**0.0000**	**0.0159**

3.3 Hot Tap to Existing Pipeline - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.7000e-004	3.7700e-003	4.2900e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.5000e-004	1.5000e-004	0.0000	0.9411	0.9411	3.0000e-004	0.0000	0.9486
Total	**4.7000e-004**	**3.7700e-003**	**4.2900e-003**	**1.0000e-005**		**1.6000e-004**	**1.6000e-004**		**1.5000e-004**	**1.5000e-004**	**0.0000**	**0.9411**	**0.9411**	**3.0000e-004**	**0.0000**	**0.9486**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	6.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0159	0.0159	0.0000	0.0000	0.0159
Total	**1.0000e-005**	**1.0000e-005**	**6.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0159**	**0.0159**	**0.0000**	**0.0000**	**0.0159**

3.4 Pipeline Install- Utility Location - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.5000e-004	0.0000	5.5000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2400e-003	9.6300e-003	9.6100e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.4000e-004	3.4000e-004	0.0000	2.7310	2.7310	8.8000e-004	0.0000	2.7531
Total	**1.2400e-003**	**9.6300e-003**	**9.6100e-003**	**3.0000e-005**	**5.5000e-004**	**3.7000e-004**	**9.2000e-004**	**6.0000e-005**	**3.4000e-004**	**4.0000e-004**	**0.0000**	**2.7310**	**2.7310**	**8.8000e-004**	**0.0000**	**2.7531**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.4 Pipeline Install- Utility Location - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.5000e-004	0.0000	2.5000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2400e-003	9.6300e-003	9.6100e-003	3.0000e-005		3.7000e-004	3.7000e-004		3.4000e-004	3.4000e-004	0.0000	2.7310	2.7310	8.8000e-004	0.0000	2.7531
Total	**1.2400e-003**	**9.6300e-003**	**9.6100e-003**	**3.0000e-005**	**2.5000e-004**	**3.7000e-004**	**6.2000e-004**	**3.0000e-005**	**3.4000e-004**	**3.7000e-004**	**0.0000**	**2.7310**	**2.7310**	**8.8000e-004**	**0.0000**	**2.7531**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.5 Pipeline Install- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4500e-003	0.0115	0.0118	3.0000e-005		4.6000e-004	4.6000e-004		4.3000e-004	4.3000e-004	0.0000	3.0176	3.0176	9.7000e-004	0.0000	3.0417
Total	**1.4500e-003**	**0.0115**	**0.0118**	**3.0000e-005**		**4.6000e-004**	**4.6000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**3.0176**	**3.0176**	**9.7000e-004**	**0.0000**	**3.0417**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.5 Pipeline Install- Trenching - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4500e-003	0.0115	0.0118	3.0000e-005		4.6000e-004	4.6000e-004		4.3000e-004	4.3000e-004	0.0000	3.0176	3.0176	9.7000e-004	0.0000	3.0417
Total	**1.4500e-003**	**0.0115**	**0.0118**	**3.0000e-005**		**4.6000e-004**	**4.6000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**3.0176**	**3.0176**	**9.7000e-004**	**0.0000**	**3.0417**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.6 Pipeline Install- Base and Pipe Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1600e-003	9.1400e-003	8.3600e-003	3.0000e-005		3.6000e-004	3.6000e-004		3.3000e-004	3.3000e-004	0.0000	2.3623	2.3623	7.5000e-004	0.0000	2.3811
Total	**1.1600e-003**	**9.1400e-003**	**8.3600e-003**	**3.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.3000e-004**	**3.3000e-004**	**0.0000**	**2.3623**	**2.3623**	**7.5000e-004**	**0.0000**	**2.3811**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.6 Pipeline Install- Base and Pipe Install - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.1600e-003	9.1400e-003	8.3600e-003	3.0000e-005		3.6000e-004	3.6000e-004		3.3000e-004	3.3000e-004	0.0000	2.3623	2.3623	7.5000e-004	0.0000	2.3811
Total	**1.1600e-003**	**9.1400e-003**	**8.3600e-003**	**3.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.3000e-004**	**3.3000e-004**	**0.0000**	**2.3623**	**2.3623**	**7.5000e-004**	**0.0000**	**2.3811**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.7 Pipeline Install- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.5000e-004	5.1900e-003	4.8500e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.2737	1.2737	4.0000e-004	0.0000	1.2837
Total	**6.5000e-004**	**5.1900e-003**	**4.8500e-003**	**1.0000e-005**	**2.0000e-005**	**2.1000e-004**	**2.3000e-004**	**0.0000**	**2.0000e-004**	**2.0000e-004**	**0.0000**	**1.2737**	**1.2737**	**4.0000e-004**	**0.0000**	**1.2837**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.7 Pipeline Install- Backfill - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.5000e-004	5.1900e-003	4.8500e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.2737	1.2737	4.0000e-004	0.0000	1.2837
Total	**6.5000e-004**	**5.1900e-003**	**4.8500e-003**	**1.0000e-005**	**1.0000e-005**	**2.1000e-004**	**2.2000e-004**	**0.0000**	**2.0000e-004**	**2.0000e-004**	**0.0000**	**1.2737**	**1.2737**	**4.0000e-004**	**0.0000**	**1.2837**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.8 Pipeline Install- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-004	1.8700e-003	2.6600e-003	0.0000		9.0000e-005	9.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.3575	0.3575	1.2000e-004	0.0000	0.3604
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.9000e-004**	**1.8700e-003**	**2.6600e-003**	**0.0000**		**9.0000e-005**	**9.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.3575**	**0.3575**	**1.2000e-004**	**0.0000**	**0.3604**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

3.8 Pipeline Install- Testing - 2022

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.9000e-004	1.8700e-003	2.6600e-003	0.0000		9.0000e-005	9.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.3575	0.3575	1.2000e-004	0.0000	0.3604
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.9000e-004**	**1.8700e-003**	**2.6600e-003**	**0.0000**		**9.0000e-005**	**9.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.3575**	**0.3575**	**1.2000e-004**	**0.0000**	**0.3604**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.5100e-003	3.2000e-004	0.0000	1.0000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.4456	0.4456	2.0000e-005	0.0000	0.4462
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**6.0000e-005**	**1.5200e-003**	**4.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.5000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.4773**	**0.4773**	**2.0000e-005**	**0.0000**	**0.4779**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Unmitigated	4.0000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	9.0000e-005
Total	**4.0000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Bypass Valve Construction

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	7.20	1000sqft	0.17	7,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Bypass Valve Construction - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construcion pahsing and timing updated to matych the project and infomratio provided by the applicant.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers

Grading - Cut and fill information provided by Wood Rodgers

Trips and VMT - Worker and hul trips updated to match the project description.

Construction Off-road Equipment Mitigation - Mitigation accounts for BMP

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	5.00	7.00
tblConstructionPhase	NumDays	100.00	7.00
tblConstructionPhase	NumDays	100.00	8.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	PhaseEndDate	8/25/2021	3/4/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	2/23/2022
tblConstructionPhase	PhaseStartDate	8/19/2021	2/24/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	2/23/2022
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	70.00
tblGrading	MaterialExported	0.00	25.00
tblGrading	MaterialImported	0.00	70.00

Bypass Valve Construction - Napa County, Annual

tblGrading	MaterialImported	0.00	25.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators

Bypass Valve Construction - Napa County, Annual

tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	6.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	4.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	HaulingTripNumber	18.00	9.00
tblTripsAndVMT	HaulingTripNumber	0.00	9.00
tblTripsAndVMT	WorkerTripNumber	13.00	6.00
tblTripsAndVMT	WorkerTripNumber	10.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	6.00
tblTripsAndVMT	WorkerTripNumber	3.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0249	0.2025	0.1969	5.9000e-004	1.3200e-003	8.3700e-003	9.6900e-003	3.1000e-004	7.7100e-003	8.0200e-003	0.0000	51.9984	51.9984	0.0162	0.0000	52.4029
Maximum	**0.0249**	**0.2025**	**0.1969**	**5.9000e-004**	**1.3200e-003**	**8.3700e-003**	**9.6900e-003**	**3.1000e-004**	**7.7100e-003**	**8.0200e-003**	**0.0000**	**51.9984**	**51.9984**	**0.0162**	**0.0000**	**52.4029**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0249	0.2025	0.1969	5.9000e-004	1.1600e-003	8.3700e-003	9.5300e-003	2.9000e-004	7.7100e-003	8.0000e-003	0.0000	51.9984	51.9984	0.0162	0.0000	52.4029
Maximum	**0.0249**	**0.2025**	**0.1969**	**5.9000e-004**	**1.1600e-003**	**8.3700e-003**	**9.5300e-003**	**2.9000e-004**	**7.7100e-003**	**8.0000e-003**	**0.0000**	**51.9984**	**51.9984**	**0.0162**	**0.0000**	**52.4029**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**12.12**	**0.00**	**1.65**	**6.45**	**0.00**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
4	**12-15-2021**	**3-14-2022**	0.0877	0.0877
5	**3-15-2022**	**6-14-2022**	0.1417	0.1417
		Highest	0.1417	0.1417

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.2000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**6.2000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Bypass Valve Construction - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Flow Facility- Site Preparation	Site Preparation	2/23/2022	2/23/2022	5	1	
2	Flow Facility- Prep and Pour Foundation	Paving	2/24/2022	3/4/2022	5	7	
3	Flow Facility- Install of Piping	Building Construction	3/5/2022	3/15/2022	5	7	
4	Power Line- Trenching	Trenching	3/16/2022	3/17/2022	5	2	
5	Power Line- Base & Conduit Install	Building Construction	3/18/2022	3/29/2022	5	8	
6	Power Line- Backfill	Grading	3/30/2022	4/5/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.17

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Power Line- Backfill	Concrete/Industrial Saws	0	8.00	81	0.73
Flow Facility- Prep and Pour Foundation	Cement and Mortar Mixers	1	6.00	9	0.56
Flow Facility- Install of Piping	Cranes	0	4.00	231	0.29
Power Line- Base & Conduit Install	Cranes	0	4.00	231	0.29
Flow Facility- Install of Piping	Forklifts	0	6.00	89	0.20
Power Line- Base & Conduit Install	Forklifts	0	6.00	89	0.20
Flow Facility- Site Preparation	Graders	0	8.00	187	0.41
Flow Facility- Prep and Pour Foundation	Pavers	0	7.00	130	0.42
Flow Facility- Prep and Pour Foundation	Rollers	0	7.00	80	0.38

Power Line- Backfill	Rubber Tired Dozers	0	1.00	247	0.40
Flow Facility- Install of Piping	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Base & Conduit Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Power Line- Backfill	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Flow Facility- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Prep and Pour Foundation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Flow Facility- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Flow Facility- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Flow Facility- Site Preparation	Excavators	1	7.00	158	0.38
Flow Facility- Prep and Pour Foundation	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Off-Highway Trucks	2	8.00	402	0.38
Flow Facility- Install of Piping	Excavators	1	7.00	158	0.38
Power Line- Trenching	Excavators	1	8.00	158	0.38
Power Line- Trenching	Trenchers	1	8.00	78	0.50
Power Line- Trenching	Off-Highway Trucks	2	8.00	402	0.38
Power Line- Base & Conduit Install	Excavators	1	8.00	158	0.38
Power Line- Base & Conduit Install	Trenchers	1	8.00	78	0.50
Power Line- Base & Conduit Install	Off-Highway Trucks	3	8.00	402	0.38
Power Line- Backfill	Excavators	1	8.00	158	0.38
Power Line- Backfill	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Flow Facility- Install of Piping	4	6.00	1.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Site Preparation	5	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Base & Conduit Install	6	5.00	1.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Backfill	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Flow Facility- Prep and Pour Foundation	4	6.00	0.00	4.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Power Line- Trenching	4	5.00	0.00	9.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.4000e-004	5.8900e-003	6.0500e-003	2.0000e-005		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	1.5298	1.5298	4.9000e-004	0.0000	1.5420
Total	**7.4000e-004**	**5.8900e-003**	**6.0500e-003**	**2.0000e-005**	**2.7000e-004**	**2.4000e-004**	**5.1000e-004**	**3.0000e-005**	**2.2000e-004**	**2.5000e-004**	**0.0000**	**1.5298**	**1.5298**	**4.9000e-004**	**0.0000**	**1.5420**

3.2 Flow Facility- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	7.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0191
Total	**2.0000e-005**	**5.1000e-004**	**1.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.1676**	**0.1676**	**1.0000e-005**	**0.0000**	**0.1678**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.4000e-004	5.8900e-003	6.0500e-003	2.0000e-005		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	1.5298	1.5298	4.9000e-004	0.0000	1.5420
Total	**7.4000e-004**	**5.8900e-003**	**6.0500e-003**	**2.0000e-005**	**1.2000e-004**	**2.4000e-004**	**3.6000e-004**	**1.0000e-005**	**2.2000e-004**	**2.3000e-004**	**0.0000**	**1.5298**	**1.5298**	**4.9000e-004**	**0.0000**	**1.5420**

3.2 Flow Facility- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	7.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0191
Total	**2.0000e-005**	**5.1000e-004**	**1.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.1676**	**0.1676**	**1.0000e-005**	**0.0000**	**0.1678**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.3800e-003	0.0343	0.0313	1.0000e-004		1.3400e-003	1.3400e-003		1.2400e-003	1.2400e-003	0.0000	9.1198	9.1198	2.9200e-003	0.0000	9.1928
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.3800e-003**	**0.0343**	**0.0313**	**1.0000e-004**		**1.3400e-003**	**1.3400e-003**		**1.2400e-003**	**1.2400e-003**	**0.0000**	**9.1198**	**9.1198**	**2.9200e-003**	**0.0000**	**9.1928**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**8.0000e-005**	**5.5000e-004**	**6.1000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.2818**	**0.2818**	**1.0000e-005**	**0.0000**	**0.2821**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.3800e-003	0.0343	0.0313	1.0000e-004		1.3400e-003	1.3400e-003		1.2400e-003	1.2400e-003	0.0000	9.1198	9.1198	2.9200e-003	0.0000	9.1928
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.3800e-003**	**0.0343**	**0.0313**	**1.0000e-004**		**1.3400e-003**	**1.3400e-003**		**1.2400e-003**	**1.2400e-003**	**0.0000**	**9.1198**	**9.1198**	**2.9200e-003**	**0.0000**	**9.1928**

3.3 Flow Facility- Prep and Pour Foundation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**8.0000e-005**	**5.5000e-004**	**6.1000e-004**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.2818**	**0.2818**	**1.0000e-005**	**0.0000**	**0.2821**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9200e-003	0.0396	0.0415	1.2000e-004		1.6100e-003	1.6100e-003		1.4800e-003	1.4800e-003	0.0000	10.5151	10.5151	3.4000e-003	0.0000	10.6002
Total	**4.9200e-003**	**0.0396**	**0.0415**	**1.2000e-004**		**1.6100e-003**	**1.6100e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**10.5151**	**10.5151**	**3.4000e-003**	**0.0000**	**10.6002**

3.4 Flow Facility- Install of Piping - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	1.0000e-005	3.6000e-004	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0893	0.0893	0.0000	0.0000	0.0894
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**9.0000e-005**	**9.1000e-004**	**7.0000e-004**	**0.0000**	**2.2000e-004**	**0.0000**	**2.3000e-004**	**6.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.3711**	**0.3711**	**1.0000e-005**	**0.0000**	**0.3715**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9200e-003	0.0396	0.0415	1.2000e-004		1.6100e-003	1.6100e-003		1.4800e-003	1.4800e-003	0.0000	10.5151	10.5151	3.4000e-003	0.0000	10.6001
Total	**4.9200e-003**	**0.0396**	**0.0415**	**1.2000e-004**		**1.6100e-003**	**1.6100e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**10.5151**	**10.5151**	**3.4000e-003**	**0.0000**	**10.6001**

3.4 Flow Facility- Install of Piping - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	5.0000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1485	0.1485	1.0000e-005	0.0000	0.1487
Vendor	1.0000e-005	3.6000e-004	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0893	0.0893	0.0000	0.0000	0.0894
Worker	7.0000e-005	5.0000e-005	5.0000e-004	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1333	0.1333	0.0000	0.0000	0.1334
Total	**9.0000e-005**	**9.1000e-004**	**7.0000e-004**	**0.0000**	**2.2000e-004**	**0.0000**	**2.3000e-004**	**6.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.3711**	**0.3711**	**1.0000e-005**	**0.0000**	**0.3715**

3.5 Power Line- Trenching - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.6300e-003	0.0133	0.0126	4.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	3.0861	3.0861	1.0000e-003	0.0000	3.1111
Total	**1.6300e-003**	**0.0133**	**0.0126**	**4.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**3.0861**	**3.0861**	**1.0000e-003**	**0.0000**	**3.1111**

3.5 Power Line- Trenching - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**5.0000e-005**	**1.1500e-003**	**3.6000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.3659**	**0.3659**	**2.0000e-005**	**0.0000**	**0.3664**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.6300e-003	0.0133	0.0126	4.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	3.0861	3.0861	1.0000e-003	0.0000	3.1111
Total	**1.6300e-003**	**0.0133**	**0.0126**	**4.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**3.0861**	**3.0861**	**1.0000e-003**	**0.0000**	**3.1111**

3.5 Power Line- Trenching - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0317	0.0317	0.0000	0.0000	0.0318
Total	**5.0000e-005**	**1.1500e-003**	**3.6000e-004**	**0.0000**	**1.2000e-004**	**0.0000**	**1.2000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.3659**	**0.3659**	**2.0000e-005**	**0.0000**	**0.3664**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.3100e-003	0.0758	0.0730	2.1000e-004		3.4300e-003	3.4300e-003		3.1500e-003	3.1500e-003	0.0000	18.1019	18.1019	5.8500e-003	0.0000	18.2483
Total	**9.3100e-003**	**0.0758**	**0.0730**	**2.1000e-004**		**3.4300e-003**	**3.4300e-003**		**3.1500e-003**	**3.1500e-003**	**0.0000**	**18.1019**	**18.1019**	**5.8500e-003**	**0.0000**	**18.2483**

3.6 Power Line- Base & Conduit Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	1.0000e-005	4.1000e-004	1.0000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1021	0.1021	1.0000e-005	0.0000	0.1022
Worker	7.0000e-005	4.0000e-005	4.8000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1270	0.1270	0.0000	0.0000	0.1270
Total	**1.1000e-004**	**1.5900e-003**	**8.2000e-004**	**0.0000**	**2.7000e-004**	**0.0000**	**2.7000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.5632**	**0.5632**	**3.0000e-005**	**0.0000**	**0.5638**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.3100e-003	0.0758	0.0730	2.1000e-004		3.4300e-003	3.4300e-003		3.1500e-003	3.1500e-003	0.0000	18.1019	18.1019	5.8500e-003	0.0000	18.2482
Total	**9.3100e-003**	**0.0758**	**0.0730**	**2.1000e-004**		**3.4300e-003**	**3.4300e-003**		**3.1500e-003**	**3.1500e-003**	**0.0000**	**18.1019**	**18.1019**	**5.8500e-003**	**0.0000**	**18.2482**

3.6 Power Line- Base & Conduit Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	1.0000e-005	4.1000e-004	1.0000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1021	0.1021	1.0000e-005	0.0000	0.1022
Worker	7.0000e-005	4.0000e-005	4.8000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1270	0.1270	0.0000	0.0000	0.1270
Total	**1.1000e-004**	**1.5900e-003**	**8.2000e-004**	**0.0000**	**2.7000e-004**	**0.0000**	**2.7000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.5632**	**0.5632**	**3.0000e-005**	**0.0000**	**0.5638**

3.7 Power Line- Backfill - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.4700e-003	0.0278	0.0293	9.0000e-005		1.1200e-003	1.1200e-003		1.0300e-003	1.0300e-003	0.0000	7.4825	7.4825	2.4200e-003	0.0000	7.5430
Total	**3.4700e-003**	**0.0278**	**0.0293**	**9.0000e-005**	**2.0000e-005**	**1.1200e-003**	**1.1400e-003**	**0.0000**	**1.0300e-003**	**1.0300e-003**	**0.0000**	**7.4825**	**7.4825**	**2.4200e-003**	**0.0000**	**7.5430**

3.7 Power Line- Backfill - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**7.0000e-005**	**1.1700e-003**	**5.4000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.4135**	**0.4135**	**2.0000e-005**	**0.0000**	**0.4140**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.4700e-003	0.0278	0.0293	9.0000e-005		1.1200e-003	1.1200e-003		1.0300e-003	1.0300e-003	0.0000	7.4825	7.4825	2.4200e-003	0.0000	7.5430
Total	**3.4700e-003**	**0.0278**	**0.0293**	**9.0000e-005**	**1.0000e-005**	**1.1200e-003**	**1.1300e-003**	**0.0000**	**1.0300e-003**	**1.0300e-003**	**0.0000**	**7.4825**	**7.4825**	**2.4200e-003**	**0.0000**	**7.5430**

3.7 Power Line- Backfill - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.1400e-003	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3342	0.3342	2.0000e-005	0.0000	0.3346
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**7.0000e-005**	**1.1700e-003**	**5.4000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.4135**	**0.4135**	**2.0000e-005**	**0.0000**	**0.4140**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Unmitigated	6.2000e-004	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.7000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Total	**6.3000e-004**	**0.0000**	**7.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.7000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	7.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.3000e-004	1.3000e-004	0.0000	0.0000	1.4000e-004
Total	**6.3000e-004**	**0.0000**	**7.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.0000**	**1.4000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Outfall Construction Activities

Napa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	4.30	1000sqft	0.10	4,300.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.6	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Outfall Construction Activities - Napa County, Annual

Project Characteristics -

Land Use -

Construction Phase - Construcion phase and timing updated to match information provided for the Project

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Off-road Equipment - Construcion equipment updated to match information provided by Wood Rodgers.

Grading - Import and export info provided in Project description

Trips and VMT - Trips u[dated to match info in the PD

Construction Off-road Equipment Mitigation - BMP is show as "mitigation"

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstructionPhase	NumDays	100.00	6.00
tblConstructionPhase	NumDays	1.00	4.00
tblConstructionPhase	NumDays	1.00	5.00
tblConstructionPhase	NumDays	100.00	10.00
tblConstructionPhase	NumDays	5.00	10.00
tblConstructionPhase	PhaseEndDate	8/18/2021	4/19/2022
tblConstructionPhase	PhaseEndDate	3/29/2021	4/11/2022
tblConstructionPhase	PhaseStartDate	4/1/2021	4/12/2022
tblConstructionPhase	PhaseStartDate	3/27/2021	4/6/2022
tblGrading	AcresOfGrading	0.00	2.50
tblGrading	AcresOfGrading	0.00	0.50
tblGrading	MaterialExported	0.00	5.00

Outfall Construction Activities - Napa County, Annual

tblGrading	MaterialImported	0.00	200.00
tblGrading	MaterialImported	0.00	5.00
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentType		Off-Highway Trucks
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	1.00	2.00
tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	HaulingTripNumber	0.00	2.00
tblTripsAndVMT	HaulingTripNumber	20.00	10.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00
tblTripsAndVMT	WorkerTripNumber	2.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	5.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0288	0.2278	0.2204	7.1000e-004	2.6400e-003	8.7500e-003	0.0114	4.5000e-004	8.0700e-003	8.5200e-003	0.0000	61.9689	61.9689	0.0193	0.0000	62.4520
Maximum	**0.0288**	**0.2278**	**0.2204**	**7.1000e-004**	**2.6400e-003**	**8.7500e-003**	**0.0114**	**4.5000e-004**	**8.0700e-003**	**8.5200e-003**	**0.0000**	**61.9689**	**61.9689**	**0.0193**	**0.0000**	**62.4520**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0288	0.2278	0.2204	7.1000e-004	1.7500e-003	8.7500e-003	0.0105	3.6000e-004	8.0700e-003	8.4200e-003	0.0000	61.9688	61.9688	0.0193	0.0000	62.4520
Maximum	**0.0288**	**0.2278**	**0.2204**	**7.1000e-004**	**1.7500e-003**	**8.7500e-003**	**0.0105**	**3.6000e-004**	**8.0700e-003**	**8.4200e-003**	**0.0000**	**61.9688**	**61.9688**	**0.0193**	**0.0000**	**62.4520**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**33.71**	**0.00**	**7.81**	**20.00**	**0.00**	**1.17**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
5	3-15-2022	6-14-2022	0.2559	0.2559
		Highest	0.2559	0.2559

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Outfall Construction Activities - Napa County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Discharge Headwall- Site Preparation	Site Preparation	4/6/2022	4/11/2022	5	4	
2	Pour Headwall & Install Valve	Building Construction	4/12/2022	4/19/2022	5	6	
3	Rip Rap- Tree Removal	Site Preparation	4/20/2022	4/26/2022	5	5	
4	Rip Rap- Install	Building Construction	4/27/2022	5/10/2022	5	10	
5	Rip Rap- Testing	Paving	5/11/2022	5/24/2022	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Rip Rap- Testing	Cement and Mortar Mixers	0	6.00	9	0.56
Rip Rap- Install	Cranes	0	4.00	231	0.29
Rip Rap- Install	Forklifts	0	6.00	89	0.20
Rip Rap- Tree Removal	Graders	0	8.00	187	0.41
Pour Headwall & Install Valve	Cranes	0	4.00	231	0.29
Pour Headwall & Install Valve	Forklifts	0	6.00	89	0.20
Discharge Headwall- Site Preparation	Graders	0	8.00	187	0.41
Rip Rap- Testing	Pavers	0	7.00	130	0.42
Rip Rap- Testing	Rollers	0	7.00	80	0.38
Rip Rap- Install	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Testing	Tractors/Loaders/Backhoes	0	7.00	97	0.37

Pour Headwall & Install Valve	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Rip Rap- Tree Removal	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Excavators	1	8.00	158	0.38
Discharge Headwall- Site Preparation	Dumpers/Tenders	1	8.00	16	0.38
Discharge Headwall- Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Discharge Headwall- Site Preparation	Off-Highway Trucks	2	8.00	402	0.38
Pour Headwall & Install Valve	Off-Highway Trucks	3	8.00	402	0.38
Pour Headwall & Install Valve	Dumpers/Tenders	1	8.00	16	0.38
Pour Headwall & Install Valve	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Tree Removal	Excavators	1	8.00	158	0.38
Rip Rap- Tree Removal	Off-Highway Trucks	2	8.00	402	0.38
Rip Rap- Install	Excavators	1	8.00	158	0.38
Rip Rap- Install	Dumpers/Tenders	1	8.00	16	0.38
Rip Rap- Install	Off-Highway Trucks	3	8.00	402	0.38
Rip Rap- Testing	Off-Highway Trucks	2	8.00	402	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Rip Rap- Install	6	5.00	1.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Discharge Headwall- Site Preparation	5	5.00	0.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Testing	2	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Pour Headwall & Install Valve	6	5.00	1.00	2.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Rip Rap- Tree Removal	5	5.00	0.00	10.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.0100e-003	0.0240	0.0250	7.0000e-005		9.7000e-004	9.7000e-004		9.0000e-004	9.0000e-004	0.0000	6.2332	6.2332	1.9900e-003	0.0000	6.2830
Total	**3.0100e-003**	**0.0240**	**0.0250**	**7.0000e-005**	**2.7000e-004**	**9.7000e-004**	**1.2400e-003**	**3.0000e-005**	**9.0000e-004**	**9.3000e-004**	**0.0000**	**6.2332**	**6.2332**	**1.9900e-003**	**0.0000**	**6.2830**

3.2 Discharge Headwall- Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0635	0.0635	0.0000	0.0000	0.0635
Total	**4.0000e-005**	**2.7000e-004**	**2.9000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**2.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1377**	**0.1377**	**0.0000**	**0.0000**	**0.1379**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.0100e-003	0.0240	0.0250	7.0000e-005		9.7000e-004	9.7000e-004		9.0000e-004	9.0000e-004	0.0000	6.2332	6.2332	1.9900e-003	0.0000	6.2830
Total	**3.0100e-003**	**0.0240**	**0.0250**	**7.0000e-005**	**1.2000e-004**	**9.7000e-004**	**1.0900e-003**	**1.0000e-005**	**9.0000e-004**	**9.1000e-004**	**0.0000**	**6.2332**	**6.2332**	**1.9900e-003**	**0.0000**	**6.2830**

3.2 Discharge Headwall- Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0635	0.0635	0.0000	0.0000	0.0635
Total	**4.0000e-005**	**2.7000e-004**	**2.9000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**2.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1377**	**0.1377**	**0.0000**	**0.0000**	**0.1379**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.1000e-003	0.0481	0.0477	1.5000e-004		1.9000e-003	1.9000e-003		1.7500e-003	1.7500e-003	0.0000	12.8480	12.8480	4.1200e-003	0.0000	12.9510
Total	**6.1000e-003**	**0.0481**	**0.0477**	**1.5000e-004**		**1.9000e-003**	**1.9000e-003**		**1.7500e-003**	**1.7500e-003**	**0.0000**	**12.8480**	**12.8480**	**4.1200e-003**	**0.0000**	**12.9510**

3.3 Pour Headwall & Install Valve - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	1.0000e-005	3.1000e-004	8.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0766	0.0766	0.0000	0.0000	0.0766
Worker	5.0000e-005	3.0000e-005	3.6000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0952	0.0952	0.0000	0.0000	0.0953
Total	**7.0000e-005**	**5.9000e-004**	**4.9000e-004**	**0.0000**	**1.6000e-004**	**0.0000**	**1.6000e-004**	**4.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2460**	**0.2460**	**0.0000**	**0.0000**	**0.2463**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.1000e-003	0.0481	0.0477	1.5000e-004		1.9000e-003	1.9000e-003		1.7500e-003	1.7500e-003	0.0000	12.8480	12.8480	4.1200e-003	0.0000	12.9510
Total	**6.1000e-003**	**0.0481**	**0.0477**	**1.5000e-004**		**1.9000e-003**	**1.9000e-003**		**1.7500e-003**	**1.7500e-003**	**0.0000**	**12.8480**	**12.8480**	**4.1200e-003**	**0.0000**	**12.9510**

3.3 Pour Headwall & Install Valve - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	2.5000e-004	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0743	0.0743	0.0000	0.0000	0.0744
Vendor	1.0000e-005	3.1000e-004	8.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0766	0.0766	0.0000	0.0000	0.0766
Worker	5.0000e-005	3.0000e-005	3.6000e-004	0.0000	1.2000e-004	0.0000	1.2000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0952	0.0952	0.0000	0.0000	0.0953
Total	**7.0000e-005**	**5.9000e-004**	**4.9000e-004**	**0.0000**	**1.6000e-004**	**0.0000**	**1.6000e-004**	**4.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2460**	**0.2460**	**0.0000**	**0.0000**	**0.2463**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.3400e-003	0.0000	1.3400e-003	1.5000e-004	0.0000	1.5000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7600e-003	0.0300	0.0313	9.0000e-005		1.2200e-003	1.2200e-003		1.1200e-003	1.1200e-003	0.0000	7.7915	7.7915	2.4900e-003	0.0000	7.8537
Total	**3.7600e-003**	**0.0300**	**0.0313**	**9.0000e-005**	**1.3400e-003**	**1.2200e-003**	**2.5600e-003**	**1.5000e-004**	**1.1200e-003**	**1.2700e-003**	**0.0000**	**7.7915**	**7.7915**	**2.4900e-003**	**0.0000**	**7.8537**

3.4 Rip Rap- Tree Removal - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**8.0000e-005**	**1.2900e-003**	**5.7000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.9000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4507**	**0.4507**	**2.0000e-005**	**0.0000**	**0.4512**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-004	0.0000	6.0000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7600e-003	0.0300	0.0313	9.0000e-005		1.2200e-003	1.2200e-003		1.1200e-003	1.1200e-003	0.0000	7.7915	7.7915	2.4900e-003	0.0000	7.8537
Total	**3.7600e-003**	**0.0300**	**0.0313**	**9.0000e-005**	**6.0000e-004**	**1.2200e-003**	**1.8200e-003**	**7.0000e-005**	**1.1200e-003**	**1.1900e-003**	**0.0000**	**7.7915**	**7.7915**	**2.4900e-003**	**0.0000**	**7.8537**

3.4 Rip Rap- Tree Removal - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	3.0000e-005	3.0000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0794	0.0794	0.0000	0.0000	0.0794
Total	**8.0000e-005**	**1.2900e-003**	**5.7000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.9000e-004**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4507**	**0.4507**	**2.0000e-005**	**0.0000**	**0.4512**

3.5 Rip Rap- Install - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0102	0.0801	0.0794	2.4000e-004		3.1700e-003	3.1700e-003		2.9200e-003	2.9200e-003	0.0000	21.4134	21.4134	6.8700e-003	0.0000	21.5850
Total	**0.0102**	**0.0801**	**0.0794**	**2.4000e-004**		**3.1700e-003**	**3.1700e-003**		**2.9200e-003**	**2.9200e-003**	**0.0000**	**21.4134**	**21.4134**	**6.8700e-003**	**0.0000**	**21.5850**

3.5 Rip Rap- Install - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	2.0000e-005	5.2000e-004	1.3000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1276	0.1276	1.0000e-005	0.0000	0.1277
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.4000e-004**	**1.8400e-003**	**1.0000e-003**	**0.0000**	**3.1000e-004**	**0.0000**	**3.2000e-004**	**8.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.6576**	**0.6576**	**3.0000e-005**	**0.0000**	**0.6583**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0102	0.0801	0.0794	2.4000e-004		3.1700e-003	3.1700e-003		2.9200e-003	2.9200e-003	0.0000	21.4133	21.4133	6.8700e-003	0.0000	21.5850
Total	**0.0102**	**0.0801**	**0.0794**	**2.4000e-004**		**3.1700e-003**	**3.1700e-003**		**2.9200e-003**	**2.9200e-003**	**0.0000**	**21.4133**	**21.4133**	**6.8700e-003**	**0.0000**	**21.5850**

3.5 Rip Rap- Install - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	2.0000e-005	5.2000e-004	1.3000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1276	0.1276	1.0000e-005	0.0000	0.1277
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.4000e-004**	**1.8400e-003**	**1.0000e-003**	**0.0000**	**3.1000e-004**	**0.0000**	**3.2000e-004**	**8.0000e-005**	**0.0000**	**9.0000e-005**	**0.0000**	**0.6576**	**0.6576**	**3.0000e-005**	**0.0000**	**0.6583**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.3100e-003	0.0403	0.0338	1.3000e-004		1.4700e-003	1.4700e-003		1.3500e-003	1.3500e-003	0.0000	11.6608	11.6608	3.7700e-003	0.0000	11.7551
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.3100e-003**	**0.0403**	**0.0338**	**1.3000e-004**		**1.4700e-003**	**1.4700e-003**		**1.3500e-003**	**1.3500e-003**	**0.0000**	**11.6608**	**11.6608**	**3.7700e-003**	**0.0000**	**11.7551**

3.6 Rip Rap- Testing - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.2000e-004**	**1.3200e-003**	**8.7000e-004**	**0.0000**	**2.8000e-004**	**0.0000**	**2.9000e-004**	**7.0000e-005**	**0.0000**	**8.0000e-005**	**0.0000**	**0.5300**	**0.5300**	**2.0000e-005**	**0.0000**	**0.5306**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.3100e-003	0.0403	0.0338	1.3000e-004		1.4700e-003	1.4700e-003		1.3500e-003	1.3500e-003	0.0000	11.6608	11.6608	3.7700e-003	0.0000	11.7550
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.3100e-003**	**0.0403**	**0.0338**	**1.3000e-004**		**1.4700e-003**	**1.4700e-003**		**1.3500e-003**	**1.3500e-003**	**0.0000**	**11.6608**	**11.6608**	**3.7700e-003**	**0.0000**	**11.7550**

3.6 Rip Rap- Testing - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.2600e-003	2.7000e-004	0.0000	8.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	3.0000e-005	0.0000	0.3713	0.3713	2.0000e-005	0.0000	0.3718
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-005	6.0000e-005	6.0000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1587	0.1587	0.0000	0.0000	0.1588
Total	**1.2000e-004**	**1.3200e-003**	**8.7000e-004**	**0.0000**	**2.8000e-004**	**0.0000**	**2.9000e-004**	**7.0000e-005**	**0.0000**	**8.0000e-005**	**0.0000**	**0.5300**	**0.5300**	**2.0000e-005**	**0.0000**	**0.5306**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.593730	0.035302	0.167493	0.109091	0.021115	0.005747	0.017044	0.037455	0.003901	0.001761	0.005404	0.001027	0.000929

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Unmitigated	3.7000e-004	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	9.0000e-005					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	9.0000e-005					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.0000e-005	8.0000e-005	0.0000	0.0000	8.0000e-005
Total	**3.7000e-004**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.0000e-005**	**8.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX 3.6-A

Geotechnical Investigation Report
Rector Reservoir Bypass Valve Project

Geotechnical Investigation Report

Rector Dam Diversion Valve and Pipeline Project | Napa County, California

04.00166261-PR-002 01 | December 4, 2020

Draft

California Department of General Services

CALIFORNIA DEPARTMENT OF GENERAL SERVICES

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Client Contact	Ms. Michele Leong
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Project Team

Initials	Name	Role
MW	Marlene Watson, PE, GE	Principal Geotechnical Engineer
RB	Ron Bajuniemi, PE, GE	Principal Geotechnical Consultant

FUGRO
Fugro USA Land, Inc.
1777 Botelho Drive, Suite 262
Walnut Creek, California 94596
T +1 925 949-7100

Department of General Services
Real Estate Services Division
Project Management and Development Branch
Attn: Ms. Michele Leong
707 3rd Street, 4th Floor
West Sacramento, California 95605

December 4, 2020

Dear Ms. Leong,

Fugro is pleased to submit this Geotechnical Design Investigation Report for the Rector Dam Diversion Valve and Pipeline Project, located at Rector Dam in Napa County, California (Site). This report was prepared in accordance with our proposal dated April 10, 2020, and Agreement No. 5901-B with DGS (Task Order No. 12 signed May 14, 2020). Previously, we also prepared a Geotechnical and Geologic Feasibility Report dated July 31, 2020[1], discussing the geotechnical and geologic considerations related to this project.

We understand that studies for the Diversion Valve and Pipeline Project were initiated in 2018 by the California Department of Veterans Affairs (CDVA) to address a lawsuit concerning water discharges from the dam into Rector Creek. While environmental and hydrology/hydraulic studies are ongoing by others, we understand the management of the design and construction of the diversion project has been turned over to California Department of General Services (DGS).

The purpose of this report is to identify key geotechnical aspects that could impact the project and provide geotechnical recommendations for design and construction. This report summarizes results of our geotechnical site data review, site subsurface explorations, engineering analyses, and conclusions and recommendations for the project. Should you have any questions or require additional information, please contact us.

Yours faithfully,

Marlene Watson, PE, GE
Principal Geotechnical Engineer

Ronald Bajuniemi, PE, GE
Principal Geotechnical Consultant

[1] Fugro, July 31, 2020. Geotechnical and Geological Feasibility Report, Rector Dam Diversion Valve and Pipeline Project.

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1. Introduction

The California Department of Veterans Affairs (CDVA), with the assistance of the California Department of General Services (DGS), intends to design and construct a new diversion valve and pipeline (Project) to maintain a continuous flow of water along Rector Creek in the area of Rector Dam, in Napa County, California. As requested by DGS and authorized in DGS Agreement No. 5901-B, Task Order No. 12, signed May 14, 2020, Fugro has prepared this Geotechnical Design Investigation Report to summarize the results of our data review, subsurface explorations and engineering analyses, and to assist with design development for the proposed Diversion Valve and Pipeline (Project).

Fugro prepared a Geotechnical and Geological Feasibility Report dated July 31,2020, (Feasibility Report) for the Project. Relevant portions from the Feasibility Report are incorporated into this report.

The Project is located east of the Napa County Fire Training Grounds, 7300 Silverado Trail in Napa County, California, as shown on the Site Vicinity Map, **(Plate 1)**.

1.1 Project Description

The Project includes design and construction of a water diversion system from the dam to provide constant flow back into Rector Creek. The diversion system includes a new underground diversion pipeline that would tie into the existing water supply line east of the existing valve house, through a Flow Control Valve, to a discharge point downstream of Rector Dam and west of the existing Valve House. We understand the Flow Control Valve weighs less than 1000 pounds, has low settlement tolerance, and will be supported on a reinforced slab-on-grade. The water pipeline would consist of 12-inch diameter ductile iron pipe or PVC. A concrete headwall with rip rap will be constructed at the discharge point. The water diversion pipeline will have invert depths varying from about 4 to 5 feet below grade. The new diversion pipeline crosses over an existing 30-inch water line. We understand the invert elevation of the new diversion pipe will be one foot minimum above the top of the existing 30-inch water pipe. The Project also includes small diameter conduit for underground power and communication lines extending from the flow control valve to the Water Treatment Plant. We understand the communications line have a minimum of 3 feet of cover.

The locations of the planned underground water pipeline, outfall, and communications line are shown on the Site Plan, **(Plate 2).**

1.2 Scope of Work

Task 1 of our Scope of Work included attending a site meeting and performing a preliminary site reconnaissance for the Project. Task 2 consisted of preparing a Geotechnical and Geologic Feasibility Report dated July 31, 2020, summarizes the findings, discussions and conclusions developed from Tasks 1 and 2. Relevant portions of the Feasibility Report are incorporated into this Geotechnical Design Investigation Report (Design Report). The site geologic map is shown on **Plate 3**.

Task 3 included pre-field activities, subsurface explorations, laboratory testing, engineering analyses and preparation of this Design Report.

Note that evaluation of the dam, spillway, or site features not related to the proposed diversion valve and pipeline project is not included in our scope of work.

2. Data Review, Field Exploration and Laboratory Testing

2.1 Review of Existing Data

Prior to conducting our field exploration and laboratory testing, Fugro reviewed relevant information relating to geotechnical and geologic information. Specifically, we reviewed the following:

- Geotechnical and Geological Feasibility Report prepared by Fugro for the Project.
- Design-Development 30% plans prepared by Wood Rogers, dated July 15 and August 18, 2020.

2.2 Field Exploration

Due to the possibility of encountering intact bedrock, rocks, and boulders, we recommended in our Feasibility Report that the subsurface exploration be conducted using a back-hoe to advance shallow test-pits.

Ten test pits were excavated on October 1st and 2nd, 2020, to verify and evaluate subsurface conditions along the pipeline and power-communication alignments. Test Pits TP-01 to TP-05 were located along the proposed pipeline alignment, and Test Pits TP-06 to TP-10 were located along the proposed power-communications alignment. The test pits were extended to a maximum depth of about 5-3/4 feet.

The soils encountered in the test pits were logged in the field by our representative. The soils are described in accordance with the Unified Soil Classification System (ASTM D-2487). Upon completion of our field explorations, the test pits were backfilled with the excavated materials and compacted with the backhoe bucket. The logs of the test pits are shown on **Plates 4 to 13**, and a key for the classification of the soil is included in **Appendix A**.

Representative bulk soil samples were collected from four of the test pits. Three samples were transmitted to the Moore Twinning Associates (MTA) laboratory in Fresno for laboratory testing; the fourth sample was not suitable for testing.

The attached test pit logs and related information show our interpretation of the subsurface conditions at the dates and locations indicated, and subsurface conditions may vary at other locations as well as with changes resulting over time.

The approximate locations of the test pits are shown on the Site Plan **(Plate 2)**. Logs of the test pits are included in **Plates 4 through 13**. Photographs of the test pits are provided in **Appendices C through L**. The subsurface conditions encountered in the test pits are summarized in Section 3.

2.3 Geotechnical Laboratory Testing

Laboratory testing was conducted on soil samples collected from the test pits.

Our geotechnical laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site. This program included:

- Three (3) sieve analyses,
- Three (3) Atterberg Limits, and
- Three (3) Corrosivity tests (redox, pH, chlorides, sulfates, and resistivity).

All tests were performed by at Moore Twinning Associates (MTA) laboratory in Fresno, California. Our laboratory testing results are included in **Appendix B**.

The samples were retrieved from Test Pits TP-7 at a depth of about 4.7 to 5.8 feet, TP-8 from a depth of 0 to 4.5 feet, and TP-9 from a depth of about 3.5 to 5.5 feet.

3. Site Conditions

3.1 Review of Prior Reports

The Preliminary Design Report (J.C. Chang & Associates, Inc., 2018) provides preliminary plans for two conceptual design options for a bypass water pipe to provide constant flow back into Rector Creek downstream of Rector Dam. One of the considerations for establishing the point of discharge back into the creek is the porosity of the creek bed and associated percolation into the subgrade. ~~Final design will begin after the outfall location is selected, and a Geotechnical Investigation along the pipe route has been performed.~~ Previous options for the pipe alignment (J.C. Chang & Associates, Inc., 2018) include Option 1, with about 245 LF of pipeline, would introduce the flow back near the lower portion of the existing spillway and includes a pipe

bridge with a span of about 70 feet; and Option 2, with about 1200 LF of pipeline, introduces the water back into the creek further downstream.

During the site meeting on April 21, 2020, the optional pipeline alignments (J.C. Chang & Associates, Inc., 2018) were discussed. Option 1 with a bridge crossing includes engineering challenges for access that would impact the costs of investigation and installation. Option 2 alignment was generally considered too long which would also add unnecessary cost for investigation and installation. The general consensus for the location of the pipeline would be extending north from the Valve House and then extending roughly west with an entry point into the creek in the vicinity of the scour pool downstream of the spillway. The planned location of the pipeline alignment is shown on the Site Plan, **Plate 2**.

The spillway conditions assessment report (GEI Consultants, 2017) indicates:

- "The bedrock at the site and beneath the spillway structure generally consists of andesitic and basaltic flows with lesser amounts of tuff upstream of the weir (east of the fault)."
- "The excavation of the spillway approach … was noted to pass through a fault zone 'with the material on both sides sheared sufficiently to make a weak rock.'"
- "The fault that crops out from the left abutment just upstream of the spillway has become significantly more obvious following the August 24, 2014 Napa Earthquake. The change in appearance is likely the result of the seismic shaking loose fault gouge and other debris, followed by rains which exposed fresh and relatively unweathered material."

Rector Dam Construction, Sheet 7 (CA DWR, date illegible), provides a plan view of dam area and test pit information from the various borrow areas.

The Phase 1 Inspection Report (CA DWR, 1979) includes a brief summary of "Areal Geology," "Regional Seismicity and Faulting," "Foundation," and "Design." Only a portion of the report was provided.

3.2 Geology and Seismicity

Rector Reservoir is located on the eastern margin of Napa Valley where Rector Creek flows into the valley from its headwaters in the Coast Range (**Plate 1**). The dam is sited at the mountain front with bedrock of the Sonoma Volcanics mapped at both abutments (Bezore et al., 2005), here composed of andesitic and basaltic lava flows with minor tuff (GEI, 2017). The reservoir extends east into the lower portion of Rector Canyon and the creek flows west from the dam into Napa Valley.

Between the dam and its confluence with Conn Creek approximately 1.7 miles downstream in the center of Napa Valley, Rector Creek flows across a large alluvial fan composed of sediment deposited by the creek. Isolated conical hills of Sonoma Volcanics protrude above the alluvial fan

surface. Rector Creek flows into Conn Creek, which then joins the Napa River approximately 1.2 miles further downstream (**Plate 1**).

The study area is located downstream from the dam where the spillway and the outlet from the valve house discharge into Rector Creek. From this point, the creek flows downstream about ¼ mile to cross the Silverado Trail (**Plate 2**).

Fugro prepared a site geologic map based on field reconnaissance and desktop interpretation of lidar topographic data collected in 2018 (USGS, 2020) and aerial imagery (**Plate 3**). Field reconnaissance was conducted on April 21, 2020, by geologist Mike Wilson. Mr. Wilson walked the channel from the spillway downstream as far as Silverado Trail, making observations of channel bed and bank materials, noting evidence of geologic processes, and taking photographs. The field observations were augmented with interpretation of topographic and aerial imagery and compiled in GIS to produce the site geologic map (**Plate 3**). Key photographs are presented in Appendix A of the Feasibility Report. Table 2.1 presents a description of each map unit.

Table 3.1: Geologic Map Units

Symbol	Unit	Description
Af	Artificial fill	Engineered fill.
Qhc	Modern stream channel deposits	Alluvium deposited by Rector Creek in the stream channel. In the study area, clast size ranges from sand to small boulders.
Qhf	Holocene alluvial fan deposits	Alluvium deposited by Rector Creek on its alluvial fan prior to dam construction. Sediments are stratified and clast sizes range from sand to small boulders.
Tv	Tertiary volcanic rocks	Andesite and basalt flows of the Sonoma Volcanics, including minor tuff.

The impounded water of Rector Reservoir is released either via a pipe through the dam that discharges at the Valve House into a rip-rap-lined channel (Appendix A, photo 3 in Feasibility Report), or may overtop into a concrete-lined spillway that is separated from the rip-rap-channel by natural ridge of bedrock. The spillway discharges into a bedrock floored channel (Appendix A, photo 4 in Feasibility Report) that joins the rip-rap lined channel.

The flow from the spillway and the valve house converge in a scour pool located about 325 feet downstream of the valve house and 200 feet downstream of the end of the spillway (**Plate 3**). The pool is floored with bedrock (Tv) that transitions to alluvium downstream (Appendix A, photos 5 and 6 in Feasibility Report). A review of a time series of aerial imagery in Google Earth, and USGS stream gaging records for the Napa River, show that the scour pool is a persistent and dynamic feature of the channel, experiencing renewed scour in high discharge years and fluctuating in size with the seasons.

Downstream from the pool, the creek channel (Qhc) widens to about 175 feet as it makes a southward bend. Here the channel has two main thalwegs (see blue dashed lines on Plate 3) flowing on either side of a three-to-five-foot-high gravel bar. The northern thalweg appears to be armoured by a lag deposit of rounded cobbles and boulders derived from the alluvium (Appendix A, photos 8, 9, and 10 in Feasibility Report). The southern thalweg is primarily floored by bedrock. The entire channel is inset into the alluvial fan deposits (Qhf) whose terrace surface sits about 10 feet above the channel bottom at this location.

The north bank of the channel bend has experienced erosion in past high discharge events, resulting in widening of the creek channel at the bend. Donald Callison of the California Department of Veterans Affairs provided photographs of the damage in one such event that took place in 2002 (Appendix A, photos 1 and 2 in Feasibility Report). Based on the photographs, we estimate approximately 50 feet of the alluvial fan surface above the north bank was eroded during the 2002 event as labelled on Plate 3. The damage was subsequently repaired with artificial fill and the channel wall restored to its former position. Field photographs taken in April 2020 by Fugro (Appendix A, photos 5 and 6 in Feasibility Report) show an area of the channel wall covered with boulders, presumably placed to protect it from further erosion. The boulders are rounded and assumed to be locally derived, in contrast to the angular rip rap that lines the channel downstream from the valve house (Appendix A, photo 1 in Feasibility Report).

Downstream of the big bend, the channel narrows, the two thalwegs join, and the single thalweg is floored by bedrock (Appendix A, photos 11 and 12 in Feasibility Report). A narrow body of alluvium contours along the flank of the bedrock hill on the south side of the channel (Appendix A, photos 13 and 14 in Feasibility Report). Artificial fill on the west bank is identified by the presence of the berm along the creek bank and by comparison of current to older historical aerial photographs that show the former position of the creek bank. Continuing downstream, the channel narrows further and becomes floored by alluvium where it passes beyond the mountain front into the broader valley of the Conn and Napa Rivers. The channel is straight, tree-lined, and incised into the alluvial fan sediments as it approaches the bridge at Silverado Trail. Good exposures of the alluvial fan terrace deposits near the bridge show in-place examples of the small rounded boulders that form lag deposits in the modern channel (Appendix A, photos 15 and 16 in Feasibility Report)

3.3 Surface Conditions

The planned pipeline will be extending north from the Valve House and then roughly to the west with an entry point into the creek in the vicinity of the scour pool downstream of the spillway. The planned power-communication line will be starting from the north of the Valve House, branching off the pipeline, and then connected to the west side of the Water Treatment Plant. The ground surface of the alignment is relatively level with a slight downward gradient to the west/southwest. In the vicinity of the discharge location for the water line, the slope of the creek

channel is about 2.5:1 and locally as steep as about 1.5:1 (Horizontal to Vertical). The materials exposed in the face of the slope in the vicinity of the proposed discharge location consist of Holocene alluvial fan deposits and artificial fill.

3.4 Subsurface Conditions

Along the proposed pipeline alignment, five test pits (TP-01 to TP-05) were excavated on October 1st, 2020, to depths ranging from 4½ to 5 feet below existing grade. The subsurface materials encountered in the test pits included fill and alluvial soils. The fill thickness varies from about 1 foot to more than 5 feet below grade which is the maximum depth of the five test pits. The fill generally consists of poorly- or well-graded gravel with cobbles and boulders (maximum diameter of about 1½ feet). Below the fill, alluvium was encountered in Test Pits TP-02 and TP-04, consisting of angular and well-graded gravel with cobbles (maximum diameter of about ¾ foot).

Along the proposed power-communication alignment, another five test pits (TP-06 to TP-10) were excavated on October 1st and 2nd, 2020. Similar to the pipeline alignment, we encountered fill and alluvial soils. Fill encountered in Test Pits TP-07 to TP-10 had thickness varying from about ½ foot to more than 5½ feet. The fill consisted of poorly- or well-graded gravel with cobble (maximum diameter of ¾ foot) and some silty sand or silt. Alluvium was encountered below the fill in Test Pits TP-06 to TP-09 extending to the maximum depth explored. The alluvial soils encountered generally consist of well-graded gravel with cobbles to boulders (maximum diameter of about 2 feet), sand, silt, and clay. The alluvium layers encountered were generally loose. Some silty sand was also encountered at the bottom of Test Pit TP-07.

The approximate locations of the test pits as shown on **Plate 2** were determined using a portable GPS device. The locations should be considered accurate only to the degree implied by the methods used. The detailed test pit logs are presented in **Appendix A**. Photographs were taken for each of the Test Pits which are provided in **Appendices C through L**.

Although bedrock was not encountered within the test pits within the depths explored, we anticipate that bedrock may be encountered during construction, particularly within the foundation excavation for the headwall. The materials encountered within the test pits are consistent with our geologic map. The subsurface materials may vary vertically and laterally beyond the locations of the test pits. The passage of time could result in changes in the subsurface conditions due to environmental changes.

3.5 Groundwater

Groundwater was not encountered in any of the Test Pits at the time of the field investigation. Considering the granular nature of the subsurface materials, we judge that groundwater will be

affected by the elevation of water in the adjacent creek, rising and falling with creek level. Groundwater levels are anticipated to fluctuate with seasonal variations in rainfall.

3.6 Corrosivity

Soluble sulfate concentration, chloride ion concentration, pH, resistivity and redox tests were performed on three samples. These tests provide an indication of the corrosion potential of the soil environment on buried concrete and ferrous metals. The laboratory test results are provided in **Appendix B** and summarized in the following table .

Table 3.2: Corrosivity Test Results

Test No.	Sample	Sulfate (mg/kg)	Chloride (mg/kg)	pH	Resistivity (ohm-cm)	Redox Potential (mV)
GK19039-01	B-7	140	15	6.6	16,000	378
GK19039-02	B-8	59	16	7.4	4,400	375
GK19039-03	B-9	27	17	7.2	5,000	382

We recommend that a corrosion engineer evaluate the corrosion potential of the soil environment on buried concrete structures and steel pipe coated with cement-mortar and provide recommendations for mitigation of corrosivity.

4. Discussion and Conclusions

Based upon the results of our data review, field observations and explorations, the primary considerations for the project are discussed in the following sections:

4.1 Seismic Hazards

Seismic hazards for the Project considered in this evaluation include surface fault rupture, ground shaking, liquefaction, slope instability, and ground settlement. There are no known Quaternary faults projecting through or near the project site. The nearest known Quaternary faults are the Green Valley fault, which is classified as having latest Quaternary movement (USGS and CGS, 2019), located 5.6 miles east of the site, and the West Napa fault, which has experienced historical rupture, located 8 miles south of the site. Therefore, we judge that the risk of fault rupture at the project site is low.

The project site is expected to experience moderate to high levels of ground shaking in the event of a major earthquake on nearby active faults. We understand that new structures are not planned and ground motion parameters are not required.

Regional mapping of geology and liquefaction susceptibility shows the study area to be underlain by Holocene alluvial fan deposits having moderate liquefaction susceptibility (Knudsen

et al, 2000). Alluvial fan deposits may exhibit significant local variability in composition, grain size distribution, degree of induration or compaction, and degree of saturation, which are factors that govern liquefaction susceptibility. Based on our review of site geology and our field explorations, subsurface conditions for the pipeline alignment consist of unsaturated artificial fill, unsaturated bouldery to gravelly alluvium, and shallow bedrock, which are generally not considered susceptible to liquefaction (Youd and Perkins, 1978). Therefore, we judge that the risk of liquefaction at the site is low.

The only slopes in the vicinity of the proposed pipeline alignment are the reconstructed and natural slopes of Rector Creek. Based upon our review and observations, we judge that the risk of slope failure due to lateral spreading is low. The risk of collapse is also considered low with the exception of areas where erosion has resulted in over-steepened slopes. Note that if high volumes of water are released from the dam, erosion can occur as discussed further in Section 4.2.1.

The existing fill and native alluvial deposits consist of bouldery to gravelly granular soils. Some seismically induced settlement may occur in these deposits as a result of strong ground shaking. Existing fill is discussed in further detail in Section 4.2.2.

4.2 Design Considerations

4.2.1 Erosion

As previously indicated, the north bank of the channel bend has been eroded in past high discharge events, resulting in broadening of the channel due to erosion and removal of the terrace deposits. Photographs provided by Donald Callison of the California Department of Veterans Affairs document damage that occurred as the result of one such event that took place in December of 2002. These photos (Appendix A, Photos 1 and 2 of Feasibility Report) show erosion of the alluvial fan terrace deposits and retreat of the north bank.

In addition to bank erosion and retreat, the stream bed has been scoured and eroded. Google Earth historical photographs show that shrubby vegetation present in the channel in August of 2002 is not present in 2003, suggesting significant scour in the 2002 event. Another significant event occurred in 2005, as USGS streamflow data indicates the Napa River at St Helena had its highest discharge of record (1930-2019) on December 31, 2005. Historical aerial photos on Google Earth show evidence of scour and deposition of fresh sediment in the channel in response to the 2005 event.

The design of the discharge location will need to include considerations for protection against erosion such as rip rap. Further, we recommend that the slope adjacent to the headwall be covered with riprap to reduce the risk of scour. The rip rap slope protection should extend from the base of the spillway to limits of the previous 2002 scour event downstream of the headwall.

4.2.2 Settlement Considerations

Based on observations from the field mapping and field explorations, existing fills are variable and locally loose. Native alluvial deposits consist of bouldery to gravelly granular soils that are locally loose. We judge that risk of static settlement of fill and alluvium affecting the planned improvements is low; however, seismically induced settlement could be up to 1 inch. Where existing fills and alluvial deposits are encountered below settlement sensitive improvements, the fills and/or alluvium should be overexcavated to expose firm native alluvial soils or bedrock and replaced with engineered fill placed in accordance with the recommendations in this report.

Differential settlement may occur at the point of connection for pipeline penetrations at the connection to existing structures or pipelines, and flexible connections should be used to accommodate potential differential settlement.

4.2.3 Groundwater

Groundwater was not encountered within the test pits at the time of our field investigation. However, if construction proceeds during or immediately after the rainy season, groundwater could be encountered within excavations, particularly the foundation excavation for the headwall. The contractor should be prepared for the possibility of encountering groundwater and provide a sump and pumping system to keep excavations free of water.

4.2.4 Corrosion

The laboratory test results for corrosivity should be evaluated by a qualified corrosion engineer, and any recommendations provided should be incorporated in the design of the pipeline or any appurtenant structures.

4.3 External Loads and Pipe Deflections

Recommended geotechnical parameters for calculating pipe loads and deflections including backfill and external live loads, and E' values are provided in Section 5.2. The soil load on a flexible buried pipe will cause a decrease in the vertical diameter and an increase in the horizontal diameter of the pipe. Flexible pipe buried under soil backfill will derive their ability to support load from their inherent strength plus the passive resistance of the soil as the sides of the pipe deflect and move outward against the soil. In general, the ability of a flexible pipe to retain its shape and integrity is dependent on the pipe rigidity, and the type, density, compressibility and strength of the envelope of native soil and/or import backfill surrounding the pipe.

4.4 Construction Considerations

4.4.1 Existing Fills

Our site observations, geologic mapping and field explorations suggest that artificial fill will likely be encountered along all or portions of the proposed water pipeline alignment. We do not have sufficient information to know the placement methods for existing artificial fill.

Fill placed to repair the 2002 erosion described in Section 4.2.1 is shown in photographs taken April 2020 by Fugro (Appendix A, photos 5 and 6 in the Feasibility Report). These photographs also show an area of the channel wall covered with boulders, presumably placed to protect it from further erosion. The boulders are rounded and assumed to be locally derived.

Based on our subsurface explorations, we anticipate the primary influence of existing fill on construction for the Project will be excavation considerations. Excavation of the pebble and boulder granular soils may result in widening or undermining of the excavation sidewalls. Engineered fill or concrete slurry can be placed to return excavations to the planned excavation limits.

4.4.2 Excavation Considerations

Based on our site observations, geologic mapping and field explorations, we anticipate that artificial fill and alluvial soils will be encountered within the excavations required for the proposed underground water line and communications line, the headwall and the slab for the valves. The fill and alluvial soils encountered within the exploration test pits and observed within the slopes of the creek bank include cobbles and boulders up to about 2 feet in diameter, and the materials are generally granular in nature. Removal of cobbles and boulders from excavations may induce partial collapse of trench sidewalls resulting in widening or undermining of the trench excavation. Note that the accumulation of water within the trench excavation can also cause caving, undermining, and widening of the excavation. Depending upon the amount of collapse and resulting trench widening, mitigation measures may be required to restore the planned trench width. Placement of forms and cement slurry may be required. Fugro should be notified during construction if collapse of trench sidewalls occurs.

Although bedrock was not encountered within the exploratory test pits, we anticipate that intact bedrock may be encountered, particularly within the foundation excavation for the outfall. Bedrock may be difficult to excavate and may require special excavation equipment. Where the presence of bedrock along the selected alignment and within the planned excavation depth is limited or where access for heavier equipment is limited, jackhammering may be suitable to break up the bedrock. Otherwise, a hoe-ram attached to an excavator or other types of heavy equipment may be needed to excavate bedrock.

4.4.3 Temporary Shoring

In areas where temporary construction slopes will not be feasible, such as adjacent to existing structures or existing pipeline, proper temporary shoring should be provided during construction to reduce potential damage to the existing pavements, adjacent buried utilities, and other facilities. The design, installation and maintenance of temporary shoring are generally considered to be the contractor's responsibility. Recommendations for temporary shoring are provided in Section 5.1.3.

4.4.4 Groundwater Control

Groundwater may be encountered within excavations particularly if construction occurs during the wet winter months. If water collects within the trench excavations, considerable sidewall caving may occur especially where granular materials are present. Water should not be allowed to collected within excavations and sumps/pumps should be used as needed to prevent accumulation of water within excavation.

5. Recommendations

5.1 Earthwork

5.1.1 Engineered Fill Materials

Fill materials will be required to backfill underground utility trenches and retaining walls. Engineered fill will also be needed to prepare the subgrade for the slab-on-grade supporting the valve. On-site fill containing no environmental contaminants or construction debris can be used as general fill provided that the boulders and cobbles can be either sorted out or broken down to meet the size recommendations.

Both on-site and imported fill should not contain rocks or lumps larger than 4 inches in greatest dimension with not more than 15 percent larger than 2.5 inches. The plasticity index of import fill materials should not exceed 15.

5.1.2 Fill Placement and Compaction

Prior to fill placement, the contractor should provide a stable subgrade surface. Where the new water pipeline crosses over the existing pipeline, the contractor should locate the existing pipeline and exercise caution during excavation and fill placement to prevent damage to the existing pipeline. Compaction equipment should not be operated over the existing pipeline for the pipe bedding and shading layers.

Engineered fill should be compacted to at least 90 percent relative compaction as determined by ASTM Designation D1557-91. Fill material should be spread and compacted in lifts not exceeding 8 inches in uncompacted thickness. In order to achieve satisfactory compaction of the

fill materials, it may be necessary to adjust the water content at the time of construction. This may require that water be added to soils that are too dry, or that aeration be performed in any soils that are too wet.

5.1.3 Temporary Shoring

It is recommended that temporary shoring be designed by the Contractor or his specialty subcontractor. We recommend that our office and the Structural Engineer's office review the final temporary shoring plans. In addition, we recommend that a representative from our office observe the installation of the temporary shoring systems. All appropriate requirements of OSHA should be incorporated into the design of the temporary shoring system by the Contractor.

The design excavation depth should include an additional depth below the pipe invert or slab bottom to account for bedding material and any anticipated overexcavation requirements. Any bracing or shoring should be removed from the trench as the backfilling proceeds. Temporary shoring should take into consideration the presence of existing improvements below or near the excavation.

5.1.4 Construction During Wet Weather Conditions

If construction proceeds during or shortly after wet weather conditions, the moisture content of the on-site soils could be appreciably above optimum. Consequently, subgrade preparation, placement and/or reworking of on-site soil as structural fill might not be possible. The geotechnical engineer can provide alternative wet-weather construction recommendations in the field at the time of construction.

Note that the accumulation of water within the trench excavation can cause caving, undermining, and widening of the excavation as discussed in Section 4.4.2 and 4.4.4. The contractor should provide sumps and pumps to prevent free water from accumulating within excavations.

5.2 Pipeline Design

5.2.1 Thrust Restraint

At all locations where the pipeline changes direction, ends, or develops thrust at valves or other attachments, and thus has a tendency to move horizontally or downward, these movements can be resisted by: 1) friction between the pipe and the backfill, and/or 2) thrust blocks. Refer to Sections 4.4.2 and 4.4.4 regarding potential for caving and trench widening during excavation. To determine the frictional force between steel pipe and backfill, a coefficient friction of 0.30 can be used. If a continuous wrapping of polyethylene is applied to the pipe or if HDPE pipe is used, this friction value should be lowered to 0.20. It is recommended that these values be reviewed and revised, as appropriate, once pipe bedding and pipe zone backfill materials are determined.

When hydraulic forces tend to move the pipe horizontally, as at horizontal curves or bend fittings, these movements can be resisted by the lateral passive resistance of the pipe backfill and adjacent soil or bedrock materials. The horizontal passive resistance acting on thrust blocks can be evaluated using equivalent fluid weights of 400 pounds-per-cubic foot (pcf) for dead loads (static pressure). For transient loads (surge pressure), the horizontal resistance acting on thrust blocks can be evaluated using equivalent fluid weights of 530 pcf. For certain trench configurations, higher bearing values may be warranted in areas where bedrock of very stiff/dense natural soils are present. It is recommended that these values be reviewed and revised, if necessary, on the basis of preliminary trench designs once thrust block locations and loading requirements are determined.

When hydraulic forces tend to move the pipe in the downward direction, as at vertical curves or vertical bend fittings, these movements can be resisted by the bearing capacity of the underlying native soil or bedrock. Thrust blocks can be designed for an allowable downward bearing pressure of 2000 and 5000 pounds per square foot (psf) for dead loads (static pressure) and 3000 and 7500 psf for transient loads (surge pressure) in native soils and bedrock, respectively. The thrust blocks should be at least 12 inches wide and be founded at least 12 inches below the pipe invert. Higher bearing values may be warranted in areas where bedrock of very stiff/dense natural soils are present. It is recommended that these values be reviewed and revised, if necessary, once thrust block locations and loading requirements are determined.

When hydraulic forces tend to move the pipe in the upward direction, as at vertical curves or vertical bend fittings, these movements can be resisted by the weight of the pipe, its contents, and the overlying soil. For determination of the overlying soil weight, a soil unit weight of 120 and 55 pcf can be used above and below the design groundwater level, respectively. Note that high groundwater levels are anticipated to correlate with high water levels in the adjacent creek.

5.2.2 Soil and Surcharge Loads on Pipes

The structural integrity of rigid pipe should be designed to resist the earth, vehicular traffic and other temporary loads during construction, including excavated soils, construction equipment, men and materials. Protection of the existing 30-inch diameter water line should also be considered.

The earth load is the weight of the soil backfill above the pipe crown that must be ultimately carried by the pipe. The earth load is usually calculated by multiplying the given Marston coefficient (C_d), moist density of the soil backfill, and outside diameter of the pipe. As shown on Plate 4, the recommended Marston coefficient will depend on the ratio of H/B_d (H is the height of soil cover over the top of pipe and B_d is the width of the trench at the top of pipe) and soil type used for the trench backfill. We recommend using a typical soil density of 125 pounds per cubic foot (pcf) to calculate the earth load. The earth load calculated above should be compared

with rigid pipe three edge or D-load pipe strengths (along with appropriate bedding factor) to determine the minimum required pipe strength for design.

In addition to the earth load, vertical loads will be transmitted through soil cover to the pipe from vehicular traffic. Plate 5 presents anticipated vertical soil pressure for different height of soil cover above the pipe crown due to AASHTO HS-20 live load with a 50 percent provision for impact. The given soil pressure in Plate 5 should be multiplied by the outside diameter (width) of the pipe in order to obtain the total load per lineal foot acting on the pipe.

If flexible pipe will be utilized in lieu of rigid pipe, the soil load on a flexible buried pipe will cause a decrease in the vertical diameter and an increase in the horizontal diameter of the pipe. Flexible pipe buried under soil backfill will derive their ability to support load from their inherent strength plus the passive resistance of the soil as the sides of the pipe deflect and move outward against the soil. In general, the ability of a flexible pipe to retain its shape and integrity is dependent on the type, density, compressibility and strength of the envelope of native soil and/or import backfill surrounding the pipe.

We recommend the Modified Iowa formula be used to evaluate the required flexible pipeline wall thickness for a given allowable soil deflection and modulus of soil reaction value (E'). Medium dense to dense granular soils are anticipated where most pipeline will be embedded (E'n) and Class 2 aggregate base pipe zone backfill (E'b) are estimated to be 700 and 2,000 pounds per square inch (psi). In addition, the E' value should also be modified based on the soil supporting combining factor (S), which is determined by the ratio of Bd/D (Bd is the width of the trench at the top of pipe and D is pipe diameter). Our recommended modulus of soil reaction values (E') for various trench width configurations are summarized in the table below. If a thinner pipe-wall section is desired, a higher E' value could be applied by increasing the width of the trench and pipe zone backfill. Since a prism loading condition is assumed in the Modified Iowa Formula, a deflection lag factor of 1.0 can be applied.

Table 5.1: E' (Modulus of Soil Reaction Value) for Flexible Pipeline Design

E'n/E'b = 0.35	Bd/D			
	1.5	2	2.5	3
S (Soil Supporting Combining Factor)	0.45	0.56	0.78	0.89
E' (Modulus of Soil Reaction)	900 psi	1,120 psi	1,560 psi	1,780 psi

5.3 Foundations

5.3.1 Reinforced Concrete Mat Foundation

We recommend a structural mat foundation for support of the settlement sensitive valve structure. Existing fills and loose alluvial soils below the mat foundation should be removed to expose firm, undisturbed alluvial soils or bedrock. The over-excavation should extend beyond the edges of the mat a minimum distance equal to the depth of the excavation. The over-excavation should be backfilled with engineered fill or CLSM placed in accordance with the recommendations in this report. The mat foundation should be supported on properly prepared subgrade that is proof-rolled to provide a smooth, unyielding surface for slab support. Reinforced concrete mat should consist of a structural slab designed to span the maximum mat dimension.

Our recommended allowable bearing pressure for valve mat are 1000 psf (DL; Factor of 3.0), 1500 psf (DL+LL; Factor of 2.0), 2000 psf (All loads including wind or seismic; Factor of 1.5). These allowable bearing pressures are net values; therefore, the weight of the slab can be neglected for design purposes. Based on these loads, we estimate that static settlements of the structures will be less than 1/2 inch with a maximum differential of ¼ inch across the mat.

Where slab is located within an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the bottom edge of the adjacent utility trenches, the slab reinforcing could be increased to span the area defined above assuming no soil support is provided.

We recommend a modulus of subgrade reaction (k_1, 1 foot by 1 foot) of 280 pounds per cubic inch (pci) be used for the design of the structural mat slab foundation. This value can be modified to k as 280/B pci, where B is the equivalent foundation width measured in feet. If applicable, we recommend the mat slab be designed in accordance with WRI/CRSI Design of Slab-on-Ground Foundations. An Effective Plasticity Index of 15 can be used for the slab designs when at least 12 inches of properly compacted non-expansive engineered fills or Caltrans Class 2 Aggregate Base will be provided below the slab. The thickness and reinforcing of the slabs should be designed by the project Structural Engineer based upon the actual use and loading of the slabs. Resistance to lateral loads can be provided by friction along the base of the foundations. An allowable friction coefficient of 0.35 times the dead load (a factor of safety of 1.5) may be used between the slab bottom and supporting subgrade soils.

We recommend the foundation designer determine if corrosion protection is needed for the foundation concrete and reinforcing steel. The corrosivity test results of onsite soil samples and a brief evaluation report by others are included in **Appendix B**; the foundation designer should determine if additional testing is needed. In addition, the foundation designers should provide recommendations to reduce the potential for differential concrete curing if necessary.

5.4 Outflow Headwall

The outflow head wall can be supported on spread footing foundations. Fill placed behind wall should conform to the engineered fill materials, and fill placement and compaction recommendations. If heavy compaction equipment is used behind the wall, the wall should be appropriately designed to withstand loads exerted by the heavy equipment and/or temporarily braced.

5.4.1 Lateral Loads

The outflow headwall should be designed to resist both lateral earth pressures and any additional lateral loads caused by roadway surcharging and earthquake loading. We anticipate that groundwater levels behind and in front of the headwall will be relatively equal.

We recommend that drained unrestrained walls be designed to resist an equivalent fluid pressure of 50 pounds per cubic foot (pcf). Drained restrained walls should be designed to resist an equivalent fluid pressure of 75 pcf. This assumes wall with level backfills. Walls with inclined backfill should be designed for an additional equivalent fluid pressure of 1 pound per cubic foot for every 2 degrees of slope inclination. Walls subjected to surcharge loads should be designed for an additional uniform lateral pressure equal to 1/3 the anticipated surcharge load for unrestrained walls, and 1/2 the anticipated surcharge load for restrained walls.

These recommended drained lateral pressures assume walls are fully-back drained to prevent the build-up of hydrostatic pressures. This can be accomplished by using ½ to ¾ inch crushed, uniformly graded gravel entirely wrapped in filter fabric, such as Mirafi 140N or equal (an overlap of at least 12 inches should be provided at all fabric joints). The gravel and fabric should be at least 8 inches wide and extend from the base of the wall to within 12 inches of the finished grade at the top (Caltrans Class 2 permeable material (Section 68) may be used in lieu of gravel and filter fabric). A 4-inch diameter, perforated pipe should be installed at the base and centered within the gravel. The perforated pipe should be connected to a solid collector pipe that transmits the water directly to suitable discharge facilities.

For walls which are higher than 6 feet, we recommend the walls also be designed to resist a uniform lateral pressure of 38H psf/foot for both unrestrained and restrained wall conditions based on the ground acceleration from a design basis earthquake[2,3], where H is the height of the retaining portion of the walls. This seismic induced earth pressure is in addition to the pressures noted above. Due to the transient nature of the seismic loading, a factor of safety of at least 1.1 can be used in the design of the walls when they resist seismic lateral loads.

[2] Seed and Whitman, 1970, *Design of Earth Retaining Structures for Dynamic Loads.*

[3] Atik and Sitar, 2007, *Development of Improved Procedures for Seismic Design of Buried and Partially Buried Structures*, Pacific Earthquake Engineering Research Center.

5.4.2 Wall Footing Foundation

Retaining walls can be supported by conventional spread footings that bear on competent undisturbed bedrock, undisturbed competent native soils, or CLSM. Over-excavation of any weak soils or disturbed bedrock below the footings may be required. The overexcavation can be backfilled with engineered fill in accordance with the recommendations of the report or CLSM. The bottom of the footings should be at least 24 inches wide and founded at least 24 inches below lowest adjacent finished grade. Deeper embedment will be required for footings that are located on slopes or near top of slopes. Portion of the footings located within 10 feet (as measured laterally) of the slope face should be ignored in both vertical and passive resistance design.

Footings located adjacent to utility trenches should also bear below an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the bottom edge of the adjacent footings or utility trenches. Our recommended allowable spread footing bearing pressures are provided below. These allowable bearing pressures are net values; therefore, the weight of the footing can be neglected for design purposes.

Table 5.2: Allowable Wall Spread Footing Bearing Pressures

Load Condition	Allowable Bearing Pressure (psf)	Factor of Safety
Dead Load	2,000	3.0
Dead plus Live Loads	3,000	2.0
Total Loads (including Wind or Seismic)	4,000	1.5

Resistance to lateral loads can be provided by friction along the base of footings and by passive pressures acting on the sides of footings or shear keys. An allowable friction coefficient of 0.40 times the dead load (a factor of safety of 1.5) may be used to evaluate the allowable frictional resistance along the bottom of footings. Where the footing is poured neat against competent subgrade soils, a passive pressure equal to an equivalent fluid pressure of 400 pounds per cubic foot (pcf) can be used for lateral load resistance against the sides of footings perpendicular to the direction of loading. The upper 12 inches of soils should be ignored, unless they are confined by pavement or slab. This passive resistance should be considered as an ultimate value (a factor of safety of 1.0) and assumes a deflection of approximately 0.5 inch in order to fully mobilize the passive resistance.

5.5 Erosion Mitigation

The area around the outfall and the adjacent slopes extending 10 feet on either side of the outfall should be protected by placing ½ ton rip rap. The rip rap should be placed a bench a minimum of 5 feet wide that slopes downward into the slope. Prior to rip rap placement, the

base of the bench and the back of the cut slope should be lined with filter fabric such as Mirafi 140N (or similar) to reduce the risk of fine-grained materials from migrating through the riprap. If filter fabric cannot be used, a natural filter consisting of soil and aggregate can be used. We will provide recommendations separately for a soil/aggregate filter, if needed.

5.6 Additional Geotechnical Services

Fugro should review geotechnical aspects of the plans and specifications to check for conformance with the intent of our recommendations. The analyses, designs, opinions, and recommendations submitted in this report are based in part upon the data obtained from the subsurface explorations and upon the conditions existing when services were conducted. Variations of subsurface conditions from those analysed or characterized in the report are possible, as may become evident during construction. In that event, it may be advisable to revisit certain analyses or assumptions.

We recommend that Fugro be retained to provide geotechnical services during construction to observe compliance with the design concepts and recommendations presented in this report. Our presence will also allow us to modify design if unanticipated subsurface conditions are encountered. During construction, our field engineer should observe and/or test the following:

- Soil conditions exposed in excavations, to check that they are consistent with those encountered during the field explorations and to confirm overexcavation requirements.

6. Limitations

Our services consist of professional opinions, conclusions, and recommendations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The analyses and recommendations contained in this report are based on the data obtained from the subsurface explorations conducted for this study. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our conclusions and recommendations are based on our analysis of the observed conditions. If conditions other than those described in this report are encountered, we should be notified so that we can provide additional recommendations, as appropriate.

This report has been prepared for the exclusive use of California Department of General Services and their consultants for specific application to the Rector Dam Diversion Valve and Pipeline Project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the

conclusions and recommendations contained in this report should not be considered valid unless: 1) the project changes are reviewed by Fugro and 2) conclusions and recommendations presented in this report are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for use of segregated portions of this report without consultation from Fugro.

7. References

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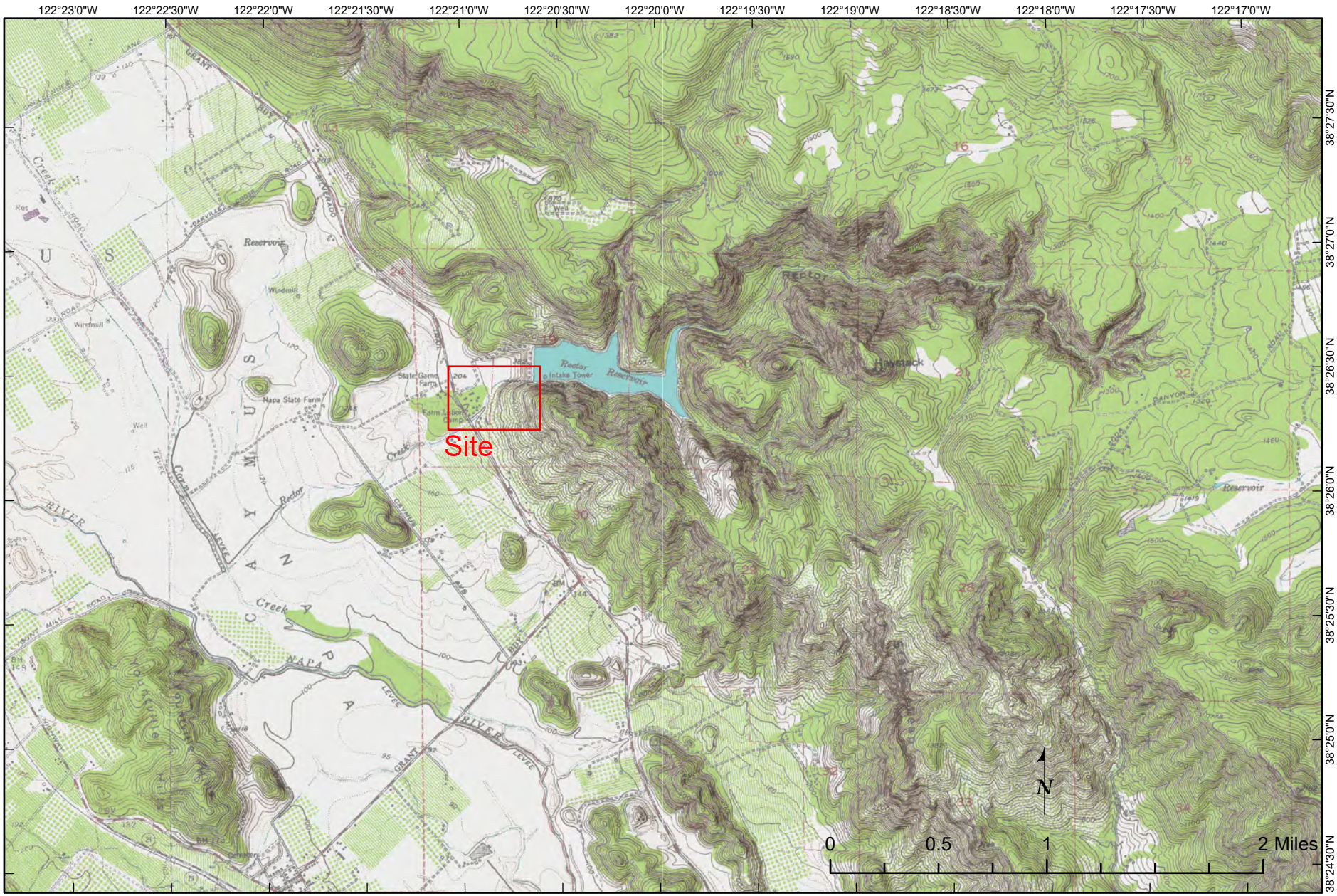
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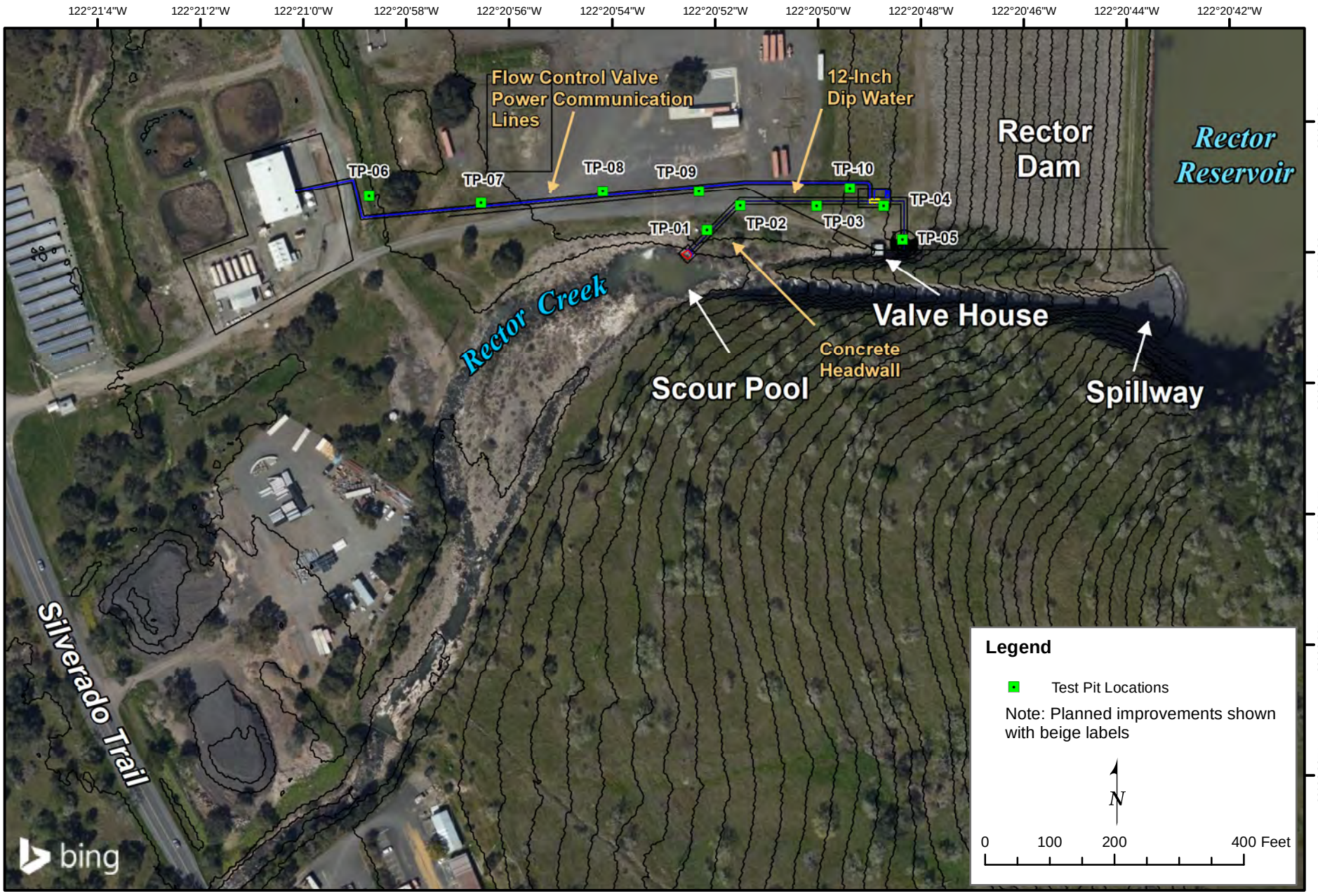
List of Plates

Title	Plate No.
Vicinity Map	1
Site Plan	2
Site Geology Map	3
Marston Coefficient Curve	4
Vertical Soil Pressure on Pipes Due to Vehicular Loads	5



Base from USGS 7.5-minute topographic map, 1973 & 1978.

Plate 1: Site Vicinity Map



Base map: © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS

Plate 2: Site Plan

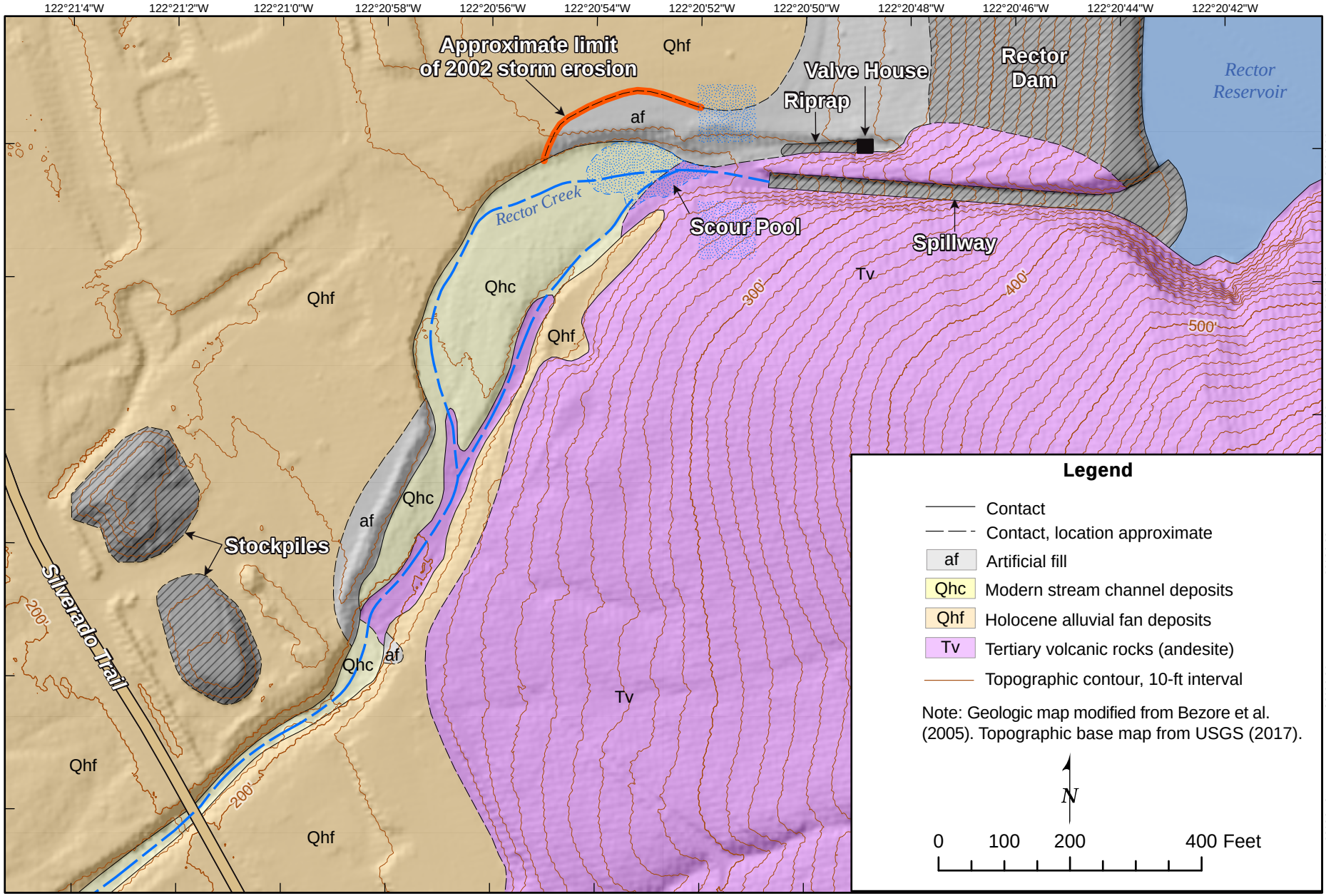


Plate 3: Site Geologic Map

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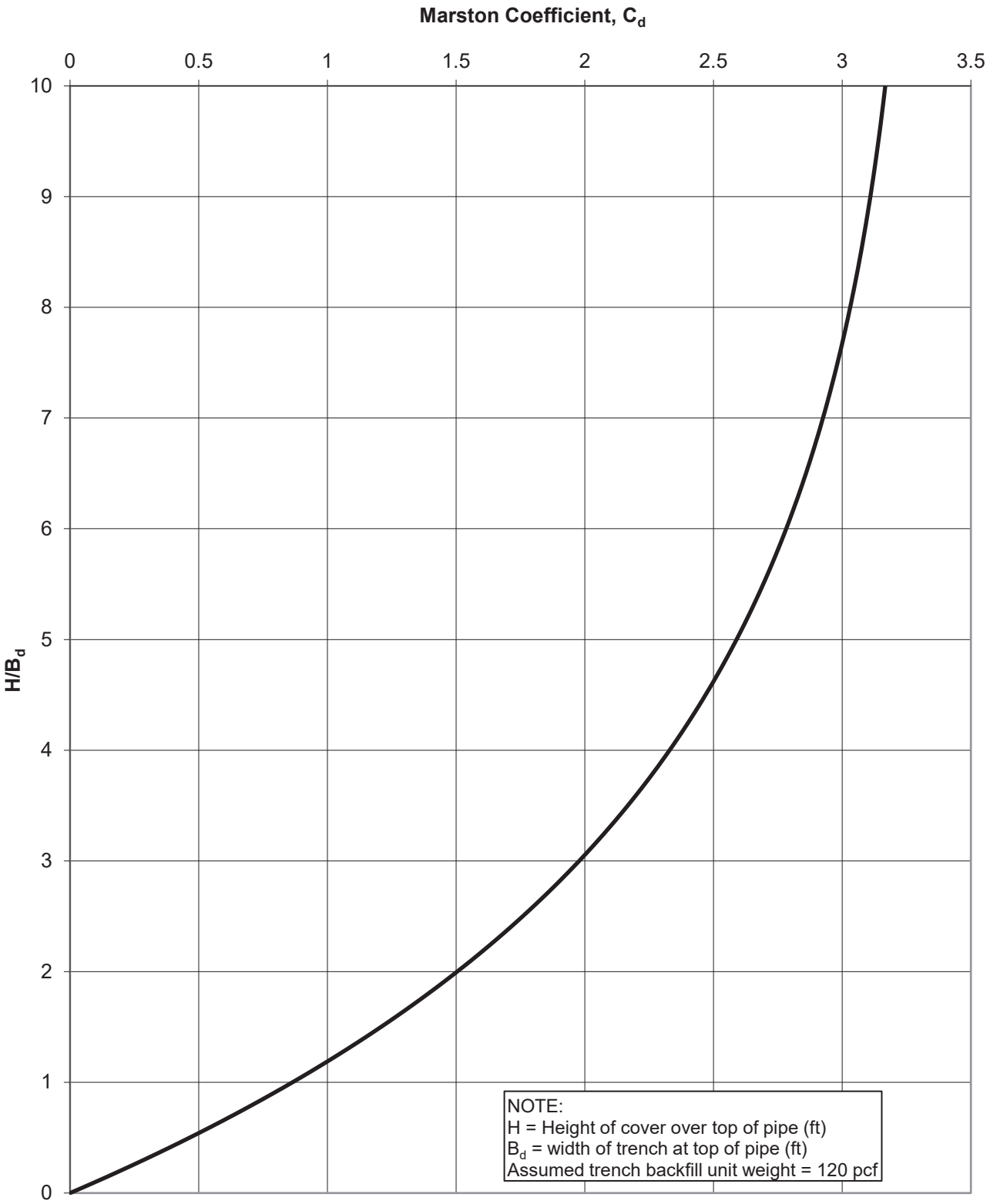


Plate 4: Marston Coefficient Curve

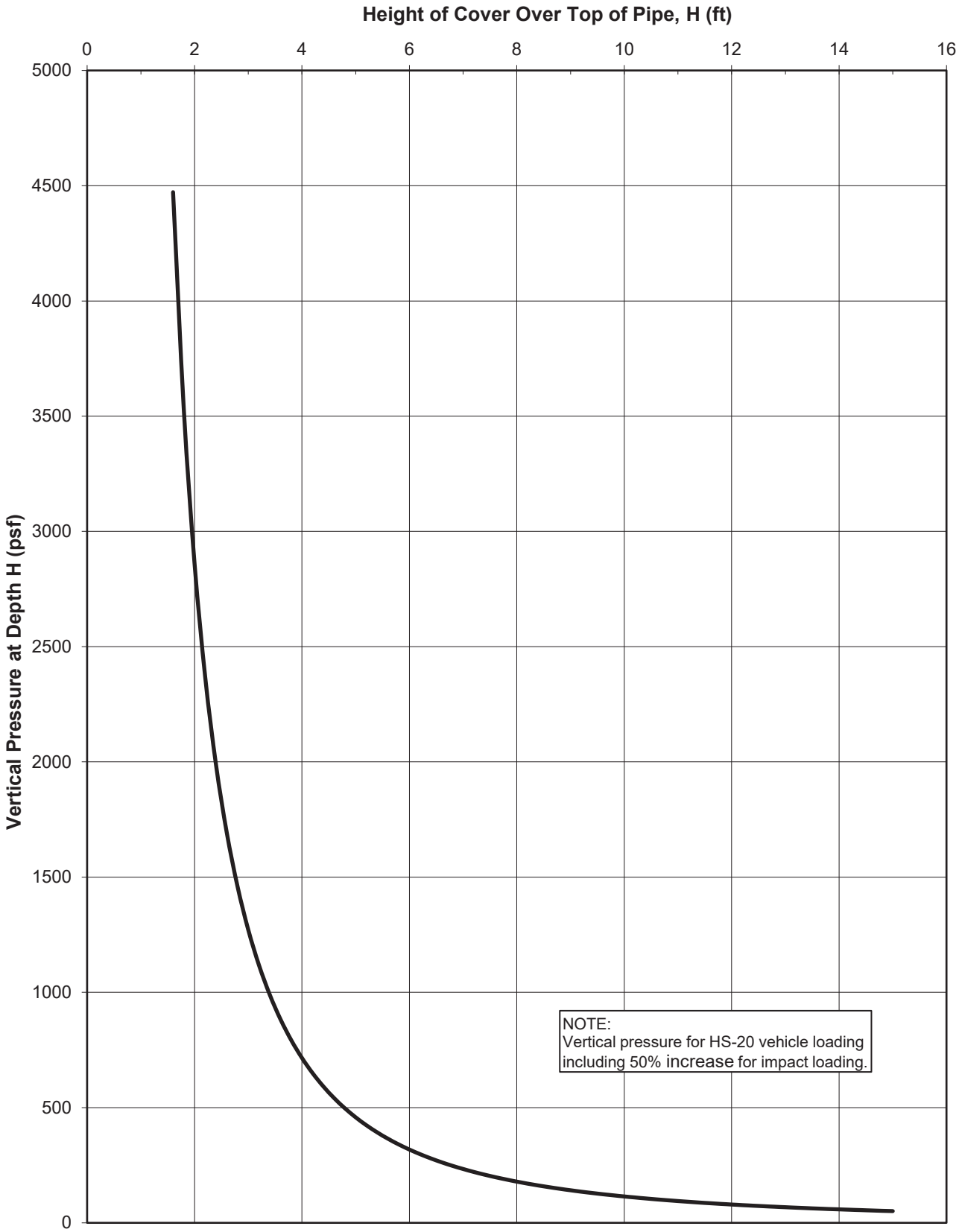


Plate 5: Vertical Soil Pressure on Pipes Due to Vehicular Loads

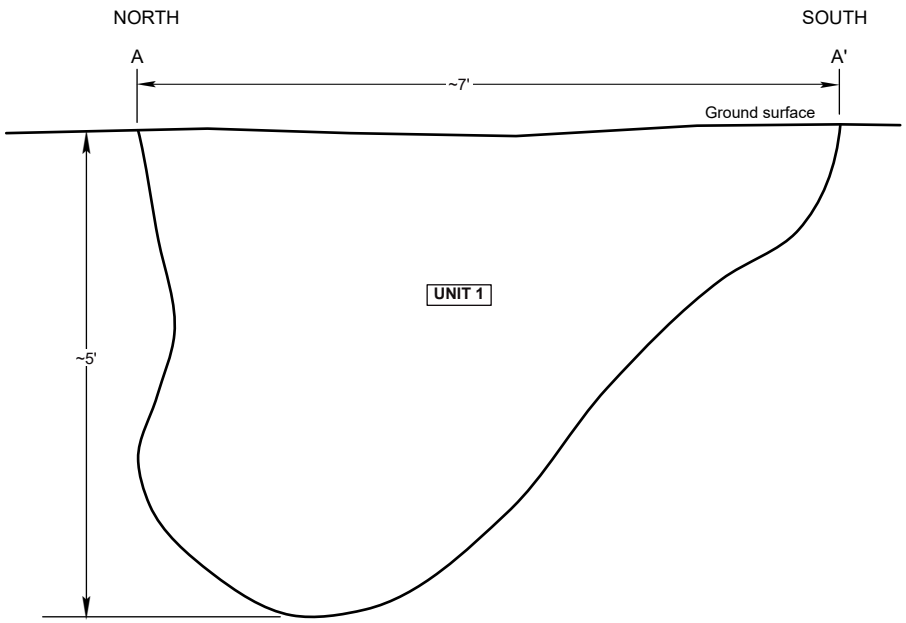
Appendix A

Field Explorations

Appendix A List of Plates

Title	Plate No.
Logs of Test Pits	A-1 to A-10
Key to Soil Classification and Test Data	A-11

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



Location of test pit: 38.4411990, -122.3478300 (refer to site plan)

Direction facing: East

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

LEGEND

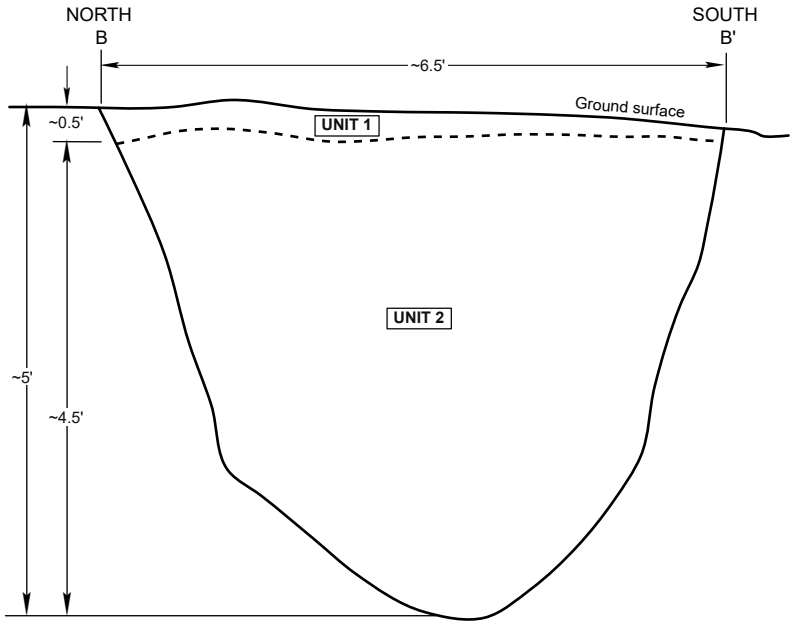
Contact; dashed where approximate

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Poorly graded, angular to rounded, clast supported, brown, dry to moist, pebble to cobble GRAVEL (GP), grades upwards, cobble diameter ≤ ½'

Plate A-1: Log of Test Pit TP-01

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

Location of test pit: 38.44125721, -122.34786611 (refer to site plan)

Direction facing: East

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

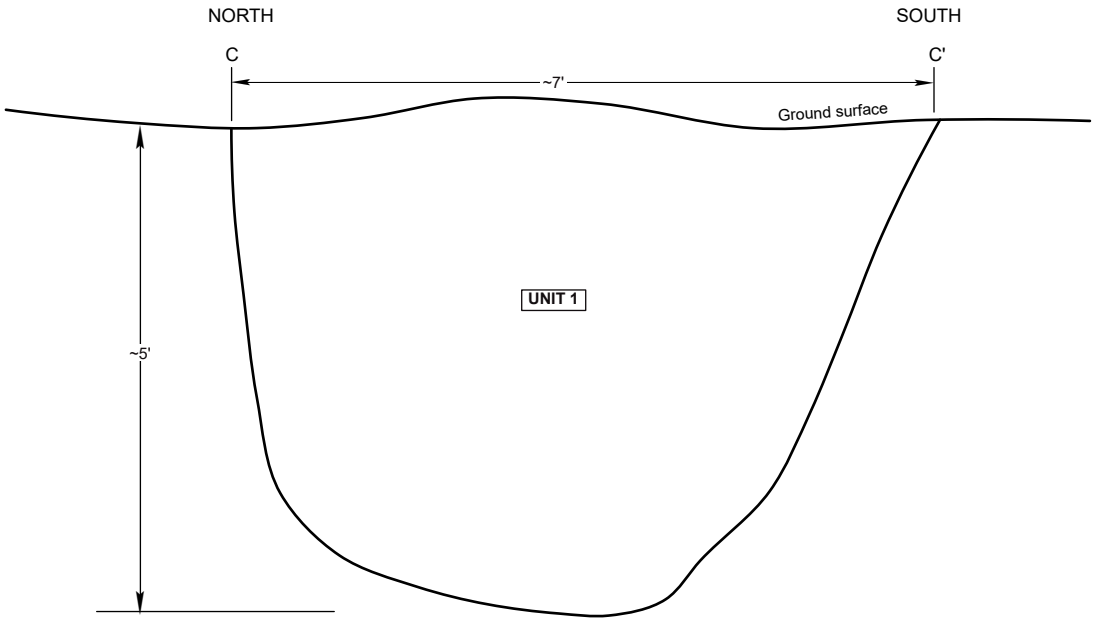
SOIL DESCRIPTIONS

UNIT 1: **FILL. Asphalt**

UNIT 2: **ALLUVIUM**. Angular, well graded, clast-supported, very dark brown, dry to moist, pebble to cobble GRAVEL (GW), cobble diameter ≤ ¾'

Plate A-2: Log of Test Pit TP-02

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

Location of test pit: 38.4411990, -122.3478300 (refer to site plan)

Direction facing: East

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

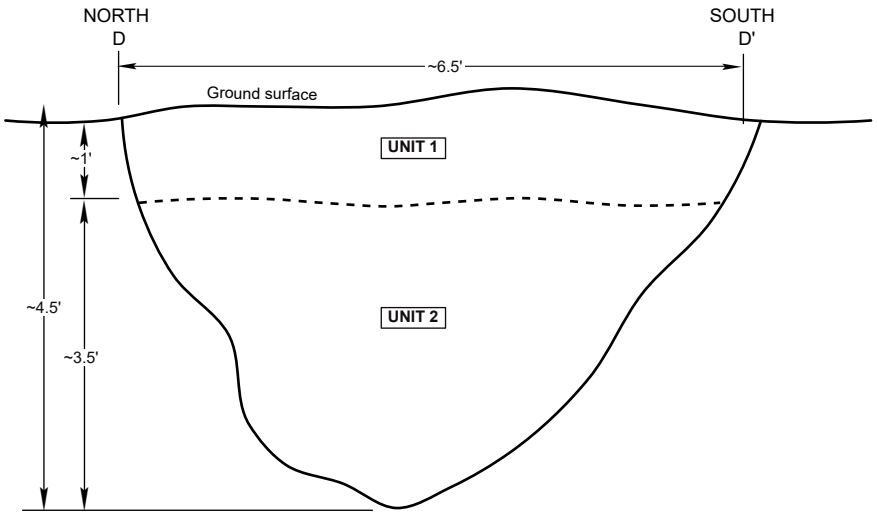
Checked by: Marlene Watson

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Poorly graded, clast supported, brown, dry ,pebble to boulder GRAVEL (GP), boulder diameter ≤1½'

Plate A3: Log of Test Pit TP-03

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

Location of test pit: 38.44134063, -122.34689268 (refer to site plan)

Direction facing: East

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

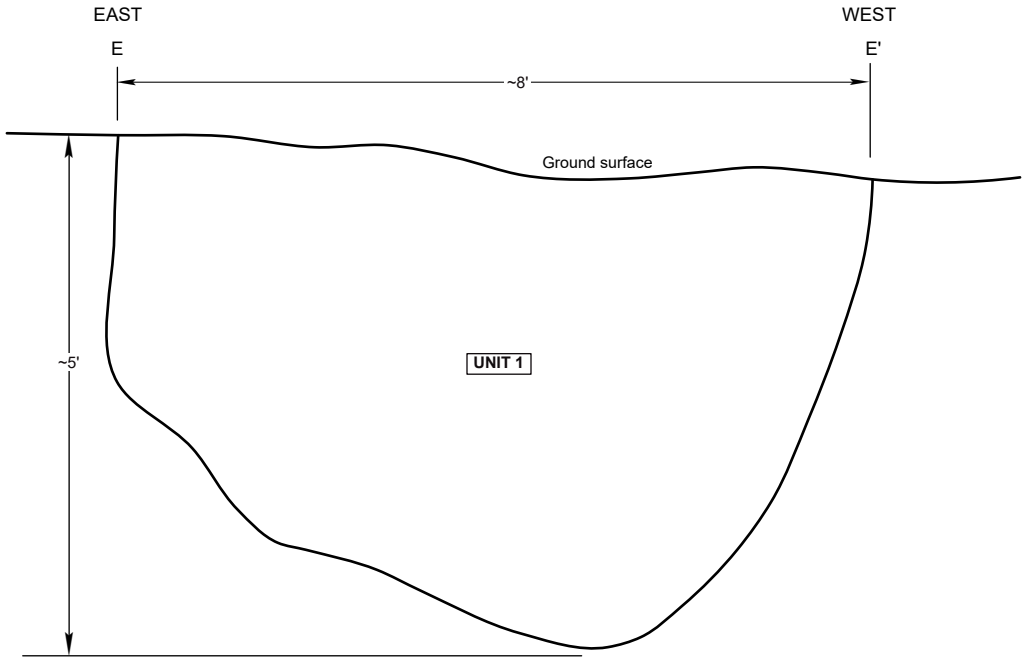
Checked by: Marlene Watson

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Angular to rounded, well graded, matrix-supported, dry, pebble to cobble GRAVEL (GW), cobble diameter ≤ ½'

UNIT 2: **ALLUVIUM.** Angular, well graded, clast-supported, very dark brown, dry to moist, pebble to cobble GRAVEL (GW), cobble diameter ≤ ¾'

Plate A-4: Log of Test Pit TP-04



Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder

LEGEND

Contact; dashed where approximate

Location of test pit: 38.4411620, -122.3467750 (refer to site plan)

Direction facing: South

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

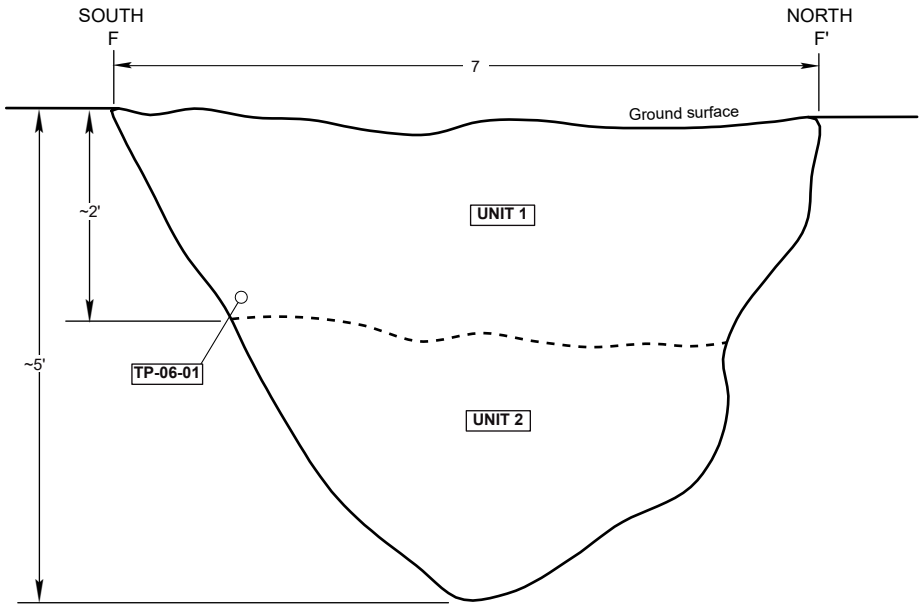
Checked by: Marlene Watson

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Well graded, angular to rounded, clast supported, pebble to cobble GRAVEL (GW), grades upwards, cobble diameter ≤ ¾'

Plate A-5: Log of Test Pit TP-05

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

TP-06-01 Sample Location

Location of test pit: 38.44140791, -122.34765030 (refer to site plan)

Direction facing: West

Date of excavation and observation: 10/02/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

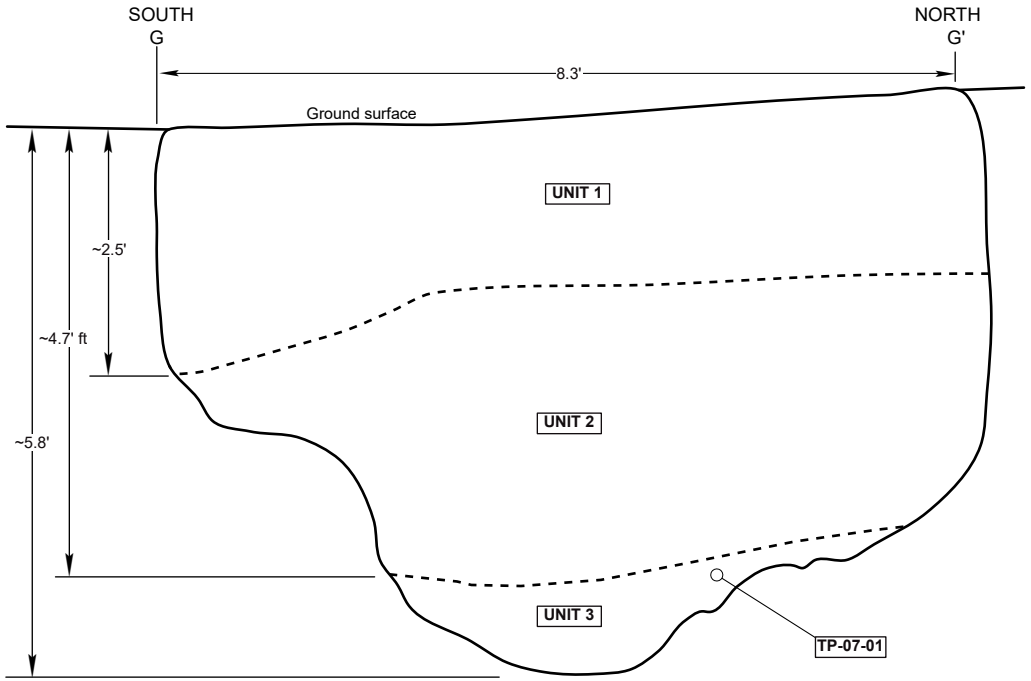
SOIL DESCRIPTIONS

UNIT 1: **ALLUVIUM.** Well graded, well rounded to subangular, matrix-supported, pebble to cobble GRAVEL with fine- to course-grained SAND (GW), loose, dry, cobble diameter ≤ ¼'

UNIT 2: **ALLUVIUM**. Rounded, well graded, clast-supported, pebble to cobble GRAVEL with SAND (GW), boulder diameter ≤1 ½'

Plate A-6: Log of Test Pit TP-06

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

TP-07-01 Sample Location

Location of test pit: 38.44135772, -122.34910737 (refer to site plan)

Direction facing: West

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

SOIL DESCRIPTIONS

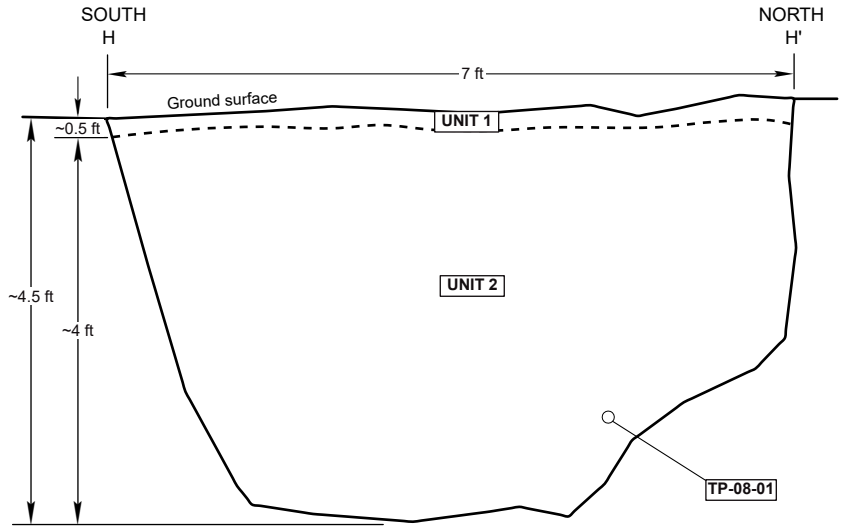
UNIT 1: **FILL (?).** SILTY Rounded to subangular, well graded, pebble to minor cobble GRAVEL with SAND and SILT, loose, dry (GW-GM); cobble diameter ≤ ½'

UNIT 2: **ALLUVIUM.** Well rounded, well graded, clast-supported cobble to boulder GRAVEL (GW), dry, loose; boulder diameter ≤ 2'

UNIT 3: **ALLUVIUM**. SILTY SAND with pebble GRAVEL (SM), loose, dry brown to black, charcoal present near contact; gravel diameter ≤ ¼'

Plate A-7: Log of Test Pit TP-07

Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder



LEGEND

Contact; dashed where approximate

TP-08-01 Sample Location

Location of test pit: 38.44129053, -122.3844458 (refer to site plan)

Direction facing: West

Date of excavation and observation: 10/02/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

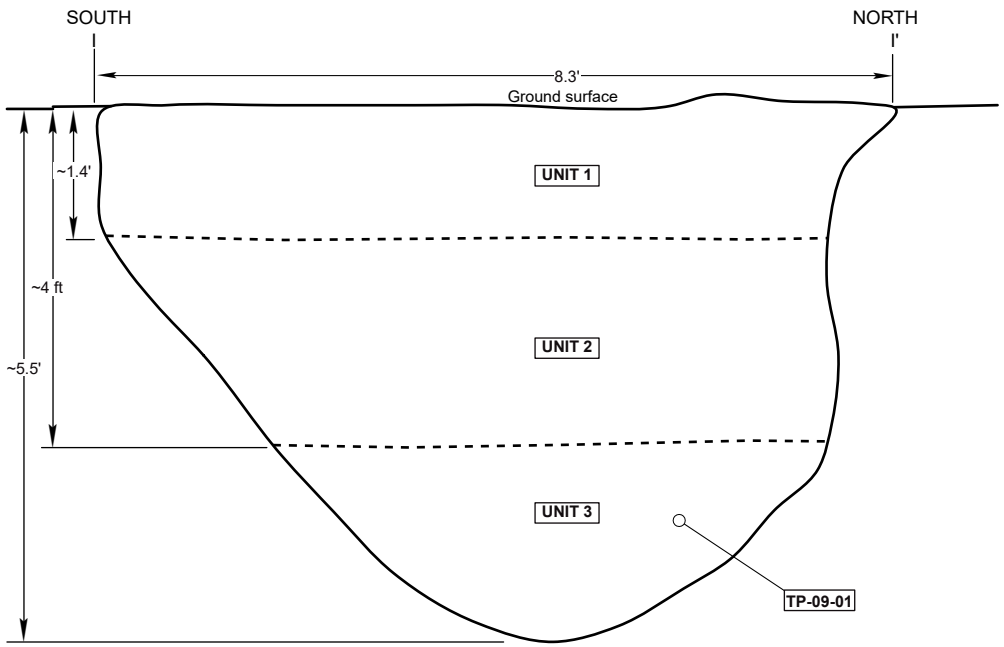
Checked by: Marlene Watson

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Poorly graded, angular pebble GRAVEL (GP)

UNIT 2: **ALLUVIUM.** well graded, well rounded, clast supported, pebble to boulder GRAVEL with CLAY and fine- to coarse-grained SAND (GW-GC), loose, dry, normally graded, boulder diameter ≤ 1'

Plate A-8: Log of Test Pit TP-08



Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder

LEGEND

Contact; dashed where approximate

TP-09-01 Sample Location

Location of test pit: 38.44143013, -122.34787628 (refer to site plan)

Direction facing: West

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

SOIL DESCRIPTIONS

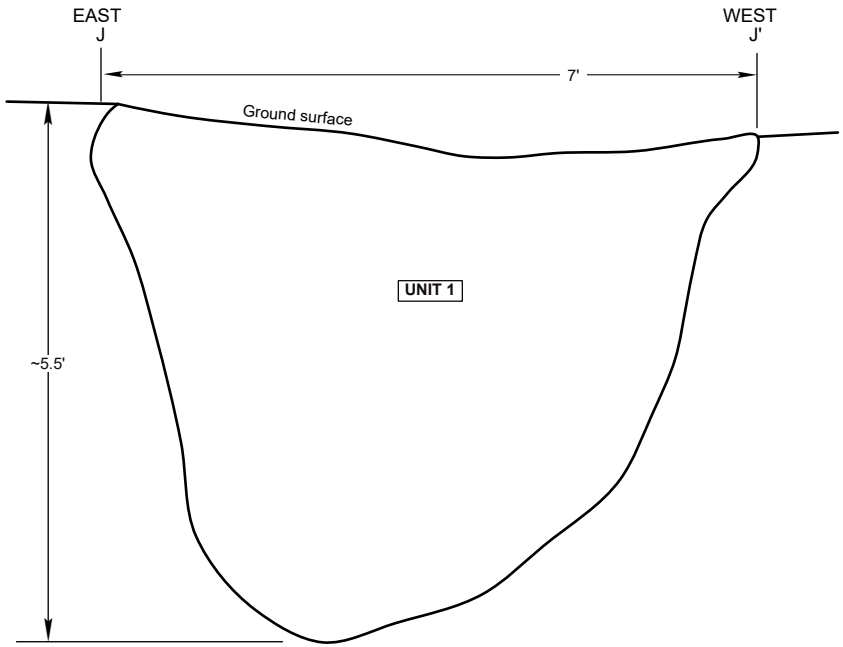
UNIT 1: **FILL.** SILTY SAND with pebble GRAVEL (SM)

UNIT 2: **ALLUVIUM.** Well graded, well rounded, matrix supported, pebble to cobble GRAVEL with coarse-grained SAND and CLAY (GW-GC), loose, dry; cobble diameter ≤ ¾'

UNIT 3: **ALLUVIUM**. Angular to rounded, poorly graded, pebble to boulder GRAVEL with coarse grained SAND and CLAY (GC), loose, moist, brown, boulder diameter ≥ 1 ¼'

Plate A-9: Log of Test Pit TP-09

D:\Rector_Reservior\Rector_Test_Pits\Rector_Test_Pits_Figures\Rector_Test_Pits_Figures.aprx; J.Niles; 10/26/2020D:\Rector_Reservior\Rector_T



Size range (inches)	Aggregate name (Wentworth class)
1.26–2.5 in	Pebble
2.5–10.1 in	Cobble
>10.1 in	Boulder

LEGEND

Contact; dashed where approximate

Location of test pit: 38.44140960, -122.3407268 (refer to site plan)

Direction facing: South

Date of excavation and observation: 10/01/2020

Groundwater: Not encountered

Backfill: Spoils returned and compacted

Excavation by: Jamey Dobbs, Patriot Environmental Services, Inc.

Observation by: John Niles

Checked by: Marlene Watson

SOIL DESCRIPTIONS

UNIT 1: **FILL.** Well graded, angular to rounded, clast supported, pebble to cobble GRAVEL (GW), grades upwards; cobble diameter ≤ ¾'

Plate A-10: Log of Test Pit TP-10

Classification and Material Symbols

Major Divisions Per ASTM D2488-06			Major Group Names and Material Symbols		
Coarse-Grained Soils: More than 50% retained on the No. 200 sieve	GRAVELS: More than 50% of coarse fraction retained on No. 4 sieve	Clean gravels less than 5% fines	GW		Well-Graded GRAVEL
			GP		Poorly Graded GRAVEL
		Gravels with more than 12% fines	GM		SILTY GRAVEL
			GC		CLAYEY GRAVEL
	SANDS: More than 50% of coarse fraction passing No. 4 sieve	Clean sand less than 5% fines	SW		Well-Graded SAND
			SP		Poorly Graded SAND
		Sands with more than 12% fines	SM		SILTY SAND
			SC		CLAYEY SAND
Fine-Grained Soils: 50% or more passes the No. 200 sieve	SILTS and CLAYS: Liquid Limit Less than 50%		ML		SILT
			CL		Lean CLAY
			OL		ORGANIC SILT
	SILTS and CLAYS: Liquid Limit Greater than 50%		MH		Elastic SILT
			CH		Fat CLAY
			OH		ORGANIC CLAY
Highly Organic Soils			PT		Peat or Highly Organic Soils

Notes:
Classification of soils on the boring logs is in general accordance with ASTM D2488, or D2487 if appropriate laboratory data are available.
The geologic formation is noted in bold font at the top of interpreted interval on the boring logs.

Other Material Symbols	
	Debris or Mixed Fill
	Pavement with Aggregate Base

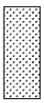
Sampler Type


SPT
(Driven)
1-3/8" ID 2" OD


Shelby Tube
(Pushed)
2-7/8" ID 3" OD

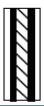

101 Geobarrel
(Rotary-Cut)
2-7/8" ID

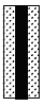

Push-Core
(Pushed)
See log for size


Modified California
(Driven)
2-3/8" ID
3" OD


Pitcher Barrel
(Rotary-Cut)
2-7/8" ID


Rock Core
(Rotary-Cut)
See log for size


Collected from Auger


Modified California
(Driven)
1-7/8" ID
2-1/2" OD


Osterberg
(Piston)
2-7/8" ID


Vibracore
(Vibrated) See log for size


Other
See log for details

Note: Refer to text of report for additional details or other sampler types.

Blow Count

Number of blows required to drive sampler each of three 6-in. intervals, as measured in the field (uncorrected). An SPT hammer (140 lb., falling 30-in.) was used unless otherwise noted on the boring log. For example:

Blow Count	Description
5 7 8	5, 7, and 8 blows for first, second, and third interval, respectively.
35 50/3"	35 blows for the first interval. 50 blows for the first 3 inches of the second interval. Lack of third value implies that driving was stopped 3 inches into the second interval.
WOH WOH 5	"WOH" indicates that the weight of the hammer was sufficient to advance the sampler over the first two intervals. 5 blows were required to advance the sampler over the third interval.

N-Value

The N-Value represents the blowcount for the last 12 inches of the sample drive if three 6-inch intervals were driven. N-value presented is independent of impact energy. If 50 hammer blows were insufficient to drive through either the second or the third interval, the total number of blows and total length driven are reported

(excluding the first interval). "ref" (refusal) indicates that 50 blows were insufficient to drive through the first 6-inch interval.

Parenthesis indicate that an approximate correction has been applied for non-SPT drive samplers. For example, a factor of 0.63 is commonly used to adjust blow counts obtained using a 3-inch outside diameter modified California sampler to correspond to Standard Penetration Test.

Undrained Shear Strength

A value of undrained shear strength is reported. The value is followed by a letter code indicating the type of test that was performed, as follows:

U - Unconfined Compression
Q - Unconsolidated Undrained Triaxial
T - Torvane
R - R-value
P - Pocket Penetrometer
M - Miniature Vane
F - Field Vane

Other Tests

Field or laboratory tests without a dedicated column on the boring log are reported in the Other Tests column. A letter code is used to indicate the type of test. For certain tests, a value representing the test result is also provided. Typical letter codes are as follows. Additional codes may be used. Refer to the report text and the laboratory testing results for additional information.

k - Permeability (cm/s)
Consol - Consolidation
Gs - Specific Gravity
MA - Particle Size Analysis
EI - Expansion Index
OVM - Organic Vapor Meter

Water Level Symbols

Initial Water Level
Final Water Level
Seepage Encountered

Increasing Moisture Content


Dry
Moist
Wet

Consistency of Cohesive Soil

Consistency	Undrained Shear Strength (KIPS per Square Foot)
Very Soft	<0.25
Soft	0.25 to 0.50
Medium Stiff	0.50 to 1.00
Stiff	1.00 to 2.00
Very Stiff	2.00 to 4.00
Hard	>4.00

Note: In absence of test data, consistency has been estimated based on manual observation.

Apparent Density of Cohesionless Soil

Apparent Density	N-Value
Very Loose	0 to 4
Loose	5 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	>49

Plate A-11: Soil Classification Chart

Appendix B

Laboratory Test Results

Introduction

Moore Twining Associates, Inc., founded in 1898, has continually provided professional consulting and analytical services throughout California for the past 115 years. Moore Twining provides professional services in geotechnical engineering, environmental services, construction inspection, materials testing, drilling services, and analytical chemistry.



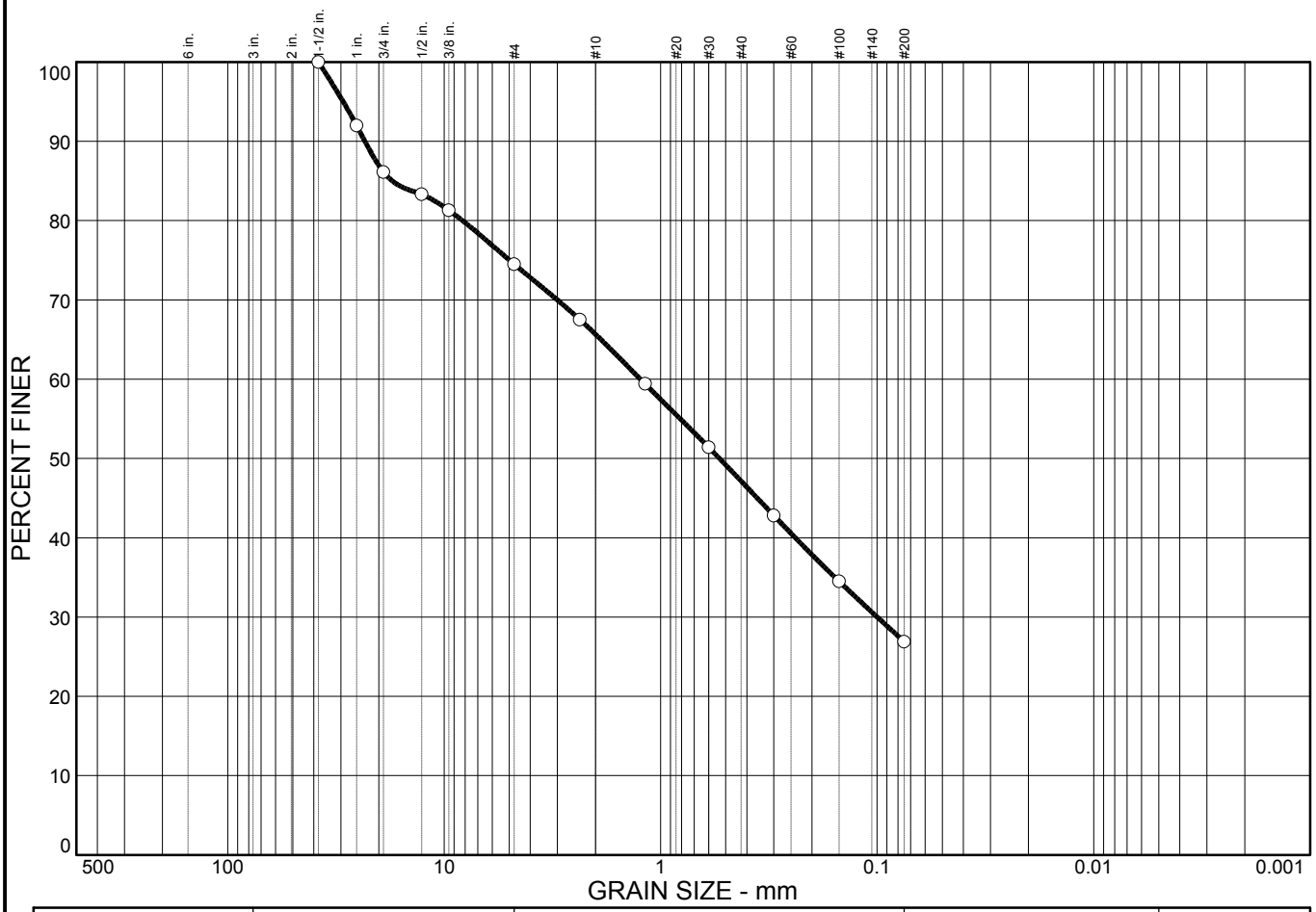
Offices are maintained in Corona, Fresno, Monterey, and Sacramento, with the Fresno office also serving as the corporate headquarters. Our professional staff consists of registered geotechnical engineers, registered civil engineers, registered geologists, registered environmental assessors, chemists, certified field and laboratory technicians, and support personnel.

Our reputation for service and integrity is known by individuals involved in all aspects of the engineering and testing industries throughout California. We take pride in providing our clients with consistently reliable and cost-effective services.

Office Locations

Fresno	2527 Fresno Street
(Corporate Headquarters)	Fresno, California 93721
	Phone: 559.268.7021
	Fax: 559.268.7126
Chemistry Division Fax:	559.268.0740
Riverside	11800 Sterling Ave., Suite C
	Riverside, California 92503
	Phone: 951.898.8932
	Fax: 951.898.8974
Monterey	501 Ortiz Avenue
	Sand City, California 93955
	Phone: 831.392.1056
	Fax: 831.392.1059
Sacramento	165 Commerce Circle, Suite D
	Sacramento, California 95815
	Phone: 916.381.9477
	Fax: 916.381.9478

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	25.5	47.6	26.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	92.0		
3/4 in.	86.1		
1/2 in.	83.3		
3/8 in.	81.3		
#4	74.5		
#8	67.5		
#16	59.4		
#30	51.4		
#50	42.8		
#100	34.5		
#200	26.9		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 17.4 D_{60}= 1.24 D_{50}= 0.535
D_{30}= 0.1000 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

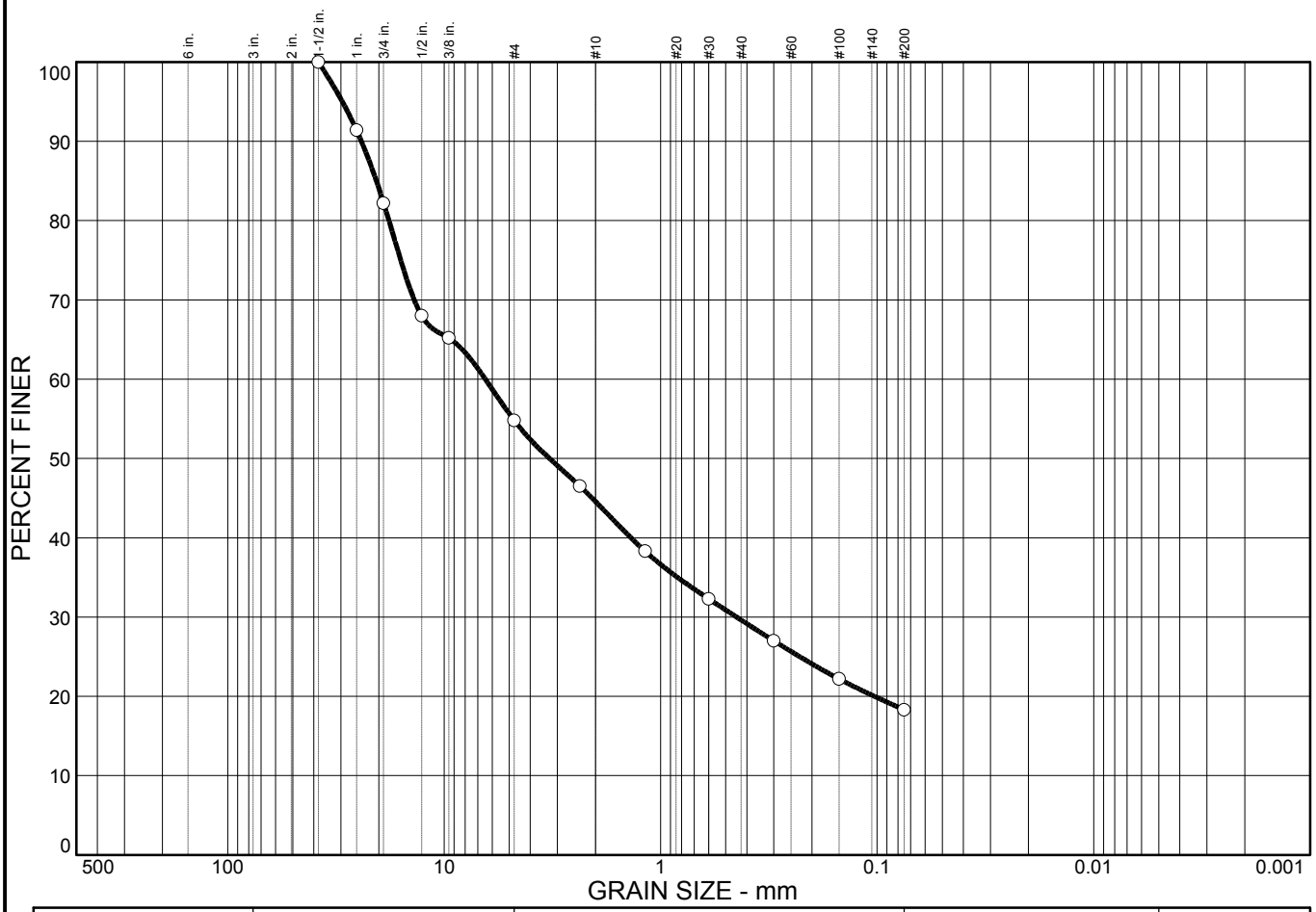
Sample No.: TP-07-01 **Source of Sample:** **Date:** 11/04/20
Location: **Elev./Depth:**

Moore Twining Associates, Inc.

Fresno, CA

Client: Fugro USA Land, Inc., Walnut Creek, CA
Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3
Project No: Pending **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	45.2	36.5	18.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	91.4		
3/4 in.	82.2		
1/2 in.	68.0		
3/8 in.	65.2		
#4	54.8		
#8	46.5		
#16	38.3		
#30	32.3		
#50	27.0		
#100	22.2		
#200	18.3		

* (no specification provided)

Material Description

Clayey gravel with sand

Atterberg Limits

PL= 20 LL= 36 PI= 16

Coefficients

D_{85}= 20.6 D_{60}= 6.46 D_{50}= 3.26
D_{30}= 0.446 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO=

Remarks

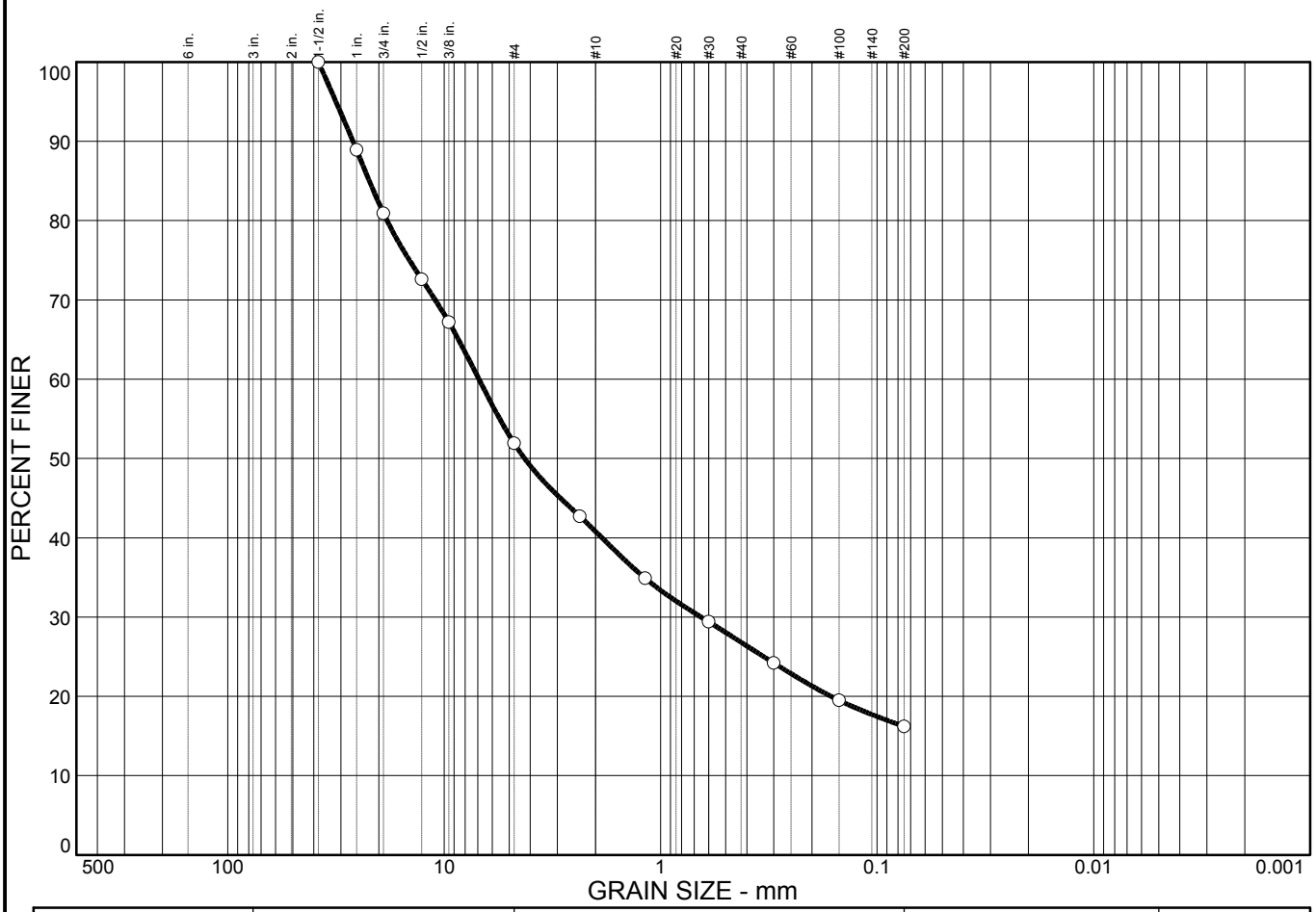
Sample No.: TP-08-01 **Source of Sample:** **Date:** 11/04/20
Location: **Elev./Depth:**

Moore Twining Associates, Inc.

Fresno, CA

Client: Fugro USA Land, Inc., Walnut Creek, CA
Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3
Project No: Pending **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	48.1	35.7	16.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	88.9		
3/4 in.	80.9		
1/2 in.	72.6		
3/8 in.	67.2		
#4	51.9		
#8	42.7		
#16	34.9		
#30	29.4		
#50	24.2		
#100	19.5		
#200	16.2		

* (no specification provided)

Material Description

Clayey gravel with sand

Atterberg Limits

PL= 19 LL= 32 PI= 13

Coefficients

D_{85}= 22.2 D_{60}= 6.91 D_{50}= 4.25
D_{30}= 0.651 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO=

Remarks

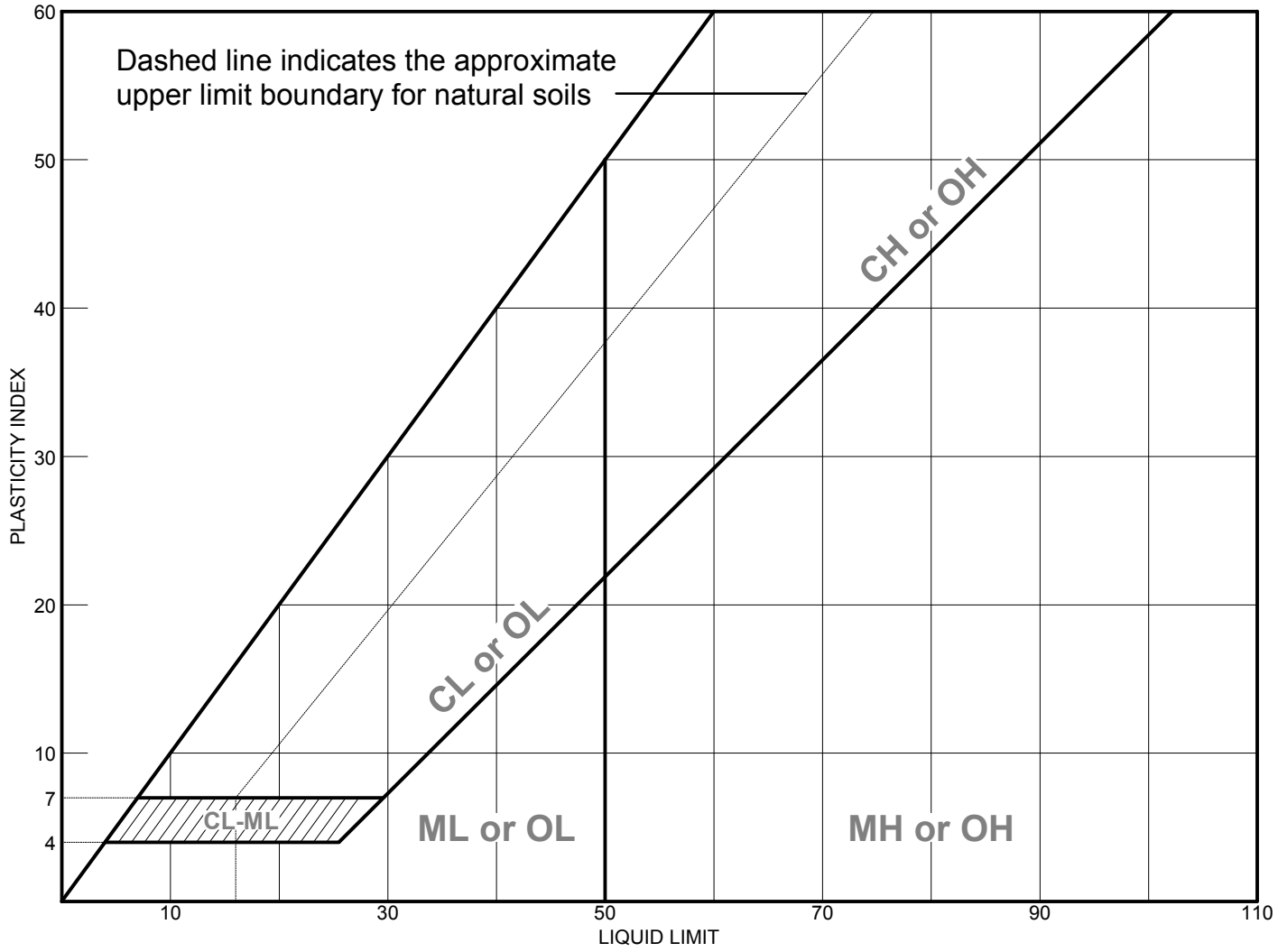
Sample No.: TP-09-01 **Source of Sample:** **Date:** 11/4/20
Location: **Elev./Depth:**

Moore Twining Associates, Inc.

Fresno, CA

Client: Fugro USA Land, Inc., Walnut Creek, CA
Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3
Project No: Pending **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand with gravel	NV	NP	NP	47.1	26.9	SM

Project No. Pending **Client:** Fugro USA Land, Inc., Walnut Creek, CA

Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3

● **Source:** **Sample No.:** TP-07-01

Remarks:

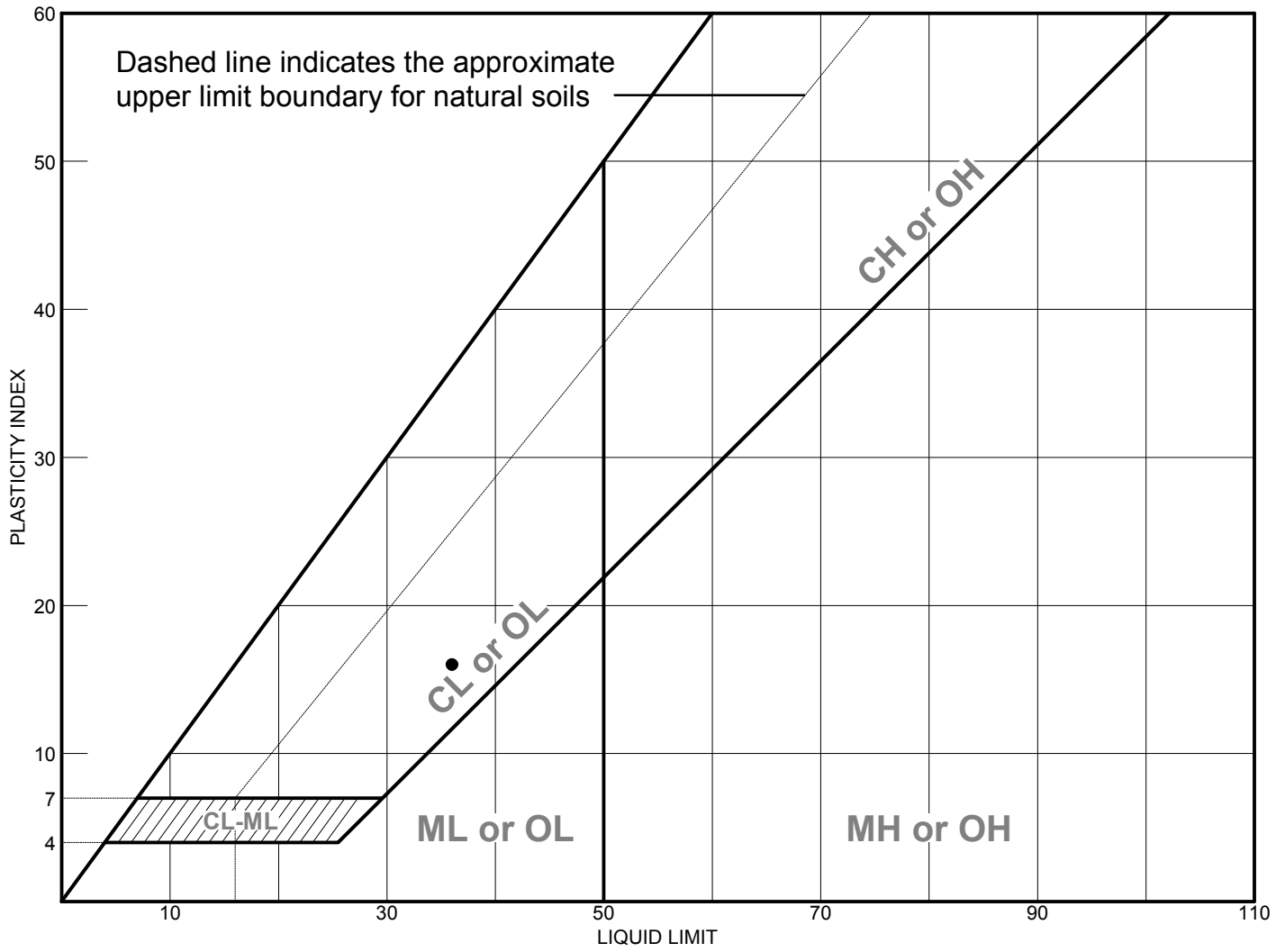
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey gravel with sand	36	20	16	29.6	18.3	GC

Project No. Pending **Client:** Fugro USA Land, Inc., Walnut Creek, CA

Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3

● **Source:** **Sample No.:** TP-08-01

Remarks:

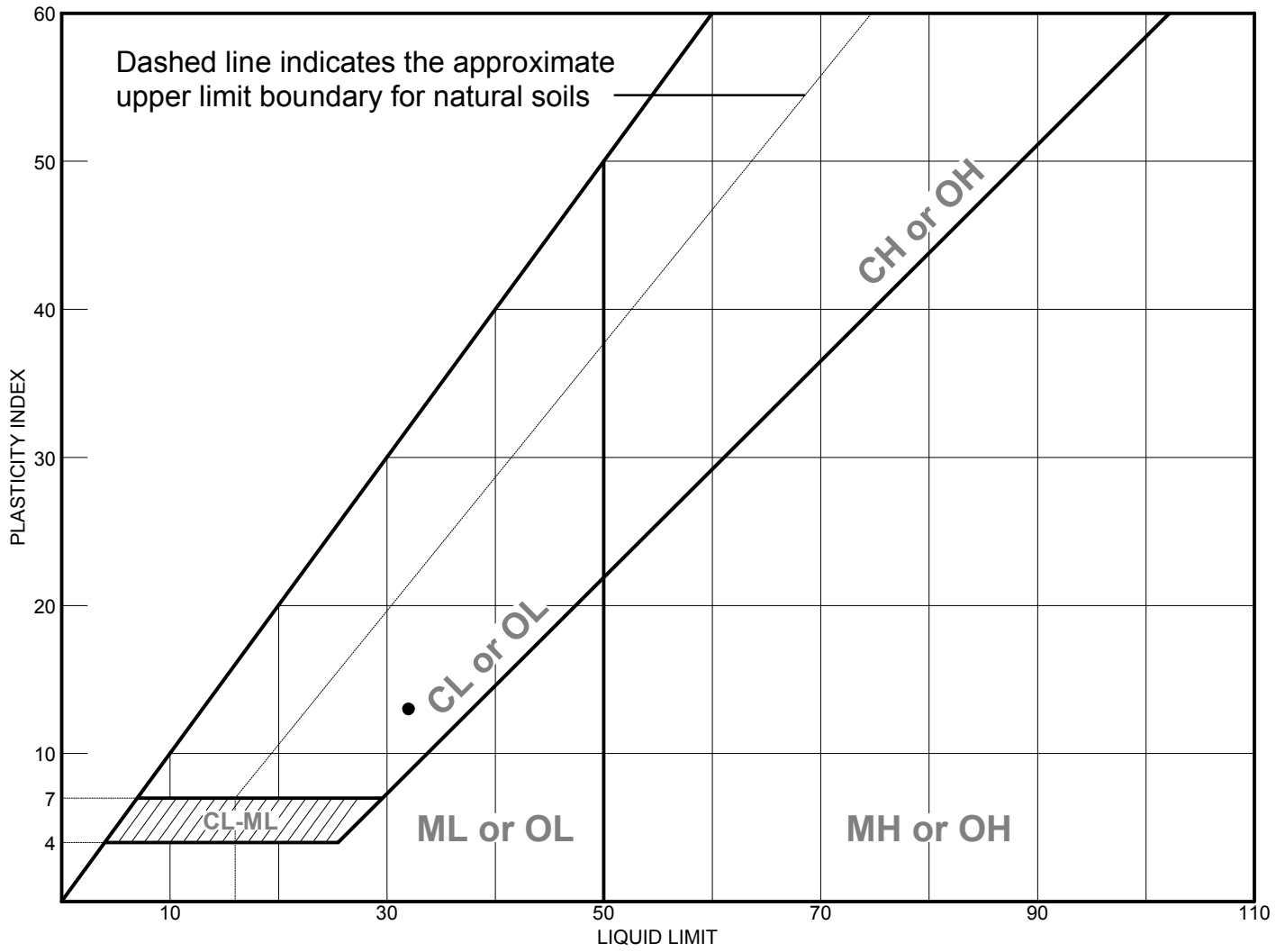
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey gravel with sand	32	19	13	26.8	16.2	GC

Project No. Pending **Client:** Fugro USA Land, Inc., Walnut Creek, CA

Project: Rector Dam Diversion Valve and Pipeline, Napa County, CA - 04.00166261, Phase 3

● **Source:** **Sample No.:** TP-09-01

Remarks:

●

Moore Twining Associates, Inc.

Fresno, CA

Figure

MOORE TWINING ASSOCIATES, INC.

Client:	Fugro USA Land, Inc., Walnut Creek, CA	Report Date:	11/18/2020
Project Name:	Rector Dam Diversion Valve and Pipeline, Napa County, CA	Sample Date:	11/4/2020
	Job No.: 04.00166261, Phase 3	Sampled By:	Client
		Tested By:	Michael S.

Project Number: Pending

Subject: Minimum Resistivity, CTM 643
Material Description: Silty sand with gravel (SM)
Location: TP-07-01

Laboratory Test Results, Minimum Resistivity - CTM 643

Total Water Added, mls	Resistivity, Ohm-cm
125 mls	29,000
150 mls	19,000
175 mls	16,500
200 mls	16,000
225 mls	16,000
250 mls	17,000

Remarks: Min. Resistivity is 16,000 Ohm-cm

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.

Client:	Fugro USA Land, Inc., Walnut Creek, CA	Report Date:	11/18/2020
Project Name:	Rector Dam Diversion Valve and Pipeline, Napa County, CA	Sample Date:	11/4/2020
	Job No.: 04.00166261, Phase 3	Sampled By:	Client
		Tested By:	Michael S.

Project Number: Pending

Subject: Minimum Resistivity, CTM 643
Material Description: Clayey gravel with sand (GC)
Location: TP-08-01

Laboratory Test Results, Minimum Resistivity - CTM 643

Total Water Added, mls	Resistivity, Ohm-cm
0 mls	8,000
50 mls	6,000
100 mls	4,500
125 mls	4,400
150 mls	4,700

Remarks: Min. Resistivity is 4,400 Ohm-cm

www.mooretwining.com
PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.

Client:	Fugro USA Land, Inc., Walnut Creek, CA	Report Date:	11/18/2020
Project Name:	Rector Dam Diversion Valve and Pipeline, Napa County, CA Job No.: 04.00166261, Phase 3	Sample Date: Sampled By: Tested By:	11/4/2020 Client Michael S.

Project Number: Pending

Subject: Minimum Resistivity, CTM 643
Material Description: Clayey gravel with sand (GC)
Location: TP-09-01

Laboratory Test Results, Minimum Resistivity - CTM 643

Total Water Added, mls	Resistivity, Ohm-cm
75 mls	8,500
100 mls	5,000
125 mls	5,000
150 mls	5,400
175 mls	5,800

Remarks: Min. Resistivity is 5,000 Ohm-cm

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

November 24, 2020

Work Order #: **GK19039**

Michael Shwiyhat
MTA Materials Division
2527 Fresno St.
Fresno, CA 93721

RE: Fugro Walnut Creek-Rector Dam

Enclosed are the analytical results for samples received by our laboratory on **11/19/20** . For your reference, these analyses have been assigned laboratory work order number **GK19039**.

All analyses have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, Moore Twining Associates, Inc. (MTA) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

Sincerely,

Moore Twining Associates, Inc.



Julio Morales
Client Services Supervisor

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

MTA Materials Division	**Project:** Fugro Walnut Creek-Rector Dam	**Reported:**
2527 Fresno St.	**Project Number:** Pending	11/24/2020
Fresno CA, 93721	**Project Manager:** Michael Shwiyhat	

Analytical Report for the Following Samples

Sample ID	Notes	Laboratory ID	Matrix	Date Sampled	Date Received
TP-07-01		GK19039-01	Soil	11/04/20 00:00	11/19/20 15:15
TP-08-01		GK19039-02	Soil	11/04/20 00:00	11/19/20 15:15
TP-09-01		GK19039-03	Soil	11/04/20 00:00	11/19/20 15:15

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

MTA Materials Division 2527 Fresno St. Fresno CA, 93721	**Project:** Fugro Walnut Creek-Rector Dam **Project Number:** Pending **Project Manager:** Michael Shwiyhat	**Reported:** 11/24/2020

TP-07-01

GK19039-01 (Soil) Sampled: 11/04/20 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		**15**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 422
Chloride		**0.0015**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
Sulfate as SO4		**0.014**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
pH		**6.6**	0.10	pH Units	1	B0K2310	11/23/20	11/24/20	Cal Test 643
Sulfate as SO4		**140**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 417

TP-08-01

GK19039-02 (Soil) Sampled: 11/04/20 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		**16**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 422
Chloride		**0.0016**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
Sulfate as SO4		**0.0059**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
pH		**7.4**	0.10	pH Units	1	B0K2310	11/23/20	11/24/20	Cal Test 643
Sulfate as SO4		**59**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 417

TP-09-01

GK19039-03 (Soil) Sampled: 11/04/20 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		**17**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 422
Chloride		**0.0017**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
Sulfate as SO4		**0.0027**	0.00060	% by Weight	3	[CALC]	11/23/20	11/23/20	[CALC]
pH		**7.2**	0.10	pH Units	1	B0K2310	11/23/20	11/24/20	Cal Test 643
Sulfate as SO4		**27**	6.0	mg/kg	3	B0K2310	11/23/20	11/23/20	Cal Test 417

Notes and Definitions

µg/L	micrograms per liter (parts per billion concentration units)
mg/L	milligrams per liter (parts per million concentration units)
mg/kg	milligrams per kilogram (parts per million concentration units)
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference

Analysis of pH, filtration, and residual chlorine is to take place immediately after sampling in the field.
If the test was performed in the laboratory, the hold time was exceeded. **(for aqueous matrices only)**

MOORE TWINING

CHAIN OF CUSTODY / ANALYSIS REQUEST

2527 FRESNO STREET • FRESNO, CA 93721 • PHONE (559) 268-7021 • FAX: (559) 268-0740

ANALYTICAL CHEMISTRY DIVISION
CALIFORNIA ELAP CERTIFICATION # 1371

WORK ORDER #: 2 CK19039
PAGE 1 **OF** 2

REPORT TO:
ATTENTION: Michael Shwiyhat
COMPANY NAME: MTA
ADDRESS:
PHONE:
EMAIL / FAX:

☐ **INVOICE TO:**
ATTENTION:
COMPANY NAME:
ADDRESS:
PHONE:
EMAIL / FAX:

☐ **REPORT COPY TO:**

REPORTING:
☐ STANDARD FORMAT ☐ PDF
☐ EDT (SWRCB) ☐ EXCEL
☐ GEOTRACKER/COELT (LUFT)
GLOBAL ID:
☐ COUNTY ENVIRONMENTAL HEALTH:
☐ STATE WATER RESOURCES CONTROL BOARD:
☐ OTHER:

SAMPLE INFORMATION
SAMPLED BY (PRINT): Client
SIGNATURE:
☐ PUBLIC SYSTEM ☐ ROUTINE
☐ PRIVATE WELL ☐ REPEAT
☐ OTHER ☐ REPLACEMENT

TURN AROUND TIME
☐ STANDARD
☒ RUSH, DUE ON: 3 Day TAT

SAMPLE TYPES
SOLID:
BS - BIOSOLID
CR - CERAMIC
(SL - SOIL/SOLID)
LIQUID:
DW - DRINKING WATER
GW - GROUND WATER
OL - OIL
SF - SURFACE WATER
ST - STORM WATER
WW - WASTEWATER

PROJECT INFORMATION
CONTRACT / P.O. NO.:
PROJECT: Fugro - Rector Dam
PROJECT NUMBER: Pending
PROJECT MANAGER: Michael Shwiyhat

ANALYSIS REQUESTED

LAB USE

NOTES ON RECEIVED CONDITION:
☐ CUSTODY SEAL(S) BROKEN ☐ SAMPLES(S) DAMAGED
☐ ON ICE ☐ AMBIENT TEMP. ☐ INCORRECT PRESERVATION

	CLIENT SAMPLE ID	DATE	TIME	TYPE				STATION CODE
1	TP-07-01	11/4/20	[illegible]	S	X	X	X	
2	TP-08-01	"	[illegible]	"	X	X	X	
3	TP-09-01	"	[illegible]	"	X	X	X	

COMMENTS / ADDITIONAL INSTRUCTIONS:
Lab ID: 20-755 #1 & 3

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Michael Shwiyhat	MTA	11/19/20	3:15		MTA

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in MTA's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody and agrees to MTA's terms and conditions for laboratory services unless contractually bound otherwise. MTA's current terms and conditions can be obtained by contacting our accounting department at (559) 268-7021.

Moore Twining Associates

Sample Integrity — Page 2 of 2 — WO# GK19039 — MTA Bottles: Yes or No

COC Info

Was temperature within range? Chemistry ≤6°C Micro <10°C Temp ___ °C	Yes No N/A	Did all bottle labels agree with COC?	Yes No N/A
If samples were taken today, is there evidence that chilling has begun? Recvd ___ C°	Yes No N/A	Was a sufficient amount of sample received?	Yes No N/A
Did all bottles arrive unbroken and intact?	Yes No N/A	Were correct containers and preservatives received for the tests requested?	Yes No N/A
Do samples have a hold time <72 hours?	Yes No N/A		
Were there bubbles in VOA vials? (**Volatiles Only**)	Yes No N/A		
Was PM notified of discrepancies? PM: By/Time:	Yes No N/A		

Bottles Received

125ml (A) 250ml (B) 1Liter (C) 40ml VOA (V)	1-3																						
Bacti $Na_2S_2O_3$																							
None (P)																							
Cr6 Buffer (P) Borate Carbonate Buffer																							
HNO_3 (P)																							
H_2SO_4 (P)																							
NaOH (P)																							
NaOH+ZnAc (P)																							
Dissolved Oxygen 300ml (P)																							
None (AG)																							
None (CG) 500ml																							
$Na_2S_2O_3$ 250ml (Brown P) 549																							
$Na_2S_2O_3$ (AG)																							
$Na_2S_2O_3$ (AG)																							
Thio/K Citrate																							
NH_4Cl (AG) 552																							
HCl (AG)																							
None (CG) 500ml																							
H_3PO_4 (AG)																							
Other:																							
Plastic Bag	i																						
Low Level Hg/Metals Double Bag																							
Client Own																							
Glass Jar: 125/ 250/ 500																							
Soil Tube: Brass/ Steel/ Plastic																							
5 g Encore																							

Comments

Filter or Split

	Container	Preservative	Date/Time/Initials
S P F			
S P F			
S P F			
S P F			
S P F			

Labeled by: YB @ ___ Labels checked by: YB @ 1600

FL-SC-0003-06

MOORE TWINING ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

December 03, 2020

Work Order #: **GK10062**

Michael Shwiyhat
MTA Materials Division
2527 Fresno St.
Fresno, CA 93721

RE: Fugro Walnut Creek-Rector Dam

Enclosed are the analytical results for samples received by our laboratory on **11/10/20** . For your reference, these analyses have been assigned laboratory work order number **GK10062**.

All analyses have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, Moore Twining Associates, Inc. (MTA) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

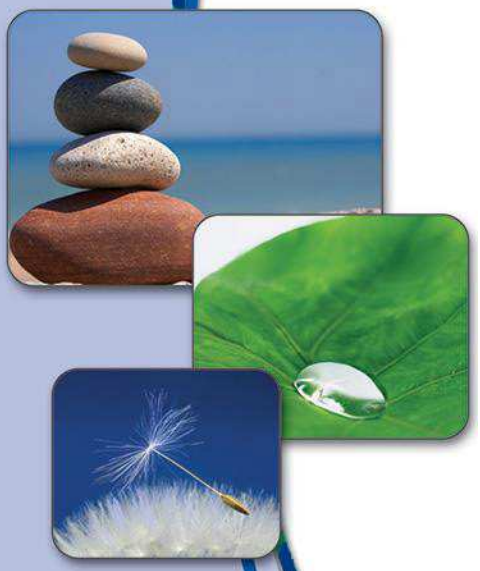
Sincerely,

Moore Twining Associates, Inc.



Julio Morales
Client Services Supervisor

eurofins | Environment Testing America



ANALYTICAL REPORT

Eurofins Calscience LLC
7440 Lincoln Way
Garden Grove, CA 92841
Tel: (714)895-5494

Laboratory Job ID: 570-43741-1
Client Project/Site: GK10062

For:
Moore Twining Associates, Inc.
2527 Fresno Street
Fresno, California 93721

Attn: Julio Morales

Vik Patel

Authorized for release by:
12/3/2020 8:38:27 AM

Vikas Patel, Project Manager I
(714)895-5494
vikas.patel@eurofinset.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at:
www.eurofinsus.com/Env

The test results in this report meet all 2003 NELAC, 2009 TNI, and 2016 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Job ID: 570-43741-1

Laboratory: Eurofins Calscience LLC

Narrative

Job Narrative
570-43741-1

Comments
No additional comments.

Receipt
The samples were received on 11/13/2020 10:00 AM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 3.1º C.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Client Sample ID: TP-07-01 — Lab Sample ID: 570-43741-1

Analyte	Result	Qualifier	RL		Unit	Dil Fac	D	Method	Prep Type
Oxidation Reduction Potential	378	HF	10.0		mV	1		D1498-14	Soluble

Client Sample ID: TP-08-01 — Lab Sample ID: 570-43741-2

Analyte	Result	Qualifier	RL		Unit	Dil Fac	D	Method	Prep Type
Oxidation Reduction Potential	375	HF	10.0		mV	1		D1498-14	Soluble

Client Sample ID: TP-09-01 — Lab Sample ID: 570-43741-3

Analyte	Result	Qualifier	RL		Unit	Dil Fac	D	Method	Prep Type
Oxidation Reduction Potential	382	HF	10.0		mV	1		D1498-14	Soluble

This Detection Summary does not include radiochemical test results.

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

General Chemistry - Soluble

Client Sample ID: TP-07-01
Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-1
Matrix: Solid

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	378	HF	10.0		mV			12/02/20 18:30	1

Client Sample ID: TP-08-01
Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-2
Matrix: Solid

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	375	HF	10.0		mV			12/02/20 18:30	1

Client Sample ID: TP-09-01
Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-3
Matrix: Solid

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	382	HF	10.0		mV			12/02/20 18:30	1

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Method: D1498-14 - Oxidation-Reduction Potential

Lab Sample ID: LCS 410-72222/1-A
Matrix: Solid
Analysis Batch: 72284

Client Sample ID: Lab Control Sample
Prep Type: Soluble

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Oxidation Reduction Potential			427	435.0		mV		102	98 - 102		

Lab Sample ID: 410-20367-A-4-G DU
Matrix: Solid
Analysis Batch: 72284

Client Sample ID: Duplicate
Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Oxidation Reduction Potential	330			325.5		mV				1	5

QC Association Summary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

General Chemistry

Leach Batch: 72222

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-43741-1	TP-07-01	Soluble	Solid	DI Leach	
570-43741-2	TP-08-01	Soluble	Solid	DI Leach	
570-43741-3	TP-09-01	Soluble	Solid	DI Leach	
LCS 410-72222/1-A	Lab Control Sample	Soluble	Solid	DI Leach	
410-20367-A-4-G DU	Duplicate	Soluble	Solid	DI Leach	

Analysis Batch: 72284

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-43741-1	TP-07-01	Soluble	Solid	D1498-14	72222
570-43741-2	TP-08-01	Soluble	Solid	D1498-14	72222
570-43741-3	TP-09-01	Soluble	Solid	D1498-14	72222
LCS 410-72222/1-A	Lab Control Sample	Soluble	Solid	D1498-14	72222
410-20367-A-4-G DU	Duplicate	Soluble	Solid	D1498-14	72222

Lab Chronicle

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Client Sample ID: TP-07-01

Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-1

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			24.33 g	25 mL	72222	12/02/20 16:29	JB	ELLE
Soluble	Analysis	D1498-14		1			72284	12/02/20 18:30	JB	ELLE
	Instrument ID: NOEQUIP									

Client Sample ID: TP-08-01

Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-2

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			24.56 g	25 mL	72222	12/02/20 16:29	JB	ELLE
Soluble	Analysis	D1498-14		1			72284	12/02/20 18:30	JB	ELLE
	Instrument ID: NOEQUIP									

Client Sample ID: TP-09-01

Date Collected: 11/10/20 15:30
Date Received: 11/13/20 10:00

Lab Sample ID: 570-43741-3

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			24.56 g	25 mL	72222	12/02/20 16:29	JB	ELLE
Soluble	Analysis	D1498-14		1			72284	12/02/20 18:30	JB	ELLE
	Instrument ID: NOEQUIP									

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Env, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Accreditation/Certification Summary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Laboratory: Eurofins Lancaster Laboratories Env, LLC

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
A2LA	Dept. of Defense ELAP	1.01	12-31-20
Alaska	State	PA00009	06-30-21
Alaska (UST)	State	17-027	01-31-21
Arizona	State	AZ0780	03-12-21
Arkansas DEQ	State	19-053-0	08-09-21
California	State	2792	01-31-21
Colorado	State	PA00009	06-30-21
Connecticut	State	PH-0746	12-26-20
Delaware (DW)	State	N/A	01-31-21
Florida	NELAP	E87997	07-01-21
Hawaii	State	N/A	01-31-21
Illinois	NELAP	004559	01-31-21
Iowa	State	361	03-02-22
Kansas	NELAP	E-10151	10-31-21
Kentucky (DW)	State	KY90088	12-31-20
Kentucky (WW)	State	KY90088	12-31-20
Louisiana	NELAP	02055	06-30-21
Maine	State	2019012	03-12-21
Maryland	State	100	06-30-21
Massachusetts	State	M-PA009	06-30-21
Michigan	State	9930	01-31-21
Minnesota	NELAP	042-999-487	12-31-21
Missouri	State	450	01-31-22
Montana (DW)	State	0098	01-01-22
Nebraska	State	NE-OS-32-17	01-31-20 *
Nevada	State	PA000092019-3	07-31-21
New Hampshire	NELAP	273019	01-10-21
New Jersey	NELAP	PA011	06-30-21
New York	NELAP	10670	04-01-21
North Carolina (DW)	State	42705	07-31-21
North Carolina (WW/SW)	State	521	12-31-20
North Dakota	State	R-205	01-31-20 *
Oklahoma	NELAP	R-205	02-01-21
Oregon	NELAP	PA200001-018	09-12-21
PALA	Canada	1978	05-08-21
Pennsylvania	NELAP	36-00037	01-31-21
Rhode Island	State	LAO00338	12-30-20
South Carolina	State	89002002	01-31-21
Tennessee	State	02838	01-31-21
Texas	NELAP	T104704194-20-38	08-31-21
Utah	NELAP	PA000092019-16	02-28-21
Vermont	State	VT - 36037	10-29-21
Virginia	NELAP	10561	06-14-21
Washington	State	C457	04-11-21
West Virginia (DW)	State	9906 C	12-31-20
West Virginia DEP	State	055	12-31-20
Wyoming	State	8TMS-L	01-07-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Method	Method Description	Protocol	Laboratory
D1498-14	Oxidation-Reduction Potential	ASTM	ELLE
DI Leach	Deionized Water Leaching Procedure	ASTM	ELLE

Protocol References:

ASTM = ASTM International

Laboratory References:

ELLE = Eurofins Lancaster Laboratories Env, LLC, 2425 New Holland Pike, Lancaster, PA 17601, TEL (717)656-2300

Sample Summary

Client: Moore Twining Associates, Inc.
Project/Site: GK10062

Job ID: 570-43741-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
570-43741-1	TP-07-01	Solid	11/10/20 15:30	11/13/20 10:00	
570-43741-2	TP-08-01	Solid	11/10/20 15:30	11/13/20 10:00	
570-43741-3	TP-09-01	Solid	11/10/20 15:30	11/13/20 10:00	

MOORE TWINING ASSOCIATES, INC.

Analytical Chemistry Division
California ELAP Certification # 1371

SUBCONTRACT ORDER

Purchase Order # 34661
MTA Project # GK10062

43741

Please reference these numbers on all reports and invoices.
We also request QC data be provided with final report.

SENDING LABORATORY:	PROJECT MANAGER / REPORT TO:	RECEIVING LABORATORY:
Moore Twining Associates, Inc	Julio Morales	Eurofins Calscience, LLC.
2527 Fresno Street	JulioM@MooreTwining.com	7440 Lincoln Way
Fresno, CA 93721	INVOICE TO:	Garden Grove, CA 92841-1427
Phone: (559) 268-7021	Denise Willis	Phone: (714) 895-5494
Fax: (559) 268-0740	AccountsPayable@MooreTwining.com	Fax: (714) 894-7501

SAMPLE INFORMATION	COMMENTS / SOURCE ID

Client Sample ID: TP-07-01

MTA Sample ID: GK10062-01 **Matrix:** Soil **Sampled Date/Time:** 11/10/20 15:30
Requested Analysis: Redox Value (Soils) **Holding Time Expires:** 12/08/20 15:30
Containers Supplied:
Plastic Bag (A)

Client Sample ID: TP-08-01

MTA Sample ID: GK10062-02 **Matrix:** Soil **Sampled Date/Time:** 11/10/20 15:30
Requested Analysis: Redox Value (Soils) **Holding Time Expires:** 12/08/20 15:30
Containers Supplied:
Plastic Bag (A)

Client Sample ID: TP-09-01

MTA Sample ID: GK10062-03 **Matrix:** Soil **Sampled Date/Time:** 11/10/20 15:30
Requested Analysis: Redox Value (Soils) **Holding Time Expires:** 12/08/20 15:30
Containers Supplied:
Plastic Bag (A)

570-43741 Chain of Custody

Released By	Date / Time	Received By	Date / Time
Greg Botts	11-12-20/1630	[signature]	11/13/2020 10:00
Released By	Date / Time	Received By	Date / Time

Please email copy of receipt with your assigned Sample ID Number to JulioM@MooreTwining.com

3-9/3-1 SRB

43741

GLS

800-322-5555
www.gls-us.com

Ship From
MOORE TWINING ASSOCIATES,INC
SAMPLE CONTROL
2527 FRESNO STREET
FRESNO, CA 93721

Ship To
EUROFINS CALSCIENCE, LLC-SAMPLE RECIEVING
SAMPLE RECEIVING
7440 LINCOLN WAY
GARDEN GROVE, CA 92841

COD: $0.00
Weight: 0 lb(s)
Reference:
61-745
Delivery Instructions:

Signature Type: REQUIRED

Tracking #: 551144982

CPS

570-43741 Waybill

GARDEN GROVE

S92841A

30595864

ORC CA927-CL1

Print Date: 11/12/2020 9:43 AM

LABEL INSTRUCTIONS:

Do not copy or reprint this label for additional shipments - each package must have a unique barcode.
Step 1: Use the "Print Label" button on this page to print the shipping label on a laser or inkjet printer.
Step 2: Fold this page in half.
Step 3: Securely attach this label to your package and do not cover the barcode.

TERMS AND CONDITIONS:

By giving us your shipment to deliver, you agree to all of the General Logistics Systems US, Inc. (GLS) service terms & conditions including, but not limited to; limits of liability, declared value conditions, and claim procedures which are available on our website at www.gls-us.com.

Eurofins Calscience LLC
7440 Lincoln Way
Garden Grove, CA 92841
Phone: 714-895-5494 Fax: 714-894-7501

Chain of Custody Record

eurofins Environment Testing America

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Patel, Vikas	Carrier Tracking No(s):	COC No: 570-63382.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: vikas.patel@eurofinset.com	State of Origin: California	Page: Page 1 of 1
Company: Eurofins Lancaster Laboratories Env LLC		Accreditations Required (See note):		Job #: 570-43741-1
Address: 2425 New Holland Pike, ,	Due Date Requested: 12/1/2020			
City: Lancaster	TAT Requested (days):			
State, Zip: PA, 17601				
Phone: 717-656-2300(Tel)	PO #:			
Email:	WO #:			
Project Name: GK10062	Project #: 57001980			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	D1498_14/DI_LEACH_NP	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
TP-07-01 (570-43741-1)	11/10/20	15:30 Pacific		Solid			X	1	
TP-08-01 (570-43741-2)	11/10/20	15:30 Pacific		Solid			X	1	
TP-09-01 (570-43741-3)	11/10/20	15:30 Pacific		Solid			X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Calscience places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Calscience laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Calscience attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins Calscience.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1	[signature]	11/16/2020 1100	EC1			
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by: [signature]	Date/Time: 11/17/20 1147	Company EIE

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 3.1°C

Ver: 01/16/2019

Login Sample Receipt Checklist

Client: Moore Twining Associates, Inc.

Job Number: 570-43741-1

Login Number: 43741
List Number: 1
Creator: Ramos, Maribel

List Source: Eurofins Calscience

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Moore Twining Associates, Inc.

Job Number: 570-43741-1

Login Number: 43741
List Number: 2
Creator: Phillips, Ann-Marie E

List Source: Eurofins Lancaster Laboratories Env
List Creation: 11/17/20 10:58 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable (</=6C, not frozen).	True	
Cooler Temperature is recorded.	True	
WV: Container Temperature is acceptable (</=6C, not frozen).	N/A	
WV: Container Temperature is recorded.	N/A	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses.	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	N/A	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
Sample Preservation Verified.	N/A	
Residual Chlorine Checked.	N/A	
Sample custody seals are intact.	N/A	

MOORE TWINING

CHAIN OF CUSTODY / ANALYSIS REQUEST

2527 FRESNO STREET • FRESNO, CA 93721 • PHONE (559) 268-7021 • FAX: (559) 268-0740

ANALYTICAL CHEMISTRY DIVISION
CALIFORNIA ELAP CERTIFICATION # 1371

WORK ORDER #: GK10062
PAGE 1 OF 3

REPORT TO:	☐ INVOICE TO:	☐ REPORT COPY TO:	REPORTING:
ATTENTION: Michael Shwiyhat	ATTENTION:		☐ STANDARD FORMAT ☐ PDF ☐ EDT (SWRCB) ☐ EXCEL ☐ GEOTRACKER/COELT (LUFT) GLOBAL ID:
COMPANY NAME: MTA	COMPANY NAME:		☐ COUNTY ENVIRONMENTAL HEALTH:
ADDRESS: FRESNO	ADDRESS:		☐ STATE WATER RESOURCES CONTROL BOARD:
PHONE:	PHONE:		☐ OTHER:
EMAIL / FAX:	EMAIL / FAX:		

SAMPLE INFORMATION

SAMPLED BY (PRINT): Client

SIGNATURE:

☐ PUBLIC SYSTEM ☐ ROUTINE
☐ PRIVATE WELL ☐ REPEAT
☐ OTHER ☐ REPLACEMENT

TURN AROUND TIME
☒ STANDARD
☐ RUSH, DUE ON: _____

SAMPLE TYPES

SOLID:
BS - BIOSOLID
CR - CERAMIC
SL - SOIL/SOLID
LIQUID:
DW - DRINKING WATER
GW - GROUND WATER
OL - OIL
SF - SURFACE WATER
ST - STORM WATER
WW - WASTEWATER

PROJECT INFORMATION

CONTRACT / P.O. NO.:

PROJECT: Fugro Walnut Creek - Reetor Dam

PROJECT NUMBER: Pending

PROJECT MANAGER: Michael Shwiyhat

ANALYSIS REQUESTED

NOTES ON RECEIVED CONDITION:
☐ CUSTODY SEAL(S) BROKEN ☐ SAMPLES(S) DAMAGED
☐ ON ICE ☐ AMBIENT TEMP. ☐ INCORRECT PRESERVATION

LAB USE	CLIENT SAMPLE ID	DATE	TIME	TYPE	X	STATION CODE
1	TP-07-01	11/10/20	3:30		X	
2	TP-08-01	"	"		X	
3	TP-09-01	"	"		X	

COMMENTS / ADDITIONAL INSTRUCTIONS: Lab ID: 20-755

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Michael Shwiyhat	MTA	11/10/20	3:30		

Payment for services rendered as noted herein are due in full within 30 days from the date invoiced. If not so paid, account balances are deemed delinquent. Delinquent balances are subject to monthly service charges and interest specified in MTA's current Standard Terms and Conditions for Laboratory Services. The person signing for the Client/Company acknowledges that they are either the Client or an authorized agent to the Client, that the Client agrees to be responsible for payment for the services on this Chain of Custody and agrees to MTA's terms and conditions for laboratory services unless contractually bound otherwise. MTA's current terms and conditions can be obtained by contacting our accounting department at (559) 268-7021.

GK 100602

2&3

d.wells@fugro.com / www.fugro.com
Fugro USA Land, Inc.
1777 Botelho Dr, Walnut Creek, CA 94596

From: donotreply@gls-us.com <donotreply@gls-us.com>
Sent: Tuesday, November 3, 2020 2:03 PM
To: Wells, Donald <d.wells@fugro.com>
Subject: GLS Shipment Notification

Parcel | Express | Freight

800-322-5555

GLS Shipment Notification

A GLS label has been created for a shipment to you. When the shipment arrives at our hub, the tracking details will be updated.

Ship From:	LARISA SWARTZ, FUGRO USA LAND INC
Ship To:	Michael Shwiyhat, Moore Twinning Associates 2527 Fresno Street Fresno, CA 93721
Tracking Number(s):	551038525
Reference:	04.00166261, Phase 00003.
Estimated Delivery Date:	11/04/2020

Please use the following link to track the status of this shipment online:
https://n.gso.com/hipvXN0x

Please DO NOT REPLY TO THIS MESSAGE. This email was sent from a notification-only email address that cannot accept incoming email.

Sample Integrity

Page 2 of 2

Moore Twining Associates

WO# GK10062

MTA Bottles: (Yes) or No

COC Info

Was temperature within range? Chemistry ≤6°C Micro <10°C Temp_____°C	Yes No (N/A)	Did all bottle labels agree with COC?	(Yes) No N/A
If samples were taken today, is there evidence that chilling has begun? Recvd_____C°	Yes (No) N/A	Was a sufficient amount of sample received?	(Yes) No N/A
Did all bottles arrive unbroken and intact?	(Yes) No N/A	Were correct containers and preservatives received for the tests requested?	(Yes) No N/A
Do samples have a hold time <72 hours?	(Yes) No N/A		
Were there bubbles in VOA vials? (**Volatiles Only**)	Yes (No) N/A		
Was PM notified of discrepancies? PM: By/Time:	Yes (No) N/A		

Bottles Received

125ml (A) 250ml (B) 1Liter (C) 40ml VOA (V)	1-3																						
Bacti $Na_2S_2O_3$																							
None (P)																							
Cr6 Buffer (P) Borate Carbonate Buffer																							
HNO_3 (P)																							
H_2SO_4 (P)																							
NaOH (P)																							
NaOH+ZnAc (P)																							
Dissolved Oxygen 300ml (P)																							
None (AG)																							
None (CG) 500ml																							
$Na_2S_2O_3$ 250ml (Brown P) 549																							
$Na_2S_2O_3$ (AG)																							
$Na_2S_2O_3$ (AG)																							
Thio/K Citrate																							
NH_4Cl (AG) 552																							
HCl (AG)																							
None (CG) 500ml																							
H_3PO_4 (AG)																							
Other:																							
Plastic Bag	1																						
Low Level Hg/Metals Double Bag																							
Client Own																							
Glass Jar: 125/ 250/ 500																							
Soil Tube: Brass/ Steel/ Plastic																							
5 g Encore																							

Comments

Filter or Split

	Container	Preservative	Date/Time/Initials
S P F			
S P F			
S P F			
S P F			
S P F			

Labeled by: _____@_____

Labels checked by: _____@1700

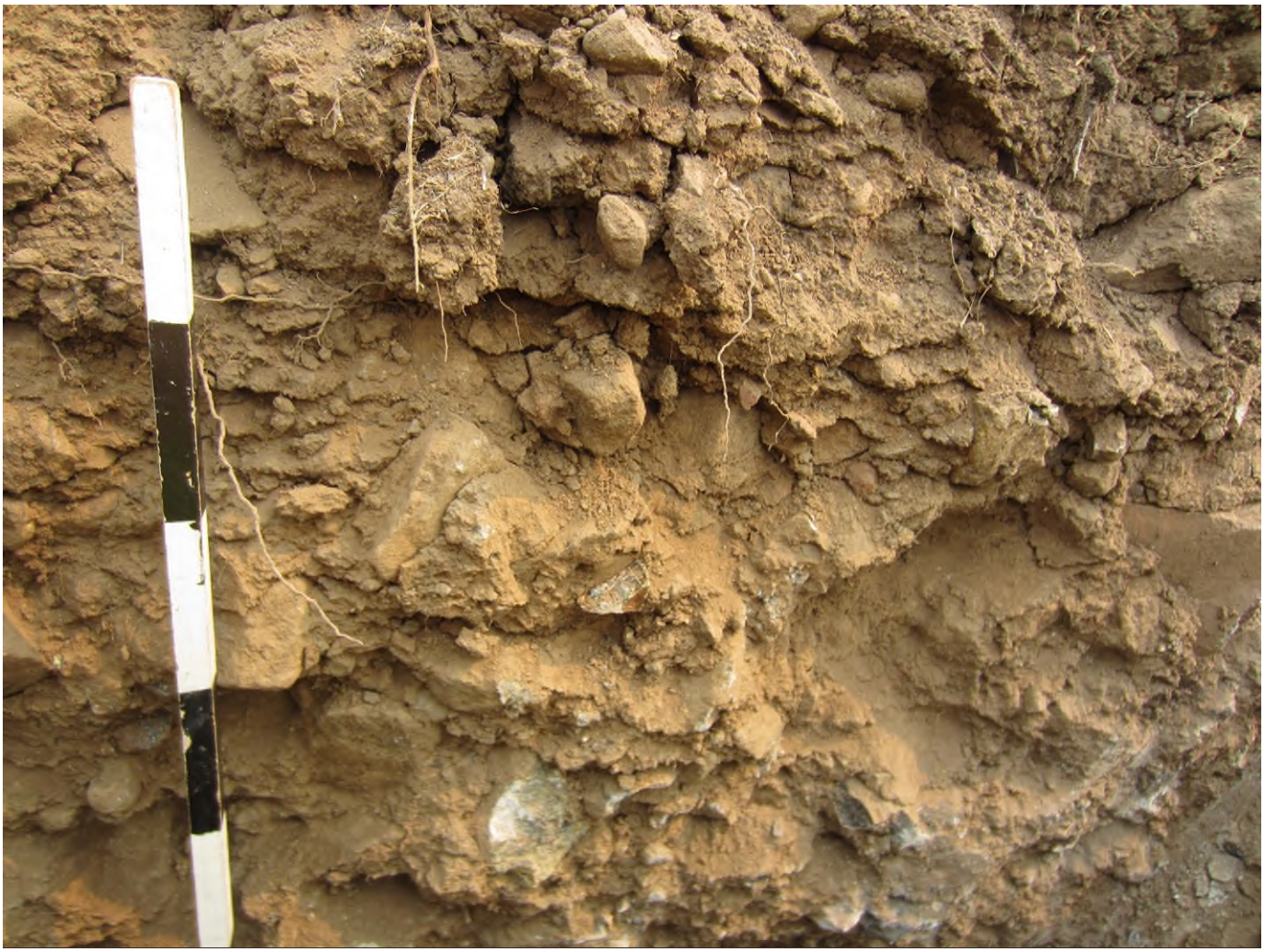
Appendix C

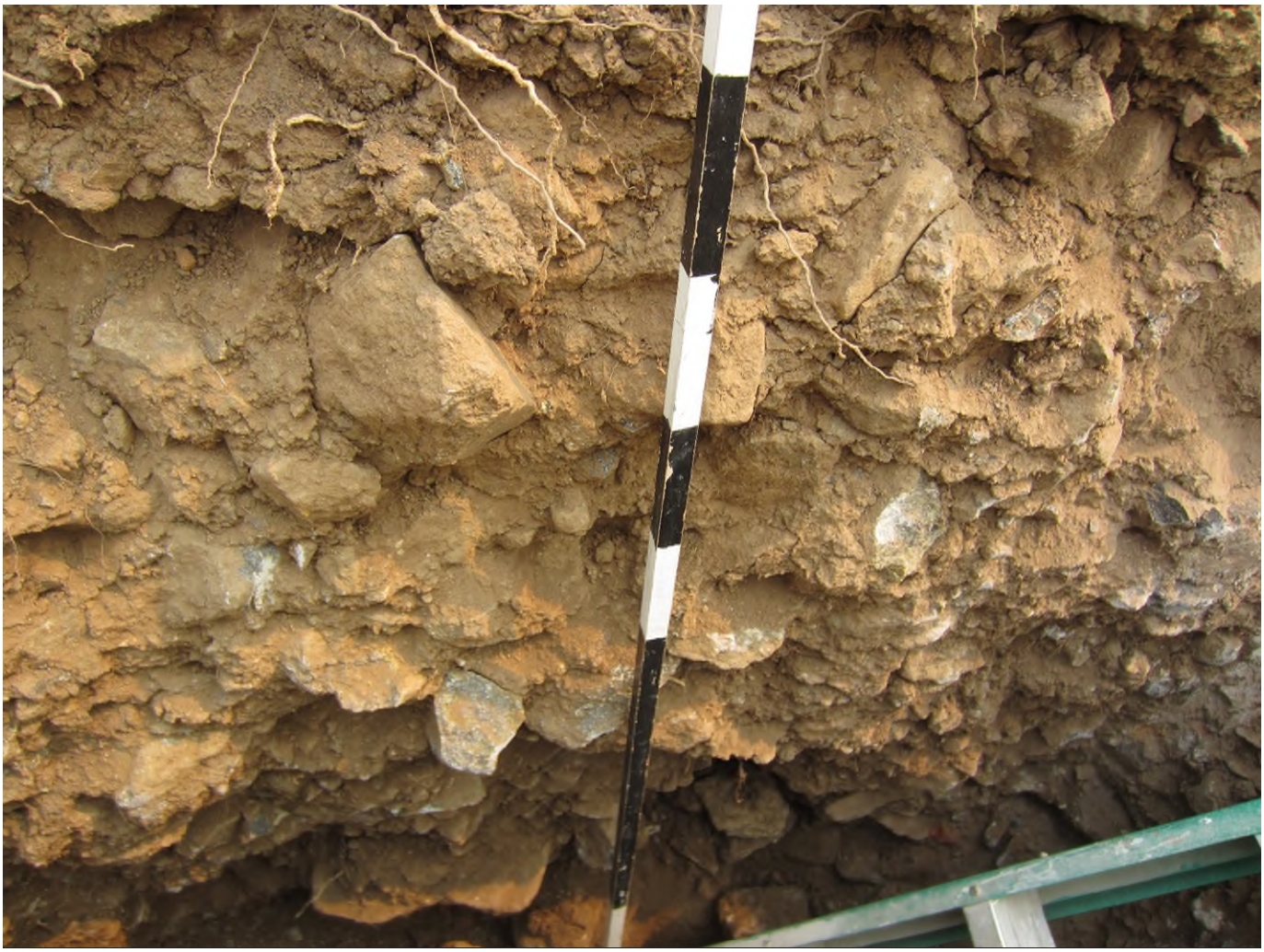
Photos of Test Pit TP-01

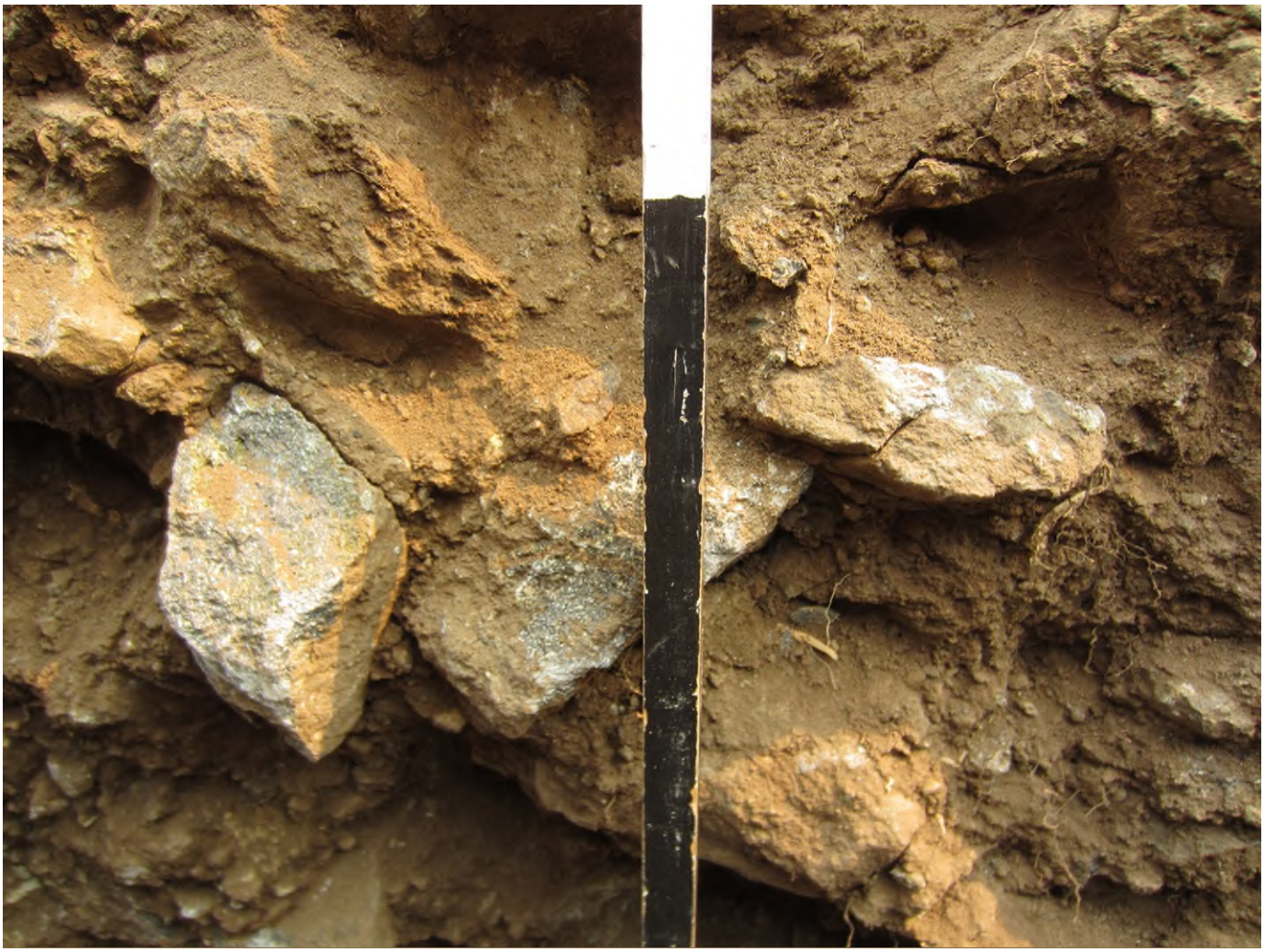


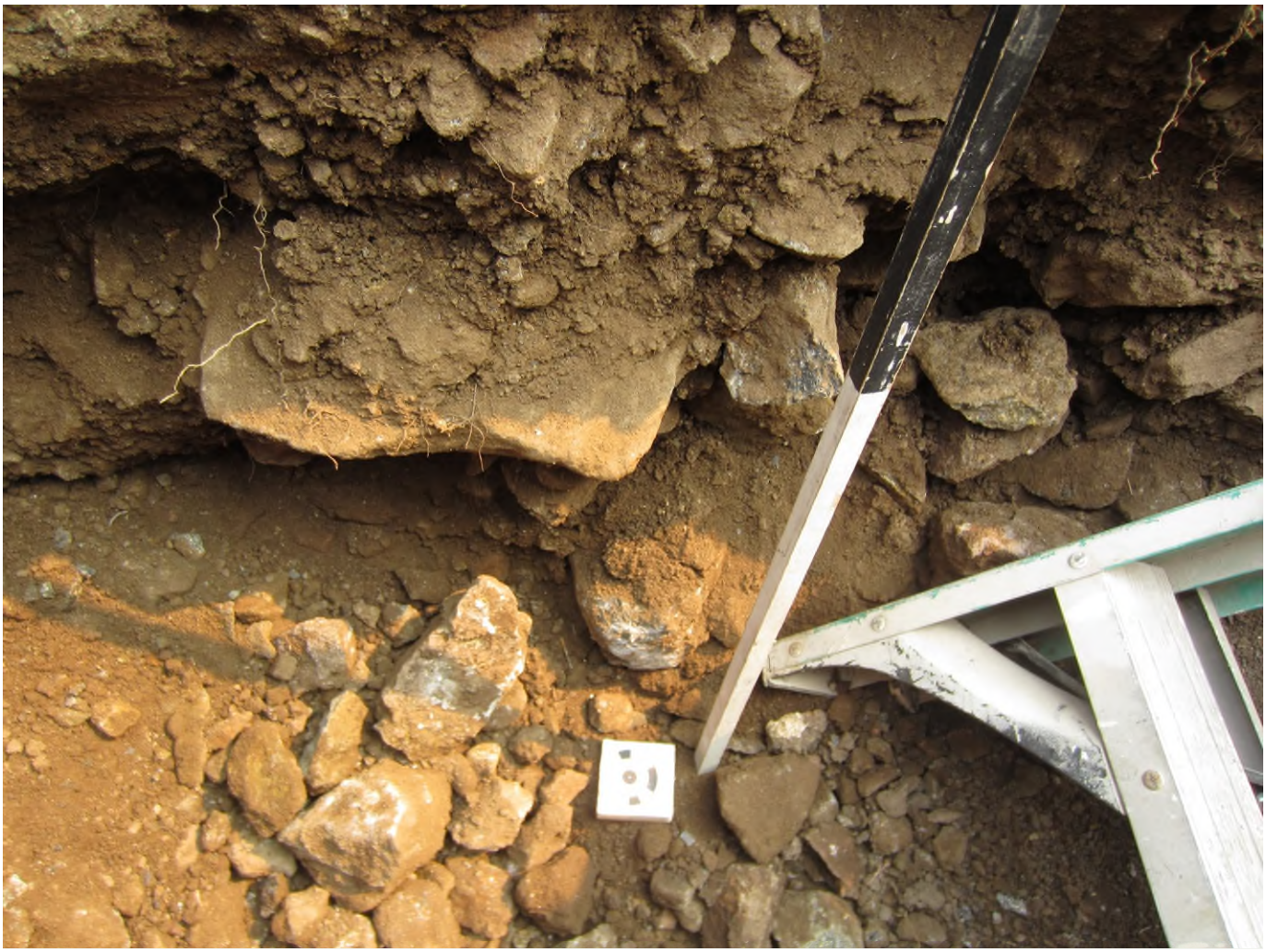



PROJECT NAME: RECTOR DAM
PROJECT #: 4001662
TEST PIT: TP-01
GEOLOGIST: NILES
DATE: 10/11/2









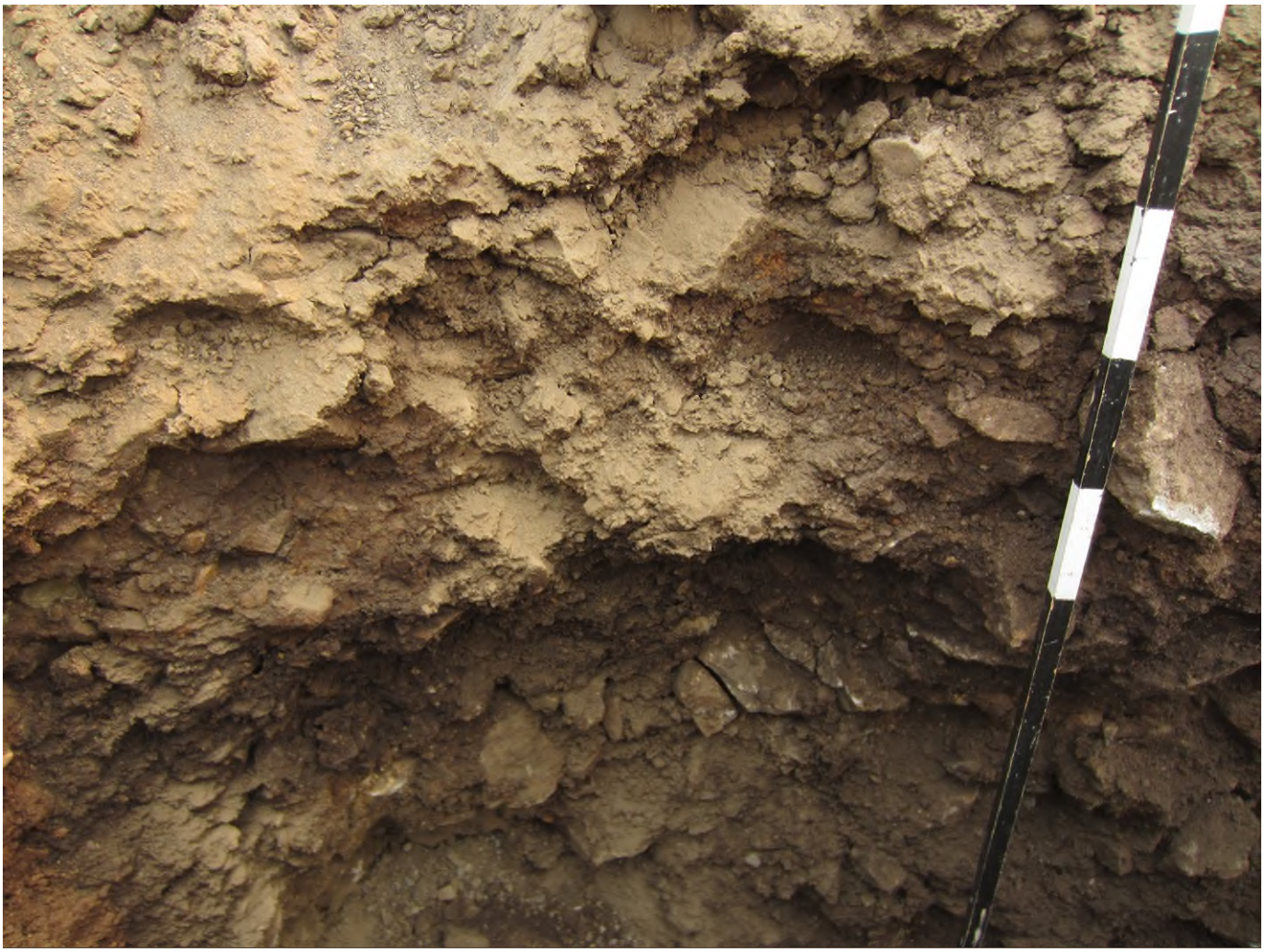
Appendix D

Photos of Test Pit TP-02




PROJECT NAME: RECTOR DAM
PROJECT #: 04 00166261
TEST PIT: TP-02
GEOLOGIST: ALLES
DATE: 10/1/20







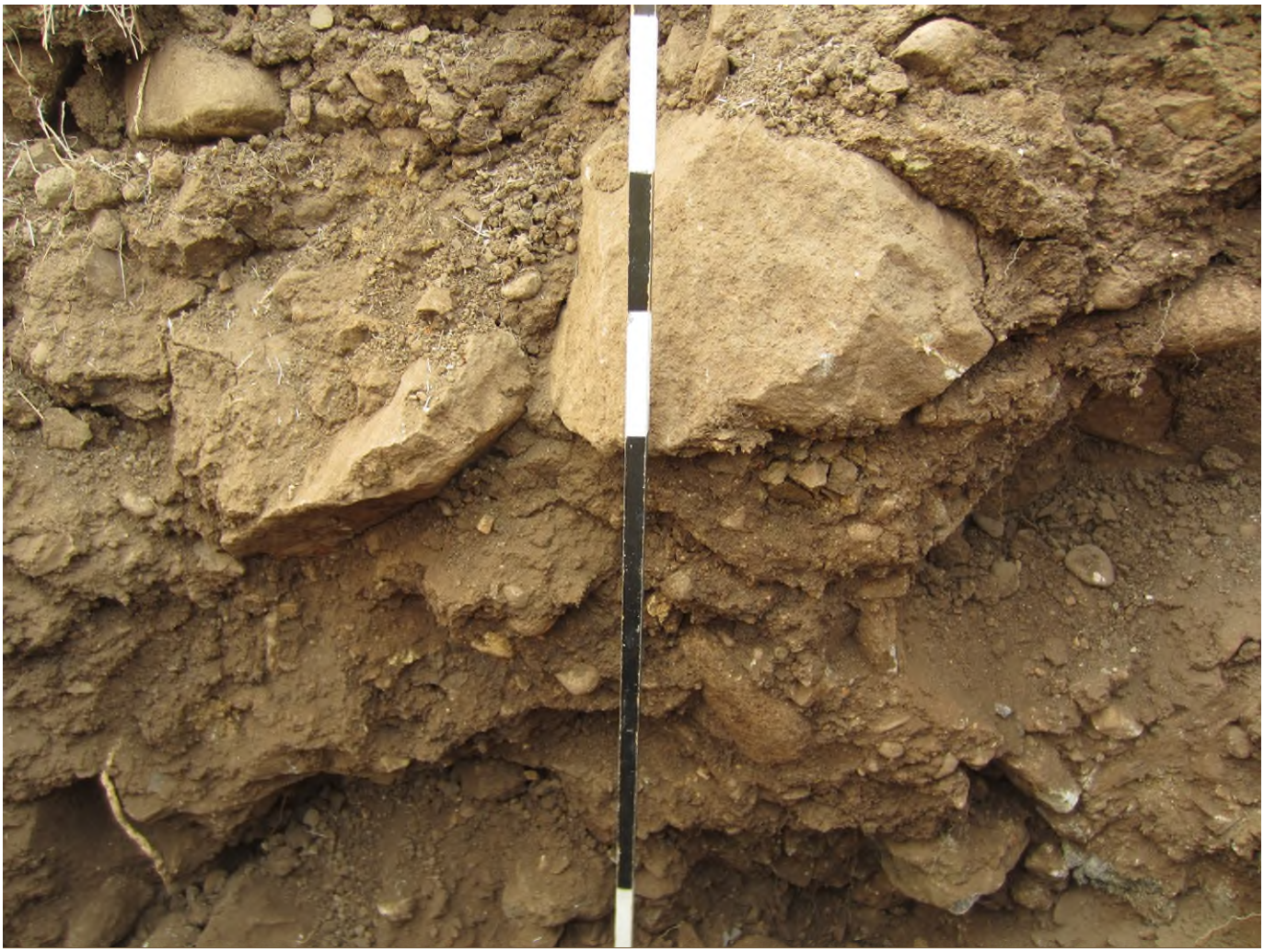
Appendix E

Photos of Test Pit TP-03













Appendix F

Photos of Test Pit TP-04




PROJECT
TEST PIT TP-04
GEOLOGIST NILES
DATE 10/21/20





Appendix G

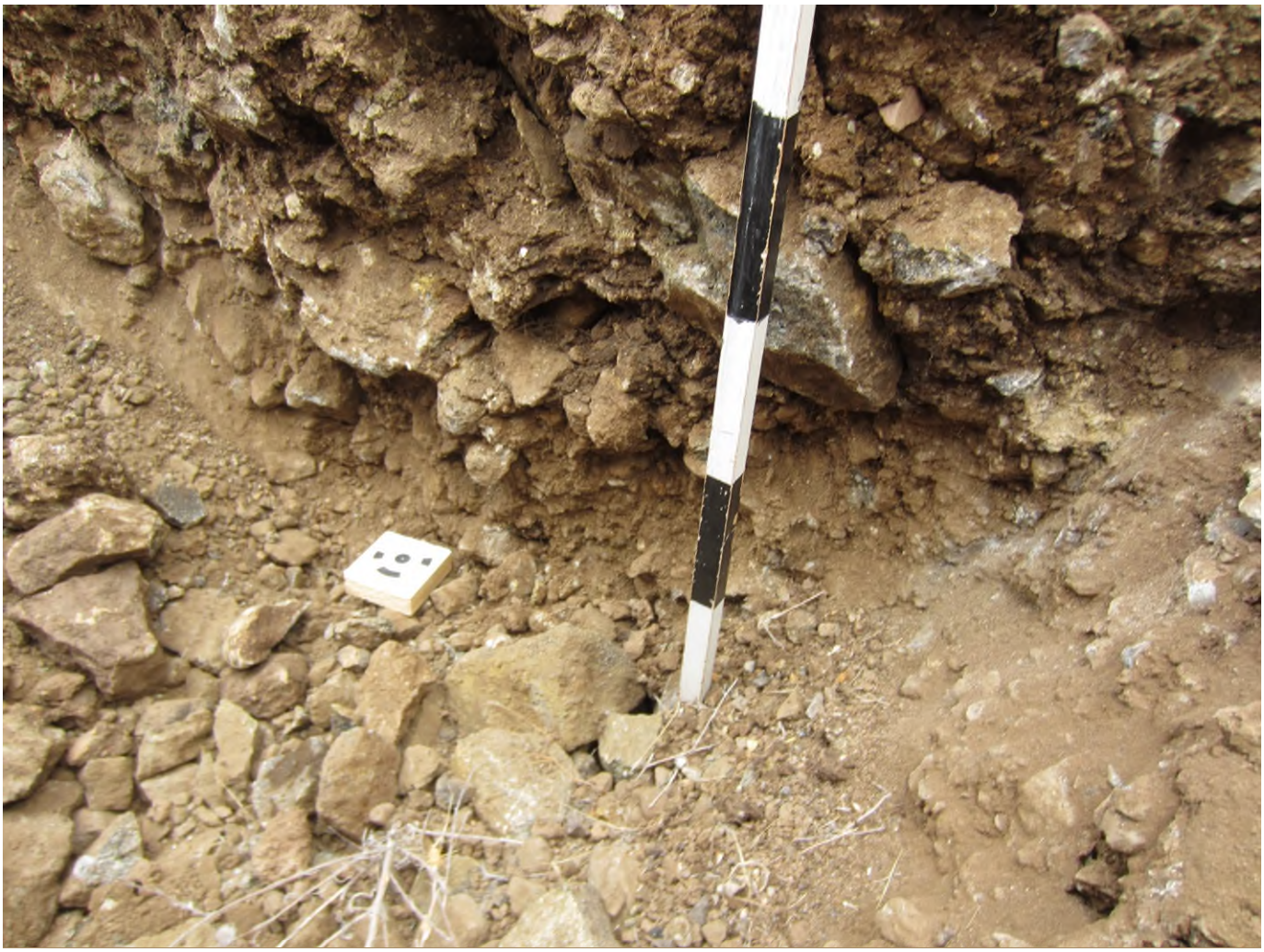
Photos of Test Pit TP-05


Bobcat
E85









Appendix H

Photos of Test Pit TP-06




PROJECT NAME: PESTOR DAM
PROJECT #: 04.00166261
TEST PIT: TP-06
GEOLOGIST: NILES
DATE: 10/2/20





Appendix I

Photos of Test Pit TP-07






PROJECT #: 04.00166261
TEST PIT: TP-07
GEOLOGIST: NILES
DATE: 10/1/20



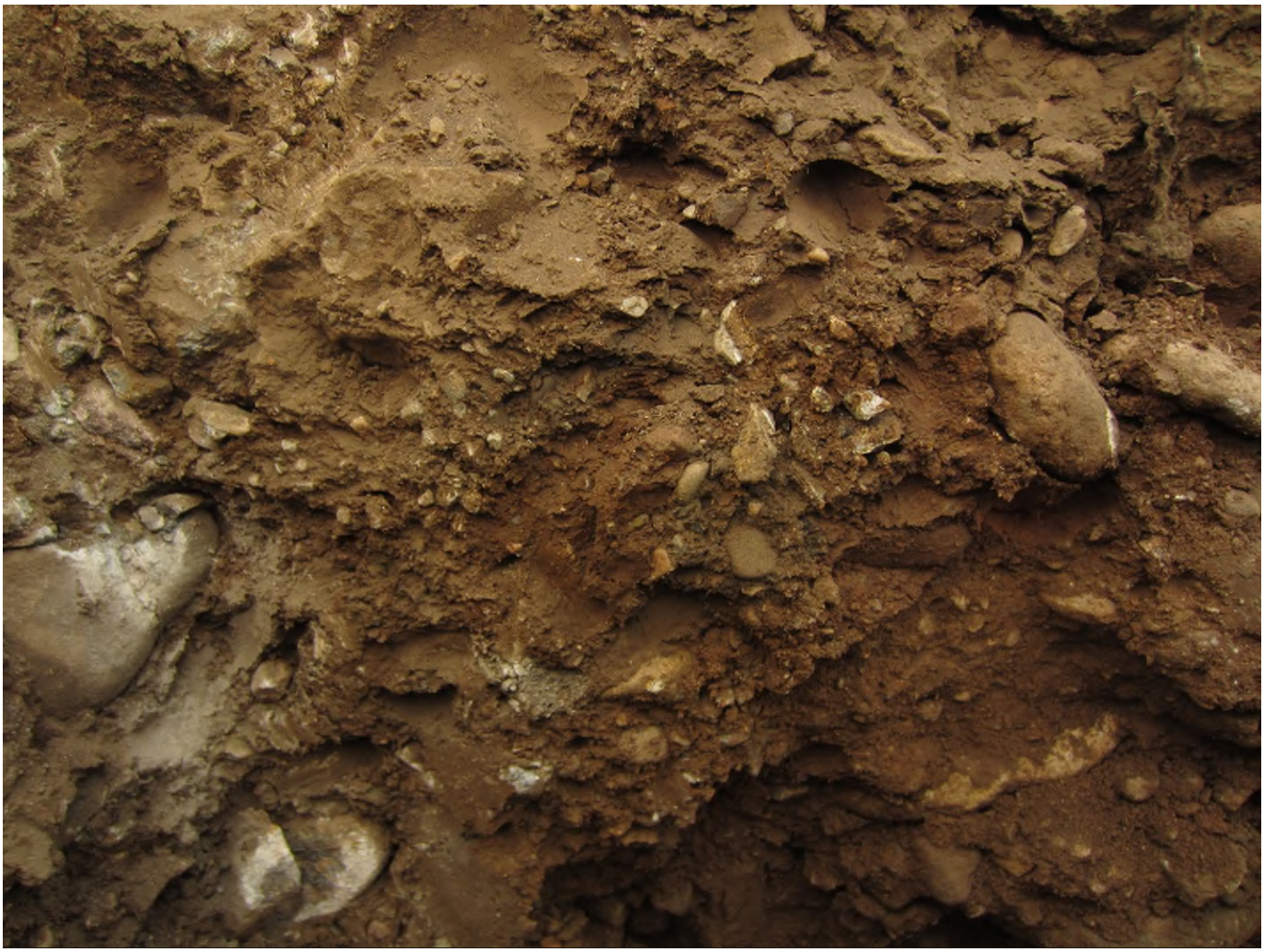


Appendix J

Photos of Test Pit TP-08




GEOLOGIST: NILES
DATE: 10/17/2c







Appendix K

Photos of Test Pit TP-09











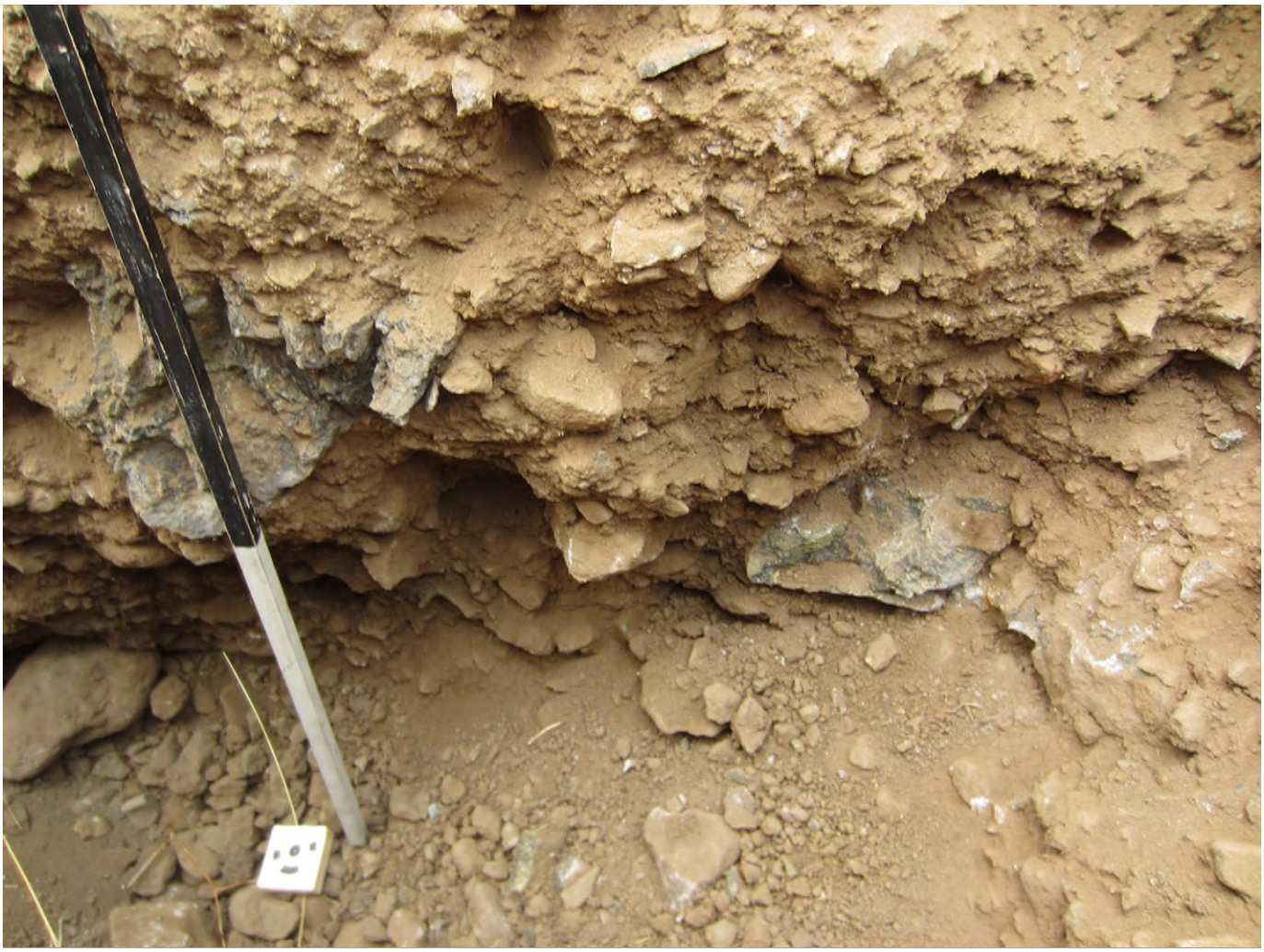
Appendix L

Photos of Test Pit TP-10


PROJECT NAME RJ
TEST PIT TP-
GEOLOGIST MILES
DATE 10/1/20




GEOLOGIST: NILES
DATE: 10/1/20





APPENDIX 3.6-B

Rector Reservoir Watershed Survey Update
Rector Reservoir Bypass Valve Project

Veterans Home of California at Yountville

Rector Reservoir Watershed Survey Update July 23, 2017

By Teri jo Barber, MS PH QSD/P of Ridge to River Environmental



Rector Reservoir Canyon east with Stagecoach and other Vineyards by Teri jo Barber from the air 1/5/2017

Prepared For

Veterans Home and Rector Reservoir Surface Water Treatment Plant

California Department of Health Services Drinking Water Division

Prepared by

Teri Jo Barber

Professional Surface Water Hydrologist #00H-1535 American Institute of Hydrology

Professional Storm Water Design and Practitioner and QSD/P #21493

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Potential Contaminant Sources	page 34
Watershed Control and Management Practices	page 52
Water Quality	page 61
Conclusions and Recommendations	page 82
References	page 90



Freshwater pool in Rector Canyon 5/25/17 tjb



Teri jo Barber, author, carries out piece of black plastic irrigation pipe 5/25/17

Acronyms or Abbreviations

AWWA	American Water Works Association
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CCR	California Code of Regulations
CAL FIRE	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
DMG	Division of Mines and Geology
DO	Dissolved Oxygen
DWD	Drinking Water Division of SWRCB, Field Operations, Santa Rosa Office
EPA	U.S. Environmental Protection Agency
MCL	Maximum Contaminant Level
mg/L	milligrams per Liter (equivalent to parts per million)
ml	milliliter
MPN	Most probable number
MSL	Mean Sea Level
NCEMD	Napa County Environmental Management Department
NCFD	Napa County Fire Department
NCFWCD	Napa County Flood Control and Water Conservation District
NCPD	Napa County Planning Department
NCSSC	Napa County Soil Survey of California
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
pCi/L	picocuries per Liter
PBES	Napa County Planning, Building, and Environmental Services
ppm	parts per million = mg/l
RWQCB	California Regional Water Quality Control Board, San Francisco Bay Region
NRCS	U.S. Department of Agriculture Natural Resource Conservation Service
RCD	Resource Conservation District
SRA	State Responsibility Area
SWFDTR	California Surface Water Filtration and Disinfection Treatment Regulations
SWTR	Federal Surface Water Treatment Rule
USDIGSM	U.S. Department of the Interior Geological Survey Map
µg/l	micrograms per liter also ug/l which mens one millionth of a gram per liter
VH	Veterans Home

1. INTRODUCTION

The Yountville Veteran's Home (VH) is in Napa County, in northern California, between the cities of Napa and St. Helena (Fig. 1). Veterans Home collects its source water from Rector Creek Reservoir, an eastern tributary of the Napa River. Raw source water is treated just downhill of the dam, and finished water is pumped uphill to a storage tank on the hill that feeds Veterans Home by gravity, along with other customers along its way across Napa Valley to Yountville.

Figure 1.1 Vicinity Map



Figure 1.2 Napa Valley Location Map



Sanitary Survey Requirements

This document is an update of the 2009 Rector Creek Reservoir Watershed Sanitary Survey. Public water systems are required to conduct the initial watershed sanitary survey and update it every five years to evaluate changes that may affect the quality of source waters and compliance with State of California Drinking Water Standards (California Regulations Relating to Drinking Water CH 15, Art. 1 §64401.40. 2007).

Objectives of this Watershed Sanitary Survey 2017 Update

The objective of this update is to convey changes in geographical, biological, agricultural, and hydrological conditions in Rector Creek's watershed, uphill from the dam, from 2009 through May 2017. Use of this information is intended to help VH manage their water supply.

Report Organization

Report organization follows American Water Works Association Watershed Sanitary Survey Guidance Manual.

Study Approach and Organization

This update contains foundational information and updates in land management activities in the watershed, potential water pollution contaminants, raw and finished water quality, watershed control and management practices, and an evaluation of the system's ability to meet requirements the Surface Water Treatment Rules (CH 17, Art 7. 1 §64665. 2007). The study was conducted by field exploration of Rector Watershed, data analysis, air photo interpretation, Internet research, and communications with regulatory agencies, residents, and VH as follows:

- 2009 Watershed Sanitary Survey of Rector Reservoir
- Communications with Robert Rice, Jimmy Hartman, Edwin Wooster, Lynn Scott, and Joe Rodgers of VH, geographer Amber Manfree, Andre Napolitano and other staff persons at Napa County, California Department of Fish and Wildlife, California Department of Pesticide Regulation. California Drinking Water Services Guy Schott and Amy Little
- Dam, finished water tank, and water treatment facilities tour on Jan 5, 2017
- Tour of Veterans Home campus and water storage facilities on Jan 6, 2017
- Field watershed reconnaissance by air on March 1 and April 14, 2017
- Windshield survey along roads by car April 10, 2017
- Watershed foot survey May 25, 2017
- Reservoir boat survey May 26, 2017
- Geological update by California Professional Geologist Elias Steinbuck 5-5-17
- Graphing raw and finished water quality from online Drinking Water Division database

Acknowledgements

Robert Rice and Lynn Scott provided insight into Veterans Home history and day to day water management. Treatment operations were described by Edwin Wooster and Jimmy Hartman. Amber Manfree, local resident and PhD cartographer, provided photos, maps, and insight into neighborhood concerns about the rapid pace of agricultural development risking wildlife habitat, road safety, and downstream water quality. The assistance provided by these individuals and agencies enhanced the depth of information provided in this update. Guidance by Amy Little at SWRCB's Drinking Water Division directed this update to identify potential partnerships entities to stretch available dollars and maximize the quality of shared water resources among a variety of water users. Napa County's offices of Environmental Health, Planning, and its Agricultural Commissioner Andre Napolitano extended important information to Veterans Home including notification of proposed projects in the watershed. Napa County's website provides public information in a format that allows access to proposed developments, land use ordinances aimed to balance the interests of development while conserving shared Public Trust water resources, and its extensive GIS system along with a variety of current information for residents and tourists.

2. WATERSHED AND WATER SUPPLY SYSTEM

Rector Creek Watershed

Location

The drainage area contributing to Rector Creek reservoir encompasses about 11 square miles, the equivalent of 6971 acres (Fig. 2). The dam and reservoir are approximately 2.5 miles northeast from the Town of Yountville on Silverado Trail, in Napa County between Napa and St. Helena. Rector Creek crosses Silverado Trail approximately 700 feet downstream of the spillway. Vehicle access to the reservoir and the water treatment plant is through the gate at 7300 Silverado Trail. Rector Plateau is accessed via Soda Canyon Road, 7 miles from its intersection with Silverado Trail.

Rector Reservoir embraces three main tributaries: North Fork; mainstem Rector Canyon and South Fork (known locally as No Name Creek or the LeRette). The watershed boundary around Rector's contributing drainage area extends upstream easterly 4.7 miles to Atlas Peak Mountain (Fig. 2.1). Rector Canyon is steep and narrow, is bounded by the wide plateau all around (cover photo) which continues to be developed for wine grape agriculture. Short tributaries have very steep climbing inlets, while longer winding tributaries ascend the canyon more gently and then wind their way across the flat plateau.

Natural Setting

Rector Reservoir Watershed rises to elevations of 2663 feet above mean sea level (MSL) at Atlas Peak Mountain and 1446 feet atop Haystack Mountain. From Atlas Peak to the reservoir is some 4 miles in length down the plateau winding along the mainstem canyon. Rector Creek's South Fork, sometimes referred to as No Name Creek or the LeRette by old time residents, begins at its headwaters approximately 2.2 miles east of Rector Reservoir on the east side of Haystack Mountain dropping to an elevation of 400 feet above MSL along Rector Reservoir. It is the least developed of the subwatershed. The North Fork enters the reservoir nearest the dam. North Fork is steep and mountainous breaking suddenly into Rector Plateau. The mainstem Canyon is steep, and narrow punctuated with tall waterfalls and plunge pools of exquisite beauty. Overall slopes range from 2 to 75 percent with over half of the watershed within the 50 to 75 percent slope range. Erosion hazards are rated moderate to high (NCNRCS). Previous Treatment Plant Operator, Mark Nicander, confirmed the appearance of slide actively around the margins of the reservoir eroding rubble sized colluvium into the lake every year or so (Barber, 2003 Rector Sanitary Survey.

Land Use

Rector Plateau is now recognized as an exceptional climate for production of premium California wine grapes grown on volcanic soils in what is now known as the Atlas Peak Appellation. There are 1,491 acres of grapevines, two wineries, and sixty-one residences here as of 2017 (Fig. 2.1).

The north plateau developed into vineyard tracts at a rapid pace from 1993–2002 (Figs. 2.2, 2.3, 2.4). Napa County is expected to continue authorizing more vineyards conversions, until all the arable land here is converted to grape agriculture due to the high value of wine grapes.

Table 2.1 Rector Watershed Land Cover 2017, courtesy A. Manfree		
Owner	**Sector**	**Acres**
Veterans Administration land	California Public	711.5
Veterans Administration reservoir surface	California Public	71.1
Bureau Land Management (federal)	Fed Public	81.3
California Department of Fish and Wildlife	California Public	103.1
Napa Land Trust	NGO	326.0
Vineyard	Private	1491.5
Undeveloped/rural residential	Private	4187.0
	Watershed total:	**6971.5**

Conservation, Open Space, Public Land

Public, Open Space, and Conservation lands reflect the natural setting but they amount to 18 % Table 2.1 and Fig. 2.5 describe acreage in the contributing drainage area of Rector Reservoir Watershed. Open space sums to 1292 acres or nearly 19% of the watershed. Seventy-one of these acres are the reservoir itself, along with another 711 acres managed as open space for benefit of the protecting the VH water supply. BLM owns a total of eighty-one acres along Rector Creek's mainstem, and no known activity occurs there. 336 acres comprise the Rector side of the Sutro Ranch along the ridgeline near Atlas Peak, a 2014 donation from Elizabeth Sutro, managed by the Land Trust of Napa County (St Helena Star, Jun 17, 2014). The rest of the area mapped as open space is continuous with the VA lands, including rocky oak woodlands and chaparral managed by CDFW for wildlife. The CDFW wildlife area hosts 27 species of mammals, 40 species of birds, and 14 types of reptiles and amphibians in oak woodland forests with chaparral (CDFW headquarters Bay Delta office in Napa). Type C hunting, and angling are permitted at the CDFW Wildlife area, but not at the reservoir, which is closed to the public. The document "2016–2017 Waterfowl, Upland Game Hunting and Public Use of Department Lands Regulations" lists the current Type C hunting seasons for a variety of game animals and waterfowl. The document clarifies camping, horseback riding, dog training, and other activities that are allowed in most areas except the ecological reserves (Fish and Game Commission, 2016).

Figure 2.9 depicts a foot trail in the DFW area that will be added to the Napa Valley Vine Trail and ultimately establish a link along the Go North Trail, crossing the South Fork and the mainstem of Rector Creek, just above the reservoir, to continue northerly and connect with other open space areas enroute to Calistoga and Mount St. Helena (E. Byers. Bay Area Ridge Trail, Bay Area Ridge Trail Council).

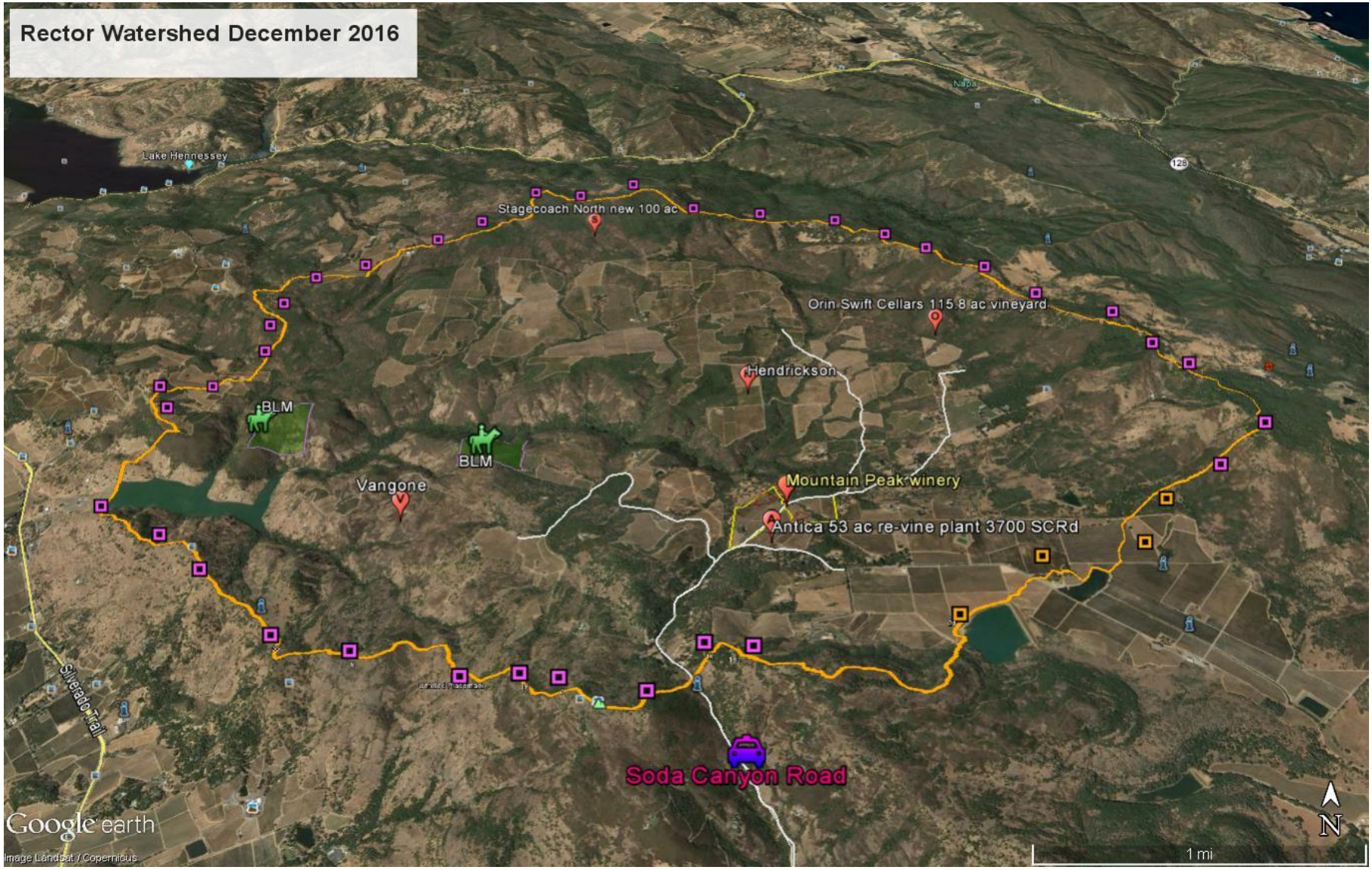
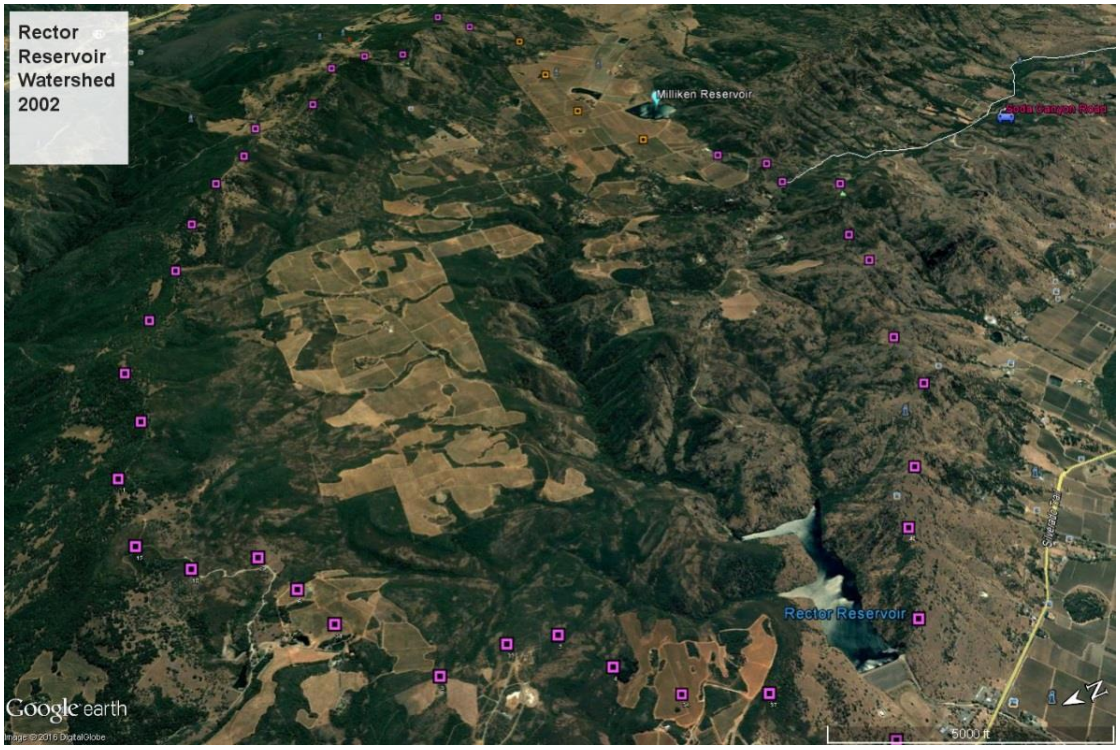


Fig 2.0. 2016 Steep canyon walls, abruptly transitioning to broad upland plateau, Soda Canyon Road (white), proposed developments in last 5 years



Fig 2.1 (blurred) and 2.5 identify a vineyard expansion phase extending well beyond Atlas Peak Vineyards



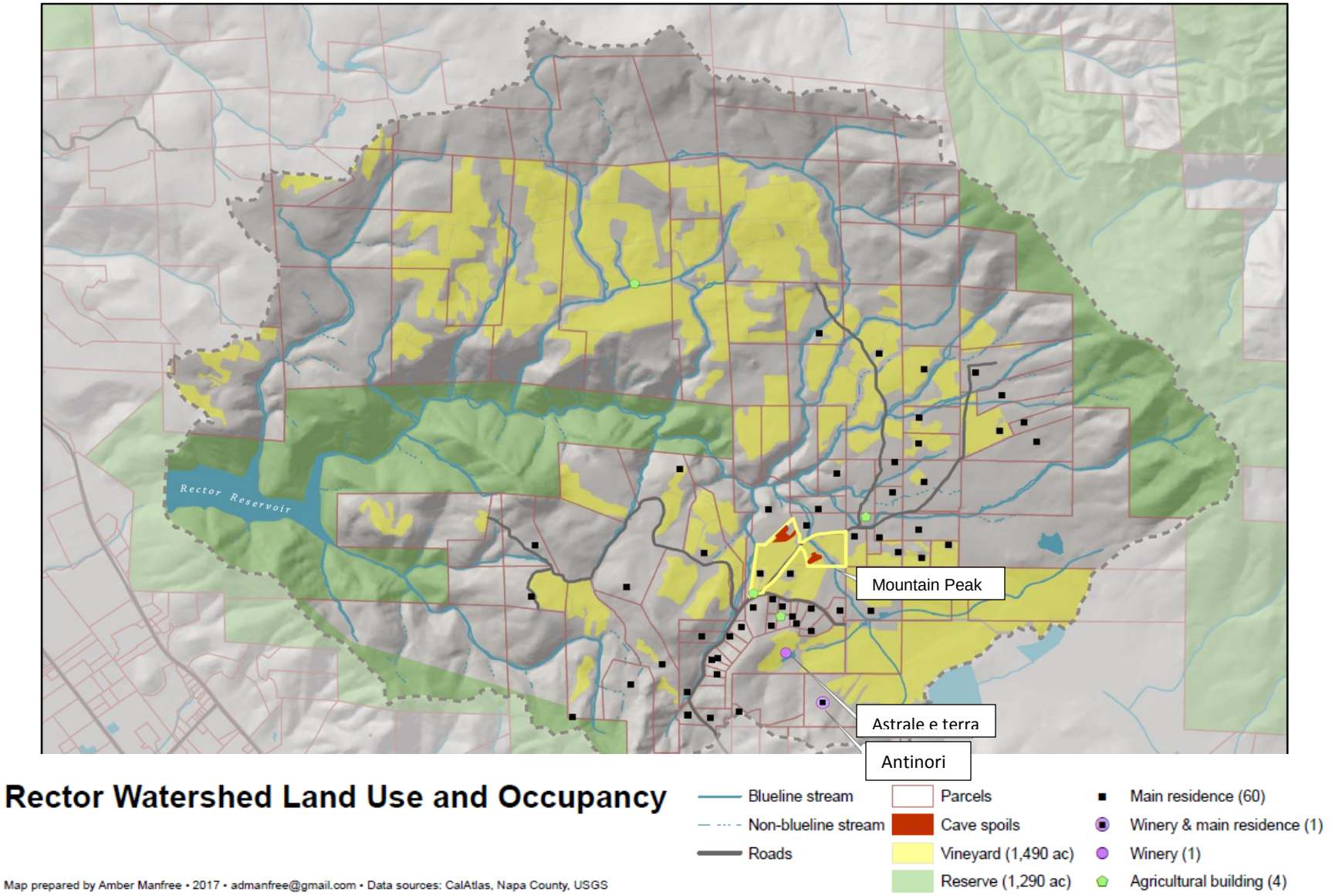


Fig 2.2. Land Use in Rector Reservoir Watershed in 2017, prepared by Amber Manfree

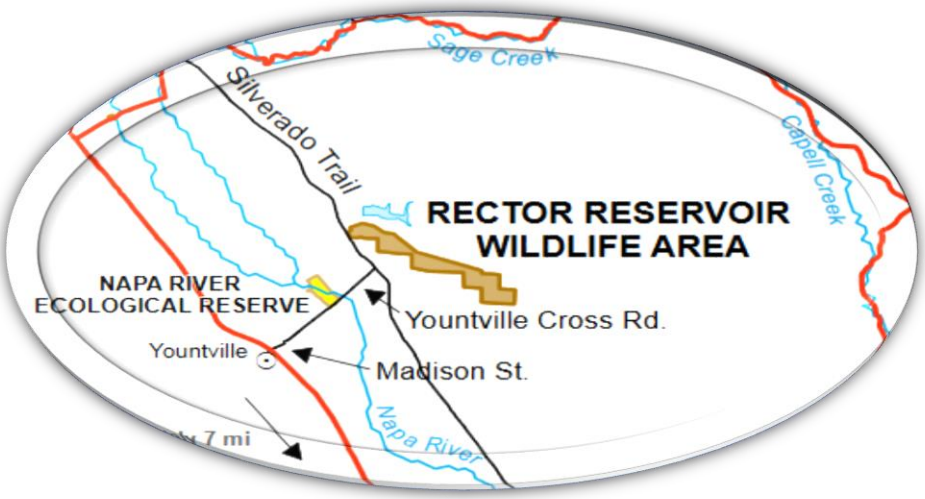


Figure 2.3 map of Napa River Ecological Reserve and Rector Wildlife Area

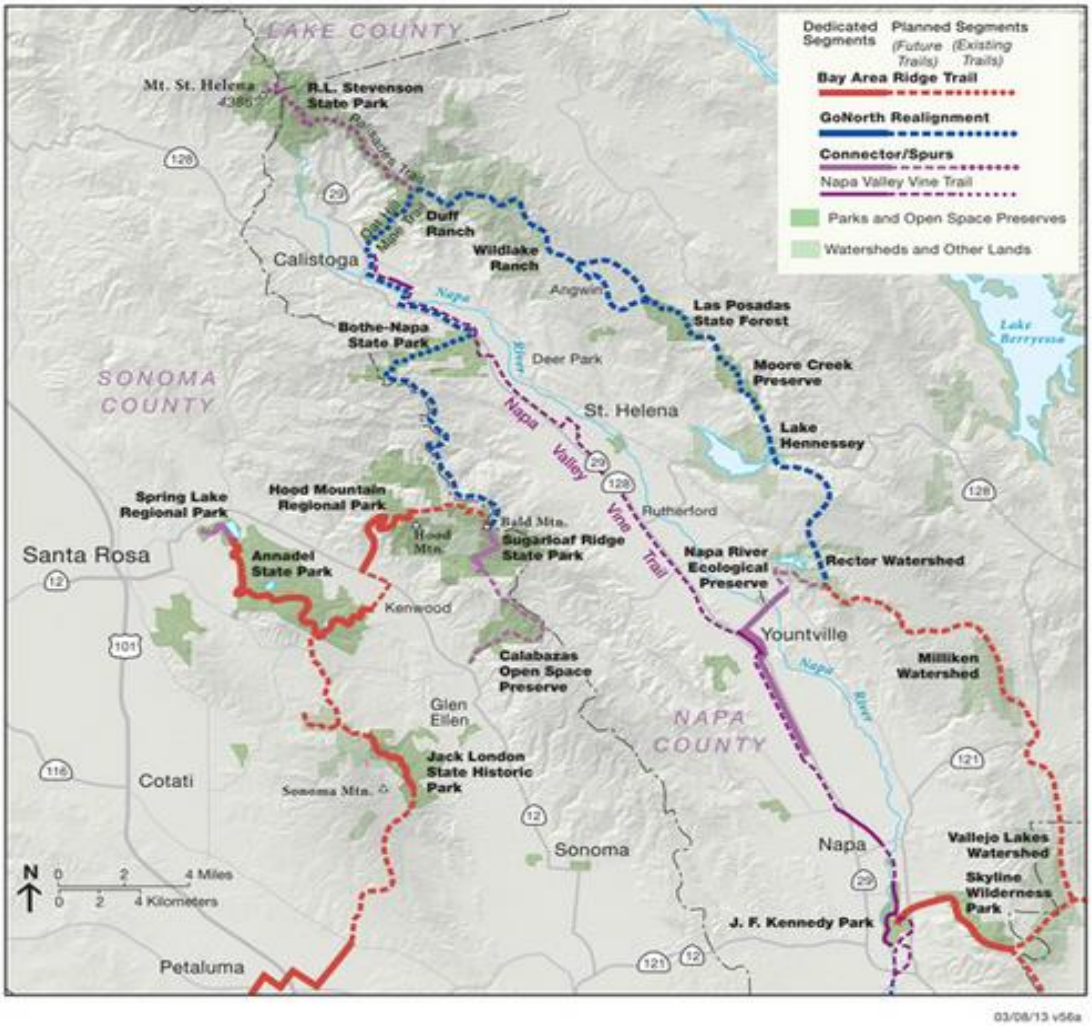


Figure 2.4 Bay Area Ridge Trail Parks and Open Space along a proposed Go North Trail

Geology - by PG Elias Steinbuck

The lithology in the watershed is characterized by Pliocene Sonoma Volcanics (Graymer and others, 2007; Wagner and Bortugno, 1982). Sonoma Volcanics consist of a series of mixed volcanic rock types including andesite to basalt lava flows, pumiceous and welded ash-flow tuffs, and tuff breccias. Volcanic bedrock derived from mafic lava typically exhibits high primary porosity despite being hard and consolidated. Cooling joints, lava tubes, and interflow zones (subsurface flow across irregular surfaces of preceding lava flows) all contribute to high primary porosity, which enhances permeability and groundwater storage.

The entire region has been intensely folded and fractured through tectonic forces with Graymer and others (2007) depicting several discontinuous fault traces within the basin. The most pertinent fault in the Rector Creek drainage is the East Napa Fault, a northwest-southeast trending fault mapped through the western portion of the drainage basin just east of the reservoir. However, this fault and others in the surrounding area are not active faults per the Alquist-Priolo Fault Zoning Act that defines active faults as those that have ruptured in the past 11,000 years. No "active" faults are mapped in the Rector Creek watershed (Bryant and Hart, 2007). Folding, faulting, chemical and physical weathering, and jointing of the volcanic bedrock is a significant contributor to secondary porosity. In general, this is likely to be less significant in terms of groundwater routing and storage relative to the high primary porosity of the mafic lava rock types found in the basin.

Landslides observed within the Rector Creek watershed consist of rapid moving shallow seated debris slides and flows and are typically found on steep streamside slopes adjacent to Rector Creek and its larger tributaries. Observed landslides were generally less than 0.25 acres in aerial extent and were identified on the historic set of aerial photographs by their readily identifiable (accordingly relatively recent) bare failure scars.

The most common natural triggering mechanisms for landslides are intense or long duration rainfall, undercutting of the toe of the hillside by stream bank erosion, and earthquake-induced ground shaking (Wieczorek, 1996). Human associated activities that can contribute to slope failure include excavation (a change of the mass balance of the hillslope), and alteration of the local hydrology (concentrating road run-off, or increasing soil moisture from vegetation removal). Landslides have been a continuing process vital to the development of the regional geomorphology (Benda et al., 2003), however earth materials delivered to stream systems can adversely impact water quality by causing rapid increases in turbidity levels after initial slope failure, and chronic increases in turbidity levels as disturbed soils are exposed to subsequent rainfall events prior to revegetation.

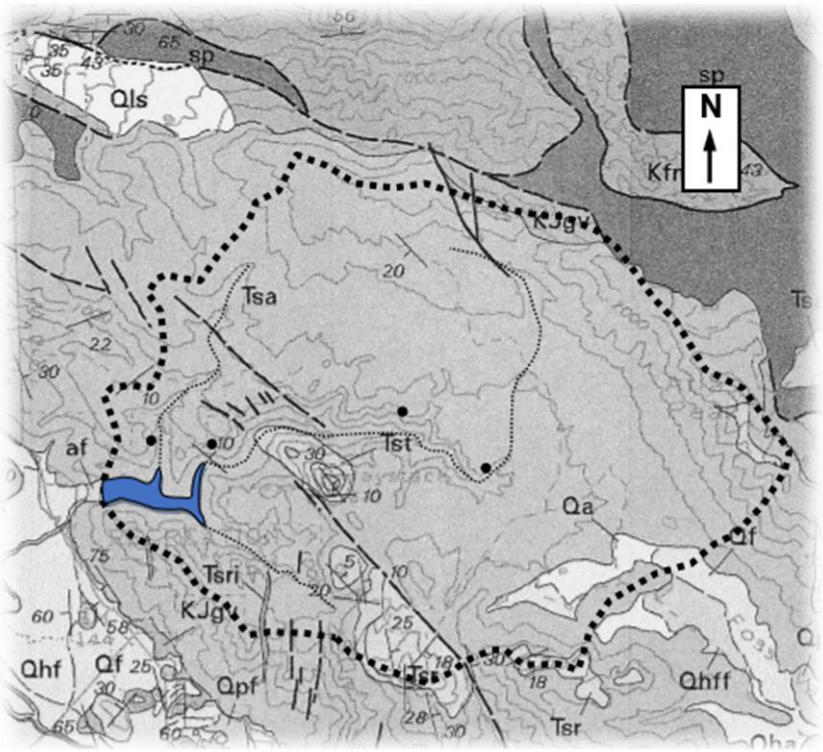


Figure 2.5 Regional Geology and Landslide Map of Rector Creek, Napa County, California Scale 1:75000 by PG Elias Steinbuck, CEG, 5-5-2017

LEGEND

Surficial Deposits (Holocene – Late Pleistocene)

Qa	Alluvium
Qf	Alluvial fan deposits

Sonoma Volcanics (Pliocene)

Tsa	Andesite to basalt lava flows
Tst	Pumiceous ash-flow tuff
Tsr	Rhyolite flows
Tsri	Rhyolite plugs

Great Valley Sequence (Late Cretaceous – Late Jurassic)

KJgv	Sandstone, shale, and conglomerate

Rector Reservoir

Watershed Boundary

Main Watercourse

Fault contact

Contact
Depositional or intrusive contact

35
Strike and Dip

Small Landslide
too small to depict at map scale

Mod. from: Graymer and others, 2007. Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California. USGS Scientific Investigations Map 2956, contour interval 200 feet, original map scale 1:100,000.

Topography

Rector Reservoir Watershed rises to elevations of 2,663 feet above mean sea level (MSL) at Atlas Peak Mountain and 1,446 feet atop Haystack Mountain. From Atlas Peak to the reservoir is some 4 miles in length down the plateau and on through the canyon. Rector's South Fork is sometimes referred to as No Name Creek or the LeRette by old-time residents (Irving Thomas, personal communication) and is mostly undeveloped. South Fork headwaters begin two miles east of the reservoir along the east side of Haystack Mountain and drop to elevations of 400 feet above MSL at the reservoir. The North Fork enters the reservoir nearest the dam and is the shortest and steepest of the main tributaries. Rector's nearly flat upper plateau cannot be observed from the dam or reservoir due to the low elevations and confinement of the canyon. Conversely, the narrow canyon cannot be seen from the plateau, dropping quickly away at the shoulder and back up the other side. Slopes range 2–75 percent, with over half within 50–75 percent slope range.

Vegetation

Chemise, chaparral, and wildflowers are the main native cover over vast areas of the plateau and between them are stands of oak, bay laurel, ash, and buckeye, with some Douglas fir in the blend. Oaks bring deep water up into the bark and foliage where fungi and lichen coexist. Acorns provide abundant forage for deer, squirrels, woodpeckers, chipmunks, and for people, in the past. Wine grape vineyards have replaced the native cover across much of the Rector Plateau.

Besides ongoing vineyard operations, vegetation management includes landscaping around homes and wineries, and occasional removal of cattail thickets by VH to protect dam stability. CEQA allows conversion of oak woodland habitat to agriculture without rising to "significance" even though oaks, especially, sustain acorn-dependent wildlife and nesting raptors. As vineyard expansion replaces native vegetation across the plateau, wildlife habitat shrinks. Napa County regulations protect oaks larger than 18 inches in diameter or in groups of other age combinations so that some are retained in proposed developments. Riparian protections and other Napa County conservation regulations are discussed in 4. WATERSHED CONTROL AND MANAGEMENT PRACTICES. The following table lists many of the plants in the watershed.

Table 2.2 Selected Plants in Rector Watershed adapted from A Manfree, with permission

Hardwood Trees

Acer macrophyllum	Big-leaf maple	Native
Aesculus californica	California buckeye	Native
Fraxinus latifolia	Oregon ash	Native
Quercus agrifolia	Coast live oak	Native
Quercus chrysolepis	Canyon oak	Native
Quercus douglasii	Blue Oak	Native
Quercus wisizeni var. frutescens	Interior-live oak (Scrub oak)	Native
Umbellularia californica	California bay	Native

Softwood Trees

Pseudotsuga menziesii	Douglas fir	Native
Torreya californica	California nutmeg	Native

Ferns and Fern Allies

Woodwardia fimbriata	Chain fern	Native
Equisetum sp.	Horsetail	Native
Adiantum aleuticum	Five-finger fern	Native
Adiantum jordanii	California Maiden-hair Fern	Native
Polypodium glycyrrhiza	Licorice fern	Native

Vines, Herbs and Shrubs

Vitis vinifera	Mediterranean wine grape	cultivated
Vinca major	Greater periwinkle	Exotic invasive
Genista monsplessulana	French broom	Exotic invasive
Aristilochia californica	Dutchman's pipe	Native
Anisocarpus madioides	Woodland madia	Native
Artemesia douglasiana	Mugwort	Native
Hieracium albiflorum	White-flowered hawkweed	Native
Alnus rhombifolia	White alder	Native
Calycanthus occidentalis	Spicebush	Native
Silene laciniata	Indian pink	Native
Rhododendron occidentale	Western azalea	Native
Toxicodendron diversilobum	Poison oak	Native
Hoita macrostachya	Leather-root	Native
Pickeringia montana var. montana	Chaparral pea	Native
Rupertia physodes	California tea	Native
Ribes sp.	Gooseberry	Native
Whipplea modesta	Yerba de selva	Native
Mentha arvensis	Field mint	Native
Trichostema laxum	Turpentine weed	Native
Trientalis latifolia	Starflower	Native
Clarkia concinna ssp. concinna	Red ribbons	Native
Epilobium cilatum ssp. cilatum	California willowherb	Native
Castilleja affinis ssp. affinis	Indian Paintbrush	Native
Mimulus auranticus	Orange-bush monkeyflower	Native
Mimulus cardinalis	Scarlet monkeyflower	Native
Mimulus guttatus	Seep-spring monkeyflower	Native
Mimulus pilosus	Minature monkeyflower	Native
Collinsia heterophylla	Chinese houses	Native
Keckiella corymbosa	Red beardtongue	Native
Rumex salicifolia	Willow dock	Native

Delphinium nudicaule	Canyon delphinium	Native
Ceanothus parryii	Parry's ceanothus	Native
Amelanchier utahensis	Utah serviceberry	Native
Holodiscus discolor	Ocean spray	Native
Physocarpus capitatus	Ninebark	Native
Rosa californica	California rose	Native
Rubus ursinus	California blackberry	Native
Boykinia occidentalis	Brook foam	Native
Heuchera micrantha	Alum root	Native
Carex nudata	Torrent sedge	Native
Fritillaria affinis	Checker lily	Native
Epipactis gigantea	Stream orchid	Native
Melica torreyana	Torrey's onion grass	Native
Typha latifolia	Cattail	Native
Vitis californica	California grape	Native

Soils

The dominant soil found in the watershed is Hambright. It is prominent across most of the agricultural soils cultivated for grape production on the Rector Plateau on 2 to 30 percent slopes:

> *The Hambright series consists of well drained soils on uplands. Elevation is 400 to 2,500 feet. These soils formed in material weathered from basic volcanic rock. The vegetation is annual grasses and forbs and oaks on gentler slopes. Most of the areas are brushy and rocky. In a representative profile the surface layer is dark grayish brown and brown, medium acid very stony loam and about 6 inches thick. The subsoil is dark brown, medium acid very stony loam about 6 inches thick. Fractured basic igneous bedrock is at a depth of 12 inches. Permeability is moderate. Available water capacity is 1 to 2 inches (Obtained from Napa County database. USDA, 1978).*

The native soil develops slowly over time from volcanic bedrock parent materials below the surface. Air spaces in the underlying rock derive from gas bubbles in once-molten lava, and from folding and faulting, or brought on by freeze-thaw weathering to invite some percolation of rainfall. Precipitation infiltrated uphill may become underflow beneath the soil but atop the bedrock, to reemerge downhill as surface flow to form the headwaters of surface streams.

Native soils are cultivated for agricultural purposes first by grading them and removing cobble-sized field stones. These are set aside in piles, reclaimed for armoring rock lined stream channels popular in Erosion Control Plans, or are crushed into road base gravel (photo page 36). The remaining native soils must be amended by the addition of imported topsoil and compost to cultivate them for revegetation in vineyard rows, oriented cross-slope or downhill. Cover crops are planted between rows to reduce soil erosion. Conservation-oriented vineyards invite beneficial insects and farm with organic, slow release amendments that are likely to remain while the cheaper chemicals fertilizers runoff without benefit of the long term organic sponge of compost.

Wildlife

Wildlife habitat in the upland is considered poor to fair in dense chaparral and best in the woodland. Indigenous terrestrial animals are diverse, and scattered across the plateau but in decline as upland wildlands are converted to vineyard. Vineyard fences have been erected to control deer, hare, and wood rats browse but they have become extensive wildlife migration barriers. Observed wildlife include black tailed deer, bobcat, mountain lion, gray fox, opossum, skunk, coyote, jack rabbit, squirrel, wild turkey, quail, prairie and peregrine falcon, Cooper's and sharp-shinned hawks, golden eagles and wintering bald eagles, red shoulder hawk, red tailed hawk, kestrel, osprey, gull, northwestern pond turtles, wood duck, and yellow-legged frogs have and numerous resident and migratory songbirds (www.wildlife.ca.gov). During field visits the author observed red winged blackbird, red tailed hawk, bullfrog tadpoles, yellow legged frog tadpoles, juvenile pacific giant salamanders, young of the year trout, and sign of beaver working over the willow trees. Beavers, hunted out in the 1800s are rebounding in nearby Milliken watershed and these may have spread back into Rector Watershed (CDFW). Especially beaver but many other mammals listed here are hosts to Giardia lamblia, an intestinal parasite that may infect a human host who drinks water infected by their reproductive cysts.



Wetlands including Rector Reservoir host riparian birds and amphibians and provide a drinking water source for terrestrial wildlife. The open reservoir laps into the inlets of the North and South Forks of Rector Creek and into the mainstem canyon where riparian cottonwoods and willow thickets are likely to be favorite habitats for a score of migratory songbirds and waterfowl. Aquatic amphibians living in Rector Creek need cool flowing water, streambed cobbles and gravel, and stable water depths during immobile life phases like egg brood development. Foothill yellow-legged frogs lay eggs that they stick to cobbles surrounded by running water. California giant salamander eggs need cold water percolating through large rocks to support egg development during one of the longest amphibian incubation times known (O'rear, 2016). Rainbow trout must spawn in gravel-sized rocks that remain wetted with clear, cold water for successful egg incubation, and all trout life-cycle stages require cool clear water to breath from and see their prey through. Pulses of fine sediment can clog reproduction of native trout by clogging their gravel nests and thereby inhibiting gas exchange and waste removal. Wetted streams host the core of the aquatic food web comprised of insects, worms, and crustaceans that become prey for the larger animals. Groundwater springs provide the water that wets aquatic habitat throughout the dry summer season.

Non-native American bullfrogs (Lithobates catesbeianus) Largemouth bass (Micropterus salmoides) and green sunfish (Lepomis cyanellus) were observed in Rector Reservoir. They can survive in warmer slower-moving water, and are not selective as to substrate size. As water levels

drop, flow to riparian system lessens, surface water elevations drop and wetted habitat shrinks. Less flow also translates to increasing water temperatures. The changing conditions favor non-native species who may even consume native animals directly.

The 433-acre oak woodland and mixed chaparral vegetation along the southwestern ridge is managed for wildlife by CDFW hosting 27 species of mammals, 40 species of birds, and 14 species of reptiles and amphibians. Aquatic species are listed in Table 4.3 identified by T. O'Rear. M.S., Ecology, UC Davis. SSC status indicates Species of Special Concern.

Table 2.3 Vertebrates Identified in Rector Creek above Reservoir – by MS Teejay O'Rear

Species	Native	Substrate preference	Flow requirements	Temperature preference	Status
Foothill yellow-legged frog	Y	cobble	moderate	cool	SSC
CA giant salamander	Y	cobble	moderate	cool	SSC
rainbow trout	Y	cobble	moderate	cool	
rough-skinned newt	Y	> gravel	varies	cool	
Coast Range newt	Y	> gravel	varies	cool	
largemouth bass	N	none	still	warm	
green sunfish	N	none	still	warm	
bullfrog	N	none	still	warm	
Pacific chorus frog	Y	none	still	none	



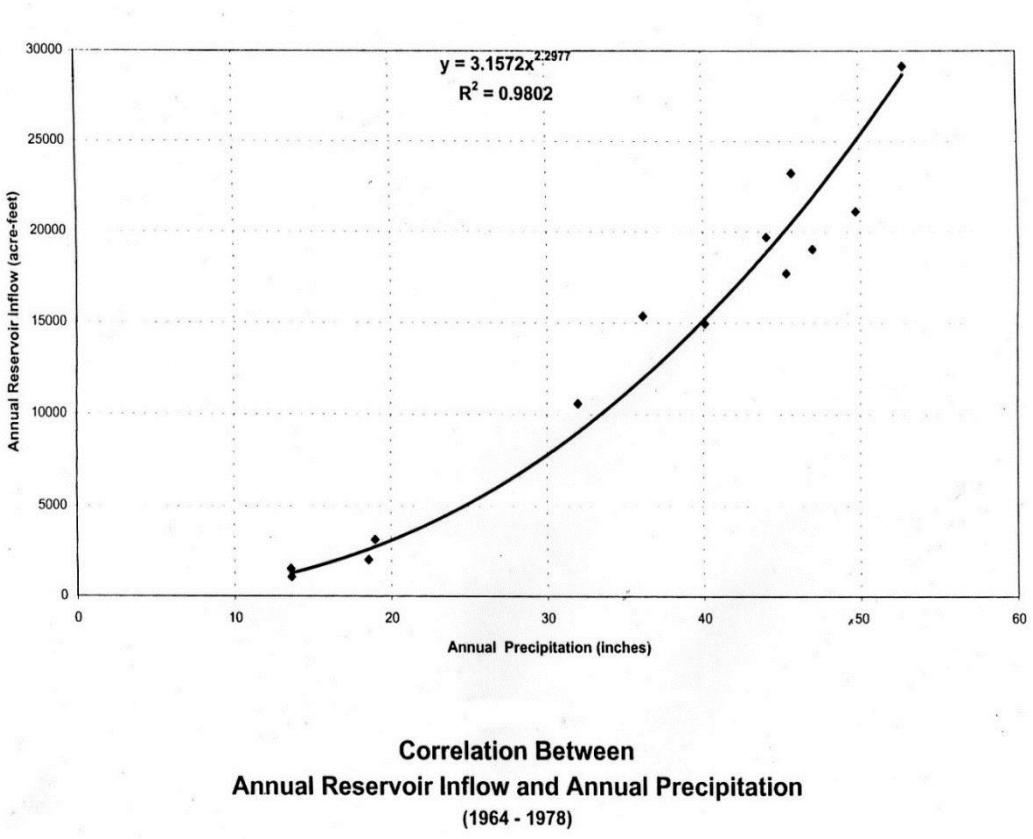
Beaver sign near the mouth of mainstem Rector Creek 5-26-17 tjb

Hydrology

Annual precipitation in the Rector Watershed averaged 36 inches since 1914 before the recent drought (2009 WSS). 85% of that falls as rain between November and March (NCSSC, NCFWCD). DWR graphed inflow on precipitation from 1964 to 1978 concluding 2000-29000 acre-feet per year flow enter the reservoir when precipitation ranged from 13-53 inches per year, respectively. The following curve has a correlation coefficient of R2 = 98% indicating high confidence in estimating inflow from annual precipitation according to Figure 6. Annual rainfall of 36 inches would generate 12,000 AF of inflow according to the curve below. However, the underlying data refers back to 1978, before vineyard expansion took hold, so current groundwater pumping is not represented in the equation or the graph below.

y=3.1572 X 2.2977 where y=inflow (acre-feet) and x=annual precipitation (inches) (DWR, 2000)

Figure 2.6 Annual Reservoir Inflow from Annual Precipitation



Rector Creek flow flows perennially with summer flow dependent upon springs that daylight groundwater to the creek. Incoming springflow replenishes the reservoir so as to maintain volume, balancing out surface evaporation losses. Perennial flows also support aquatic wildlife habitat that is especially pronounced at pools near a handful of mainstem waterfalls (photo page 18). The flow rate of waters collected from the reservoir's tower for treatment and beneficial uses is usually 529 gallons per minute, year-round (JD Hartman, personal com.)

Upstream Water Uses

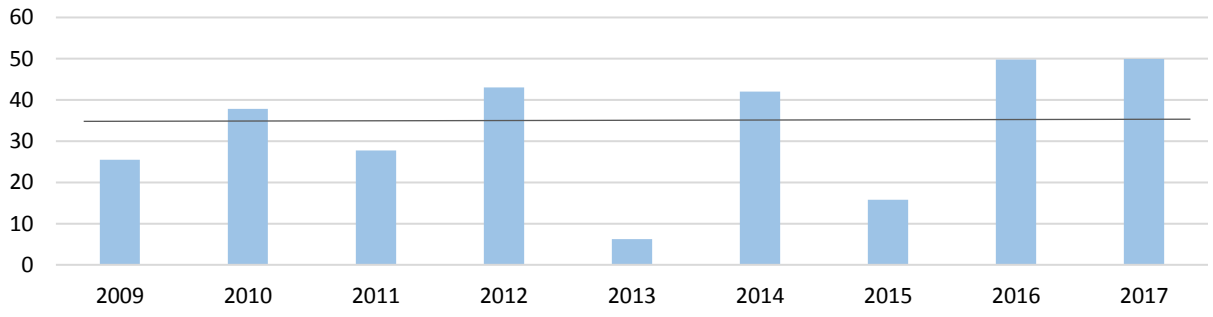
Wells across the Rector Plateau provide domestic water to 61 rural homes and irrigation for 1492 acres of vineyard. Other vineyards maintain water storage ponds filled by surface water runoff. The recent California drought brought renewed sensitivity to competing water interests. Napa County required extensive water use studies for agricultural developments proposed during the most recent drought. The hydrological evaluation of one proposed vineyard enumerated the amount of water required to irrigate new vineyards at nearly double the amount required for established vineyards for at least the first two years.

Creek flows may be reduced during extended irrigation since vineyard irrigation continues all through the summer. North Fork was dry at the mouth already by the author's May 25 2017 lake visit. Water is also used in winter for frost control. A small fraction of the applied water might return underground from the root zone after evapotranspiration and fruit culture losses. Flows might recede and then return in periods with and without pumping from wells regardless of the use or season.

Current Rainfall and Climatic Conditions

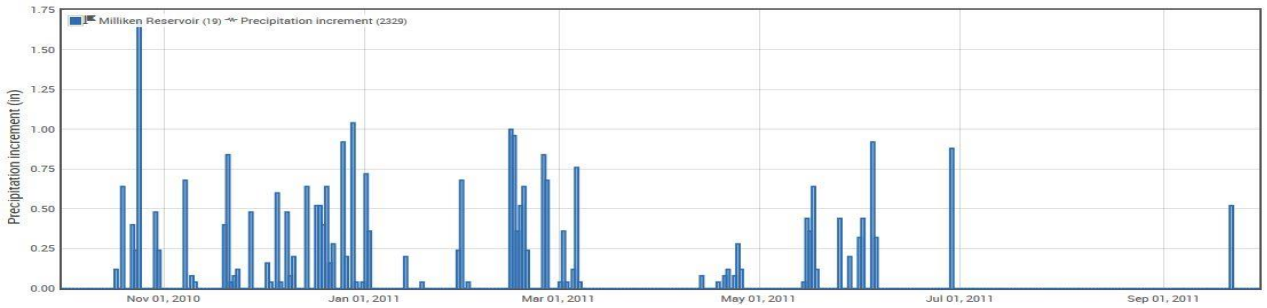
Figure 2.7 charts annual rainfall totals at VH 2009-2017 against the previous average of 36 inches. 2009, 2011, 2013, and 2015 totals were well below that (2017 sums rainfall through April). The recent widespread California Drought dominated hydrological conditions across most of the state for 7 or more years since 2009 forcing widespread water conservation as a practical matter. California Governor Brown stepped in to regulate water use so that urban users including everyday citizens and families were required to reduce water use by at least 20% while many agricultural users went completely without. Beginning in the spring of 2014 and through 2015-16 and 2016-17 "atmospheric rivers" brought drought relief with sustained, heavy rainfall that finally recharged California's water storage reservoirs. Since most heavy rains fell on saturated soils and ran off, it remains to be seen whether groundwater aquifers, too, have been completely recharged.

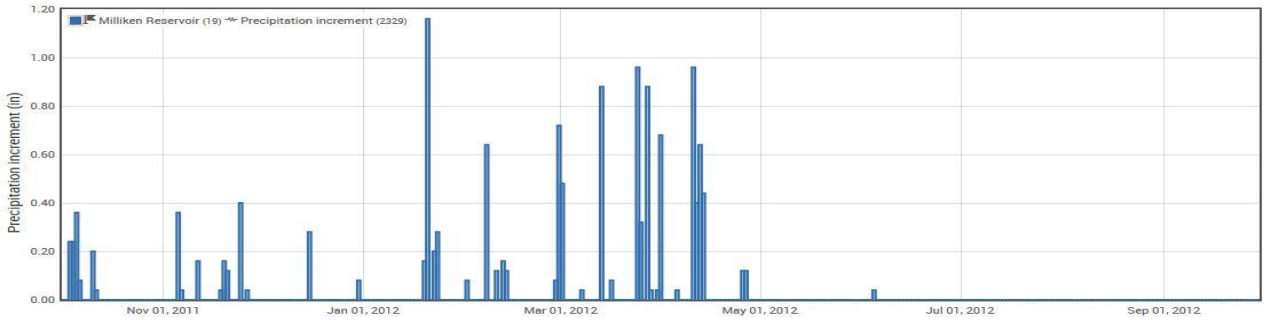
Figure 2.7 Annual Rainfall at VH Treatment in inches Jan-Dec

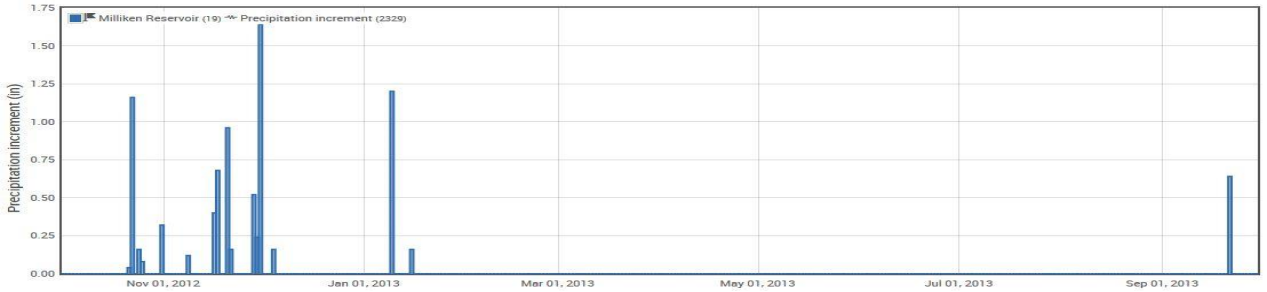


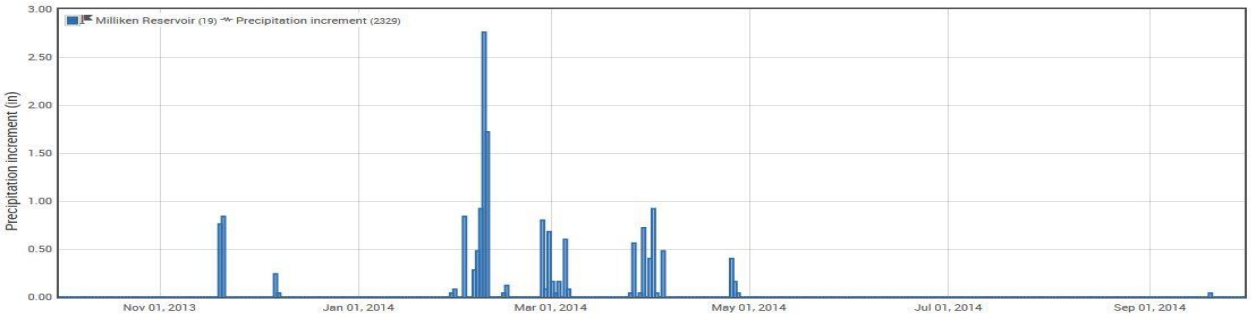
The following series of daily rainfall histograms by water year (through May of 2017) is from Milliken Creek adjacent to the upper watershed at Foss Valley. They show dry periods between rains were much longer after 2010, during the drought, especially in 2012 and 2013.

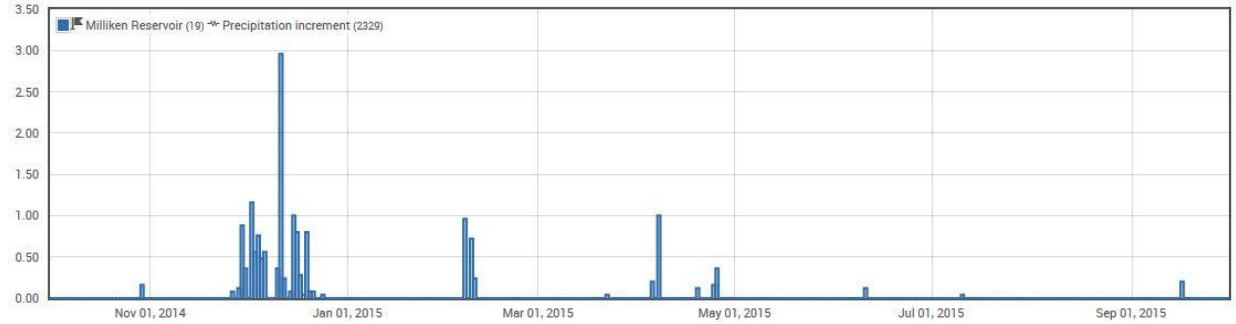
Figures 2.8 Daily Rainfall Oct 1 – Sept 30 Water Years 2011 to 2016 at nearby Milliken Reservoir

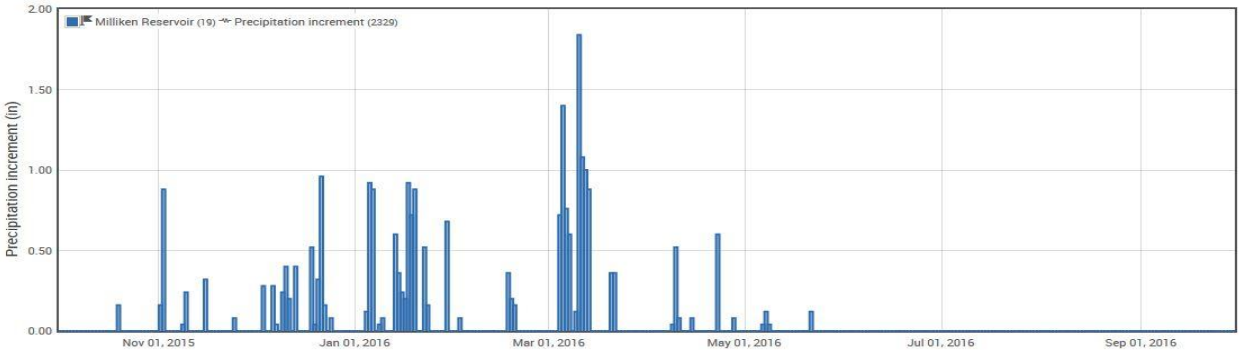


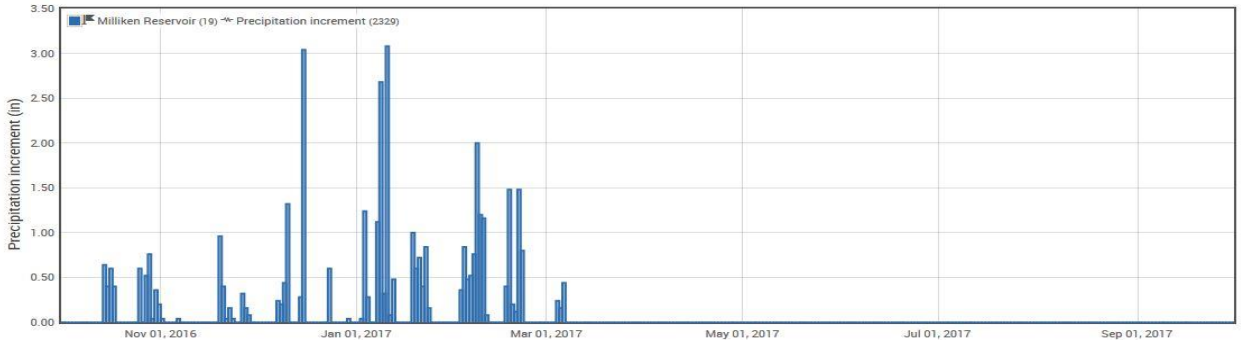














Rector Canyon waterfall, photo credit to A. Manfree 7-4-16, used with permission

Veterans Home Water Supply System

Rector Reservoir is currently the single water source presently used at Veterans Home. Lake Hennessey reservoir is available as a back-up supply for Veterans Home customers in times of outage, from the City of Napa's intertie system.

History

Veterans Home of California is a state-run facility managed by Department of Veterans Affairs. It was established in the mid to late 1800's after Spanish, Indian and Civil War "homeward bound" veterans or "Hobos" took shelter in caves and shacks at what has since become an established housing and medical care facility. Veterans Home operated its original water supply system beginning in the 1880s from the creek next-door, Hinman Creek. Water continues to be stored above the old Hinman Dam, 3 miles uphill from its Napa River confluence, constructed by Veterans Home in 1897, with the dam being raised 10 feet in 1909 (Robert Rice, personal communication). Hinman Creek supports a small steelhead fishery up and downstream, documented in the 1970s when the reservoir was drained (Leidy, et al. 2005). The Hinman source outgrew its humble beginnings at the end of World War I when a surge of returning veterans entered VH. Vets Home persevered 25 years or longer with inadequate water (Lynn Scott, VH, 2017). Eventually the state capitol at Sacramento released funds to construct Rector Creek Dam in 1947 (Robert Rice, VH 2017) to collect and store runoff from Rector Watershed for America's veterans. Since dam construction, water flows across the Napa Valley by gravity to VH's facility in Yountville. A Treatment Facility is now operated downhill of the dam, where water is filtered and disinfected to potable drinking water standards. Finished water is pumped to a 1 million-gallon storage tank located just up the hill from the Water Treatment Facility but still features gravity flow across the Napa Valley to Yountville and the Veterans Home.



Hinman Creek Reservoir – early Veterans Home water supply (Tj Barber 2017)

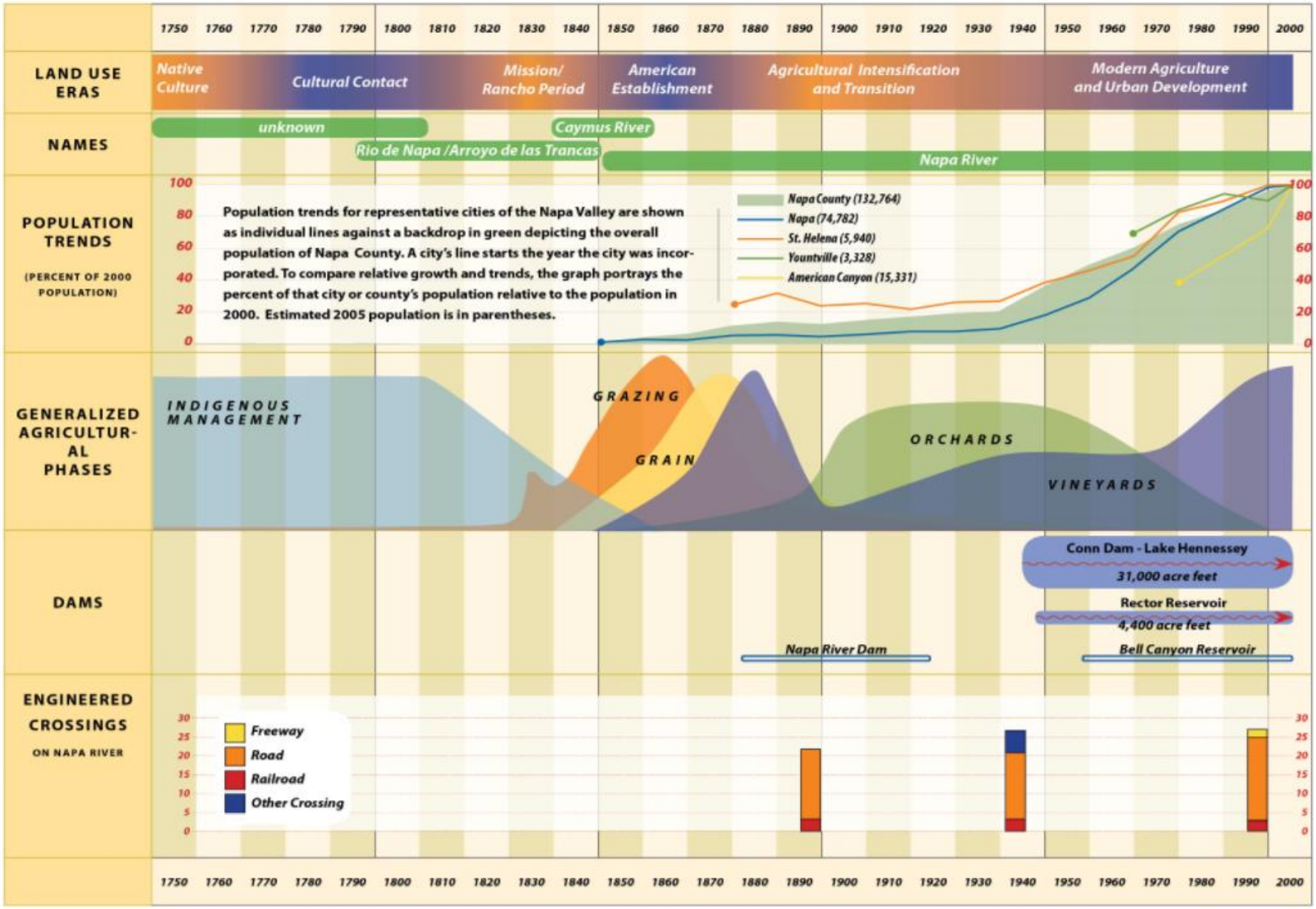
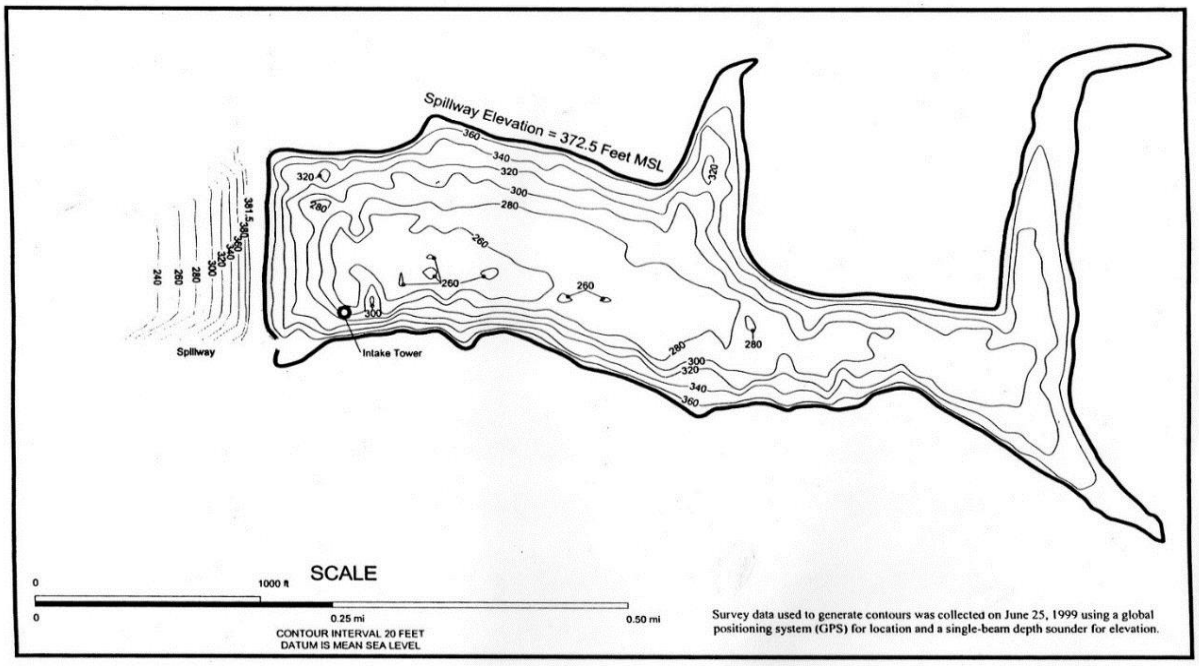


Figure 2.9 Historical Timeline of Population, Agriculture, Water Management and Napa River stream crossings 1750-2000
Courtesy, Watershed Information and Conservation Council

Spillway evaluation in 1989 determined that the 11square mile drainage area could produce peakflows of 10,731 cfs. Spillway capacity, measured at 15,817 cfs, is sized sufficiently to convey the predicted 10,731 cfs peakflow – and then some. A vertical Intake Tower extends from the bottom of the reservoir to above the surface including a lookout platform and seven 18" gate valve openings that allow operators flexibility as to where in the vertical water column the sourcewater is collected. During turbid winter conditions, the upper and lower waters contain higher turbidity. Mid-level waters near the surface are usually preferred for collection of best sourcewater quality (JD Hartman, personal communication 2017).

In the late 1990s, problems with excessive turbidity and backwashing interfered with maintaining a constant flow of finished water to customers. This timeframe corresponded with a phase of rapid paced agricultural conversions. Turbidity problems were likely caused by suspended sediments derived from agriculture practices upstream. The watershed had been recovering from the extensive wildfire of 1981. A new water treatment system went online in 2000 at a cost of roughly $5 million after the previous system could not effectively remove enough of the particles from the sourcewater. The new system gained an operating permit issued by the state's Drinking Water Division in 2002. That same year SPH Associates Consulting Engineers compared first year operation's water quality to expected performance standards and found problems with a disrupted portion of support gravel, sand, and anthracite coal in Filter #2 of the new Roberts Filters. A portion of the sand and other media were found in the clearwell and were removed in 2005 (Russell Van Voorhis – 2008, personal communication). Flow monitoring required by California's water right licensing program was established in 1990-91 at a weir measuring 450-1700 GPM (1-4 CFS). It washed out the following winter (2009 WSS).

Fig 2.10 Reservoir Bathymetry June 1995, MSL elevation via single-beam depth sounder



Current Operations

Rector Dam and Reservoir

Rector Dam was inspected on December 16, 2015 and Aug 11 2016 and found safe. All tower valves were exercised and found operable during the inspection. Inspection Reports for the last few years have indicated that the 24" gate valve is "difficult to operate under differential head and should therefore be considered unreliable under head. The valve should therefore be kept fully open at all times unless required to be closed for maintenance and operation of the 24" knife gate valve" (California Division of Safety of Dams, 2015).

Table __ gives the depth of the openings in Rector's Outlet Tower. Opening #7 at 118 feet is not functional due to siltation smothering that inlet gate. Raw sourcewater is collected at about 4 NTU turbidity from the Intake Tower, and then either transmitted directly untreated to California Department of Fish and Wildlife nearby, just across Silverado Trail for fish culture operations, or continues on to the Water Treatment Facility at the base of the dam at 7300 Silverado Trail.



Rector Reservoir, dam, spillway. Arrows to intake tower, finished storage tank, water treatment facility.
photo credit: A. Manfree, 7/4/2016 used with permission

The photo above shows clear blue water stored in Rector Reservoir after prolonged summer weather. But in winter conditions, stored water is brown and turbid from incoming sediments derived from watershed erosion upstream.



Reservoir in Winter with tower and spillway inlet, and Haystack Peak at 1446‘ above MSL

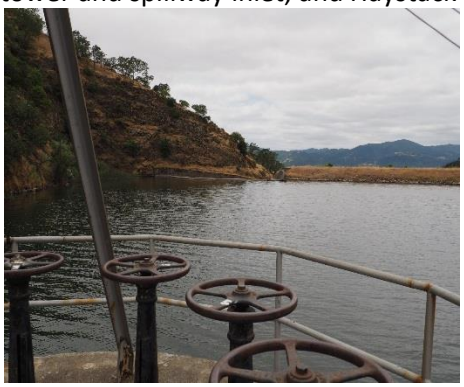


Table 2.4 Gate Valve Depth and Water Quality from the Outlet Tower

RECTOR RESERVIOR
Depth Profile

Lake Level: 372.5 Air Temp: 18.7 °C Date: 4/27/06 Weather Conditions: Sunny

Spillway Crest = 372.5 ft.

Valve No.	Depth (ft.)	D.O (mg/l)	Temp. (°C)	Turbidity (NTU)	pH
1	17.5	3.2	11.5	11.2	7.21
2	33.5	3.0	10.1	10.0	7.25
3	49.5	3.2	10.0	10.7	7.25
4	65.5	2.9	10.0	9.12	7.18
5	81.5	2.7	9.9		
6	97.5	2.6	9.9		
7	118.5	2.1	9.8		

Veterans Home Water Works Staff

The VH Water Treatment Plant at Rector Dam is staffed four days per week in 10-hour shifts by

Chief Operator, Jimmy D. Hartman Jr. T-3 # 32591, D-2 # 43735

Shift Operator & Distribution Chief, Robert J. Rice T-2 # 32840, D-2 # 41009

Shift Operator, Edwin A. Wooster T-4 # 14820, D-2 # 35121

Water Collected for Beneficial Uses

California Department of Veterans Affairs maintains Water Right License #010911 application #A010456 with the State Water Resources Control Board's Division of Water Rights which authorizes year-round diversion from Rector Creek of 5.55 cfs to a maximum appropriation of 3518 AFA. VH's license includes storage from October through May annually of 1767 Acre Feet for purposes of a fish culture, irrigation, residential, commercial, and municipal uses (VH Report of Licensee for 2013). The following graphs show actual use 2008-2013 and a 2013 snapshot of monthly maximum diversion rates. Water began spilling this water year on December 15 2016.

Fig 2.11. Total Annual Acre Feet of Water Diversion Appropriations by VH

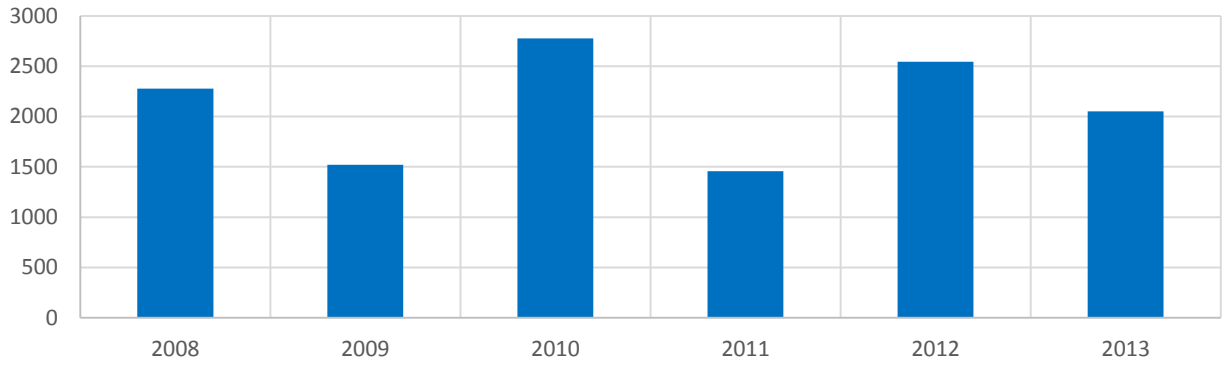
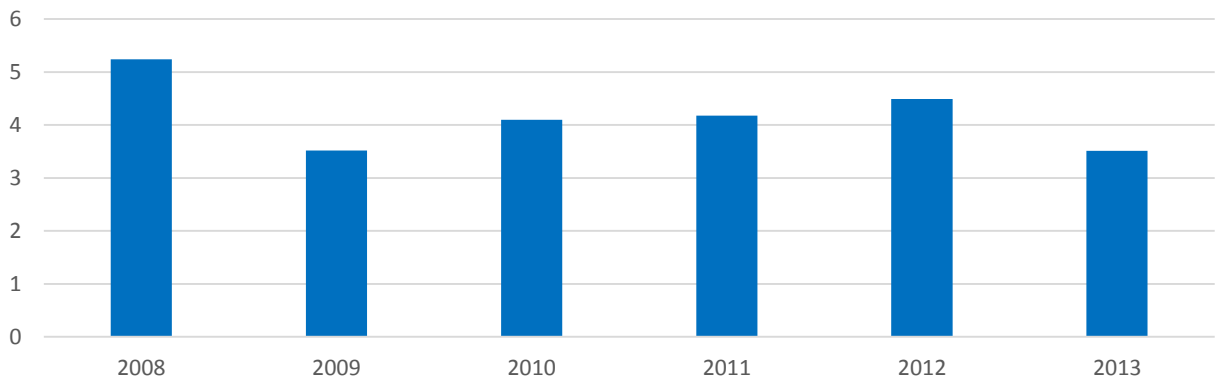
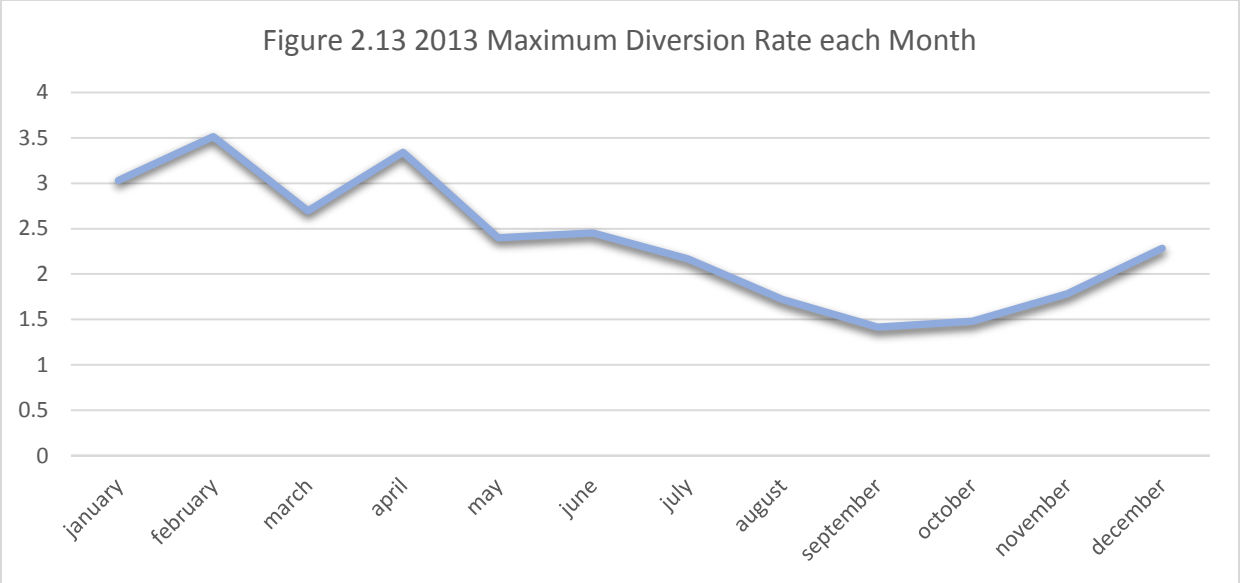


Fig 2.12. Maximum Direct Water Diversion Rates by VH in CFS







Rector water passes over the dam into the spillway



Rector water speeds down the spillway to re-enter Rector Creek at the bottom

Water Treatments and Distribution

Incoming source water collected from the Inlet Tower on my visit entered the Water Treatment Plant at 4 NTU at a rate of 500 GPM, the optimum rate at which to run the plant to maintain a steady flow of finished water to VH (JD Hartman, personal com). Chemical coagulation and sand filtration are preliminary treatments that remove the coarsest suspended materials. Once indoors, finer particles are removed in upflow clarifiers to 0.288 NTU then polished by slow anthracite mixed-media filtration. Disinfection by injection of sodium hypochlorite in a 5.25% solution is established during Contact Time when chlorination takes place as treated water is directed into the clearwell through baffling in a 30,000-gallon water tank beneath the floor of the water treatment building. Zinc orthophosphate is injected at the end to neutralize acidic waters and minimize pipe corrosion in finished water distribution pipelines. Finished water is regularly filtered to 0.03-0.06 NTU and pumped uphill to a Tank 1, a 1-million-gallon storage tank near the reservoir that maintains gravity-feed across the Napa Valley to Yountville. On the way, CDFW collects treated water for staff at their Bay Delta Regional Office across the street on Silverado Trail. Just before Yountville, Vyborny Vineyard Management, Inc, Paraduxx winery, and the Napa County Corporation Yard collect finished water from a 16" water main on its way to Yountville customers. The rest flows uphill to Veteran's Home on the hill above Yountville to VH's Tank #2. Tank 2 was retrofitted from an earlier tank and now holds 9-13 feet of water in a concrete tank covered by a locked Temcor aluminum dome storing 1.5 million gallons (upper right in page 34 photo). The

80,000-gallon clearwell, finished water tank #1, and finished water tank #2 at Veterans Home was cleaned and inspected in 2015. Tank #2 was cleaned again in 2017 by MM Divers of Crescent City.



Polishing Filter at Rector Water Treatment Facility at Silverado Trail (photo by Tj Barber)



Leaking water line is repaired at a bend in a leaking finished pipeline Dec.19, 2016 (Napa Valley Register)

Point of Use

Yountville VH presently cares for and houses some 1000 veterans presently living on site. Many deceased veterans and now buried in the grounds which are carefully tended and irrigated with Rector waters. A new staff of about 500 will increase water demand once the new 430 bed Skilled Nursing Facility is complete.

Unresolved Water Issues at Veterans Home

A lawsuit filed by California Water Audit in November 2016 in Sacramento County Superior Court asks that VH install inflow and water temperature monitoring equipment, alleges that VH exceeds its authorized uses by Department of Water Rights license, and requests release of more water from Rector Reservoir to replenish adequate bypass flows year-round to support downstream fish. California Water Audit has successfully challenged Calistoga and St. Helena in similar lawsuits. Their lawsuit against City of Calistoga was begun by a Calistoga resident, who was eventually represented by the Water Audit group, was heard by Napa County Superior Court in 2015, and $555,767 was awarded to California Water Audit (Napa Valley Register, November 25, 2016).

An online news article in Hydro News from 2/20/17 indicates there is a concern from Department of Water Resources for lack of an Emergency Plan (Corso, Ron in Hydro News). An Emergency Plan might include topics ranging from dam safety, to water shortage, earthquake, boil water orders, etc.

Year	Pop-ulation	Equiv. Number of Conn.	Total Water Demand (MG)			Average Daily Usage (gpdc)		
			Annual	Max. Month	Max. Day	Annual	Max Month	Max Day
1998	1,150	348	189.9	45.5	2.0	1,495	4,218	5,747
1999	1,150	348	181.4	27.4	1.8	1,428	2,540	5,172
2000	2,500	758	331.6	46.5	1.77	1,199	1,979	2,335
2001	2,500	758	311.0	44.1	1.89	1,124	1,877	2,493
2002	2,500	758	318.9	46.9	1.91	1,153	1,996	2,520
2005	2,500	758	540.3	77.52	1.75	1,953	3,299	2,309
2006			362.5	42.53	2.28			
2007	3,290	997	378.1	44.0	1.73	1,039	1,424	1,735



Veterans Home aluminum water tank (upper right) and Point of Use photographed overhead in Cessna plane on April 14, 2017 – photo by Tj Barber

3. POTENTIAL CONTAMINANT SOURCES

This section describes potential contaminant sources identified on the watershed. The basis of this contaminant source update involved a 2017 air photo interpretation using Google Earth, a winter and spring Cessna plane overflight of the watershed, a windshield survey along the uppermost reaches of Soda Canyon Road, foot surveys into Rector Canyon, a boat survey of the lake and three major inlets, Internet research, and consultation with Napa County offices of Environmental Health, Building and Planning, and the Agricultural Commissioner.

Wastewater Discharges

According to a query of the California Integrated Water Quality System Project (CIWQS), there is no longer a wastewater treatment facility in Rector Reservoir Watershed with an active NPDES permit. The NPDES permit for what was Atlas Peak winery is no longer active.

Septic Tank Systems

There are sixty-one residences in the watershed that utilize septic tanks and leach fields for domestic blackwater and greywater disposal. These homes are scattered throughout the plateau or clustered near Soda Canyon Road. Septic Systems here are regulated by the Napa County Environmental Health Department. These rural residences range from humble, older single-family homes, to modern upscale ranchettes. It is logical to assume that especially the older systems are in need of maintenance or repair. About one permit is pulled per year for septic system renovation or repair (Barber et al, 2008 WSS). The distance from the cluster of Soda Canyon Road homes to the reservoir is about three miles, which is a substantial environmental buffer. Potential microbial pollutants are inactivated by disinfection at Rector's Water Treatment Facility. Personal care products and pharmaceuticals, etc., are likely to dissipate to minute concentrations prior to arrival at the reservoir but if present they are likely to slip through treatments unnoticed. Nitrates, if present in source water in high concentration, would turn up as algal blooms. Algal blooms in the reservoir occur annually and are controlled by chemical CuSO4 application there at the lake.

Grazing Animals

There are few grasslands in the area that might be gently sloped enough for grazing by domesticated animals. Flatlands are more profitably managed as vineyards. BLM lands are inactive.

Erosion and Sedimentation

Erosion hazards are rated moderate to high (NCSSC). Soil erosion is a naturally occurring process, even in pristine conditions, but one that can be accelerated by any land use that disturbs vegetative soil cover or alters naturalized runoff patterns. Erosion Control Plans prepared for proposed vineyards mostly indicate that, once established, vineyards generate less soil erosion than in pre-treatment native conditions through the application of BMPs. Erosion Control BMPs include cover cropping or mulching between vineyard rows, spreading crushed field stone gravel

to resurfacing dirt roads, and installing field stone or other velocity dissipaters where runoff concentrates or where culvert systems daylight. Sediment Control BMPs include sedimentation ponds, silt fence, and straw or coconut fiber wattles that collect eroded sediments onsite to keep them from traveling downstream.



The native terrain includes massive rock knobs, flat terraces, and ravines, with sparse or dense vegetation

Once underway, erosion problems generally worsen downhill and are more difficult to control (RWQCB report) unless the cause is addressed, usually by returning natural flow paths or diffusing concentrated runoff. The steep terraces in the next photo were eroding in the last WSS but have been tended with an effort to stabilize them in recent years.



Fluvial erosion potential is highest wherever runoff is artificially concentrated including roadside ditch relief outlets and undersized stream crossing culverts. Older vineyards were sometimes built across small streams as evidenced by water staining or gullying across vineyard rows. More recent vineyard developments allow at least the minimum twenty-five feet of buffer around watercourses and wetlands with road stream crossings designed to convey the 100-year flood to reduce erosion and maintain natural riparian communities.

The period during vineyard development is a vulnerable time when erosion potential is high. Clearing operations are limited to the dry season to avoid wetting bare soil with seasonal rainfall. The next photo shows field preparation of a cleared, bare soil alongside rock crushing apparatus and transport operations that probably resurfaced dusty roads with newly crushed gravel, in March 2016, according to Google Earth. Soils are underlain with bedrock such that precipitation infiltrated into uphill soil becomes underflow beneath the soil (atop the rock) and reemerges downhill as concentrated surface flow. Most soil eroded from the landscape is plucked from the earth by rainfall or the energy of flowing water and is typically transported in runoff to downstream waterways.



Eroded soil generates the most frequent pollutant addressed by Rector's water treatment facility - elevated turbidity. Suspended sediment particles entrained in the watercourse impair water clarity and are known to carry other pollutants adhered to their surfaces including bacteria, viruses, fungi, and Giardia lamblia. Besides water quality deterioration, sedimentation year after year has decreased water storage capacity of Rector Reservoir.

The water outlet tower at the reservoir has silted over the lowermost openings, collecting a buildup of eroded sediment behind the dam. In addition to watershed erosion upstream, former Treatment Plant Operator, Mark Nicander, confirmed the appearance of slide activity around margins of the reservoir eroding rubble sized colluvium into the lake every year (Barber, 2003).

Agricultural Crop Land Use

The dominant land use in the watershed is certainly agriculture in the form of wine grape vineyards in the Atlas Peak Appellation. Paired air photos in figure 2.1 indicates the plateau experienced extensive conversion from native terrain to vineyards in 1991-2002. In 2008 there were twenty-eight vineyards in the watershed comprising 1,400 acres. In 2017 there are vineyards across 1491 acres, a few olive and walnut orchards, and a few marijuana gardens.

Wine Grape Vineyards

Potential risks to water quality associated with crop cultivation include exposure of erodible soil and exposure of agricultural chemicals to rainfall that transports sediment and chemical residues downstream into the water supply reservoir. Chemical residues might derive from application of regulated reportable application of fertilizers, fungicide, herbicide, insecticide, rodenticide, or even over-the-counter versions such as glyphosate Roundup which has received negative attention over the recent years for water quality degradation. Pesticide and fertilizer applications are discussed in the next element, pesticides. Marijuana gardens in Trinity County have brought rodenticide residues trespassing into local groundwater wells, tainting domestic water supplies, which suggest other chemical residues might also result in tainted groundwater or downstream surface waters.

Nutrient fertilizers are applied to improve plant health and to increase crop yield. Quick release nitrogen and other chemical fertilizers can mobilize in water to move away downstream to the reservoir with rainfall and runoff. Fertilizer in the reservoir is signaled by nearshore or widespread green or brown algal blooms in the summer months. Previous water treatment plant operators observed algal blooms in Rector Reservoir more frequently after the major vineyard expansion in the late 1990s (previous WSS). Copper sulfate is a mineral added to the reservoir annually for algae control dating back forty years indicating some algal blooms predated vineyards. Rector's water treatment staff is able to identify algal colonies in blooms by concentrating reservoir water or plucking pieces from the bloom itself and examining it microscopically to identify the type (R. VanVoorhis, previous WSS).

The following table, from Napa County's Agricultural and Weights and Measures 2015 Cropland Report, shows countywide wine-grape harvest values. By applying this information to the 2017 estimate of 1491 acres of vineyard in Rector's watershed, the wine-grape crop value here might reach $24,567,453. Because acreage in agricultural cropland use is the most significant land use in the watershed and because it continues to expand, potential pollutants entering Rector's water supply from agricultural cropland use is considered high.

Table 2.6 Napa Valley Wine Grape Production 2014-2015

Crop	Year	Producing Acres	Tons Per Acre*	Total Tonnage**	Value**
Red Winegrapes	**2015**	**32,976**	**2.58**	**89,562**	**$464,182,900**
	2014	33,340	3.70	123,355	$600,398,100
White Winegrapes	**2015**	**10,022**	**3.36**	**34,564**	**$82,751,000**
	2014	10,251	4.97	50,960	$117,858,000
Winegrapes Subtotal	**2015**	**42,998**	**2.76**	**124,126**	**$546,933,900**
	2014	43,591	4.00	174,315	$718,256,100

From: Napa County Department of Agricultural and Weights and Measures, 2015 Agricultural Crop Report http://www.countyofnapa.org/AgCommissioner/CropReport/2.

Beyond the existing vineyards and wineries, four proposed vineyards and one proposed winery have come before Napa County for environmental review in the last few years. Mountain Peak Winery, at the one-time home of master Rector grape grower Jan Krupp, would dwarf other wineries in the Soda Canyon Road area and was resisted by Sodacanyon.org, a group of local residents. Among the negative impacts: the mega parking lot would require twenty-six new parking places and generate 29,498 cubic yards of earthen spoils from the digging of new wine-barrel storage caves, which will be at least temporarily erodible. Theoretically, it will grow its own grapes or purchase enough locally to operate the winery at full capacity. It would theoretically use no more water than the existing use, but new infrastructure still includes a second well, two more 100,000-gallon water tanks, and a 20,000-gallon domestic water tank.

Atlas Peak Winery was sold to Antica. Antica will replant fifty-three acres. Hendrickson and Vangone are the most recent new vineyard proponents. The extensive Stagecoach Vineyards of Jan Krupp, mentioned above, were recently sold to Gallo and so Krupp's proposal to convert another 100 acres to vine was withdrawn. Bloodlines Vineyard would convert 115 acres to vine.

Marijuana Cultivation

Police found illegal marijuana cultivation operations within and near the watershed reported during the previous in 2008 survey (Ladrigan, 2008). Since that last survey marijuana cultivation is emerging as a legal crop in the state but is not permitted as an outdoor crop in Napa County. Indoor and outdoor grows will largely remain in hiding in Napa County though elsewhere new enterprises are being developed to pharmaceutical grades as medicinal and a variety of recreational consumables. Outdoor marijuana gardens are generally irrigated from streams with gravity feed and indeed black plastic pipe was found along Rector Creek and at the north Fork inlet which is already dry at the mouth. Grows employing diesel powered water pumps have spilled the diesel chronically. An increasing list of environmental concerns are associated with marijuana production which is hoped to ebb with the legal permitting going on elsewhere.

Pesticide/Herbicide and Plant Nutrient Applications

Any chemical used on a crop in Napa County with an EPA registration number is to be reported to Napa County Agricultural Department the month following application. A query of the system revealed several different formulas of insecticides, fungicides, and herbicides that were applied in Rector Watershed in Table3.1 The reporting process is electronic through CalAg's permit website for use by chemical applicators. The list was retrieved through a Public Records Request to the Napa County Department of Weights and Measures and Office of the Agricultural Commissioner. Records are retained only for the two most recent years.

There are wider, unreported applications of over-the-counter herbicides like Roundup (glyphosate). The number of different chemical herbicides, fungicides, and insecticides has steadily increased from eight reported in 1995 by the initial Sanitary Survey, to forty-two in 2003, 68 in

2009 and to 138 in 2017. It is unclear whether the amounts or frequency of application has also increased. The output from this request included only the trade names and registration numbers of herbicides and fungicides and insecticides targeting ants, flies, and mites. A few indicate they are organic. Chemicals with the same name but different reporting numbers were omitted to keep the number of pages in table 3.1more concise.

When a chemical applied to one property crosses over a property line to affect someone else's property, it is known as Chemical Trespassing. In Trinity County, California, to the north, a burgeoning marijuana industry commonly applies rodenticides to minimize crop loss to rodent browse. Poisoned animals crawl away to the water to die a painful death and release that poison into waterway and carrion-eating wildlife. The chemical is now being detected in Trinity County domestic groundwater supplies. Chemical residues may also move downstream with surface water. It is uncertain whether any of the applied pesticides in the Rector Watershed have trespassed into Rector Reservoir. This is partly because such residues would go unnoticed in the small, invisible concentrations that can be expected. With so many different chemicals applied, testing for them would be quite expensive. The security of a Non-Detect result would still leave room for doubt because actual residual chemical traces would be difficult to detect unless the sample event was very well timed after an upstream application in the wet season. Nevertheless, the upstream applications are confirmed, and so it is logical to conclude occasional pollution of the reservoir is occurring from these applications in small concentrations.

Application of herbicides, fungicides, and insecticides is done primarily by tractor sprayers across dry vineyard tracts. But during the March 13, 2017 field survey of the Rector Plateau, several men in white suits were applying an unidentified spray to wetted ground with puddles from earlier rains. Generally, wet weather conditions are to be avoided during chemical applications so as to increase contact with target organisms and minimize environmental pollution. Rector Watershed resident Amber Manfree describes many early mornings when she has seen and smelled the sulfur dust—which many vineyards apply often by to control mold—on the wind. Sulfur is probably still the most widely used chemical and is used to fight powdery mildew on vines. Oxidized by bacteria, sulfur becomes sulfate, which is not likely to leach into groundwater or adversely affect surface water (RWQCB). Sulfur is an approved fungicide in certified-organic agricultural enterprises.

Some vineyards are converting to organic agriculture, which would apply nutrients bound up in compost or mulch, allowing slower release over a longer term, increasing the depth of sponge in the soil and thus being less prone to runoff. Integrated pest management and cover-crop investments keep soil and nutrients onsite with less need for multiple applications.

Wild Animals

Wildlife species observed in the watershed are described in section 2. Water-dwelling mammals such as muskrats, otters, and beaver are potential sources of contamination because if infected themselves, their feces can spread great numbers of parasitic *Giardia lamblia* and *Cryptosporidium* oocysts to the creek and reservoir. When infected waters are consumed, Giardia and

Cryptosporidium can readily become intestinal parasites to the human digestive system. The human becomes sick with the disease and the human becomes the new host.

The California Department of Fish and Wildlife indicated that beavers were living in the watershed at one time but were hunted out over a hundred years ago. Nearby Milliken Watershed does support beaver, and beavers could return to dwell in Rector Watershed (DFW). But even if beaver return or other host wildlife spread parasitic oocytes into the watercourse, ongoing water treatments disinfect against Giardia, Cryptosporidium, and fecal coliform. Wildlife do play critical roles in ecosystem stability and flexibility, and are positive indicators of overall watershed health. Beavers in particular are being recognized recently for improving watershed ecology. Without wildlife, populations of animals like insects, lower in the food web, would flourish and cause other diseases that might stimulate fire or an assortment of unforeseen disasters.

Unauthorized Activity

Trespassing

During a 2008 field survey, one individual's homeless camp was discovered in the North Fork and reported. For lack of other resources, homeless individuals defecate in the woods, which could cause a health risk. The threat of wildfire sparked by homeless campfires is a larger concern because Rector Watershed has a "very high" wildfire potential according to CAL FIRE. Occasional swimming, fishing, and hunting have been observed around Rector Lake. This is officially prohibited and discouraged, though water treatment resolves the related health hazards. A different concern associated with trespassing is terrorism by purposeful contamination of the water supply with an agent the treatment facility does not routinely test or treat for.

Homeless camps have been on the rise since 2009 and increase whenever people cannot or will not gain sufficient roles in the economic system to support themselves or their families. They retreat to make their way in the wilds. Because water treatments are designed to disinfect for fecal coliform and other disease, the direct water quality threat from homelessness is resolved on an ongoing basis yet risk of igniting a wildfire from a campfire is significant.

Illegal Dumping

There has been no known illegal dumping of chemicals, paints, or other toxic materials in the reservoir or watershed. The reservoir itself is surrounded by wildlands with no road access where illegal dumping might directly contaminate the reservoir. Roads in the upper watershed are utilized by landowners and vineyard staff and to some extent by the public and suppliers but through locked gates. The 2017 field survey found only a few pieces of roadside junk-food litter and small to medium-sized piles of junk. It can be assumed that to some extent a few private owners may choose to dump a variety of wastes on their own lands for convenience or to avoid the cost of disposal in designated landfills.

Figure 3.1 CalAgPermit Database of Reportable Chemicals Used in Rector Reservoir Watershed January 1st, 2015 till April 13, 2017 (courtesy of Napa County)

EPA Reg No	Product Name
100-1098-AA	ABOUND FLOWABLE FUNGICIDE
400-503-AA	ACRAMITE
400-503-AA	ACRAMITE 50WS
1051080-50022-AA	ACTI-SPRED
264-827-ZA	ADMIRE PRO SYSTEMIC
264-827-ZA	ADMIRE PRO SYSTEMIC PROTECTANT
100-1351-AA	AGRI-MEK SC MITICIDE/INSECTICIDE
264-1106-AA	ALION HERBICIDE
7969-270-AA	ALTREVIN FIRE ANT BAIT INSECTICIDE
71711-21-AA	APPLAUD 70 DF INSECT GROWTH REGULATOR
8033-36-AA-70506	ASSAIL 30SG INSECTICIDE
80289-3-AA	BADGE SC
80289-12-AA	BADGE X2
59639-150-AA	BELAY INSECTICIDE
51517-50001-AA	BIOLINK SPREADER-STI
51517-50001-AA	BIOLINK SPREADER-STICKER
70057-1-AA	BIOMITE
34704-50060-AA	BOND MAX
2935-50175-AA	BRONC PLUS DRY-EDT
66196-3-AA	BSP SULFORIX
55467-9-AA	BUCCANEER PLUS GLYPHOSATE HERBICIDE
524-454-ZA-55467	BUCCANEER PLUS GLYPHOSATE HERBICIDE
45989-50001-AA	CADENCE
2935-50171-AA	CAYUSE PLUS
59639-99-AA	CHATEAU
59639-99-AA	CHATEAU HERBICIDE SW
34704-50038-AA	CHOICE WEATHER MASTER
70905-1-AA	COSAVET DF
2935-50186-AA	CROSSHAIR
352-662-ZA	DUPONT KOCIDE 3000 FUNGICIDE/BACTERICIDE
352-768-AA	DUPONT MATRIX SG HERBICIDE
66330-35-AA	ELEVATE 50 WDG FUNGICIDE
264-777-AA	FLINT
264-777-AA	FLINT FUNGICIDE
62719-498-AA	GF-120 NF NATURALYTE FRUIT FLY BAIT
62719-424-AA	GOAL 2XL
707-243-AA	GOAL 2XL HERBICIDE
62719-447-ZA	GOALTENDER
17545-50036-AA	GREEN CYPRESS ECOSPREADER
2935-50160-AA	HASTEN
2935-48-AA-71058	IAP DUSTING SULFUR
2935-50169-AA	IN-PLACE
100-1317-AA	INSPIRE SUPER
100-1317-ZA	INSPIRE SUPER
62719-442-AA	INTREPID 2F

Figure 3.1 CalAgPermit Database of Reportable Chemicals Used in Rector Reservoir Watershed - ctd

65564-1-AA	JMS STYLET-OIL
11581-2-ZA	KALIGREEN
11581-2-AA	KALIGREEN
70231-1-AA	KALIGREEN
51036-352-ZA-2935	KUMULUS DF
51036-352-AA-66330	KUMULUS DF
7969-61-AA-51036	KUMULUS DF
51036-352-AA	KUMULUS DF
100-1262-AA-2935	LAGUNA
34704-50081-AA	LEAF LIFE WIDESPREAD ORGANIC
70506-310-AA	LIFELINE
70506-310-AA	LIFELINE HERBICIDE
264-1091-AA	LUNA EXPERIENCE
80289-8-AA	METTLE 125
80289-8-AA	METTLE 125 ME FUNGIC
80289-8-AA	METTLE 125 ME FUNGICIDE
70870-1-AA-68539	MILSTOP
71512-18-AA-88783	MISSION
264-1050-AA	MOVENTO
48142-1-AA	NORDOX
48142-4-AA	NORDOX 75 WG
65564-1-ZA	ORGANIC JMS STYLET-OIL
70299-12-ZA	OXIDATE 2.0
69526-9-AA	PETRO CANADA PURESPRAY GREEN
66330-56-ZB	PH-D FUNGICIDE
66330-56-ZA	PH-D WATER DISPERSAB
66330-56-ZA	PH-D WATER DISPERSABLE GRANULES
707-261-AA-2935	PREMIUM SULFUR DUST
100-526-ZB	PRINCEP 4L
7969-199-AA	PRISTINE
1677-52-AE	PRISTINE
7969-199-AA	PRISTINE FUNGICIDE
71058-50001-AA	PRO AMS PLUS
241-418-AA	PROWL H20
241-418-AA	PROWL H2O HERBICIDE
241-243-ZA	PROWL HERBICIDE
241-243-AA	PROWL HERBICIDE
69526-9-ZA	PURE SPRAY GREEN
69526-9-ZA	PURESPRAY GREEN
62719-375-AA	QUINTEC
2935-50142-AA	R-11 SPREADER-ACTIVA
2935-50142-AA	R-11 SPREADER-ACTIVATOR
2935-50185-AA	R-56
2935-50144-ZD	R-56
2935-50144-ZA	R-56 SPREADER STICKE
62719-410-ZC	RALLY 40 WSP
62719-410-AA	RALLY 40W AGRICULTURAL FUNGICIDE IN WATER SOLUBLE POUCHES

Figure 3.1 CalAgPermit Database of Reportable Chemicals Used in Rector Reservoir Watershed - ctd

62719-410-AA	RALLY 40WSP
88685-2-AA-84237	RECKON 280SL HERBICIDE
84059-3-AA	REGALIA
264-829-ZA	RELY 280
67760-120-AA	RHYME
524-549-AA	ROUNDUP POWERMAX
524-539-AA	ROUNDUP POWERMAX
524-549-AA	ROUNDUP POWERMAX HERBICIDE
524-537-AA	ROUNDUP WEATHERMAX HERBICIDE
2935-503-AA	SER DUSTING SULFUR
69592-11-AA	SERENADE MAX
264-1160-ZA	SERENADE OPTI
264-1160-AA	SERENADE OPTIMUM
279-3242-AA	SHARK EW
19713-60-AA-11656	SIMAZINE 4L HERBICIDE
264-1153-AA	SONATA
69592-13-AA	SONATA
7969-154-AA-67760	SOVRAN FUNGICIDE
7969-154-AA	SOVRAN FUNGICIDE
2935-503-AA	SPECIAL ELECTRIC REFINED SUPER-ADHESIVE DUSTING SULFUR
10182-142-AA	SPECIAL ELECTRIC REFINED SUPER-ADHESIVE DUSTING SULFUR
7969-61-AA-2935	SULFUR DF
51036-352-AA-2935	SULFUR DF
70060-14-AA	SURROUND WP CROP PROTECTANT
2935-50189-AA	SYL-COAT
2935-50167-AA	SYL-TAC
34704-1079-AA	THIOLUX
73545-16-AA-70506	TOPSIN M WSB
4581-377-AA	TOPSIN M WSB
8033-125-AA-70506	TOPSIN M WSB
8033-103-AA-10163	TORINO
62719-580-AA	TRELLIS
2935-50152-AA	TRI-FOL
100-828-AA	VANGARD WG
100-828-ZA	VANGARD WG
100-828-ZB	VANGARD WG
59639-135-AA	VENOM INSECTICIDE
72662-50004-AA	VINTRE
400-518-ZA	VITICURE
7969-284-AA	VIVANDO
7969-284-AA	VIVANDO FUNGICIDE
34704-50056-AA	WEATHER GARD COMPLETE
34704-50061-AA	WIDESPREAD MAX
2935-50144-ZA	WILBUR-ELLIS SPREADER STICKER R-56
59639-123-AA	ZEAL MITICIDE
59639-138-AA	ZEAL MITICIDE(1)

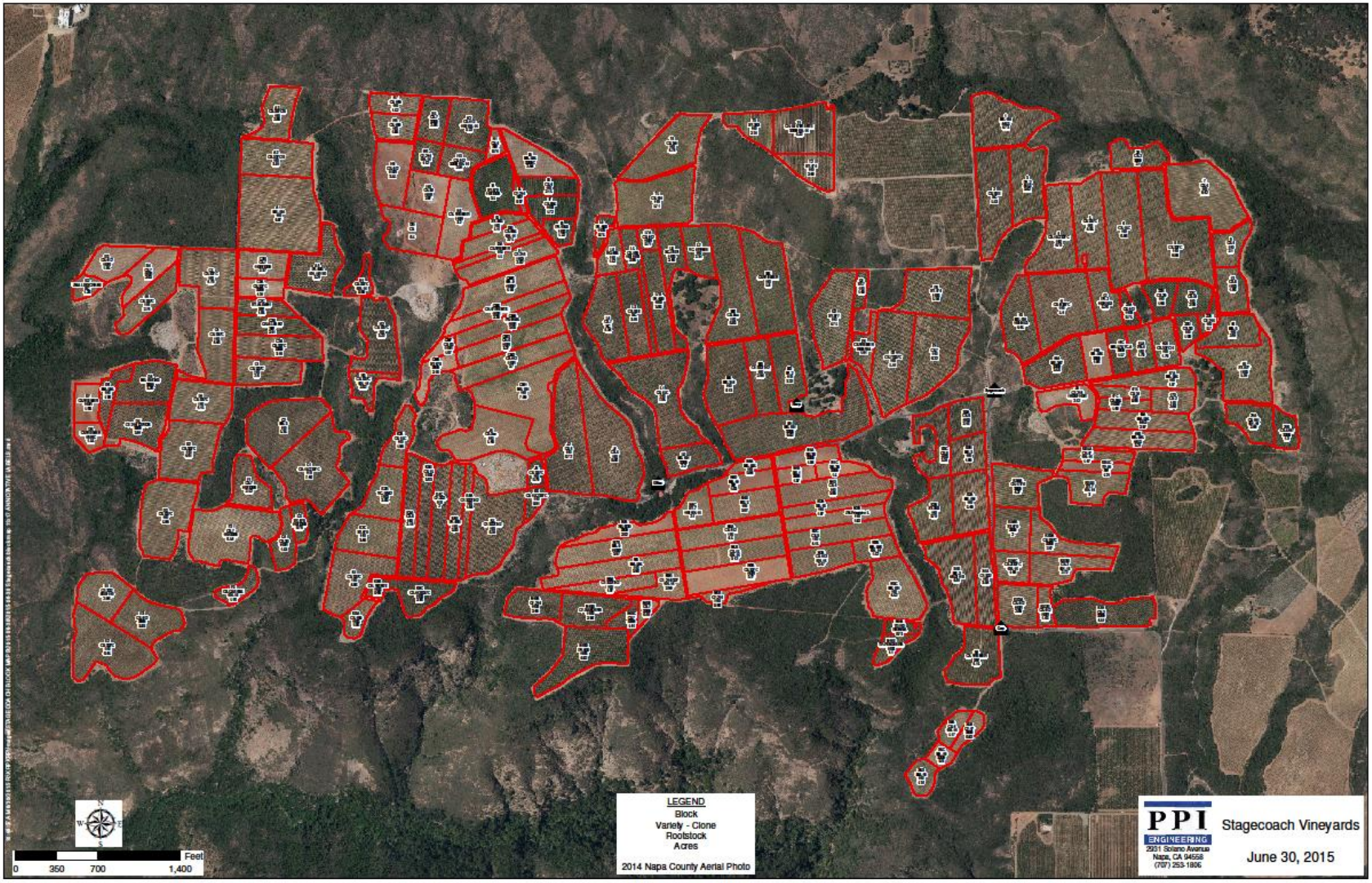


Figure 3.0 Stagecoach Vineyards layout extends to the edge of Rector Plateau where slopes steepen sharply giving way to Rector Canyon

Methamphetamine Labs

Less common unauthorized dumps with more dangerous ramifications are posed by methamphetamine laboratories. Gary Pitkin, of the Napa Special Investigations Bureau, indicated "Meth is probably the biggest drug problem we're facing in Napa County right now" (Henley, 2008). While a variety of methods can be used to manufacture methamphetamine, the most common method is the Red Phosphorus and Iodine method. In this method ephedrine—an essential ingredient available as pseudoephedrine in a variety of over-the-counter drugs - must be extracted from its starchy binding agent by grinding it into a powder and exposing it to heat, a variety of solvents, phosphorus, rock salt, and sulfuric acid gas. Typical solvents used are paint thinner, Coleman white gas, acetone, xylene, toluene, and/or benzene, which are themselves classified as volatile organic contaminants on the US EPA's Drinking Water Contaminants website www.epa.gov/safewater/hfacts.html. Fire can be ignited readily during the manufacture of meth, and so wildfire risk is heightened where meth labs are operated. Waste products from processing are poured into "binder pits," trashcans, and plastic bags or are flushed down the toilet. Binder pits, trashcans, or plastic bags may be discarded in source watersheds as a convenience. Mysterious trashcans smelling of aerosol or WD40 by the side of the road may contain them. Suspected meth wastes should be cleaned up only by a trained HazMat team because of severe toxicity associated with chemical reagents (Wayne Briley, Mendocino County Health Department).

Mine Runoff

According to the Napa County Planning Department and the Division of Mines and Geology, there is no active or inactive mining in Rector Watershed (DMG).

Solid and Hazardous Waste Disposal Facilities

No solid waste or hazardous waste disposal facilities are located in the watershed.

Logging

The Rector Watershed has very little timber of commercial value and therefore logging is not a present or anticipated land use. There is no history of any logging according to the Timber Harvest Mapper from CAL FIRE online.

Recreational Use

Recreational use of the reservoir is prohibited. However, some unauthorized fishing and swimming does occur. Boating is a prime source of MTBE the gasoline additive especially in 2-cycle engines. The reservoir is patrolled monthly, as staff time permits. Patrol is done sometimes by boat and

other times by foot. The reservoir is inspected most often during hunting season (VH). The boat that avails this patrol has been offline for repairs for some time, but was repaired in April 2017.

Underground Fuel Storage Tanks

According to the Napa County Environmental Health Department, there are no known underground fuel tanks in the watershed area (NCEMD). Antinori Winery has permitted aboveground fuel tanks that are regulated by the California Regional Water Quality Control Board, San Francisco Bay Region. (RWQCB). Smaller aboveground storage tanks are expected in rural areas, such as those accessed by Soda Canyon Road and Old Stagecoach Road. Gasoline products such as MTBE is occasionally found in other water supplies and is a potential human carcinogen.

Traffic Accidents/Spills

Traffic accidents are most likely to occur on Soda Canyon Road, the only public road accessing the watershed. All other roads are privately owned and generally gated and locked. The potential for a spill is mostly related to trucks carrying grapes from vineyard to winery and winery to market. Hazardous materials that might be trucked into the watershed area would be fuel, fertilizers, ammonia, and chemical pesticides, herbicides, and fungicides primarily for vineyard use. There are several places that a road crosses a tributary to Rector Creek. These tributaries are far from the reservoir and are usually dry except for wet season months. MTBE is found frequently in low concentrations in road runoff, according to USGS (Reuter, et al., 1998).

Groundwater that Influences Surface-Water Quality

Private landowners have groundwater and springs used for potable and agricultural uses. There are natural springs that contribute to the Rector Creek tributaries. There are no records of gas, oil, or geothermal wells on the watershed.

Seawater Intrusion

Seawater intrusion is not a potential contaminant within the watershed.

Wildfire

Besides the trauma of burning homes and tended crops and gardens, wildfire can greatly impair downstream water quality due to ash in the runoff and the increased erosion when rainfall finds bare soil (Helvey, 1980). Fires result in increase of erosion and turbid runoff for five main reasons: 1) Absence of vegetation; 2) Absence of understory duff and leaf litter that builds a sponge beneath the vegetation buffering the pace of runoff; 3) The ground surface may seal up by ash filling interstitial spaces to inhibit rainfall infiltration; 4) Hydrophobicity—melting phenolitic plant compounds in the duff vaporize and condense as they cool, draping a water-repellent layer across

the burned soil; 5) Raindrop impact onto bare ground dislodges erodible soil particles, which are then carried by overland flow downstream (DeBano, 1981: Shakesby et al., 2000; USDA, 2000).

The most recent Rector wildfire started on the afternoon of 2-23-2012 at the 3200 block of Soda Canyon Road. Called the Soda Fire, it burned 196 acres after a property management company clearing land for a vineyard started a legal burn pile of the unwanted brush. Fire embers escaped the pile, igniting steep, rugged terrain, and gusty winds spread the fire uphill. Two injuries were sustained. The fire was contained by mutual aid from local fire departments at a significant cost.

The earlier 1981 Atlas Fire was much larger, burning across the entire watershed after arson fires were ignited by four timed-incendiary devices whose blazes converged (two from Silverado Trail and two from Soda Canyon Road). It took just seven hours on the afternoon of 6-22-1981 to sweep across Rector Watershed and beyond. The fire front was up to seven miles wide, moving at 4,500 feet per hour. Conditions that day were up to 103°F temperatures, 18mph winds, and humidity at < 4%. The Atlas Peak Fire roasted 33,606 acres of brush, grass, trees, and vineyard, destroyed 61 homes and 91 outbuildings, melted 40 vehicles, sacrificed many wildlife and domestic animals, and injured 11 people. The damage was estimated at $36 million. A rainy 1981–82 winter followed the Atlas Fire, delivering highly turbidity runoff to the reservoir due to the erosion of denuded slopes and ashy residues. Veterans Home had difficulty treating the raw water to domestic water-supply standards.



Photo by Jorgen Gulliksen, Napa Valley Register 2012

http://napavalleyregister.com/news/local/soda-canyon-fire-fully-contained/article_f7d8afae-5e67-11e1-a652-001871e3ce6c.html

http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=615



Atlas Peak Fire skyline photo from *Press Democrat* archives.
http://www.pressdemocrat.com/gallery/4495818-181/story.html?artslide=0

Table 3.1. Fire History in Rector Reservoir Watershed.

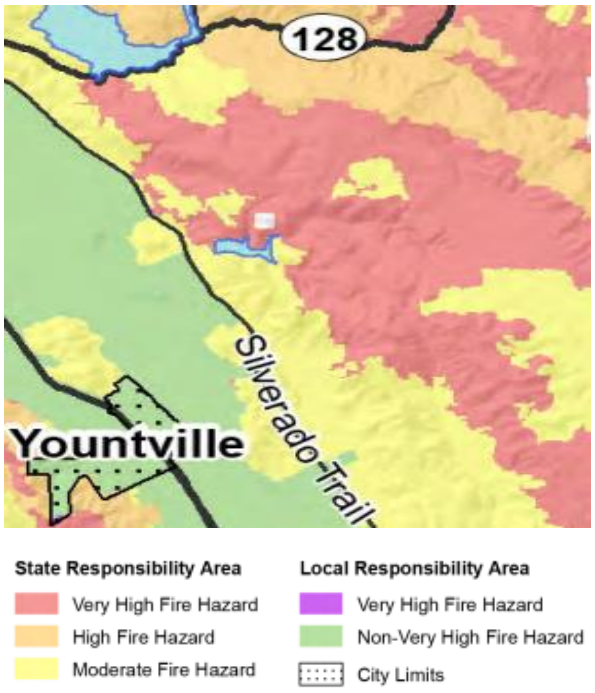
Fire Name	Date Began	Acres Consumed	Map #
R. Wilson Fire	12-3-1959	3,504	67
Stags Lake Fire	6-22-1968	562	80
Atlas Peak Fire	6-22-1981	33,606	90
Soda Fire	2-23-2012	196	113

According to CAL FIRE, the Rector Creek Watershed has a very high fire-severity potential. The scale is based on the following criteria: (NCPD)

1. Fuel loading (vegetation); chaparral is most flammable;
2. Fire weather (wind, temperature, humidity, and fuel moisture content); and
3. Topography (degree of slope).

In the past fifty years, fire-suppression policy and remote hillside developments have led to increasing fuel loading, wider occupancy of remote wildlands, and greater potential for catastrophic wildfire. Napa County has the good fortune of a predominant cool, moist southerly wind from San Pablo Bay, but occasional north winds herald dangerous wildfire conditions.

Landscapes dominated in chaparral, like Rector, are inherently flammable (Napa County General Plan Update, 2016). Wildfire typically burns fast in strong winds that carry burning embers uphill, when air temperatures are hot, humidity is dry, and slopes are steep. The combination of conditions in Rector adds to these factors inaccessible wildlands (there is one road in), and potential ignition from vineyard equipment, cookfires at laborer meals, smokers, and campfires in recreational areas or homeless encampments. Wildfire ignition sources are now estimated to be 94% human-caused and 6% by lightning strike. Arson lit off the worst fire in Rector history and news of recent arson accounts reminds us of the vulnerability of landscape and water resources to just one spark. The "One Less Spark" campaign is a new program of proactive tips for everyday activities to avoid sparking off a wildfire incidentally while towing a chained vehicle, parking a hot car on dry grass, sparks from a lawnmower, weed whacker, or chainsaw, out-of-season/unattended/over-sized burn piles in windy weather, careless smoking and campfire habits, fireplace/wood stove chimneys that vent heat and ash (*Living with Wildfire in Northern California,* 2017).



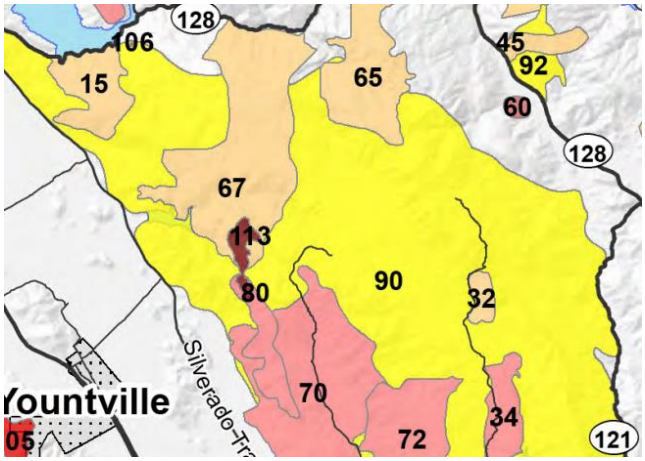


Table 3.2 Fire History in Rector Reservoir Watershed

Fire Name	Date Began	Acres Consumed	Map #
R. Wilson Fire	12-3-1959	3,504	67
Stags Lake Fire	6-22-1968	562	80
Atlas Peak Fire	6-22-1981	33,606	90
Soda Fire	2-23-2012	196	113

Napa Valley Wildland Fire Background Report, August 2014, http://www.fire.ca.gov/HUU/downloads/Living_w-Wildfire_NW_CAL_April2017.pdf

Napa County General Plan Update **www.countyofnapa.org/WorkArea/DownloadAsset.aspx?id=4294982210**

Geologic Hazards (by Elias Steinbuck, PG)

Landslides

Landslides observed within the Rector Creek watershed consist of rapid moving shallow seated debris slides and flows and are typically found on steep streamside slopes adjacent to Rector Creek and its larger tributaries. Observed landslides were generally less than 0.25 acres in aerial extent and were identified on the historic set of aerial photographs by their readily identifiable (accordingly relatively recent) bare failure scars. The most common natural triggering mechanisms for landslides are intense or long duration rainfall, undercutting of the toe of the hillside by stream bank erosion, and earthquake-induced ground shaking (Wieczorek, 1996). Human associated activities that can contribute to slope failure include excavation (a change of the mass balance of the hillslope), and alteration of the local hydrology (concentrating road run-off, or increasing soil moisture from vegetation removal). Landslides have been a continuing process vital to the development of the regional geomorphology (Benda et al., 2003), however earth materials delivered to stream systems can adversely impact water quality by causing rapid increases in turbidity levels after initial slope failure, and chronic increases in turbidity levels as disturbed soils are exposed to subsequent rainfall events prior to revegetation.

Vineyards

Based on a review of the historic aerial photos, a significant amount of ground in the basin has been devoted to vineyard development, predominately on the low gradient southwest-facing slopes found high on the slope. Significant acreage was devoted to vineyard development in the 1990-2010 time period. No obvious evidence of point source erosion resulting in sediment delivery to a watercourse was observed on the aerial photos originating from the development, likely a function of the overall low-moderate gradient slopes. However, it is possible that chronic erosion and sediment delivery to the stream system may exist in the watershed, particularly from concentrated run-off from the vineyards and associated roads.

Storage Tanks

Aboveground storage tanks (AST) are likely to exist in the watershed for fuel storage associated with the ongoing maintenance of the vineyards. The ASTs typically store diesel fuel, a hydrocarbon derived from the petroleum industry that contains known carcinogenic compounds. Fuel storage tanks have the potential to contaminate soil and possibly groundwater from a one-time spill event, or chronic leakage (ongoing drip).

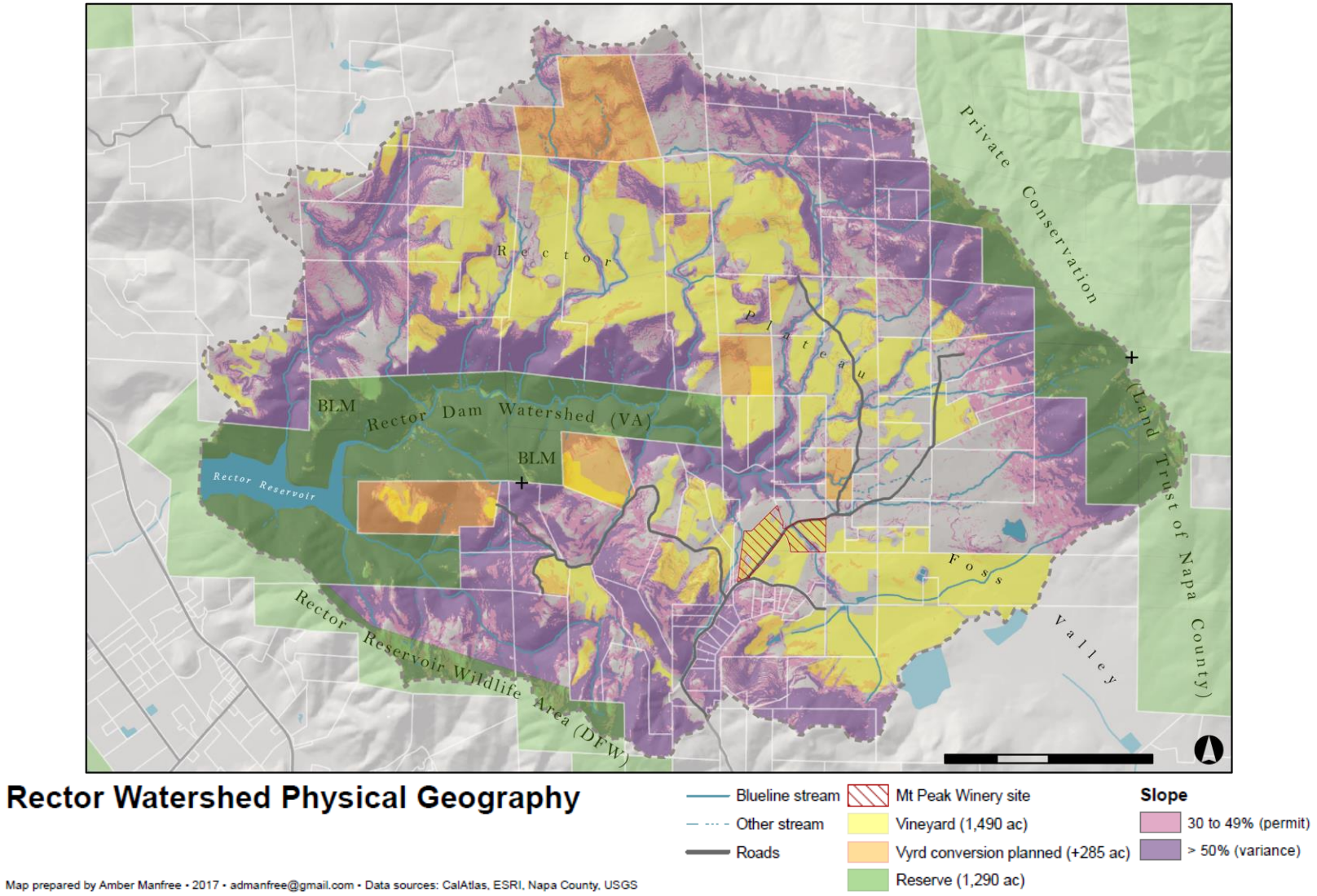


Figure 3.1 Present & Planned Vineyard Developments, Percent Slope, proximity to reservoir and open space Conservation Area (Manfree)

4. WATERSHED CONTROL AND MANAGEMENT PRACTICES

Veterans Home Property and Watershed Management Practices

The most straightforward manner to control and/or manage a watershed for abundant pure water is to protect the land in the watershed all the way to the ridgelines as open space free from development. Veterans Home owns 1,070 acres within the Rector Watershed boundary amounting to 15% of the watershed including the reservoir, streams and the canyon to the rim where it meets Rector Plateau. VH lands are managed as open space to protect its water quality. The extensive riparian vegetation buffer protects water quality by absorbing uphill nutrients and sedimentation.

The Veterans Home of California is a division of California Department of Veterans Affairs, with offices in the state capitol in Sacramento. The Veterans Home in Yountville is fully staffed onsite to manage the home and its Rector Reservoir water supply. The Plant Operations department at the Yountville campus includes Director Joe Rodgers, and Chief of Plant Operations Robert Rice. Day-to-day operations are conducted from the Water Treatment Facility at 7310 Silverado Trail by operators JD Hardman and Edwin Wooster.

A tall fence and security gate prevent access to treatment buildings, facilities, the dam and reservoir, and the 1-million-gallon finished-water storage tank. Recreational swimming, boating, hunting, fishing, and camping are prohibited in these areas, but do occur from time to time. Trespassing access may begin from the south, where adjoining VH open space is managed for wildlife values that include public recreation. That combined area extends from the shores of the reservoir, upslope and over the South Fork ridgeline, and is managed for wildlife by CDFW. There are signs posting No Trespassing. Verbal warnings are issued to trespassers if/when a trespasser is noticed. Surveillance of the reservoir is conducted by staff at regular and random intervals.



VH boat launches for survey of reservoir in May 2017

Napa County Watershed Control by Land Use Policies and Ordinances

Areas beyond VH's property include two BLM parcels and the Sutro Ranch in land trust near Atlas Peak. The remaining acreage is managed by respective property owners. Land-use activities and developments are controlled by Napa County zoning with land-use and development codes.

The earlier WSS indicated that a lawsuit filed by the Sierra Club alleged that Napa County failed to comply with California Environmental Quality Act (CEQA). This action brought the county to divide its area into distinct watersheds in 2008–2009, to be managed for highest use values according to the 2009 version of the Napa County General Plan.

Zoning

Rector Reservoir lands are zoned "Ag-Watershed," reflecting the rich wine-grape microclimate as well as the need to protect the downstream water supply for Veterans Home.

Department of Planning and Building and Environmental Services

Watershed controls for remaining undeveloped parcels within the watershed are exercised through Napa County's permitting authority. A property owner seeking to develop a parcel in Rector Reservoir Watershed follows the flowchart on page 55 to for a grading or Building Permit. Once a complete application is submitted, the proposal is subject to environmental review by the Napa County Department of Planning, Building, and Environmental Services (PBES). That department has a staff of seventy persons, includes an engineering team, and is equipped with a full GIS system. The applicant must generally consult with environmental professionals who analyze the site and develop plans whereby the project yields no significant environmental impact. Once the assigned Napa County planner deems the application is complete, it is routed to the engineering department, CAL FIRE, and other interested agencies—including VH for proposed sites within the Rector Reservoir Watershed. The cover letter from the Napa County Planner to Veterans Home invites comments that are supported by "credible evidence" that downstream sediment or other pollution would be caused by the proposed project. During this WSS update, Robert Rice forwarded four such application packages: Stagecoach Vineyards expansion; Antica/Antinori to replant existing vineyards; Orrin Swift Vineyard, and the Mountain Peak Winery. Two more proposal packages were received in May 2017.

Packages sent for review by Veterans Home included: erosion-control plans developed by the project proponent's engineers, results of geological reconnaissance, hydrologic analysis, including scores of pages from hydrological modeling outputs from TR55 and RUSLE; a set of GIS-based, high-resolution air photo maps, and a statement that the resulting project would result in no significant net yield of downhill sedimentation or reduction in water for downstream users from the project or a from the resulting cumulative effect, considering all the developments already in place. They do not delve much into the application rates of the various pesticides used to maintain vineyard yields.

Upon receipt of comments, county staff redlines the proposal. A plan review letter goes out directing the applicant to address an itemized list of corrections. Once the items are addressed, the county approves the permit and the applicant goes to work. VH, Napa County, and the public assume every project reaches a no-significant-effect level due to creative engineering used in erosion-control plans that prevent downstream effects caused by clearing vast tracts of native vegetation and replacing it with vineyard rows and driveways. With all the professional expertise hired by a proponent, the cover letter understandably requests equally credible challenges; yet the letter presumes VH can afford to engage an engineering firm willing to challenge another engineering firm, rerun the numbers, and review supporting information to reach the threshold of "credible evidence" that might come of such a peer review, all in twenty-one days—a high bar for a public agency whose mission is to provide health and home to America's veterans. There is a hopeful assumption by all parties that the work goes according to plan and schedule, that the completed project's erosion-control plan performs as designed, and that required maintenance is timely and ongoing; but one resident indicated that even repeated complaints about problematic implementation go without follow-up from and go beyond permitted activities.

Medical Marijuana Ordinance (final form dated January 15, 2016)

file:///C:/Users/teri%20jo/Downloads/Draft%20Medical%20Marijuana%20Ordinance.pdf

This ordinance would add a new county code as chapter 8.10 for limiting personal amounts of medical marijuana and expressly ban marijuana dispensaries. It prohibits outdoor grows from the unincorporated areas of the county, and prohibits dispensaries anywhere with the goal of preserving Napa's unique existing environs. Medical marijuana is the sole authorized type, and it may be cultivated only in limited amounts in secured, enclosed structures so as not to be visible or odorous from adjacent properties or by the general public. It is meant to provide for the health, safety, and welfare of the public, to prevent negative impacts on property values, prevent crime associated with marijuana, and ensure that marijuana grown for medical purposes remains secure and does not find its way to non-patients, minors, or illicit markets.

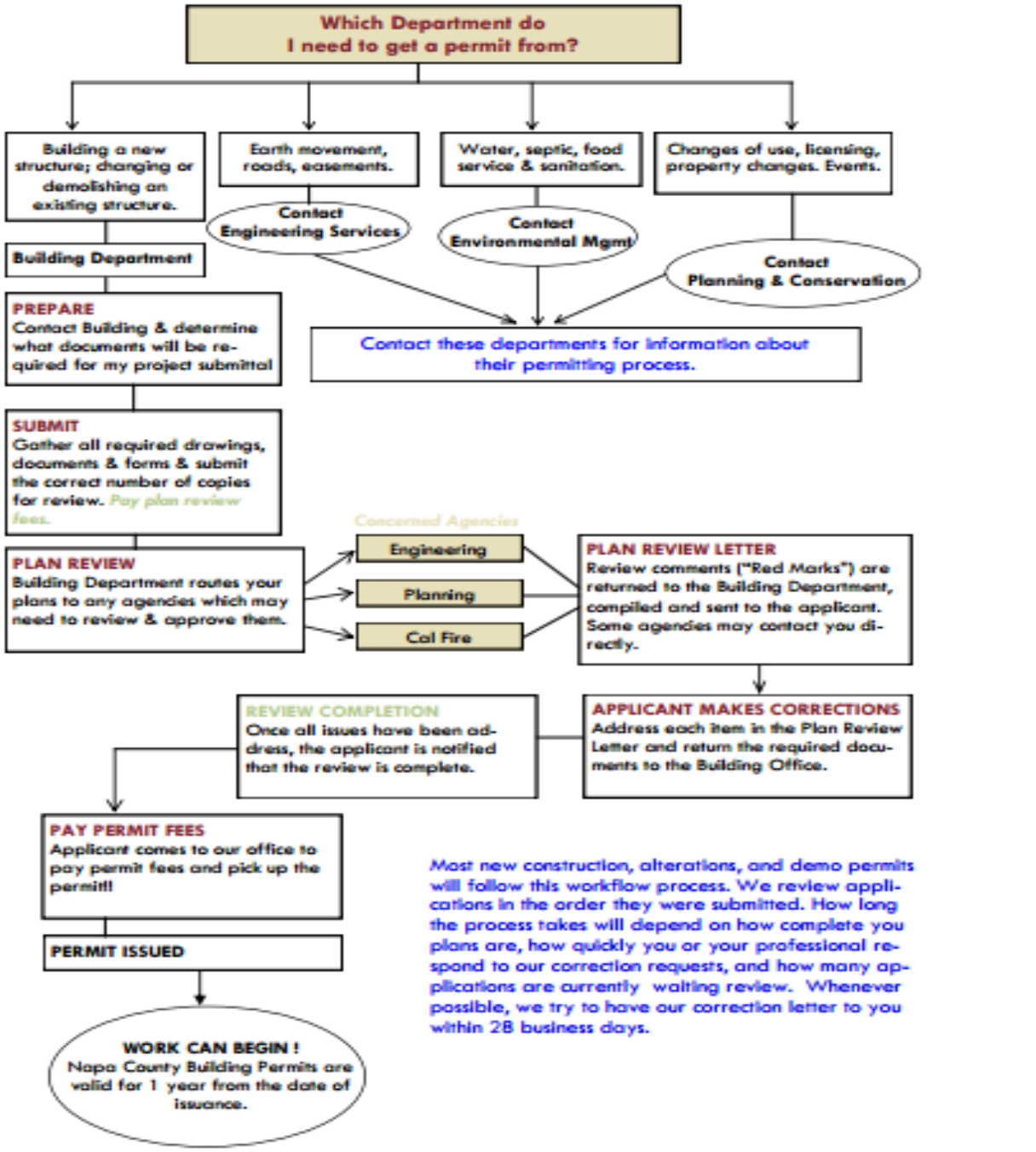
Groundwater Conservation Ordinance (Draft form dated 12-18-14)

file:///C:/Users/teri%20jo/Downloads/2014-12-18_Water_Availability_Analysis_Public_Draft_PC.pdf

In 2011, the Napa Board of Supervisors appointed a Groundwater Resources Advisory Committee. The current 12-18-14 draft groundwater conservation ordinance is based on a premise that all landowners have a right to use the groundwater beneath their property as long as it doesn't impact others. Wildland springs within 1,500 feet of a proposed well for agricultural use would require an assessment of connectivity between the aquifer system from which groundwater is to be tapped and that of the spring. It may also need to evaluate potential impacts on surface water downstream. Water-deficient areas would be mapped per Department of Public Works history of insufficient supply or declining groundwater quality. The only designated groundwater-deficient

area in Napa County so far is the Milliken-Sarco-Tulucay (MST) area, southeast of Rector Reservoir. Wells proposed for inside a WDA would prepare a tiered water-availability analysis based on guideline rates for winery process water and landscaping, or for vineyards including frost protection, heat protection, and irrigation purposes. Projects on parcels outside of a water-deficiency area would require no permit unless serving multiple parcels.

Fig. 4.0 Napa County Grading/Building Permit flow chart for Applicants through PBES



Napa Stormwater Management & Discharge Control Ordinance (from 4-21 2015) Chapter 16.28

In 2015 Napa County adopted the "Napa County Stormwater Management and Discharge Control Ordinance" (Ord. No. 1400, § 1, 4-21-2015) to protect the health, safety, and general welfare of Napa County residents; to protect water resources and to improve water quality; to protect and enhance watercourses, fish, and wildlife habitat; to cause the use of management practices that will reduce adverse effects of polluted runoff discharges; to secure benefits from use of stormwater as a resource; and to ensure the county is compliant with applicable state and federal law by promoting the following:

A. Prohibiting illicit discharges to the stormwater conveyance system

B. Establishing authority to adopt requirements for stormwater management, including source control to prevent and reduce pollution

C. Establishing authority to adopt requirements for development projects to reduce stormwater pollution and erosion during construction and after the project is complete

D. Establishing authority to adopt requirements for the management of stormwater flows from development projects, to prevent erosion and to protect existing water-dependent habitats

E. Establishing authority to adopt standards for the use of off-site facilities for stormwater management to supplement on-site practices at new development sites.

There are eleven more pages in the new stormwater ordinance that reflect the underlying clean water regulations administered by California's Regional Water Quality Control Boards that affect projects disturbing more than one acre of land. The "Phase II Stormwater Permit" of NPDES is applicable by the "County of Napa, Water Quality Order No. 2013-0001 - DWQ, and any subsequent amendment, reissuance, or successor to the NPDES permit. The ordinance is supported by the Bay Area Stormwater Management Agencies (BASMAA) Post Construction Manual of stormwater BMPs and the California Stormwater Quality Association (CASQA) handbooks. The remaining pages of the new stormwater ordinance are provided as an appendix to this document.

2008 Hillslope Ordinance for Slopes Greater than 5%

Napa County enacted the Hillslope Ordinance and other environmental protections in 2008. The Hillslope ordinance requires erosion-control plans on slopes steeper than 5%.

2008 Watercourse Setbacks & Riparian Vegetation Removal Section 16.04

A proposed activity will not be approved for any facility or structure within ten feet of the top of the streambank. No project may be allowed to result in a cut or fill slope that would make the slope susceptible to erosion unless reseeding, bank stabilization, and replanting is done at the end of the project. All road stream crossings are to be sized to convey a hundred-year storm.

Stream setbacks are twenty-five feet from jurisdictional water, and fifty feet from the outside boundary of Army Corps or DFW wetlands. The important definitions from the Napa County website are included below, some were shortened somewhat.

"Watercourse" means all streams extending to the hundred-year floodplain boundary.

"Riparian Zone" means an area extending outward fifty feet beyond the top of each bank of a watercourse except at the Napa River where the riparian zone is one hundred feet outward.

"Top of Bank" means the upper elevation of land that confines water flowing in a watercourse.

"Flood Plain" The closest FEMA flood zone begins at Silverado Trail in the Napa River floodplain.

Vegetation management from projects permitted by Napa County must not remove more than:

1. A native tree eighteen inches DBH per one hundred linear feet of riparian zone on each side of the floodplain; or

2. Three native trees twelve inches DBH per one hundred linear feet of riparian zone on each side of the floodplain; or

3. Six native trees six inches DBH per one hundred linear feet of riparian zone on each side of floodplain; or,

4. Five hundred square feet of vegetation in riparian zones beyond ten feet from the top of the bank; or

5. The temporary removal of a portion of riparian vegetation not more than fifteen feet wide beyond ten feet from the top of the bank, where replanting of such strip is a part of the project.

Napa County Fire Protection Chapter 8.24, Fire Protection

Soda Canyon Volunteer Fire Department is the nearest source of aid during wildfire. The Napa County Fire Chief is responsible for the direction and coordination of fire protection services in the unincorporated areas of Napa County, through contractual agreement with California Department of Forestry and Fire Protection (CAL FIRE), and Napa County Fire Department (NCFD). CAL FIRE operates under a Strategic Fire Plan, which is prepared by CAL FIRE and approved by the Napa County board of supervisors. A written fire permit is required before all burning between April 1 and December 1. The permit explains the hours during which burning can be conducted, and prohibits unsupervised burning.

Chapter 8.36, Fire Protection – Weed and Rubbish Abatement

Chapter 8.36 requires property owners to abate the accumulation of combustible vegetation or rubbish where it is considered a public nuisance, including within one hundred feet of any

structure and where it creates a fire hazard. It provides for abatement by the county where the property owner fails to comply with fire protection requirements.

Chapter 15.12, Building Code

Napa County adopted the 2010 Edition of the California Building Code, which requires fire and smoke protection features at new development to safeguard against the spread of fire to or from buildings. Chapter 7A of the California Building Code requires new buildings in any fire-hazard severity zone be constructed to established minimum standards that ensure the building design will resist intrusion by flames and burning embers from wildfire. Since January 1, 2008 all permitted new construction in an SRA with high or very high fire-hazard severity zones, such as in Rector Watershed, has been built in compliance with chapter 7A of the California Building Code, with Materials and Construction Methods for Exterior Wildfire Exposure.

Methods for Exterior Wildfire Exposure, Chapter 15.32, Fire Code

Napa County adopted the 2010 Edition of the California Fire Code, which is based on the 2009 International Fire Code, establishing standards for fire department access, fire hydrants, automatic sprinkler systems, fire-resistance-rated construction, fire alarm systems, and explosion hazards safety, even in wine caves or where hazardous materials are used and stored, to protect and assist first responders.

Napa Firewise Program

Napa Firewise is a community-based awareness program endorsed by Napa County and fire professionals to provide residents of Napa County information about the dangers of wildland fire, to explain fire ecology, review the natural evolution of fire in wildland settings, and to offer practical steps residents and property owners can take to protect themselves and each other in the event of a wildland fire. Their website and publications provide a guide to defensible space, fire-safe landscaping, firebrand hazards, and methods that "fire harden" buildings. They work with communities to form fire safe councils, develop community wildfire protection plans, and secure grant funding for local projects. Napa Firewise provides free brush chipping to county residents! www.countyofnapa.org/WorkArea/DownloadAsset.aspx?id=4294982210

Living with Wildfire in Northwestern California is another excellent publication full of tips to prevent wildfire, prepared by Humboldt County, Six Rivers National Forest, and CAL FIRE Humboldt–Del Norte Unit, under the guidance of Humboldt County's Fire Safe Council. www.humboldtgov.org/Fire-SafeCouncil

Napa County Emergency Plans

Napa County, with the cities of Napa, American Canyon, Yountville, St. Helena, Calistoga, and special districts, prepared the 2015 Emergency Operations Plan to ensure effective economical allocation of resources for protection of people and property in time of fire and other emergencies. The plan establishes emergency organization, assigns tasks, specifies policies and

procedures, and provides for coordination using the Standardized Emergency Management System (SEMS). Their goal is to incorporate and coordinate all facilities and personnel into an efficient organization capable of responding to any emergency. If the floodplain administrator believes an emergency exists because of a violation in relation to watercourse protection, the floodplain administrator may, with approval of the board of supervisors, order all work necessary to remove, abate, or mitigate an emergency by the county workforces, or may contract to have such work done with the costs incurred charged to the landowner causing the emergency.

Napa County Code Enforcement

If work in or near a watercourse is performed without a valid permit having first been obtained, the floodplain administrator may personally serve written notice on the permittee to cease operations and direct that permittee to have plans and specifications prepared in a form acceptable to the floodplain administrator to rectify the situation. Once the floodplain administrator approves a plan, the permittee shall abate the condition within ten days after notice is received. If the permittee fails to abate the violation, the county may abate it with its own staff or through a private contractor, but the permittee is liable for all costs of such abatement. The floodplain administrator keeps a record of the costs, and charges them to the owner/permittee who shall reimburse the county.

Public access to permitted activities can be looked up by parcel number or street address on the Napa County website. Activities like grading or building without a permit or beyond the permitted activity can be reported to the code enforcement officer at 707 253-4417.

Napa County Pesticide Use Enforcement Program

Napa County exerts watershed control on potential pollutant by pesticide through the Agricultural Commissioner's Pesticide Use and Enforcement Program. The program includes registration for those who regularly use pesticides, including gardeners, pest-control businesses, aircraft pilots, farm-labor contractors, and pest advisers, prior to purchase or application of any restricted chemical. Their goal is to educate businesses and individuals on maintaining worker safety and environmental quality. Their website indicates compliance-monitoring inspections are also part of their work. Most every year there is a campaign to rid the county of one or more pests. Weed and pest control programs sometimes require participation of agricultural land managers to use a certain pesticide to control the spread of undesirable weeds, insects, etc. http://countyofnapa.org//AgCommissioner/PUEPrograms/

http://www.countyofnapa.org/AgCommissioner/CropReport/

District Attorney's Office Environmental Pollution Reporting Hotline: 800 698-6952

Anyone can report activity that seems to pollute the land. The toll-free 800-69TOXIC (800 698-6952) will accept tips, so call right away to minimize environmental damage, and be ready to share the following information:

- The street address or location of the problem. Sketch out a simple map.
- When did the activity occur, how frequently, and for how long? When do you suspect it is likely to happen again?
- Who is involved? Who owns the property or business? Who else knows?
- What was seen, heard, or smelled?
- What do the chemicals or material look like? Are there identifying labels on a spilled or leaking container?
- How were the chemicals or materials disposed of? Were they buried, burned, or abandoned into a body of water, onto the ground, or into a storm drain or sewer?
- What type of environmental damage took place? Estimate the size in area or volume.

Napa County Resource Conservation District

Napa County Resource Conservation District (RCD) acts as a fee-free liaison between landowners and governmental organizations to assist landowners in adopting sound conservation-minded developments. The RCD recently put on the Napa Watershed Symposium on 5/25/17 invoking a theme of cooperative partnerships for water and land conservation

California Department of Fish and Wildlife

California Department of Fish and Wildlife regulates activities to protect rivers, streams and other natural waterways that support fishes. A 1600 permit from CDFW is required for any earthmoving activities that will disturb a bed or bank of a creek of any size, including class I, II, and III streams. It is illegal for any person to pollute a stream with trash, waste, chemicals, or dirt. Such activity can be reported directly to their CalTips Hotline at (888) DFG-CALTIPS [(888) 334-2258].

https://www.wildlife.ca.gov/Conservation/LSA

State Water Resources Control Board

The state's regional water boards regulate developments larger than one acre of land to minimize negative effects on stormwater runoff from construction activities and industrial processes. They are also a permitting authority with jurisdiction around Waters of the State that include rivers, streams, and wetlands.



5 WATER QUALITY

Drinking Water Regulations

Statutes related to California's drinking water regulations include part of the Health & Safety Code, and the Water Code, from Title Chapter 17 and 22 California Code of Regulations. National-level provisions from the EPA are incorporated into state laws by reference or whole statues from 40 Code of Federal Regulations. The April 2017 update of the "Blue Book" offers a comprehensive reference to the California codes.

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dwregulations-2017-04-10.pdf

Since the last WSS, changes to California drinking water regulations were as follows:

- Fees for Drinking Water Systems—effective April 10, 2017
- Point of Use/Point of Entry Treatment Emergency Regulations (PDF)— April 1, 2016
- Hexavalent Chromium Maximum Contaminant Level (MCL) (DPH-11-005)—July 1, 2014.
- Groundwater Replenishment Using Recycled Water (DPH-14-003E)— June 18, 2014.
- Long Term 1 and 2 Enhanced Surface Water Treatment Rules (DPH-09-014)—July 1, 2013. Related to these regulations, please see the memorandum to all public water systems that use surface water or groundwater under the direct influence of surface water (PDF).
- Disinfectant Residual, Disinfection Byproducts, and Disinfection Byproduct Precursors (DPH-09-004)—effective June 21, 2012.
- Point of Entry Treatment (DPH-10-011E)—effective September 22, 2011
- Ground Water Rule (DPH-09-007)—effective August 18, 2011.
- Point of Use Treatment (DPH-10-009E)—effective December 21, 2010.
- Revision of Safe Drinking Water State Revolving Fund (DPH-06-009)— April 2, 2009.

Surface Water Treatment Rules

The federal Surface Water Treatment Rule (SWTR) became effective on June 19, 1989. California's Surface Water Filtration and Disinfection Treatment Regulations (SWFDTR), which implement the federal SWTR, became effective in June 1991. The SWTR established treatment and performance standards in lieu of maximum contaminant levels (MCLs) for turbidity and microorganisms Giardia, lamblia, viruses, Legionella, and heterotrophic plate-count bacteria. California's SWFDTR requires that all public water systems that use a surface water source must ensure the consumer's safety from pathogenic bacteria, viruses, and protozoans, including Giardia cysts, by providing multi-barrier treatment that, at a minimum, achieves a total of 99.9 percent (3 log) removal/ inactivation of Giardia cysts and a total of 99.99 percent (4 log) removal and inactivation of enteric viruses.

This level of treatment also provides protection from heterotrophic plate-count bacteria and Legionella as required in the federal SWTR. Filtration and disinfection are required for public water systems in order to achieve complete disinfection from pathogenic constituents. The state SWFDTR Guidance Manual stipulates that sources with coliform concentrations over 1000 MPN/100 ml during a one-year calibration period have a higher likelihood of infection with other pathogens too, and those systems were required to provide advanced treatments to meet the anticipated need for a higher level of Giardia, cryptosporidium, and virus removal.

Widespread increases in chlorine dosing to reach complete disinfection reached a tipping point as chlorinated disinfection byproducts began turning up in the finished water, causing health risks of their own. Now disinfection byproducts have their own MCLs included in SWTR LT1 and LT2.

Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) – January 2002:

- Applies to all public water systems using surface water, or GWUDI, serving fewer than 10,000 persons
- Sets a maximum contaminant level goal (MCLG) of zero for *Cryptosporidium*
- Sets a 2-log *Cryptosporidium* removal requirements for systems that filter
- Requires that watershed protection programs address *Cryptosporidium* for system that are not required to provide filtration
- Requires certain public water systems to meet strengthened filtration requirements
- Requires systems to calculate levels of microbial inactivation to address risk trade-offs with disinfection byproducts

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) – January 2006:

- Applies to all PWSs that use surface water or GWUDI
- Targets additional *Cryptosporidium* treatment requirements to higher risk systems
- Requires provisions to reduce risks from uncovered finished water storage facilities
- Provides provisions to ensure that systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts

Constituents of Concern

Beyond the topics previously mentioned, the Surface Water Treatment Rules also require a WSS like this one to evaluate potential sources of pollutants that may be adversely affecting source water. Constituents that are likely to be in the source water are natural or have their source in land management activities described in chapter 3, Erosion/sedimentation and chemical trespass of fertilizers and pesticides are the most chronic sources of pollutants likely to enter Rector Reservoir. Wildfire is potentially the worst acute episodic source of ash and sediment pollution in this very high fire-risk watershed. Excessive sedimentation and ash residues from the Atlas Peak arson fire

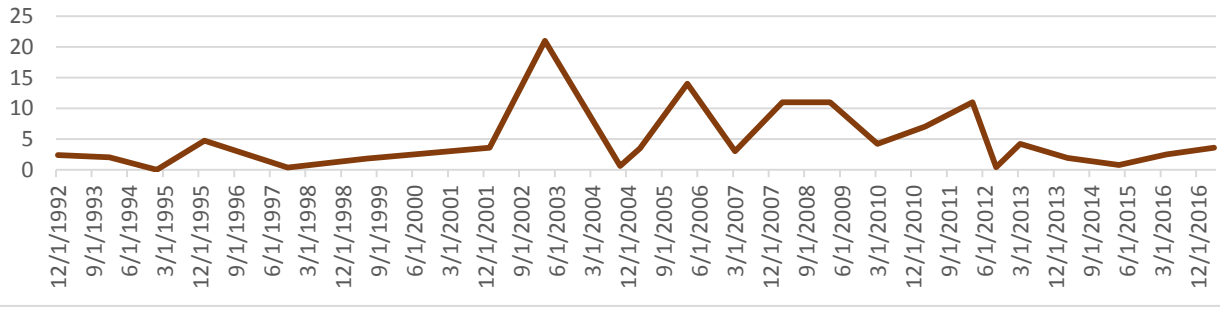
of 1981 made a mess of raw water quality that took several years to resolve. In contrast, the fire itself roasted the entirety of Rector Watershed in just seven hours during one hot windy afternoon.

During the January 2017 visit, Rector Reservoir was muddy and brown from recent heavy winter rains. In May 2017 lake waters were clear, but floating rafts of algae and a treatment infrastructure outbreak indicate summertime algal problems have begun. These two visits indicate distinct seasonal constituents of concern: suspended sediments causing turbidity in the winter and summertime algae causing taste and odor problems and infrastructure challenges in the summer.

Wintertime Turbidity

Sediments derive from upstream watershed erosion impairing water clarity downstream with cloudiness measured as turbidity. Removing particles that cause turbidity occupies the most significant portion of VH water treatments, including coagulation, filtration, and clarification. The MCL for incoming raw water turbidity is 5 NTU. More turbid sourcewaters are avoided. Finished water leaving the treatment facility must be clear at < 0.2 NTU. VH's water plant will shut down automatically after 5 minutes if treated water reaches even 0.19 NTU. Suspended sediment and other particles that make up turbidity carry other pollutants, including microscopic pathogens and pesticides attracted to sediment particles gravity and adhered tightly to their surfaces. Pollutants that don't adhere to particles directly are still usually present when turbidity is high.

Figure 5.0 Rector Source Water Turbidity 1996-2017

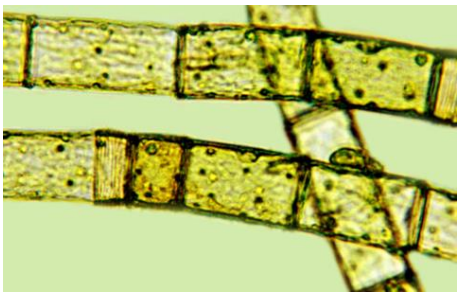


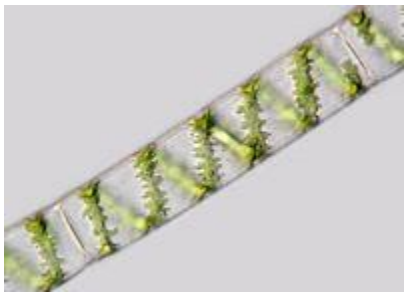


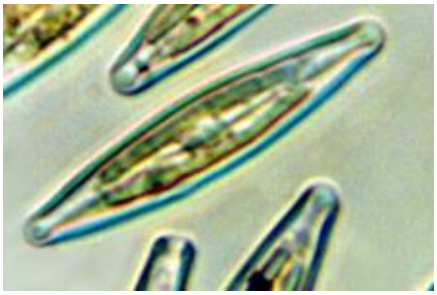
Mainstem Rector Canyon Creek water quality had mild turbidity on May 25, 2017 tjb

Algae

Two VH landscaping staffpersons and the author crossed the lake in a boat to explore Rector Reservoir on 5-26-17. Each of its 3 main inlets had floating green algal mats nearby, in various sizes and shapes that averaged 40 feet by 20 feet. These were bubbly, and were composed of filamentous algae threads in mats floating freely and extending below the surface 1-2 feet. Samples were examined under a compound microscope where some algal representatives were identified. The most abundant were representatives of Oedogonium (upper left) and the lesser Spirogyra (right). Diatoms were scattered among them amounting to less than 5% but seem likely to form a more equal balance out in the open waters. The dominant diatom was identified as the motile Navicula, pictured left.





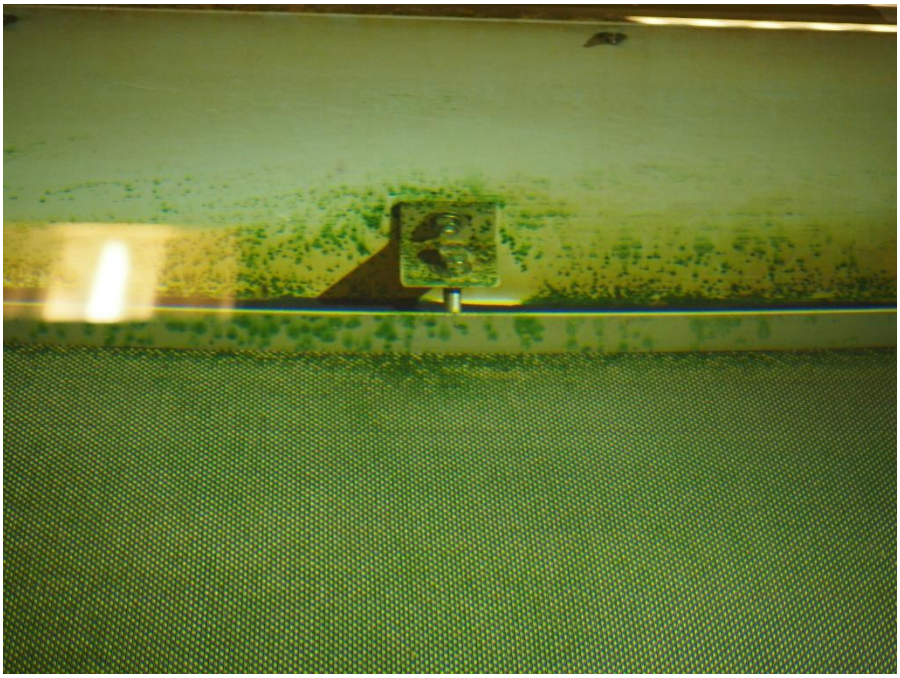


Alga Photos above: Otago Regional Council & Landcare Research
http://www.landcareresearch.co.nz/resources/identification/algae/identification-guide/identify/guide

A different, unknown, dark emerald-green alga has found its way indoors to colonize the screens and walls of the upflow clarifiers at the Rector Treatment facility. Their color and fuzzy shape indicate the alga infecting the treatment facility is not the same as the filamentous alga sampled from the reservoir. Their coloring is distinctly darker, absent of apparent filaments. Their wide dispersion suggests many tiny individuals are coating these surfaces indicating a microscopic periphyton or phytoplankton form. These have not yet been examined under the microscope. Increased frequency of scrubbing clarifier screens and walls to remove the algae, and then backwashing the apparatus, has not been completely effective at removing persistent algae so far. In 2016 the frequency of algae-related backwashing overwhelmed backwash pond storage capacity initiating a spillover to the creek beyond. To avoid reinfection, it is recommended that this alga be identified and that a customized dose of copper sulfate, etc., be considered to cleanse the entirety of the clarifier apparatus in one intensive treatment and backwash. If it returns then a more comprehensive approach might be targeted directly to the incoming source water. This issue presents an opportunity to network with Napa's other water treatment operators who may have dealt with similar algal issues. Consultation with Amy Little in the Drinking Water Division is also recommended.



Above: Rector Reservoir Algal Mat with oar for scale near south fork Rector Creek – 5-26-17 tjb





Above: Rector Treatment Plant with algae colonizing screens and walls of the upflow clarifier 5-26-17 tjb

Reservoir Treatments Using CuSO4 in the Control of Algae

Algae are often at the source of musty or fishy taste and odor in drinking water. VH operators indicate that algal problems at the lake recur most every year when the whole lake is treated to remove it. CuSO4 is the bright-blue, water-soluble crystal mineral named chalcocyanite known as copper sulfate with algaecide properties. At Rector Reservoir, this blue stone is spread across the lake in a screened mini-boat towed around the lake by a motorboat to control the lake's algal accumulations. Nine hundred pounds of copper sulfate were applied to the lake on 7-2-14, for example (E. Wooster). Though bluestone copper sulfate is widely available at low cost and is commonly used worldwide as a universal algicide, it does have side effects for applicators and fish. It is an irritant to human skin, eyes, and lungs when handled, and can be deadly for fish. Rainbow trout are particularly sensitive to even quite low concentrations.



Concentrations of 1.4 µg/L can produce a toxic effect as a physiological stress response in trout, characterized by hyperactivity, increased blood levels of the stress hormone cortisol, and synthesis of a metal-detoxifying protein, metallothionein, in fish livers (Solomon. 2009). The lake should definitely not be treated during spillover periods when the toxin would be released to downstream natural communities that include rainbow trout and steelhead, which are a protected by the Endangered Species Act. DFW is a year-round raw water customer, drawing straight source water from the reservoir for use in a fish-culture operation year-round and should be warned in advance of coming copper sulfate applications to minimize fish exposure to algaecide application.

Alternative means of algal treatment under consideration by VH management include solar-powered bees on the reservoir that would oxygenate and otherwise thwart algal reproduction by interfering with surface tension, applying ultraviolet radiation at the treatment plant, and ozonation. A treatment targeted to the raw-water pipeline at the treatment plant focus the chemical where it is needed and would minimize environmental impacts to the lake and to downstream users including the DFW raw-water fish-culture customer and protected salmonids.

http://www.ushydrotech.com/files/6714/1409/9604/Impacts_of_Copper_on_Aquatic_Ecosystems_and_human_Health.pdf

http://wildpro.twycrosszoo.org/S/00dis/toxic/MetalMineral/Copper_Toxicity.html

Microbial Pollutants in Raw Source Waters – Bacteria, Viruses, Protozoans

The microbial category of water pollutants includes pathogenic bacteria, viruses, and protozoans. These are assumed to be present at all times in natural source water. Chlorine disinfectant is applied to source waters at the treatment plant to a 4-log inactivation rate targeted for *Giardia lamblia,* whose reproductive cysts are the most resistant of the microbial class of pollutants. Source water bacteria are monitored regularly and are of interest themselves and because testing done in 2008 determined the extent to which cryptosporidium monitoring might be necessary, potentially beginning in 2014, which might be followed up with even more disinfection required.

Total and fecal coliform since 2007 were graphed over time as figures 5.1 and 5.2. Microbial pollutants impaired source water in December 2012, evident as a spike in total and fecal coliform concentrations until the event subsided later that month. Peaking total coliform of 2,419.6 occurred twice in the record suggesting both samples were beyond the maximum count possible in 100 milliliters of source water; 2,419.6 is considered "off the chart." The fecal coliform of 155.3 mpn during the same December timeframe suggests the bacterial event was caused by a warm-blooded animal either defecating into the lake or dying in a location somewhere connected to the source. A rat was found in a stilling well in the recent past, and perhaps it was the source. Another spike in total coliform on 5-6-14 did not register in the fecal chart, indicating that bacteria event in source waters was not of mammal origin during that event and suggests the event may have been caused by decomposing algae or leaf litter, dead birds or fish. An overall trend shows bacterial concentration climbed beginning in May 2014 and continued through the year. 2014 was a drought year which may have resulted in concentrating the bacteria. Disinfection that inactivates all microbial pathogens including Giardia cysts is an ongoing VH treatment, and chlorination dosing is adjusted based on bacterial source-water monitoring.

Figure 5.1 Raw Water Total Coliform (mpn/100 ml)

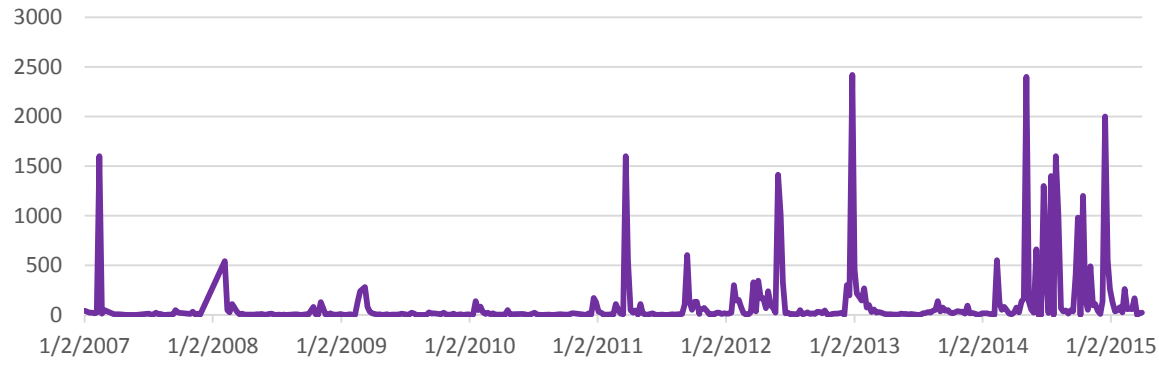
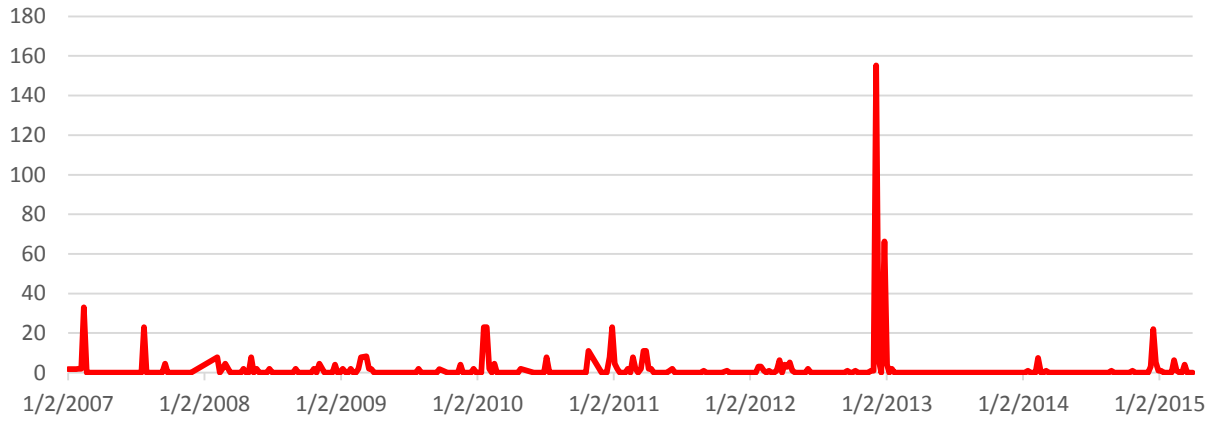


Figure 5.2 Raw Water Fecal Coliform (mpn/100 ml)



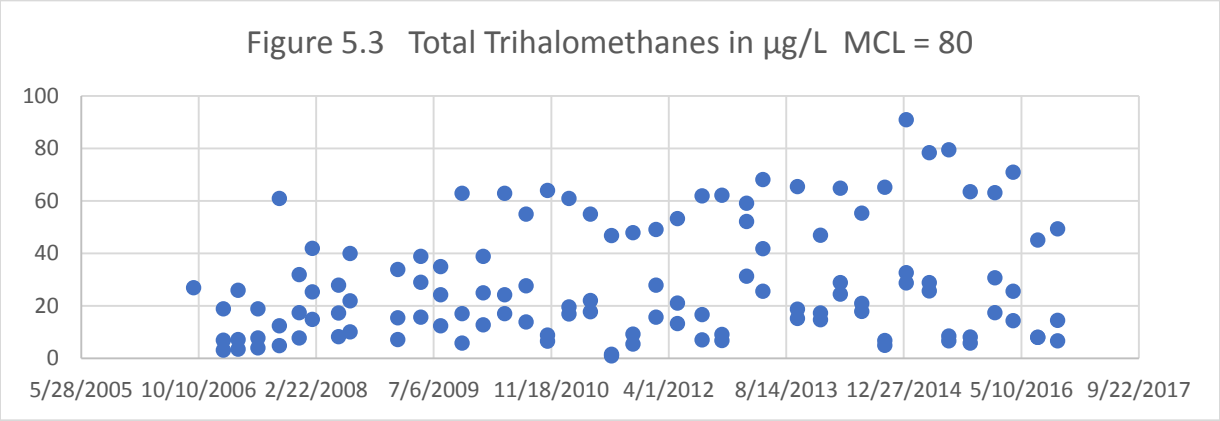
Disinfection Byproducts

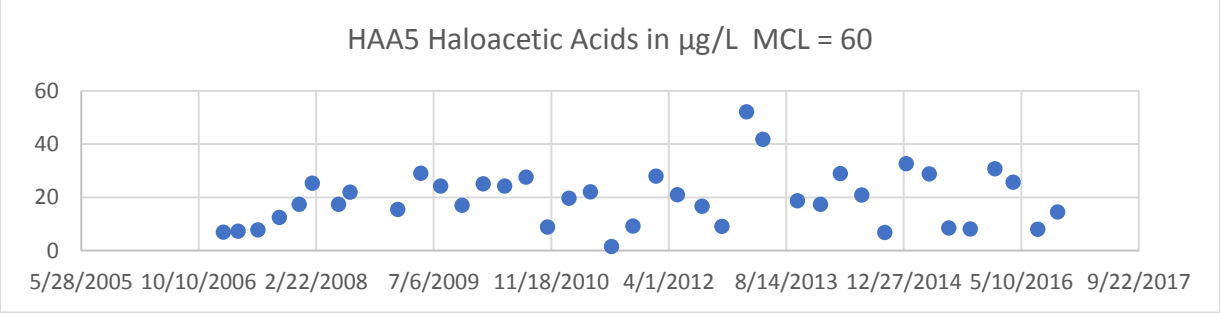
A suite of disinfection byproducts emerged across the nation as a result of the commitment to chlorine disinfection made by our government to clear the public water supply of live waterborne pathogens like cholera, shigella, etc., that devastated human health worldwide until the advent of chlorination. Disinfection chlorination must continue beyond the treatment plant to each and every home to ensure a trace of residual chlorine is measurable all the way to the last tap of the distribution system. Besides monitoring for chlorine residual, now these same taps must be monitored for disinfection byproducts that form as chlorinated water reacts with dissolved organic compounds (from algae, bugs, detritus, etc.) that are also still present in the treated water. Disinfection byproducts cause their own issues, ranging from an unpleasant taste to toxic side effects on consumers with chronic doses who may experience liver, kidney, or central nervous system problems and it may increase their risk of cancer (Calpirg, 2001). This is one factor driving the bottled water movement. Minimizing chlorine dosing to match the actual need is recommended by careful observation of bacterial concentrations in sourcewaters. Although EPA continues to require a chlorine residual, it now encourages alternate forms of disinfection such as UV radiation and ozonation. But these disinfectants do not carry a residue that can be traced to prove disinfection to the last tap. Unless the chlorine residual requirement is rescinded, sole chlorination or a combination of disinfectants must be used to stay in compliance. Small communities such as Elk, California have made ozonation their primary disinfectant and apply chlorine at the end solely to retain a measurable trace of chlorine and are able to make it work economically even with the number of ratepayers being less than 500.

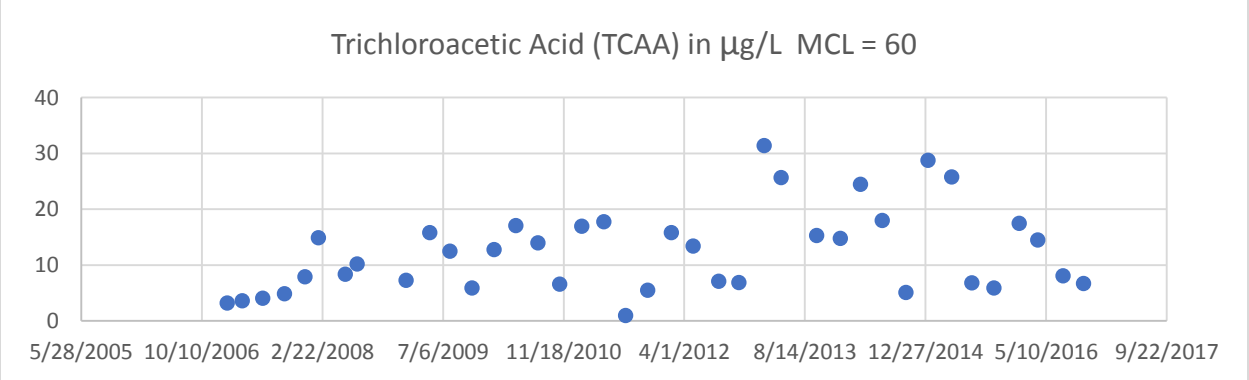
https://www.epa.gov/sites/production/files/2015-09/documents/other_than_chlorine_and_monochloramine_what_options_could_water_utilities.pdf

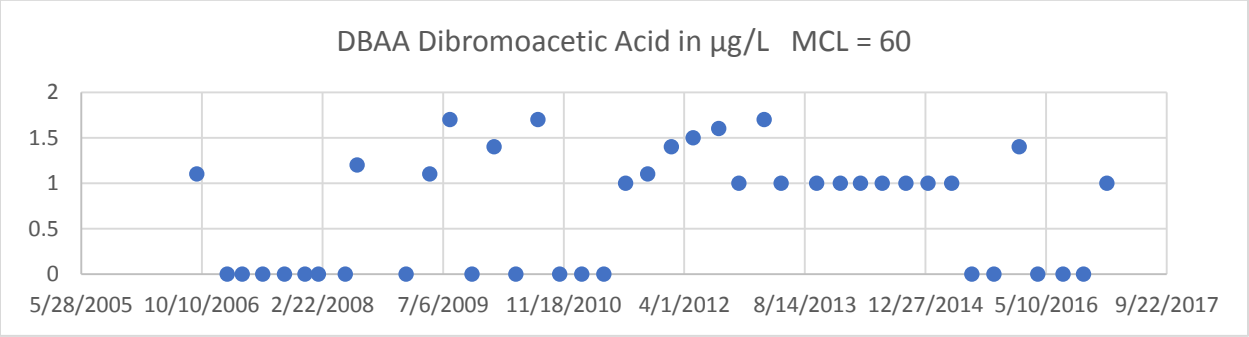
VH tests quarterly for disinfection byproducts trihalomethanes and haloacetic acids at three different water taps on its home campus, Residence #22, a hydration station, and a kitchen. Results

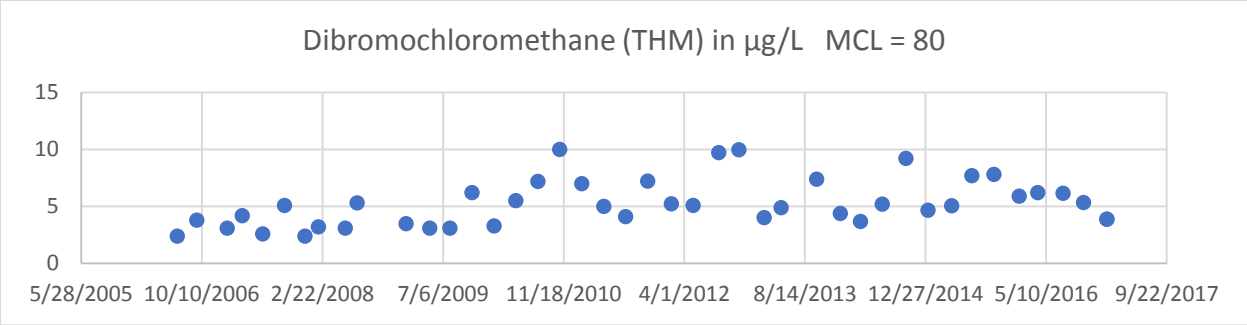
for a variety of disinfection byproducts are presented in the following graphs. The MCL for total trihalomethanes appears to have been exceeded just one time on 1-6-15 at 90.97 µg/l.

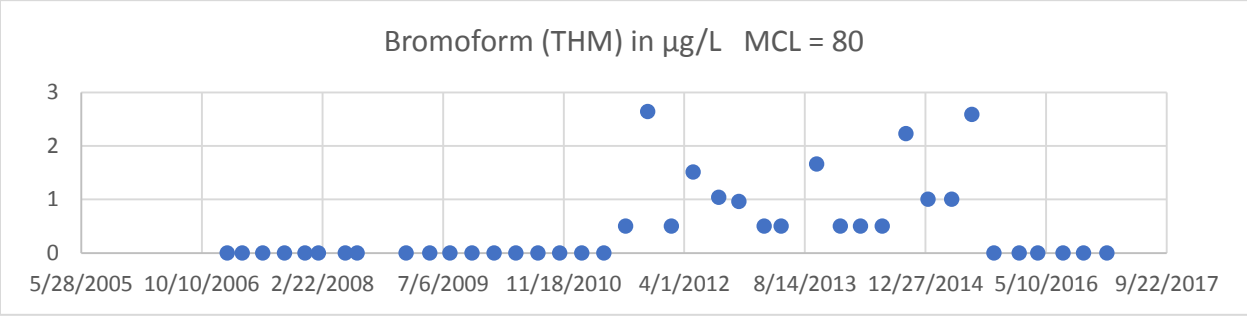


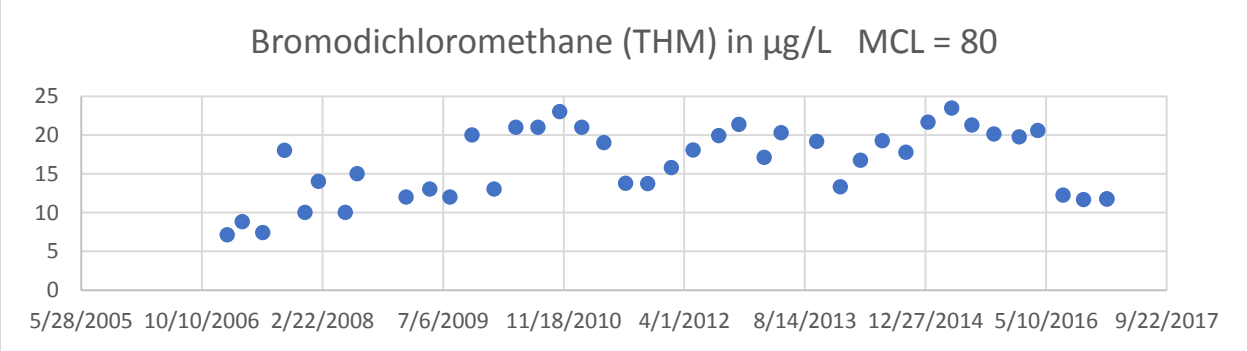


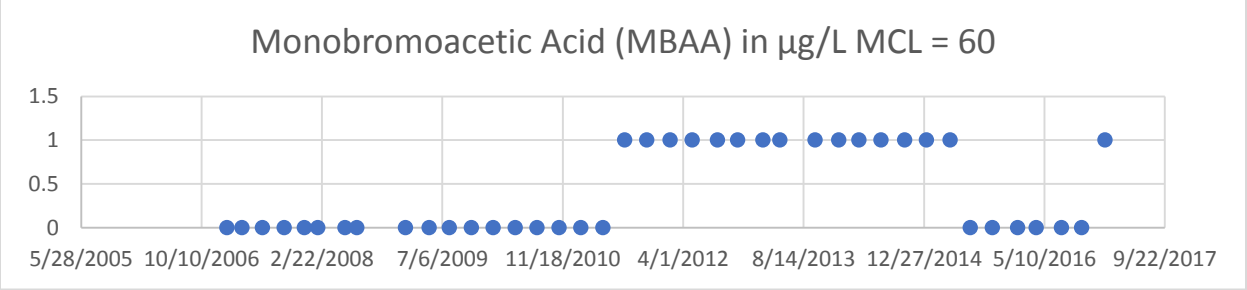












Lead and Copper

Lead and copper are unique pollutants in that instead of arriving from watershed, source waters, or from water-treatment chemicals, they usually originate at homes and other buildings where chronic corrosion leaches metals and metal alloys into drinking water from common household pipe and plumbing fixtures. Human exposure to lead and copper may cause health problems ranging from mild stomach distress to brain damage.

EPA published the first Lead and Copper Rule in the Federal Code of Regulations in 1991 to address drinking waters impaired by lead and copper concentrations. Updates to the Lead and Copper Rule in 2004 and 2007 brought education and market campaigns to increase public awareness and required help from water treatment. Legislation now requires public water systems to monitor lead and copper in drinking water at customer taps. When results indicate lead concentrations exceed an Action Level of 15 ppb (0.015 ppm) or copper exceeds an Action Level of 1.3 ppm in over 10% of customer taps sampled, the water system must take action to minimize metal corrosion by increasing pH. If Action Levels are still exceeded, the water system is responsible to inform customers about steps they should take to protect their own health such as replacement of lead or copper service pipelines with non-lead, non-copper plumbing materials.

The following chart summarizes lead and copper monitoring results at VH in relation to action levels since 2008. Lead concentrations as a group exceeded action levels in the timeframe of 2014–2016 when the lead concentration of the sampled group reached 0.027 ppm. The more recent lead-test results were within bounds, as were all copper tests.

Table 5.0 Lead and Copper Percentiles from VH Taps 2008-2017

DATE BEGAN	DATE ENDED	PERCENTILE	# TAP SAMPLES	RESULT	UNIT	METAL TEST
1/1/2008	12-31-2010	90%	27	0.357	PPM	CU90 - COPPER
1/1/2008	12-31-2010	90%	27	0.005	PPM	PB90 - LEAD
1/1/2010	12-31-2012	90%	10	0.85	PPM	CU90 - COPPER
1/1/2011	12-31-2013	90%	10	0.37	PPM	CU90 - COPPER
1/1/2011	12-31-2013	90%	10	0	PPM	PB90 - LEAD
1/1/2014	12-31-2016	90%	10	0.72	PPM	CU90 - COPPER
1/1/2014	12-31-2016	90%	10	0.027	PPM	PB90 - LEAD
7/1/2016	12-31-2016	90%	20	0.39	PPM	CU90 - COPPER
7/1/2016	12-31-2016	90%	20	0	PPM	PB90 - LEAD
1/1/2017	06-30-2017	90%	20	0.39	PPM	CU90 - COPPER
1/1/2017	06-30-2017	90%	20	0	PPM	PB90 - LEAD
7/1/2017	12-31-2017	90%	20	0.43	PPM	CU90 - COPPER
7/1/2017	12-31-2017	90%	20	0.004	PPM	PB90 - LEAD

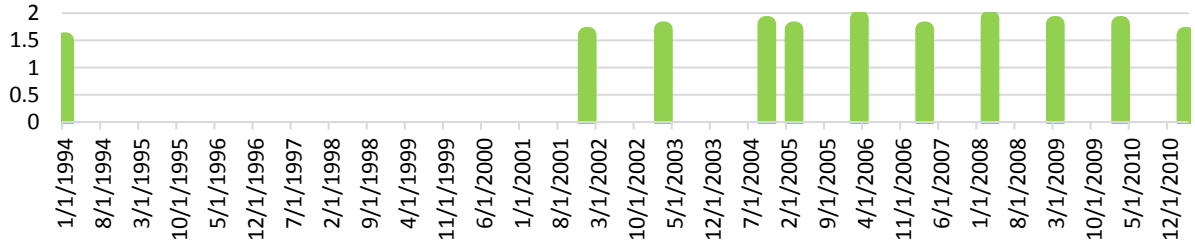
Pollutant/Chemical Trespasses

While the steep canyon sides bring a natural source of sediment, most sediment is likely eroded upstream from soils that are denuded, amended, cultivated, and converted to wine-grape agriculture. Upstream erosion on the vineyards and elsewhere increases the concentration of sediments in suspension in the reservoir, yielding high turbidity in the winter months that silently

fills the reservoir from the bottom up. In the summertime, dry, warm weather and dissolved plant nutrients stimulate algal grown that may sometimes take the form of plankton communities that bring widespread summertime turbidity. "Chemical Trespass" is a term used to describe an event in which a chemical application yields a residue that washes or blows downstream to pollute the property or resources of another. Chemical contaminants by themselves may not be observed even if they are present because the minute concentrations that might show up in raw and finished water are invisible. Other challenges to picking up traces of chemical trespass include A) the chemical composition applied is likely to change form with time and exposure to air and water; B) if testing was invoked, it would be difficult to know exactly what to test for because notification to Napa County's agricultural commissioner of applied restricted chemicals, as is required by law, is reported up to a month later than the actual application, and the information does not make it directly to VH; C) access for watershed monitoring is limited to lakeshores accessed by boat because there is no public road access to the wetted tributaries upstream; D) few of the applied chemicals would be detected in the standard suite required for source-water testing without an interactive monitoring program that tests for the chemicals currently being applied. Chapter 3 includes a list of over 100 regulated pesticides reported to Napa County's agricultural commissioner for the most recent two years. The variety of applied chemicals has increased by an order of magnitude since the first WSS in 1998 when eight different pesticides were used and reported. The chemical formulas, location, and date of chemical application would be important information on the ground floor of any targeted monitoring program, which is recommended..

Testing is required in source waters to detect some chemical trespasses. Nitrogen compounds and a suite of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs) are some of those that have required test frequencies established by EPA. For nitrate nitrogen (N) just one detection came up in Rector source water from a 4-26-16 sample, which tested at 0.41 mg/l while the MCL is 10 mg/l. Nitrite nitrogen (N) was found at concentrations ranging from 0.14-200 µg/l from 1996–2003, but since that time it was not detected at or above the detection limit of 400 µg/l, the smallest detectable concentration. Nitrate as NO3 was occasionally detected at 1.9-4.5 mg/l, and since the last WSS, concentrations were 2.0 mg/l or smaller, which are all less than the MCL of 45 mg/l. Potassium was detected at consistent concentrations over time, but no MCLs exist for potassium, though one agricultural website indicated potassium concentrations are ideally less than 20. http://agsource.crinet.com/page291/NationalDrinkingWaterRegulations

Figure 5.4 Potassium Concentration in Source Water (mg/l)



None of the regulated SOCs required for testing by water systems have ever been detected here at Rector. The list of regulated SOCs tested includes the following relatively short list comprising the same chemicals that have been tested for years without detection. It takes years of combined efforts to get a new regulation into the suite required for testing, and all the while new compounds are being created. Testing for even a popular pesticide would receive resistance from the manufacturers of popular formulas whether regulated or over-the-counter. Glyphosate, the active ingredient of Roundup, as well as its surfactant has received media attention for turning up in water supplies, but it still has not breached the group of herbicides required for testing in drinking-water sources. The fact that the following pesticide formulas required for testing have never been detected should not reassure anyone that there aren't pesticides in Rector's source water. This is because the formulas being tested do not represent the chemical formulas actually being applied. Currently the regulatory system isn't flexible enough to adjust requirements for every unique water system. But Rector could request relief from testing the list below in exchange for testing from a list of applied pesticides as reported to the Napa County Agricultural Commissioner.

Table 5.2 List of Tested Pesticides Never once Detected at Rector H = herbicide

ALACHLOR H ATRAZINE H BENTAZON H BROMACIL H BUTACHLOR H DALAPON H DINOSEB H MOLINATE H METRIBUZIN H PROPACHLOR H PROMETRYN H SIMAZINE H THIOBENCARB H 2,4,5-TP (SILVEX) H

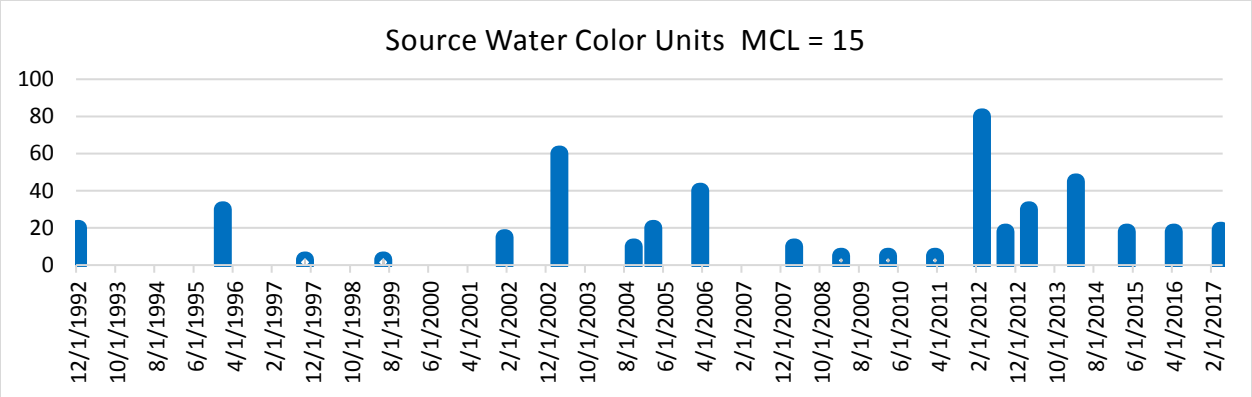
PENTACHLOROPHENOL Fungicide CARBOFURAN Insecticide DIMETHOATE Insecticide

P-XYLENE Solvent

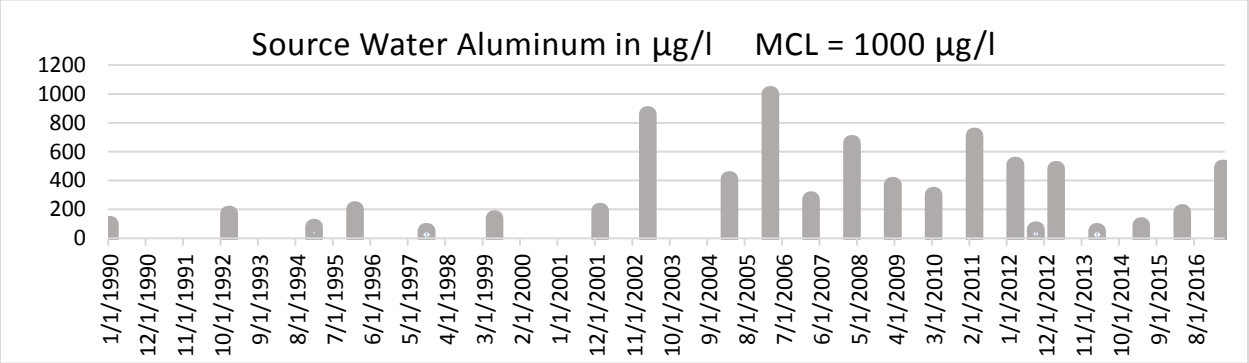
Secondary MCLs for Aesthetic Constituents

Secondary Drinking Water Regulations set guidance standards for contaminants that are not considered a risk to human health and made secondary aesthetic-scale MCLs. These MCLs guide VH in treating drinking waters for considerations such as color (MCL is 15), which showed a slight increase over time in Rector source waters, and odor (MCL is 3) which appears to be holding steady. Zinc reached a concentration of 400 mg/l on 3/4/2014, by far the highest zinc concentration on record for Rector, but it did not exceed the secondary standard of 5000 µg/l (5 mg/l). Corrosivity, like what plagued pipes in Flint Michigan, has no drinking-water standard in itself, but the Langelier Index (best above 0) suggests corrosivity is not a problem for VH (Rector's is about 1.7). To minimize corrosivity, pH should be neutral or alkaline (Rector is generally neutral at about 7) to avoid leaching of metals like lead and copper into the drinking water. Constituents that exceeded secondary standards since the last WSS were graphed on the following pages.

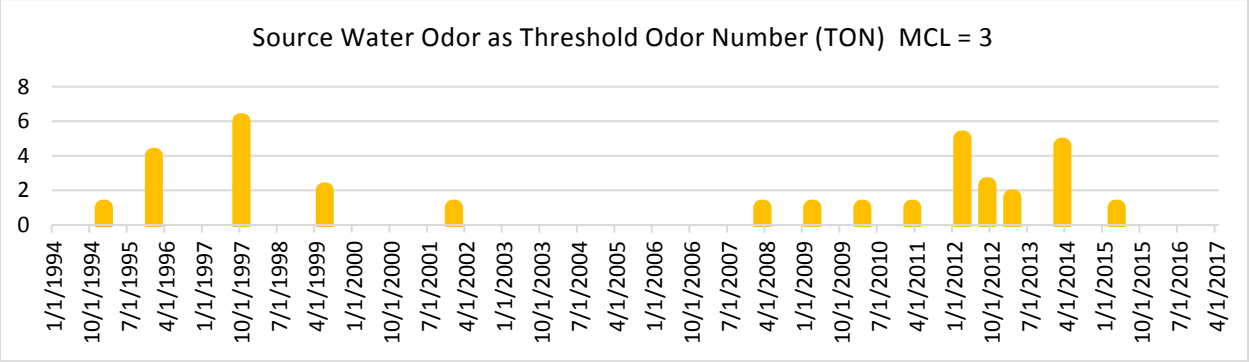
https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals



Aluminum may lend color but exceeded its MCL just once in the record so far during the last WSS.

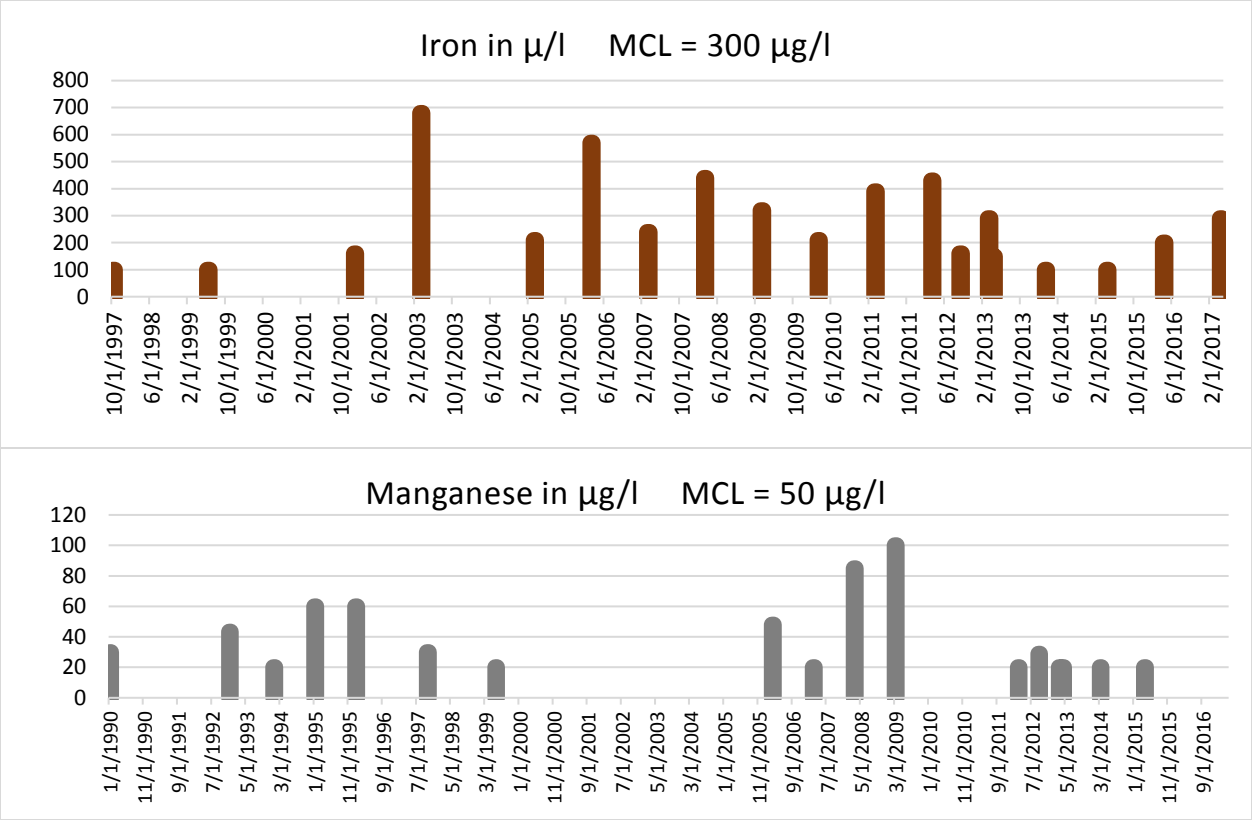


Odor levels relate to organic compounds like algae or leaf matter, reported as musty or fishy.

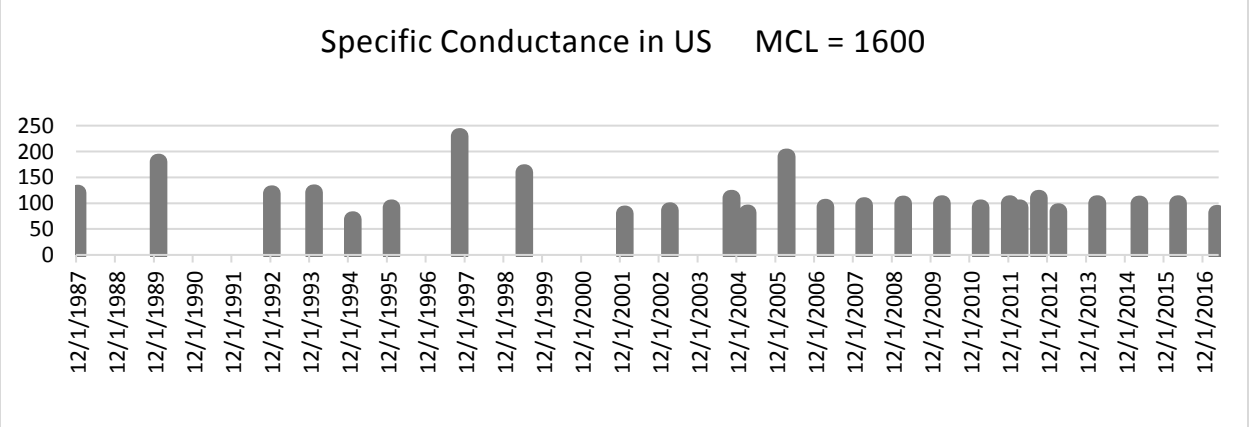


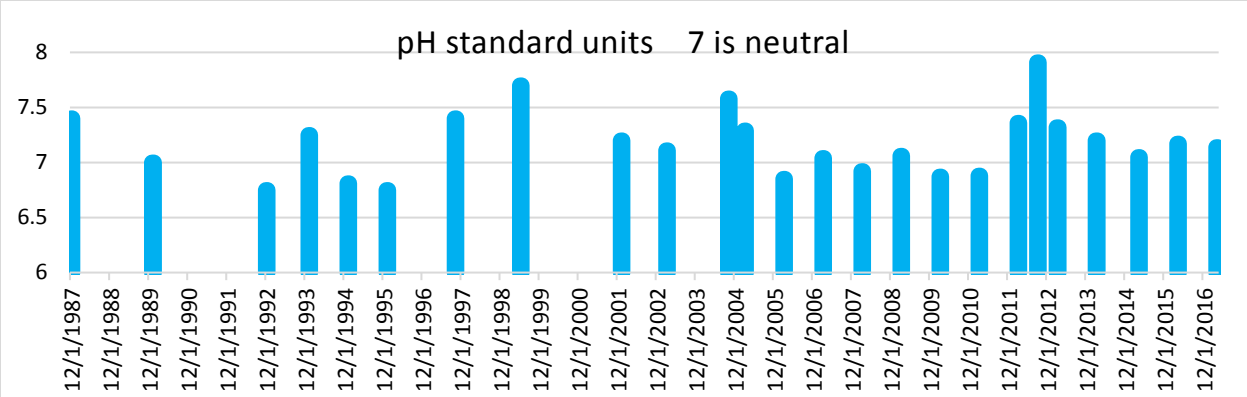
Iron and Manganese

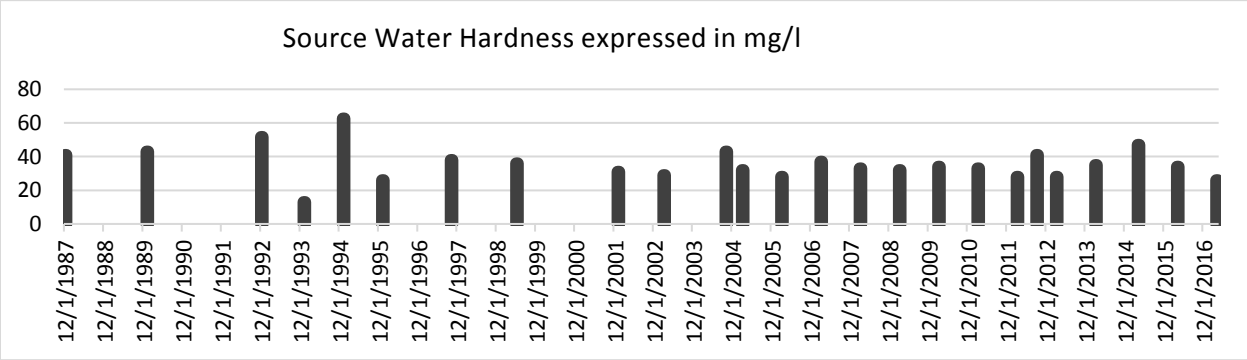
Iron and manganese are usually found together from natural mineral sources in the watershed. Secondary standards indicate porcelain and laundry staining by iron (orange or brown) or manganese (grey). Both minerals are thought to be good for the body, and drinking water is a good way to keep them in our diets.

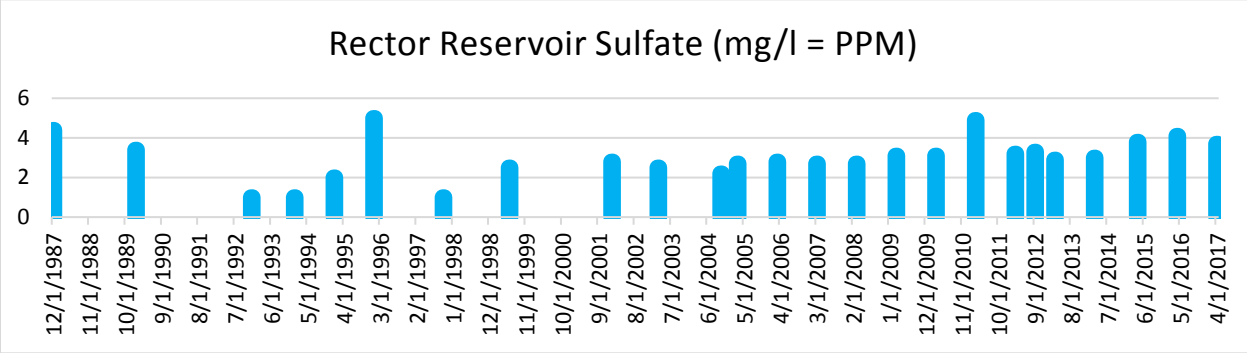


Specific conductance increases with the number and activity of dissolved ions in the source water. It is measured when test water is subjected to electric current. Conductivity has a secondary standard set 1600 µs (microsiemens) while the average in Rector is far less than 150 µs. There is not a secondary MCL for hardness but it is a basic water chemistry constituent of interest as is pH. Acid pH contributes to corrosion of lead and copper in pipes. Hardness over 100 is not ideal. Here at Rector, hardness is on par averaging under 50.









Sulfate is tested every year at Rector. The data suggest a trend in that sulfur detection occurs more frequently since about 2004. Artificial sources of sulfate include the dusting sulfur applied widely across the Rector Plateau, and the copper sulfate applications to the lake as algaecide.

Monitoring Programs

VH monitoring programs area in compliance with its Drinking Water Permit. There is no monitoring program beyond water testing required by law and surveillance efforts at the lake. Asbestos and Gross Alpha radiation are the next required analytical tests to be run on source water as samples. They are due in May 2017 according to the California Drinking Water schedule here and online at:

https://sdwis.waterboards.ca.gov/PDWW/JSP/MonitoringSchedules.jsp?tinwsys_is_number=3224&tinwsys_st_code=CA&counter=0#

Table 5.3. Recent Source Water test results and Required Monitoring Schedule

GENERAL POLLUTANTS - SECONDARY MCL			RESULT	UNIT	MCL	TRIGGER	DATE	FREQUENCY	NEXT
00440	BICARBONATE ALKALINITY		30	MG/L	------	--------	2017/04/18	12	2018/04
00916	CALCIUM		5.1	MG/L	------	--------	2017/04/18	12	2018/04
00445	CARBONATE ALKALINITY	<	ND	MG/L	------	--------	2017/04/18	12	2018/04
00940	CHLORIDE		5.0	MG/L	500	--------	2017/04/18	12	2018/04
00081	COLOR		19	UNITS	15	--------	2017/04/18	12	2018/04
01042	COPPER	<	ND	UG/L	1000	50	2017/04/18	12	2018/04
38260	FOAMING AGENTS (MBAS)		0.068	MG/L	.5	--------	2017/04/18	12	2018/04
00900	HARDNESS (TOTAL) AS CACO3		26	MG/L	------	--------	2017/04/18	12	2018/04
71830	HYDROXIDE ALKALINITY	<	ND	MG/L	------	--------	2017/04/18	12	2018/04
01045	IRON		290	UG/L	300	100	2017/04/18	12	2018/04
00927	MAGNESIUM		3.3	MG/L	------	--------	2017/04/18	12	2018/04
01055	MANGANESE	<	ND	UG/L	50	20	2017/04/18	12	2018/04
00086	ODOR THRESHOLD @ 60 C	<	ND	TON	3	1	2017/04/18	12	2018/04
00403	PH, LABORATORY		7.14		------	--------	2017/04/18	12	2018/04
01077	SILVER	<	ND	UG/L	100	10	2017/04/18	12	2018/04
00929	SODIUM		4.2	MG/L	------	--------	2017/04/18	12	2018/04
00095	SPECIFIC CONDUCTANCE		81	US	1600	--------	2017/04/18	12	2018/04
00945	SULFATE		3.7	MG/L	500	.5	2017/04/18	12	2018/04
70300	TOTAL DISSOLVED SOLIDS		86	MG/L	1000	--------	2017/04/18	12	2018/04
82079	TURBIDITY, LABORATORY		3.6	NTU	5	.1	2017/04/18	12	2018/04
01092	ZINC	<	ND	UG/L	5000	50	2017/04/18	12	2018/04
	INORGANIC CONSTITUENTS								
01105	ALUMINUM		490	UG/L	1000	50	2017/04/18	12	2018/04
01097	ANTIMONY	<	ND	UG/L	6	6	2017/04/18	12	2018/04
01002	ARSENIC	<	ND	UG/L	10	2	2017/04/18	12	2018/04
81855	ASBESTOS	<	.0000	MFL	7	.2	2008/05/27	108	2017/05
01007	BARIUM	<	ND	UG/L	1000	100	2017/04/18	12	2018/04
01012	BERYLLIUM	<	ND	UG/L	4	1	2017/04/18	12	2018/04
01027	CADMIUM	<	ND	UG/L	5	1	2017/04/18	12	2018/04
01034	CHROMIUM (TOTAL)	<	ND	UG/L	50	10	2017/04/18	12	2018/04
01032	CHROMIUM, HEXAVALENT	<	ND	UG/L	10	1	2015/11/10	108	2024/11
00951	FLUORIDE (F) (NATURAL-SOURCE)	<	ND	MG/L	2	.1	2017/04/18	12	2018/04
71900	MERCURY	<	ND	UG/L	2	1	2017/04/18	12	2018/04
01067	NICKEL	<	ND	UG/L	100	10	2017/04/18	12	2018/04
A-031	PERCHLORATE	<	ND	UG/L	6	4	2017/04/18	12	2018/04
01147	SELENIUM	<	ND	UG/L	50	5	2017/04/18	12	2018/04
01059	THALLIUM	<	ND	UG/L	2	1	2017/04/18	12	2018/04

	NITRATE/NITRITE								
00618	NITRATE (as N)	<	ND	mg/L	10	.4	2017/04/18	12	2018/04
00620	NITRITE (AS N)	<	ND	UG/L	1000	400	2015/10/27	36	2018/10
	RADIOLOGICAL								
01501	GROSS ALPHA	<	.0000	PCI/L	15	3	2008/05/27	108	2017/05
	REGULATED VOCs								
34506	1,1,1-TRICHLOROETHANE	<	ND	UG/L	200	.5	2016/03/29	36	2019/03
34516	1,1,2,2-TETRACHLOROETHANE	<	ND	UG/L	1	.5	2016/03/29	36	2019/03
34511	1,1,2-TRICHLOROETHANE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34496	1,1-DICHLOROETHANE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34501	1,1-DICHLOROETHYLENE	<	ND	UG/L	6	.5	2016/03/29	36	2019/03
34551	1,2,4-TRICHLOROBENZENE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34536	1,2-DICHLOROBENZENE	<	ND	UG/L	600	.5	2016/03/29	36	2019/03
34531	1,2-DICHLOROETHANE	<	ND	UG/L	.5	.5	2016/03/29	36	2019/03
34541	1,2-DICHLOROPROPANE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34561	1,3-DICHLOROPROPENE (TOTAL)	<	ND	UG/L	.5	.5	2016/03/29	36	2019/03
34571	1,4-DICHLOROBENZENE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34030	BENZENE	<	ND	UG/L	1	.5	2016/03/29	36	2019/03
32102	CARBON TETRACHLORIDE	<	ND	UG/L	.5	.5	2016/03/29	36	2019/03
77093	CIS-1,2-DICHLOROETHYLENE	<	ND	UG/L	6	.5	2016/03/29	36	2019/03
34423	DICHLOROMETHANE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34371	ETHYLBENZENE	<	ND	UG/L	300	.5	2016/03/29	36	2019/03
46491	METHYL-TERT-BUTYL-ETHER (MTBE)	<	ND	UG/L	13	3	2016/03/29	36	2019/03
34301	MONOCHLOROBENZENE	<	ND	UG/L	70	.5	2016/03/29	36	2019/03
77128	STYRENE	<	ND	UG/L	100	.5	2016/03/29	36	2019/03
34475	TETRACHLOROETHYLENE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34010	TOLUENE	<	ND	UG/L	150	.5	2016/03/29	36	2019/03
34546	TRANS-1,2-DICHLOROETHYLENE	<	ND	UG/L	10	.5	2016/03/29	36	2019/03
39180	TRICHLOROETHYLENE	<	ND	UG/L	5	.5	2016/03/29	36	2019/03
34488	TRICHLOROFLUOROMETHANE	<	ND	UG/L	150	5	2016/03/29	36	2019/03
81611	TRICHLOROTRIFLUOROETHANE (FREON 113)	<	ND	UG/L	1200	10	2016/03/29	36	2019/03
39175	VINYL CHLORIDE	<	ND	UG/L	.5	.5	2016/03/29	36	2019/03
81551	XYLENES (TOTAL)	<	ND	UG/L	1750	0.5	2016/03/29	36	2019/03
	REGULATED SOCs								
39045	2,4,5-TP (SILVEX)	<	1.0000	UG/L	50	1	2011/01/18	108	2020/01
39730	2,4-D	<	10.0000	UG/L	70	10	2011/01/18	108	2020/01
39033	ATRAZINE	<	ND	UG/L	1	.5	2017/03/14	36	2020/03
38432	DALAPON	<	10.0000	UG/L	200	10	2011/01/18	108	2020/01
39055	SIMAZINE	<	ND	UG/L	4	1	2017/03/14	36	2020/03

Evaluation of VH's Ability to Meet Surface Water Treatment Rules

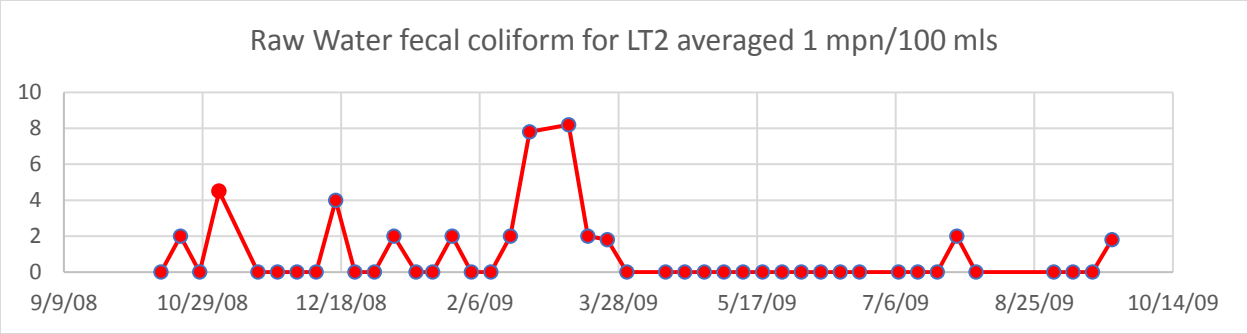
The Surface Water Treatment Rules required source water monitoring beginning in 2008 to evaluate threat of cryptosporidium as per the table on the next page. VH performed the required monitoring during the allotted one-year period for total coliform and for *E. coli,*

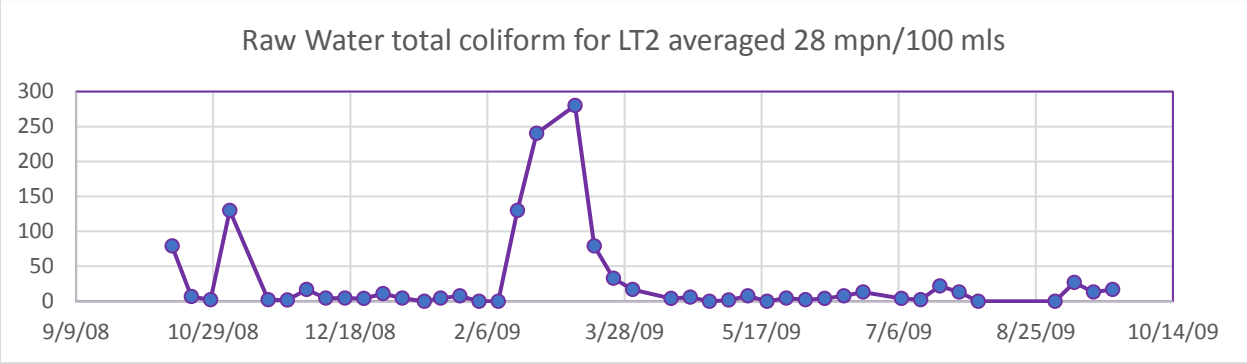
The graphs on the next page represent the snapshot in time 2008–2009 when all California water systems including VH tested microbial concentrations in raw source water to comply with the latest refinement of the SWTR, the LT2. For Rector, this testing period resulted in an average value of 28 mpn for total coliform and 1 mpn for fecal coliform in source waters. Both types of bacteria peaked in testing on March 10, 2009 but did not exceed the 1000 threshold for Total Coliform that would have required more extensive and expensive cryptosporidium monitoring and perhaps a treatment upgrade. SWTR also requires public water systems that use a surface water source to provide reduction of Giardia and viruses by 99.9% (3-log) and 99.99% (4-log), respectively. This is to be achieved by filtration (removal) and disinfection (inactivation). Since VH employs filtration, clarification, and disinfection, VH is meeting the SWTRs. Disinfection is steady and ongoing, resulting in disease-free drinking water for all its customers.

Table 5.4 LT-2 Testing Schedule and Results for SWTR Mirobial Calibration Period

SCHEDULE	Monitoring begins	Monitoring duration	Monitoring parameters and sample frequency requirements		
			Cryptosporidium	*E. coli*	*Turbidity*
SCHEDULE 4*: *Small filtered systems (serving fewer than 10,000)*	*October 1, 2008*	*1 year* [a,d]	*See next row* [§]	*Every two weeks*	*N/A*
Small unfiltered systems (serving fewer than 10,000) <u>*and*</u> [§] *Small filtered systems exceeding E. coli* trigger levels [d] *or that elect to proceed directly to Cryptosporidium monitoring or that fail to conduct E. coli monitoring*	April 1, 2010	1 year [b], 2 *Cryptosporidium* samples per month, or 2 years [e], 1 *Cryptosporidium* sample per month		N/A	N/A







Recommended Water Quality Monitoring Program

A monitoring program for water quality would have a goal of detecting and quantifying incoming pollutants that are not already addressed by VH treatments but might be controllable or treatable if we knew more about them. While erosion and sedimentation are already regulated by Napa County and DFW, the major watershed pollutants that haven't already been addressed are the pesticides applied in the upper watershed on agricultural grape vineyards. Since nutrients are also applied there, the program might add N P K fertilizers due to their stimulation of lake algae and health effects on VH clients. Approaches to such an endeavor should include partnerships with Napa County's agricultural commissioner who would share the CalAg database of the timing of reported chemical applications. Other partners might include Fish Friendly Farming and Napa Green, which are already up and running with ecological-minded vintners. Yountville might assist as a water consumer if they are interested in pesticide residues. DFW stakeholders are likely considering their fish culture and their Napa River Steelhead Restoration Program as to pesticide effects on protected Napa River steelhead. Sources to learn from include the Lake Tahoe project and the California Bay-Delta monitoring projects that are investigating pesticide effects on fishes.

Another monitoring need expressed by the Rector Watershed residential community is to determine whether sound implementation of erosion-control plans, prepared to reduce sediment impacts form wine-grape conversions, is effective at holding watershed soils in place.

Monitoring always sounds simple and straight forward. But it gets complicated quickly as the results roll in. It is best undertaken with a team of talent who can standardize the equipment used and the reporting units measured in order to minimize the effort and target the project efficiently.



Slide excerpt from EPA's webinar *Water System Partnerships (aired on 5/30/2017) Tarquinio.Ellen@epa.gov*

6 CONCLUSIONS AND RECOMMENDATIONS

Cultivate New Partnerships to Improve Water Quality

One overarching conclusion is that the challenges of today that face VH and that face other water systems, might best be resolved by working together, especially stakeholders interested in improving water quality for their own reasons. Expanded partnerships touches on many of the recommendations offered below to spread costs, share skills, and improve customer service. Vets Home's primary mission is in the care of veterans returning from service, yet it serves many of the functions of a city, especially considering that Yountville is supported by the VH water supply. Veterans Home is already partnered with Yountville, and thanks to a $4.5 million appropriation by taxpayers in 1998, it has also partnered with the Citizens of California. Other partners include volunteer firefighters at the Soda Canyon Fire Station, the county sheriff, Napa County's agricultural commissioner and its planning commission, Sutro Ranch, regular citizens, other local water districts and water agencies, the California Rural Water Association, and the plateau agricultural farmers in Rector, who can be powerful partners with their hands already active in the soils of the contributing watershed area. The Napa County RCD is already partnered with Napa County and has a rapport with agricultural developers. Another, more intimate partner is DFW across the street, which manages part of VH property for wildlife and is a raw-water customer for its fish-culture operation, which is already sensitive to water quality. Expanding these partnerships will help resolve areas of shared interest and ultimately improve Rector Water Quality.

Encouraged by the EPA and state water agencies, this concept is has broad support from by Amy Little at the Santa Rosa office of California's drinking water program. A 5/30/17 webcast was meant to inspire such cooperative endeavors and described the benefits partnerships can bring to the water system, the state, and the customer.

Recommendation Dedicate a part-time liaison who is knowledgeable about the water system and its challenges, to explore current partnerships with DFW, Napa County's agricultural commissioner and board of supervisors, the town of Yountville, Sutro Ranch, the Soda Canyon Fire Department, etc. Try a monthly "lunchbox" meeting at Vets Home with the first topic being control of algae and pass around a list, so other topics of mutual interest might be considered.



Watershed Protection Open Space are Key to Protecting Water Quality

Watershed conservation and drinking-water protection go hand in hand, as endorsed by the AWWA guide to Watershed Sanitary Survey. Watershed conservation is a key strategy for drinking watersheds like Bull Run in Portland where the whole watershed is managed by the water authority. BLM and the Sutro Ranch are open spaces here that protect water quality simply by remaining undeveloped and ecologically functional like the VH lands managed by DFW for wildlife values. New open-space partnerships were a major theme of the May 25, 2017 conference hosted by the Napa County RCD. Speaker Andrea Mackenzie from Santa Clara Valley Open Space Authority explained that while we have viewed ecosystem services as never-ending "free" public resources, this view is no longer valid. Consumers do buy their water quantity for a price enumerated on our water bills, but how much is water *quality* worth, and how can Rector users invest to secure sustained water quality for the future?

Sonoma Ag Preservation and Open Space District's Karen Gaffney explained her success in funding a taxpayer land purchase of a private ranch in the Dry Creek Watershed. That public purchase edged out an alternate offer from a subdivision developer. Since urbanization is recognized as the most pollutive land-use stressor for downstream water resources, the subdivision would have increased the pollutant load to Lake Sonoma—a primary water source for people from Windsor to Novato. The avoided subdivision pollutants include street runoff with zinc and copper, oil and grease, plus septic system leachate that includes nutrients, pharmaceuticals, personal health-care products, and bacteria. Instead, the taxpayers saw an investment opportunity to preserve a suite of ecological services that protects their water quality into the future.

Fish Friendly Farming is a relevant partner that certifies grapes grown while also protecting the riparian corridors. Napa Green offers environmental certification for vintners that emphasizes water conservation and protecting biodiversity by reducing the application of pesticides and reducing soil erosion. Partnering with advocates of fish and bees works because what is good for wildlife is also good for water quality. Napa wine connoisseurs happily pay high prices for high-quality wine, and that definition increasingly includes organically grown, bee-friendly grapes.

Benefactors like Mrs. Sutro have played a major role in land conservation that benefits downstream water quality. She donated her family's Atlas Peak ranch to be managed for open space in perpetuity. Perhaps veterans living at VH might learn about their watershed and choose to donate to a fund set up for similar land-trust ventures.

Land trusts and open space districts have secured environmental services for public recreation and wildlife values for some time now, but the lens is broadening to include agricultural partners. Since agriculture is the main watershed land use at Rector, it makes sense to work with them. The Sonoma example conserved a portion of their purchase as agricultural reserve.

SodaCanyon.org is a group of residents living near Soda Canyon Road. They are working to protect Soda Creek and beyond into Rector. Their goals are common to those of VH because they are opposing development that would bring pollutants into Rector Reservoir. A primary example

is their fight against the proposed Mountain Peak Winery. Bringing so many visitors all the way up Soda Canyon Road for wine tasting will put a heavy strain on the narrow winding road, bring parking-lot pollutants, and introduce more turbidity into Rector Reservoir because most controllable erosion is related to roads.

California Department of Fish and Wildlife run a fish-culture operation next door across Silverado Trail. Partnering with CDFW monitoring incoming sourcewater quality might help identify whether their fish project is suffering from byproducts of the variety of chemicals applied on the Rector Plateau vineyards. Perhaps they might set up a monitoring program to identify whether the effects of PAN "bad actors" pesticides are affecting fishes. Commonly, fish suffer in their reproductive phases when hormonal changes manifest from exposure to pesticides in the water they swim in.

The town of Yountville can be a partner in the form of customers valuing high water quality with a taxpayer base. As a downstream water user, Yountville can also comment on watershed developments like new projects being considered by Napa County, where more wildlands would be converted to vineyards. Another voice championing water quality would help Napa County push for better erosion control, stronger pesticide controls, and wider riparian buffers. Costs of professional-level research could be shared with Yountville in developing "credible evidence" that proposed projects do present a risk of erosion and downstream sedimentation or chemical trespass. Sedimentation and chemical trespass go hand in hand because pesticides are attracted to sediment particles, thus the two pollutants travel together and might be more readily detected by a joint monitoring program between VH and Yountville.

The Napa County RCD may be the most effective organization to approach because they are already associated with many of these groups. Their association includes the Natural Resource Conservation Service, which has technical expertise in environmental modeling often undertaken by project proponents and can function as unbiased technical assistance for Veterans Home. Because NCRCD sponsored a symposium that featured open space and agricultural reserves, and honed in on water-quality issues that face Napa steelhead and humans as well, they are positioned to understand VH issues and how they fit into the larger landscape of agriculture, fishes, and people. NCRCD could help VH embark on new partnerships with ag districts, open space districts, and land trusts to help Vets Home protect its water supply in perpetuity.

Recommendation VH should cultivate partnerships with Sutro Ranch and other open space districts to further watershed protection by purchasing land for its inherent ecological services.

Recommendation Create an endowment for VH residents to fund watershed monitoring, conservation, and protection.

Rethink Hinman Water Resources for VH and the Napa River Fishery

The Hinman water source used by VH in its earliest years is still a viable water supply. Its watershed appears to have no developments, so the water is presumably pure compared to Rector with its large tracts of vineyards upstream. While Hinman is not connected to a treatment facility, its

waters could be used directly by VH to irrigate its landscaping without treatment, but it might require a separate piping system, like the purple pipes that indicate non-potable treated wastewater for irrigation, to avoid cross-connections. This would increase the amount of finished water available from Rector for other purposes or to be released to sustain the downstream fishery. Alternatively, the Hinman dam and waterway could be restored to natural conditions for fisheries benefits right there at Hinman, since early DFW records do indicate that it hosts native salmonids. While such a move might not appear to benefit VH directly, the water itself is of value, as is the instream habitat that hosts a native fishery. "Ecosystem services" is a term whose time has come, and when viewed through a lens of fisheries restoration, water and habitat are critical elements that VH controls and can negotiate with.

Recommendation Employ the Hinman water resources or trade them to advocates of Napa River fisheries for other benefits needed by VH through its partnership with DFW.

Constituents of Concern – Sediments and Turbidity Still Challenges to VH

Soil erosion and downstream sedimentation have always been constituents of concern for VH Water Treatment Plant and its customers. This was discovered in spring 1998 when VH water system was shut down for consistently failing to meet turbidity standards. The plant was ultimately revived by infusion of $4.5 million dollars from a taxpayer appropriation for filtration renovations that took years before the system returned to service. The culprit was not VH, said Amber Manfree, PhD, and watershed resident. The treatment-plant failure was brought on by accelerated watershed erosion across newly developed vineyards in the 1990s. Though Napa County approved these, the erosion went on unchecked across the Rector Plateau. The taxpayers of California paid the bill for VH treatment-plant renovation while the wine industry reaped the profits. The May 2017 approval of the Mountain Peak Winery by Napa County's board of supervisors indicates that Napa County will probably approve all agricultural or winery projects proposed on the remaining undeveloped properties until the watershed is completely built out. This can be expected unless downstream affected users respond with "credible evidence" that downstream water quality will suffer as a result. VH does not have the capacity on its own to respond with such "credible evidence" in the twenty-one-day comment period it is offered. In the meantime, proponents will invest in engineered erosion-control plans that meet the county's criteria, and if the plans work as advertised, there should be no net increase in sedimentation to Rector Creek.

Recommendation Stakeholders for Rector water quality will need to unite and pool resources to demand high performance from agricultural erosion-control plans or submit "credible evidence" to resist future developments during the public comment period to protect Rector source-water quality.

Mountain Peak Winery will be carving a formidable system of wine caves out of the Rector Plateau, generating 71,400 cubic yards of spoils to be recultivated, converted to road gravel, or reshaped for landscaping. Beyond the potential turbidity-treatment problems is sedimentation. The

lowermost inlet openings of the water tower have already silted over. VH will someday need to remove the accumulated sediments or forego the water storage it is permitted.

Recommendation Hire a part-time liaison or add this task to an existing VH staff person, with a background in watershed management or watershed treatment, who can explain the vulnerabilities of Rector water quality to Mountain Peak project staff. This will aid in project development that also protects Rector source water quality.

Recommendation Embark on monitoring to establishes baseline conditions so pollution events caused upstream can be traced back to responsible parties who can fund rehabilitation next time.

Monitor for Chemical Trespass of Plant Nutrients and Pesticides

The number of pesticides applied to grape vineyards on the Rector Plateau has doubled since the last WSS in 2009. It is uncertain how much chemical is applied or how often, but this information is collected by the Napa County Agricultural Commissioner. The health risks for people and the environment downstream are considerable. In other watersheds, such residues might be partly secured in storage with sediment in gravel bars or floodplains. Since Rector Canyon is steep and confined, there is no open space to spread and deposit them so they head straight to the source water. Treatment practices targeted to remove sediments will remove some of these, but the dissolved portion will slip past treatments. The pesticides on the list of required testing does grow with time but will never flex to match the chemicals actually being applied in every watershed. Linking real chemical applications to water-quality testing is a necessary step to ever detecting the actual pesticides and evaluating their impacts downstream. Such a step would answer the "credible evidence" challenge given to VH by Napa County, which has the power to control the future of watershed development here. DFW has in-house expertise to plan an effective and respected monitoring program. Napa County's Agricultural Commissioner would be a necessary partner by way of their Ag-AP program where pesticide information is uploaded by pesticide applicators. Rector could be a pilot location, but the program could become widespread in Napa steelhead watersheds where there is a major focus on restoring certain stream reaches because Napa River historically hosted the biggest steelhead population in San Francisco Bay. Napa County RCD might administer the program and help gain a critical mass to get such a project rolling.

Recommendation Liaison should reach out to DFW, Napa County Ag Commissioner advisor, Napa Green, Napa County RCD, and Soda Canyon stakeholders in developing programs designed to monitor chemical constituents downstream from those applied upstream in the grape-farming industry to determine whether applied pesticides influence Rector water quality. A monitoring station might be set up on BLM land if it can be accessed readily. It is widely known that the Napa River is impaired by chemicals, and recent work in the Delta shows that pesticides reduce fish fecundity. The major push to restore habitat for Napa River steelhead requires the water itself, because certain reaches are dry in the target area, which would open up historical fish reaches. VH could partner here without cost by releasing more bypass flows in critical summer months or during spawning season, which a recent lawsuit against VH has pressed.



Purest waters belong to the South Fork without upstream pesticide applications 5-26-17 tjb

Constituent of Concern – Filamentous and other Algae

Filamentous thread algae are tiny floating plants that build up to plague Rector Reservoir regularly beginning in the summer and extending to fall die-off. In most years, VH staff has battled algae by spreading the algaecide copper sulfate across the lake source water. The poison management of algae is done to remove a fishy/musty odor from drinking water. Algal mats were noticed and sampled during the boat survey on the lake on May 26, 2017. Copper sulfate is toxic to fish in low concentrations. Nine hundred pounds of CuSO4 was spread to dissolve in the reservoir on July __ 2014. Rector source waters have been sulfate-tested and copper-tested since 1987 but have never been tested for copper sulfate. While sulfate is commonly detected at low concentrations, copper has never been detected in source waters. The EPA limit for copper in drinking water is 1 ppm, set to prevent a disagreeable taste and to protect consumers from potential copper toxicity. Internet research did not turn up an MCL or SMCL for copper sulfate. Circulation/aeration with solar bees is being considered.

http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/copper-sulfate-ext.html#10

Recommendation Reconsider the purpose of whole lake $CuS0_4$ treatments in the context of maintaining healthy bypass flows for the downstream fishery to evaluate the risk of poisoning downstream fishes. Treating whole lake algae would put off bacteria loading and decay come fall. Lack of lake treatment would allow colonial growth to expand unchecked and may lead to questioning nutrient loading by upstream agricultural practices. Relocating algicide treatments to the raw water pipeline entering the treatment facility would: reduce the amount needed, treat

only that water intended for drinking water, spare the lake, and avoid incidental poisoning of wild rainbow trout in the lake, at CDFW, and downstream.

Constituent of Concern – Wildfire

On some hot summer day, wildfire can be expected to return to Rector. CAL FIRE has consistently mapped Rector as a very high fire-severity rating due to its steep canyon and tinder dry fire-loving chemise and chaparral vegetation. Wildfire burned across the entirety of Rector watershed in 1981 during the Atlas Fire. The most recent wildfire began by burning veg cleared for new vineyards.

Recommendation Liaison should approach Soda Canyon Fire Station and CAL FIRE to develop a program to implement fire safe land practices across the watershed.

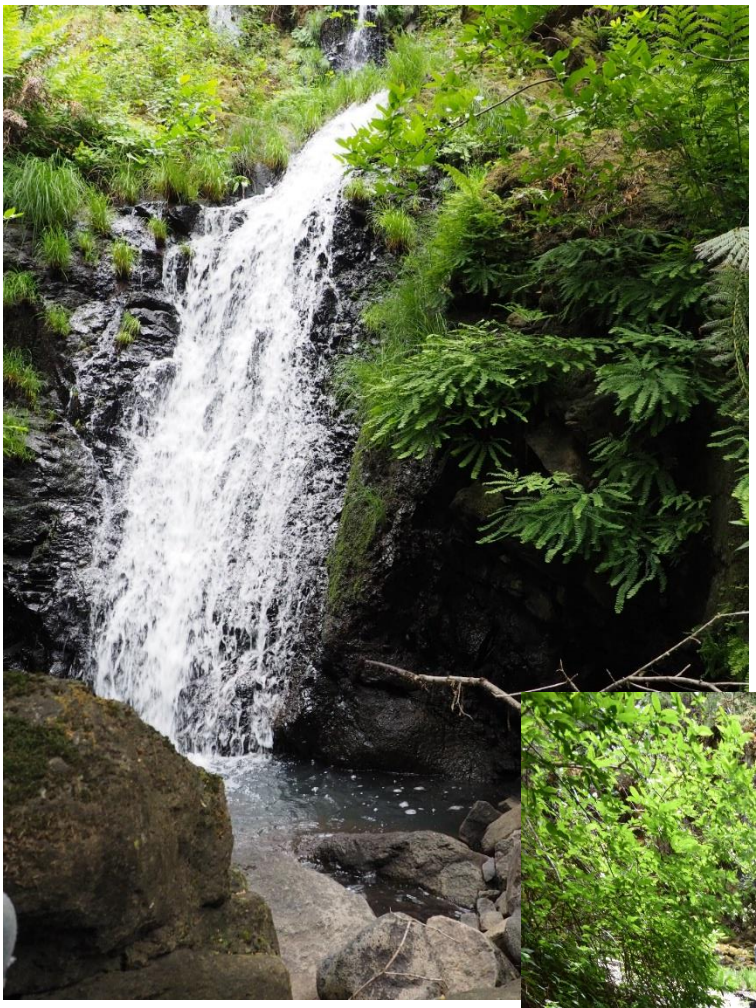
Manage Dam and Spillway to Protect Downstream Fish and Wildlife

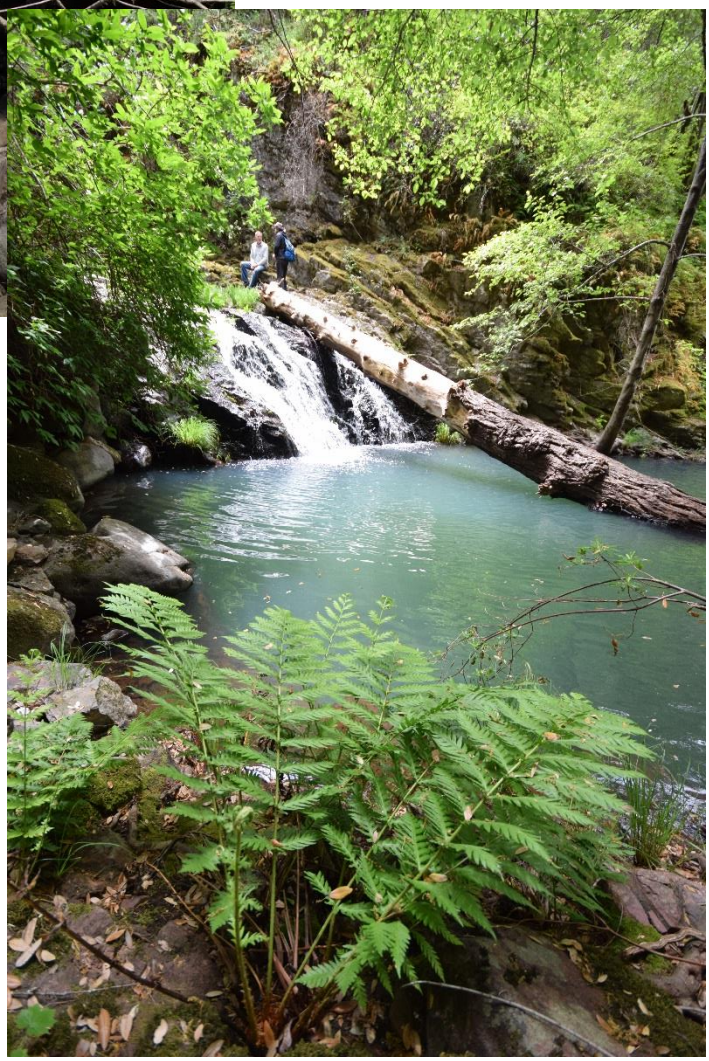
During the boat survey, the dam was observed to be spilling slightly through a weathered portion of the spillway with a metal apparatus. There appears to be infrastructure in need of repair here, unless this is an intentional way to spill bypass flows back into Rector Creek. If that is indeed the purpose, it might be better to send this water to Rector from the bottom of the dam instead and meter it in answer to the lawsuit by Water Audit.

Recommendation Evaluate the spillway and determine whether a repair is necessary. Review the dam safety report to ensure that the valve described is maintained in the right position. Review water rights and consult DFW to enumerate downstream rights to Rector Creek bypass flows, and begin a program that maintains them throughout the year. Be sure bypass flows are not poisoned by copper sulfate.



Clear, deep water in Rector Reservoir in May 2017 tjb





Waterfall and pool along Rector Creek
5-25-2017 tjb

Mild turbidity was consistent in the main fork of Rector Creek during the survey which makes for the powdery blue colour in the pool below while South Fork and North Fork (where wetted) were both much clearer. Note the author and hiking companion at upper left center for scale.

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APPENDIX 3.6-C

Basis of Design Memorandum and Drawings
Rector Reservoir Bypass Valve Project

Memorandum

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

To: Ms. Michele Leong
Department of General Services
Real Estate Services Division

From: Kevin J. Gustorf, P.E. (Wood Rodgers)
Jason A. Gornall, P.E. (Wood Rodgers)

Date: July 15, 2020

Subject: Rector Dam Diversion - Basis of Design Memorandum - DRAFT

Introduction and Objective

The California Department of Veterans Affairs (CDVA) operates the Rector Dam and Treatment Plant, located in Yountville, CA. A ruling from a recent lawsuit, and the subsequent "Settlement Agreement," now requires that water held behind the Dam be constantly released to the downstream Rector Creek. While the specific flowrate is still being determined, it is estimated that the required flow will fall between 0 and 10 cubic feet per second (cfs).

In July of 2018, a Preliminary Design Report (PDR), titled "Rector Dam Diversion Valve Preliminary Design Report", was prepared by J.C. Chang and Associates. This PDR evaluated the feasibility of two alternative layouts for a flow diversion. Both alternatives consisted of a hot tap connection of the existing 30-inch raw water pipeline from the dam's outlet tower, routed through vaulted flow control valves, then terminating at differing points into Rector Creek.

The objective of this Basis of Design (BOD) memorandum, is to evaluate the alternatives described by the previously prepared PDR, further refine the alternatives, and present the recommended facilities to meet the obligations of the Settlement Agreement. This document discusses the various project components, technical analysis, and equipment options; as well as presents 30% design drawings (found in Appendix A).

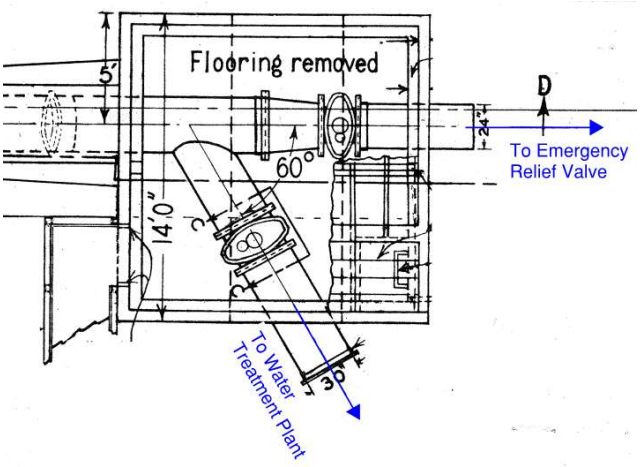
Project Location and Background

Located in Napa County, just north of the town of Yountville, at approximately 38°26'28.91"N, 122°20'50.85"W , the Rector Reservoir, dam, and water treatment plant are operated by the CDVA. In proximity to the dam, are neighboring facilities that, in addition to the water treatment plant, utilize the raw water from the reservoir. The figure (below) provides an overview of the project site, including the nearby Cal Fire training facility to the north, and California Department of Fish and Wildlife (DFW) Hatchery to the west.



Project Site

Constructed in the mid-1940s, the Rector Creek Dam is an earthen dam, constructed in 3 phases to a total height of 162 feet. In the late 1980's a project to raise the dam crest approximate 2.5' was completed. Behind the dam, water is collected from local run-off following storm events, and is discharged through an outlet tower, or during exceptionally rainy years, via a concrete spillway to Rector Creek. The outlet tower feeds a 30-inch steel pipeline that travels approximately 900 feet, through the dam, to a control facility or "valve house". Once at the valve house, water is directed to either the water treatment plant (via a continuation of the 30" steel pipe), or to Rector Creek, via a 24-inch emergency relief pipeline and gate valve. Record drawings for the existing dam, outlet tower, and valve house can be found in Appendix B.



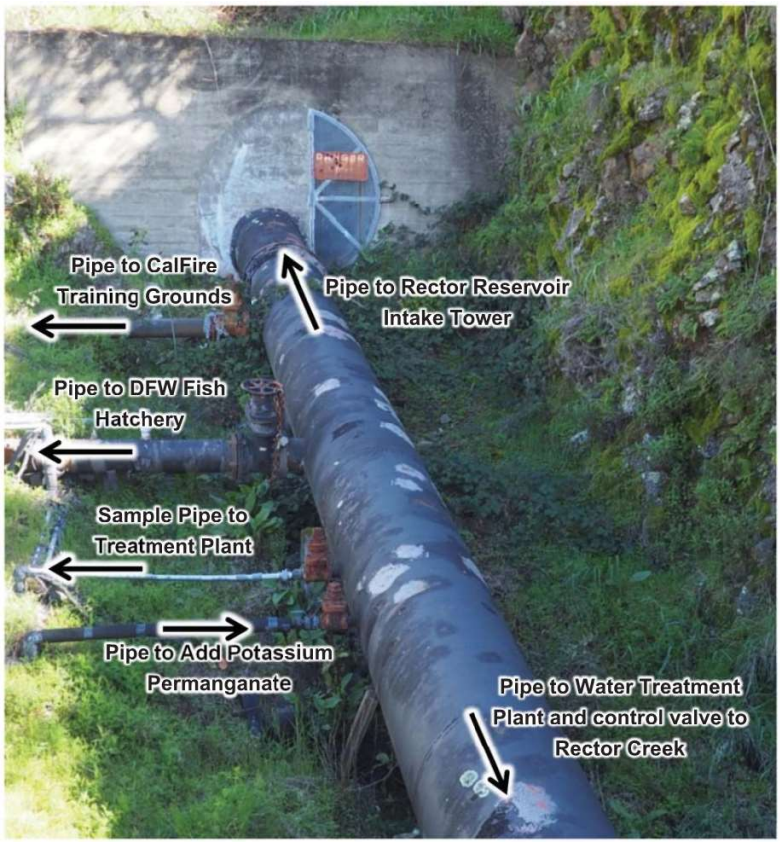
Excerpt from Dam As-built Drawing (Valve House)



24" Emergency Relief Valve

Since the 30-inch pipeline's original construction, a number of connections have been made just upstream of the valve house. The existing connections include the following:

1) Cal Fire Training Connection - Feeds fire hydrants at onsite training facility
2) Cal Fish and Wildlife Connection – Supplies water to the fish hatchery across Silverado Trail
3) Potassium Permanganate Connection - Feed line from water treatment plant (currently not operational)
4) Raw Water Sampling Connection – Supplies sample water to the treatment plant



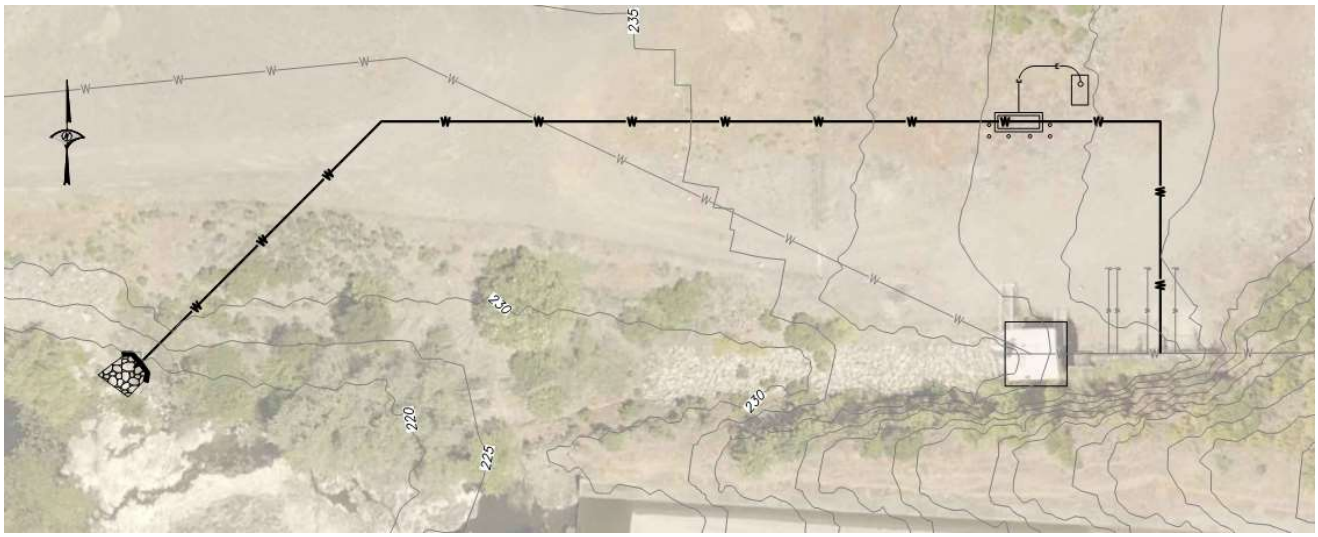
Existing 30-inch Steel Pipeline

Diversion Pipeline Overview

The supply connection for the new flow diversion pipeline is proposed to be placed between the Cal Fire Training, and DFW connections. A "hot tap" or "wet tap" type connection is the preferred method to connect to the existing 30-inch pipeline. A hot tap connection is recommended as it does not require the that the 30-inch mainline be isolated and de-energized. The process consists of attaching a tapping sleeve and valve to the mainline, then utilizing specialized drilling equipment to core an opening, all while the main line remains in service. Additional tapping sleeve product detail can be found in Appendix C.

Once connected, the diversion pipeline will traverse approximately 75-feet to the north before turning to the west 90-degrees. The pipeline will then continue west, until it reaches the flow control valves (discussed in more detail later in the memo). This flow control facility will govern the amount of flow,

between 0 and 10 cfs, discharged by the pipeline. The flow control equipment, and the pipeline have been located to the north of the existing access road to provide for a safe operator environment, and also to avoid areas where slope erosion has occurred in the past.



Following the flow control facility, the pipeline will continue approximately 300-feet before discharging to Rector Creek through a head wall and check valve. Energy dissipation will be added to the discharge location with the incorporation of engineered energy dissipaters built into the headwall / outlet structure, and/or the addition of riprap immediately downstream the discharge location in Rector Creek.

Hydraulic Conditions

As mentioned above, the water being diverted to Rector Creek originates from the Rector Reservoir, located several hundred feet from the diversion pipeline connection. While the elevation of the reservoir water surface varies, the high water level elevation of 372-feet was used for the hydraulic calculations. With the elevation of the diversion pipeline connection point estimated to be 250-feet, the connection pressure was calculated to be approximately 53 pounds per square inch (psi).

Headloss calculations were performed to aid in the sizing of the diversion pipeline and are summarized below. The results of the analysis show that there is sufficient pressure available to meet the 10 cfs maximum discharge requirement, with a resulting pressure at the discharge location (approximate elevation of 220-feet) of 93-feet of head, or 41 psi. Detailed hydraulic calculations may be found in Appendix D.

Facility (Pipe, Valve, etc.)	Maximum Headloss (at a flow of 10 cfs)
30-inch Steel Pipe (900-feet)	.4 ft
12-inch Ductile Iron Pipe (440-feet)	18.1 ft
30”x30”x12” Tee	2.5 ft
(3) 12-inch Gate Valves (Open)	1.5 ft
12” Strainer	9.6 ft
12” Flow Control Valve	15.6 ft
12” 45-Degree Bend	.4 ft
(5) 12-inch 90-degree Bend	5.0 ft
Orifice Plate	1.6 ft
Discharge Check Valve	4.0 ft
Total Headloss	**58.7 ft**

Pipeline Material and Size

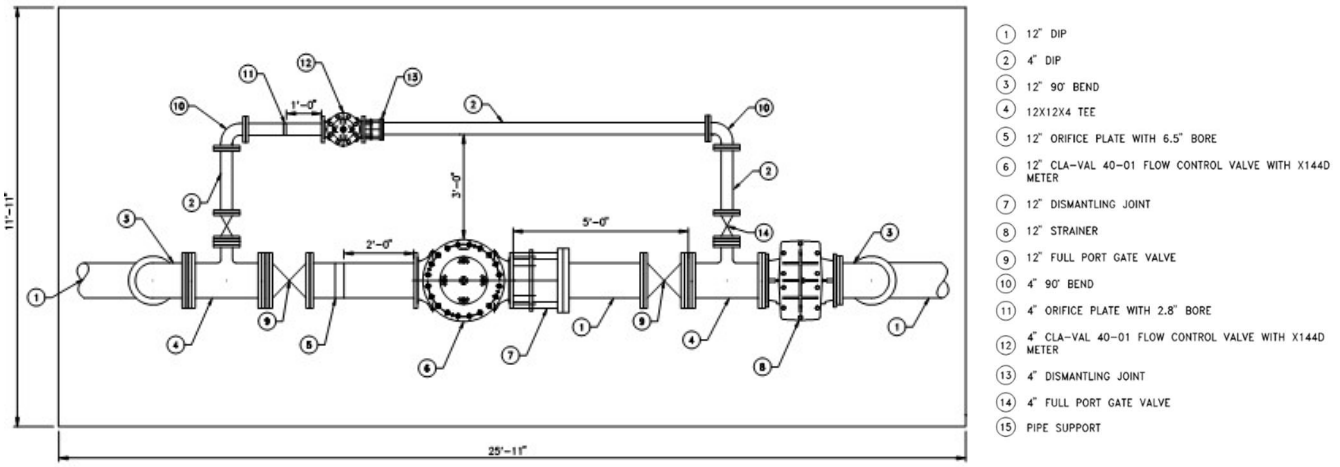
Two primary factors were considered during the selection of the pipeline size and material. The first consideration is operating pressure, which as previously discussed could range from approximately 53 psi to 41 psi. Due to the relatively low operating pressure, and non-corrosive nature of the fluid being conveyed, many suitable pipeline materials are available on the market. Our recommendation is to utilize ductile iron pipe (DIP) for this project, as it capable of meeting the operating conditions, is readily available, cost effective, and it is a piping system many contractors are familiar with installing. Additionally, since AWWA C900 Polyvinyl Chloride (PVC) pipe shares many of the advantages mentioned above with DIP, we also recommend allowing construction bids to be based on either DIP or PVC. This strategy typically creates a more competitive bidding environment, resulting in efficient quotes from the pipe suppliers.

The second parameter used to define the pipeline is the velocity of the water it conveys. For pipelines of this size maximum velocities are typically limited to 8 to 10 feet per second (fps) under normal operating conditions. However, for less frequent operations, maximum velocities of 15 fps are not uncommon. Limiting velocity both reduces headloss, and wear on the pipeline itself. For the diversion pipeline, we recommend a 12-inch diameter pipe, which at 10 cfs (maximum flow), provides a velocity of 12.7 fps. Thrust forces due to the internal pressure in the pipe can be mitigated through the use of concrete thrust blocks or restrained pipe joints. Because this pipeline is located in a relatively undeveloped area, and space is available, thrust blocks are recommended to be used to restrain the pipe. Thrust blocks have a proven track record and are typically more cost effective than restrained pipe joints.

Flow Control Facilities

Flow Control Valve

Similar to the previously prepared PDR, the rate of water discharged by the diversion pipeline will be control by a flow control valve. Hydraulically operated valves, such as the Cla-Val 40-01 limit the flow allowed to pass through via pilot controlled diaphragms. These valves utilize an orifice plate, placed downstream of the valve, to measure and adjust the valve position (in response to changes in upstream pressure) to maintain the specified flow rate. There are several variants of the Cla-Val 40-01, which can include electric solenoids and motors to remotely adjust the flow rate setting. While the electronic controls can be an added convenience, our understanding is that the flow rate will not be frequently adjusted, and therefore recommend the more reliable, manually adjusted valve be located above ground. Locating this facility above grade (instead of a vault) provides a more cost effective, operator friendly environment, that makes the equipment more accessible for maintenance and future replacement, while avoiding confined space entry.



To cover the range of flows required (0 to 10 cfs), we recommend the installation of two valves. Each of the valves operating range is limited to 1:4, meaning the maximum flow rate is limited to 4 times the minimum flow rate. For example, if a minimum flow rate of 1 cfs is desired, the maximum flow rate is limited to 4 cfs. For this projects range of flow we are recommending the installation of the following valves.

Valve Size and Type	Orifice Plate Size	Flow Range
4-inch Cla-Val 40-01	2.8-inch	.38 cfs to 1.52 cfs
12-inch Cla-Val 40-01	6.5-inch	1.87 cfs to 7.49 cfs
Valves in Combination	**N/A**	**.38 cfs to 9.01 cfs**

Because of the 4:1 nature of the valves and the two different sizes, we predict a limited number of flow range gaps. These gaps appear in between the normal operating ranges of the flow control valves. For example, if a flow rate of 1.6 cfs is desired, the 4-inch valve would be opened to its maximum flow rate of 1.5 cfs, however if the 12-inch valve was opened to make up the .1 cfs remaining, it would be operating below its specified 1.9 cfs minimum, thus incapable of meeting the specific flow rate of 1.6 cfs. Below is a summary of the flow gaps identified.

Start Flow Range Gap	End Flow Range Gap	Notes
0.01 cfs	0.37 cfs	Below 4-inch Valve Min. Operating Point
1.53 cfs	1.86 cfs	4-inch wide open, below 12-inch Min. Operating Point
7.50 cfs	7.86 cfs	12-inch wide open, below 4-inch Min. Operating Point
9.02 cfs	10.0 cfs	Above Operating Range

If more precise and granular flow control is required, the Cla-Val series 131 series valve could be installed in place of the 40-01 valves. The 131 valve is similar to the 40-01 in that it is a hydraulically operated, diaphragm valve, however flow measurement and valve controls are electronic. The 131 series valve receives flow information from a flow meter (integrated into the valve or as a separate device), and adjusts itself to a preset flow rate. Because this valve is electronically controlled, it can be integrated into exiting SCADA systems for remote operation and monitoring. However, because this valve and controller are electronic, the power requirements and complexity are higher than the 40-01 valves.

Flow Measurement

Flow measurement will be an important factor for both discharge reporting and flow control valve operation. This can be accomplished through a traditional magnetic (mag) meter, or by integrating a flow meter into the flow control valve. We recommend the meter/valve integration approach as there are

several advantages over a mag meter. First, because of its integrated nature, additional lay length (typically 5 diameters upstream and 2 downstream) is not required, making the flow control pad more compact and cost effective. Secondly, the instantaneous flow displayed by the meter at the valve will be used by the operator to adjust the flow control valve. With the flow meter integrated into flow control valve, the operator can simply watch the flow readouts as he or she is adjusting the control valve.



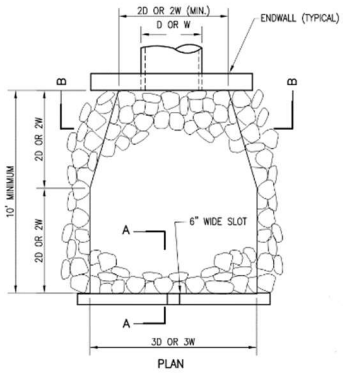
Flow Meter Integrated into Control Valve



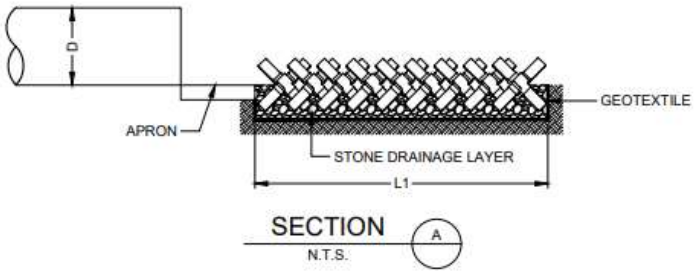
Typical Mag Meter

Flow Discharge

Once beyond the flow control valves, the water will work its way towards the discharge point at Rector Creek. Because this water will still contain energy, engineered energy dissipation facilities are recommended to protect the creek bed and side slopes from erosion. At the pipeline terminus, a concrete headwall with a check valve will be installed. The check valve allows water to discharge, but will prohibit materials, and/or animals from entering the pipeline. Immediately downstream of the headwall, energy dissipating riprap or engineered energy dissipation / slope protection will be constructed. The extent (square footage, depth, and rock size) of the riprap is determined by the velocity of the water, and will be further refined as the final flow rate is determined. For the purposes of this memo, a maximum flow rate of 10 cfs yields a velocity of just over 12 fps. This velocity results in a riprap apron approximately 8ft wide by 10ft long, and 3.5 ft deep, utilizing ½ ton rock.



Typical Rip Rap Energy Dissipater



Engineered Energy Dissipater (A-Jacks, by Contech)

Conclusions / Recommendation

In summary, the proposed improvements described in this BOD, shown on the drawings (contained in Appendix A), and summarized in the table below, fulfill the intent of the project's water diversion objectives, and therefore we recommend moving forward towards final design of these facilities. While a limited number of flow gaps have been discovered with the use of the 40-01 control valve, an alternate valve (Series 131) has been identified if the flow gaps are found to be unacceptable. Further discussion with DGS and CDVA, will be had related to the control valve selection and operation prior to finalizing the design.

Work Element	Recommended Approach	Notes
Connection to Existing 30-inch Pipeline	12-inch hot tap connection (30"x30"x12" tapping sleeve)	
Diversion Pipeline Material	Ductile Iron Pipe	Thrust blocks for restraint
Diversion Pipeline Diameter	12-inch	
Flow Control Location	Above Ground	
Flow Control Valve Type / Size	Cla-Val 40-01 / 12 and 4-inch	Cla-Val 131 as alternate
Flow Meter	Cla-Val X144D	Integrated into flow control valve
Check Valve	Tideflex 35-1	
Energy Dissipation	½ Ton Riprap Apron	
Electrical Power	20 Watt Photovoltaic Power System	Pole mounted

Included Appendices

Appendix A – 30% Design Drawings

Appendix B – Record Drawings

Appendix C – Equipment Cutsheets

Appendix D – Hydraulic Calculations

Appendix E – Cost Estimate

Appendix A – 30% Design Drawings

SCOPE OF WORK

CONSTRUCT A FLOW DIVERSION PIPELINE AND FLOW CONTROL FACILITY TO DIVERT WATER FROM THE RECTOR RESERVOIR, AND DISCHARGE TO RECTOR CREEK.

CONSTRUCTION IMPROVEMENTS INCLUDE THE FOLLOWING:

- HOT TAP CONNECTION TO AN EXISTING 30" PIPELINE
- INSTALLATION OF XX FT OF 12" DUCTILE IRON PIPE
- CONSTRUCT FLOW CONTROL FACILITY ON A CONCRETE PAD, INCLUDING A FLOW CONTROL VALVES, A WATER STRAINER, AND ISOLATION VALVES
- CONSTRUCT A DISCHARGE HEADWALL AND ENERGY DISSIPATER

GENERAL NOTES:

1. CONTRACTOR SHALL EXECUTE WORK MONDAY THROUGH FRIDAY 8:00AM TO 5:00PM; WORK ON SATURDAYS, SUNDAYS, AND HOLIDAYS IS SUBJECT TO AUTHORIZATION BY THE STATE.

2. CONTRACTOR SHALL HAUL AWAY AND DISPOSE OF RUBBLE AND WASTE IN A STATE APPROVED LANDFILL. CONTRACTOR TO PAY ALL FEES.

3. CONTRACTOR TO PROTECT EXISTING UTILITIES AND IMPROVEMENTS DURING CONSTRUCTION. REPAIR AND RESTORE DAMAGES CAUSED BY CONSTRUCTION BACK TO ORIGINAL CONDITIONS AND TO STATE'S SATISFACTION.

4. CONTRACTOR SHALL COMPLY WITH 2016 CALIFORNIA FIRE CODE, CHAPTER 14, FIRE SAFETY DURING CONSTRUCTION.

5. CONTRACTORS WILL MAINTAIN AN ALL-WEATHER APPROVED EMERGENCY VEHICLE ACCESS ROADWAY WITH A MINIMUM DIMENSION OF 20' IN WIDTH AND 13'-6" IN VERTICAL CLEARANCE THROUGHOUT CONSTRUCTION PERIOD CONFORMING TO 2016 CFC §503, §3310.1, 2013 NFPA 241 AND COORDINATED WITH THE CSFM AND LOCAL AHJ PRIOR TO COMMENCEMENT OF AY SITE AND ACCESS ALTERATION.

6. ALL CONTRACTORS PERFORMING WORK ON THIS PROJECT SHALL COMPLY WITH THE REQUIREMENTS OF 2016 CFC §901.7, SPECIFICALLY §901.7.4, CH. 11, CH. 33, AND 2013 NFPA 241 FIRE-PREVENTION PROGRAM THROUGHOUT ALL PHASES OF CONSTRUCTION.

BUILDING CODES

2016 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE
2016 CALIFORNIA BUILDING CODE
2016 CALIFORNIA ELECTRICAL CODE
2016 CALIFORNIA MECHANICAL CODE
2016 CALIFORNIA PLUMBING CODE
2016 CALIFORNIA ENERGY CODE
2016 CALIFORNIA FIRE CODE
2016 CALIFORNIA GREEN BUILDING STANDARDS CODE
2016 CALIFORNIA REFERENCE STANDARDS CODE
CCR TITLE 19. PUBLIC SAFETY: DIVISION 1. STATE FIRE MARSHAL

SHEET INDEX:

G-01	TITLE SHEET
G-02	GENERAL SYMBOLS AND ABBREVIATIONS
C-01	EXISTING SITE PLAN
C-02	SITE PLAN
C-03	DIVERSION PIPELINE PLAN AND PROFILE
C-04	FLOW CONTROL PLAN AND SECTION
C-05	CIVIL DETAILS

BUILDING CODE ANALYSIS - TREATMENT BUILDING:

DEFFERED SUBMITTALS LIST:

HAZARDOUS MATERIALS IN STORAGE AND IN USE:

State of California
Department of General Services

Real Estate Services Division
Project Management and Development Branch
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

Project Manager: MICHELE LEONG
(916) 376 - 5432 Voice

MICHELE.LEONG@dgs.ca.gov

PROJECT TITLE: RECTOR DAM DIVERSION YOUNTVILLE

CLIENT AGENCY: DEPARTMENT OF GENERAL SERVICES

PROJECT LOCATION: RECTOR CREEK DAM
YOUNTVILLE, CA 94558

PROJECT NUMBER: XXXXXXXXXXXXX

PROJECT MANAGER: KEVIN J. GUSTORF, P.E. - (916) 341-7425

PROJECT ENGINEER: JASON GORNALL, P.E., (619) 819-9240

CSFM APPLICATION NO.: 19-S-2295-CP-NW

California State Fire Marshal
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FILE DATE -

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App. No.:
SS: _____ AC: _____
Date: _____
VAULT FILE NUMBER -

Issue		
No.	Date	Description
1	7/15/20	30% PRELIMINARY DESIGN
2		
3		
4		
5		
6		

LOCATION MAP:



NO SCALE

1 OF 7 SHEETS

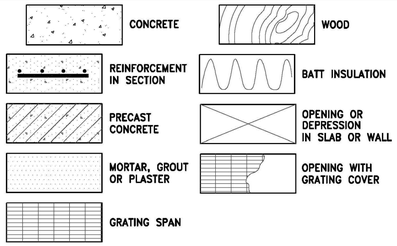
SHEET NUMBER G-01

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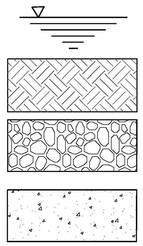
ABBREVIATIONS

A	AIR
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
ADPTR	ADAPTER
AGG	AGGREGATE
AL	ALUMINUM
ALT	ALTERNATE
APPROX	APPROXIMATE
AUX	AUXILIARY
AL, ALUM	ALUMINUM
APN	ASSESSOR'S PARCEL NUMBER
ARCH	ARCHITECTURAL
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS
AR/AV	AIR RELEASE/VACUUM VALVE
AWG	AMERICAN WIRE GAUGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BC	BEGIN CURVE
BF	BLIND FLANGE
BFV	BUTTERFLY VALVE
BKFL	BACKFILL
BL	BASELINE
BLDG	BUILDING
BM	BENCH MARK
BO	BLOWOFF
BOT	BOTTOM
BOW	BACK OF WALK
BVC	BEGIN VERTICAL CURVE
CARV	COMBINATION AIR VALVE
CB	CATCH BASIN
CFM	CUBIC FEET PER MINUTE
C&G	CURB & GUTTER
CI	CAST IRON
℄	CENTER LINE
CL	CLASS
CL2	SODIUM HYPOCHLORITE
CLR	CLEARANCE
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CML&C	CEMENT MORTAR LINED & COATED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNTRL	CONTROL
CO	CLEAN OUT
CONC	CONCRETE
COND	CONDUIT
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTROLLED
COORD	COORDINATE
CORP	CORPORATION
CP	CONTROL POINT
CPLG	COUPLING
CR	CURB RETURN
CTR	CENTER
CU	COPPER
CV	CHECK VALVE
CW	COLD WATER
CY	CUBIC YARD
D	DEPTH OR DRAIN
DBL	DOUBLE
DEG	DEGREE
DEPT	DEPARTMENT
DET	DETAIL
DI	DRAINAGE INLET OR DUCTILE IRON
DIA OR ⌀	DIAMETER
DIM	DIMENSION
DIP/DI	DUCTILE IRON PIPE
DISTRICT	SACRAMENTO AREA SEWER DISTRICT
DMH	DRAIN MANHOLE
DN	DOWN
DS	DOWNSTREAM
DWG	DRAWING
DWY	DRIVEWAY
E	EAST OR EXISTING
EA	EACH
EC	END CURVE
ECC	ECCENTRIC
EF	EACH FACE
EFF	EFFLUENT
EL/ELEV	ELEVATION
ELL/ELB	ELBOW
ELEC	ELECTRICAL
EMERG	EMERGENCY
EP	EDGE OF PAVEMENT
EW	EACH WAY
EX/EXST	EXISTING
EXT	EXTERIOR
EVC	END VERTICAL CURVE
EW	EACH WAY
EXP	EXPANSION
(F)	FUTURE
FA	FOUL AIR
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FCV	FLOW CONTROL VALVE
FD	FLOOR DRAIN
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
FIG(S)	FIGURE(S)
FIN	FINISHED
FLEX	FLEXIBLE
FLG	FLANGED
FL	FLOWLINE
FLR	FLOOR
FM	FORCE MAIN
FND	FOUNDATION
FT	FEET OR FOOT
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GIP	GALVANIZED IRON PIPE
GND	GROUND (ELEC)
GPM	GALLONS PER MINUTE
GS(P)	GALVANIZED STEEL (PIPE)
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
H	HEIGHT
HA	HIGH PRESSURE AIR
HB	HOSE BIBB
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HL	HIGH LEVEL
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPT	HIGH POINT
HR	HOUR
HT	HEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
HWL	HIGHWATER LEVEL
HYDR	HYDRAULIC
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
INT	INTERIOR
INVT	INVERT
IPS	IRON PIPE SIZE
JCT	JUNCTION
JT	JOINT
L	LENGTH OR LEFT
LA	LOW PRESSURE AIR
LB	POUND
LF	LINEAR FEET
LPT	LOWPOINT
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
LT	LEFT OR LIGHT
LWL	LOW WATER LEVEL
MAG	MAGNETIC
MATL	MATERIAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MFR	MANUFACTURER
MG	MILLION GALLONS
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MRGWB	MOISTURE RESISTANT GYPSUM WALL BOARD
MSTR	MASTER
N	NEW OR NORTH
NIC	NOT IN CONTRACT
NO OR #	NUMBER
NPT	NATIONAL PIPE THREAD
NRS	NON-RISING STEM
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
(OH)	OVERHEAD
OPNG	OPENING
OS&Y	OUTSIDE STEM & YOKE
P	POWER
P&ID	PROCESS & INSTRUMENTATION DIAGRAM
PC	PIECE
PE	PLAIN END OR POLYETHYLENE PIPE
PERF	PERFORATED
PG	PRESSURE GAGE
PI	PRESSURE INDICATOR OR POINT OF INTERSECTION
PL OR ℄	PLATE OR PROPERTY LINE
PLC	PROGRAMABLE LOGIC CONTROLER
PM	PRESSURE MAIN
P/P	POWER POLE/UTILITY POLE
PRESS	PRESSURE
PS	PIPE SUPPORT
P/S	PUMPING STATION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RED	REDUCER
REINF	REINFORCING
REL	RELATIVE
REQD	REQUIRED
RESTR	RESTRAINED
REV	REVISION
ROW	RIGHT OF WAY
RPBP	REDUCED PRESSURE
RPPA	BACKFLOW PREVENTER
RT	RIGHT
RW	RAW WATER
S	SOUTH, SLOPE
SA	SAMPLE
SCH	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SEC	SECTION
SHT	SHEET
SHWR	SHOWER
SMH	SEWER MANHOLE
SPEC	SPECIFICATIONS
SQ	SQUARE
SS	SANITARY SEWER
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STRUCT	STRUCTURAL
SUBM	SUBMERSION
SV	SOLENOID VALVE
SW	SOUTHWEST, SWITCH, OR SIDEWALK
T OR TEL	TELEPHONE
T&B	TOP & BOTTOM
TBC	TOP BACK OF CURB
TEMP	TEMPORARY
THD	THREADED
TOC	TOP OF CONCRETE OR CURB
TOF	TOP OF FOOTING
TOGE	TOP OF GROUND ELEVATION
TOPE	TOP OF PAVEMENT ELEVATION
TOS	TOP OF SLAB
TOSE	TOP OF SLAB ELEVATION
TP	TELEPHONE POLE
TRANS	TRANSFORMER OR TRANSITION
TW	TREATED WATER
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UG	UNDERGROUND
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
–V	–VOLT
VB	VALVE BOX
VTR	VENT THROUGH ROOF
W	WATER, WATT, WEST, OR WIDTH
W	WATER LINE OR WATER
WA	WASTE
WH	WHARF HYDRANT, WATER HEATER
WP	WEATHERPROOF
WS	WATER SURFACE, WATER STOP
WSP	WELDED STEEL PIPE
WT	WEIGHT
WTP	WATER TREATMENT PLANT
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
XING	CROSSING
YD	YARD
@	AT
&	AND
℄	CENTER LINE
℄	PLATE OR PROPERTY LINE
W/	WITH
W/O	WITHOUT

ARCHITECTURAL STRUCTURAL



GENERAL

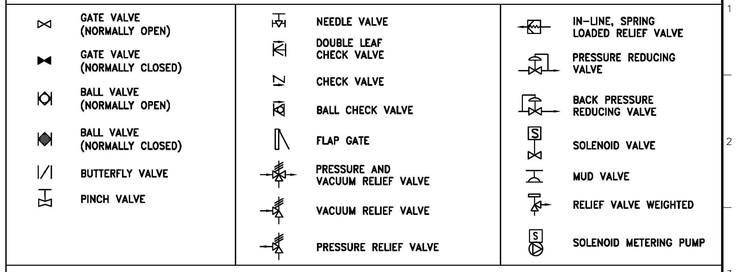


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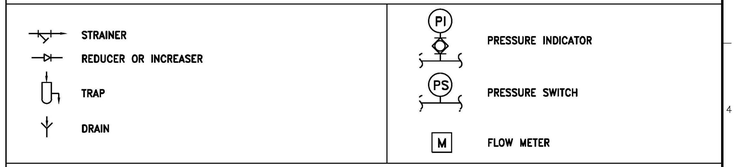
EXISTING	PROPOSED	DESCRIPTION
○	●	DRAIN MANHOLE
○	●	SEWER MANHOLE
□	■	DRAIN INLET
– –⬭	——⬬	CLEAN OUT
		CENTERLINE
6"S	6"S	SEWER LINE AND SIZE
12"D	12"D	DRAIN LINE AND SIZE
6"W	6"W	WATER LINE AND SIZE
		WATER SERVICE
		WATER VALVE
		FIRE HYDRANT
X	X	CHAIN LINK FENCE
		DRIVEWAY
		TRAFFIC SIGN AS NOTED
	S	SEWER SERVICE
		R.P. BACKFLOW PREVENTER
		DOUBLE CHECK VALVE
		AIR RELEASE VALVE
		BLOW-OFF
G T E	G T E	GAS, TELEPHONE OR ELECTRIC
		PROPERTY LINE
		MONUMENT
		STREET LIGHT
		FLUSHING BRANCH
		SIDEWALK RAMP
		TREE TO BE REMOVED/RELOCATED
+31.25	+31.25	SPOT ELEVATION
		STREET NAME SIGN (PERMANENT)
		30" R1 SIGN (STOP)
P=	P=	PAD GRADE ELEVATION
	115	FINISH GRADE CONTOURS
	120.0 X	FINISH GRADE SPOT ELEVATION

MECHANICAL

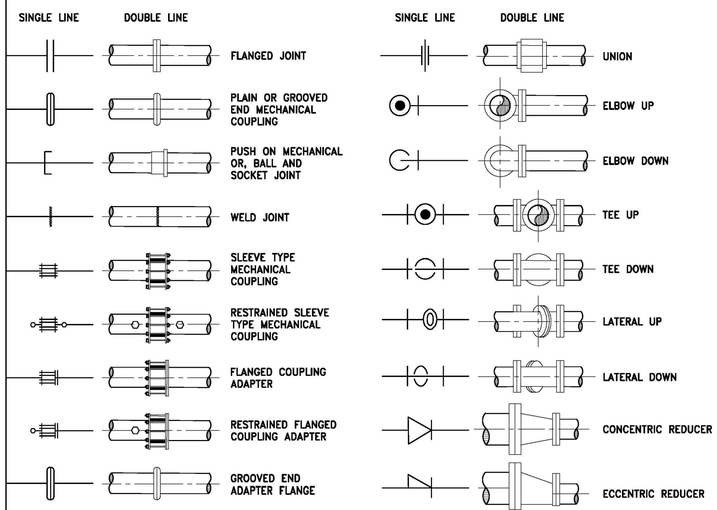
VALVES AND DEVICES



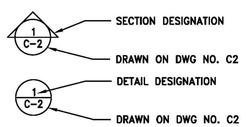
PIPE LINE DEVICE SYMBOLS



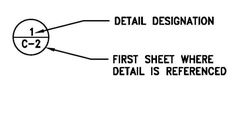
PIPE AND FITTINGS



REFERENCE SYMBOL



DETAIL SYMBOL



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DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
3301 C Street, Bldg 100-B Tel: 916.341.7760
Sacramento, CA 95816 Fax: 916.341.7767

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Issue

No.	Date	Description
1	07/15/20	30% PRELIMINARY DESIGN

Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

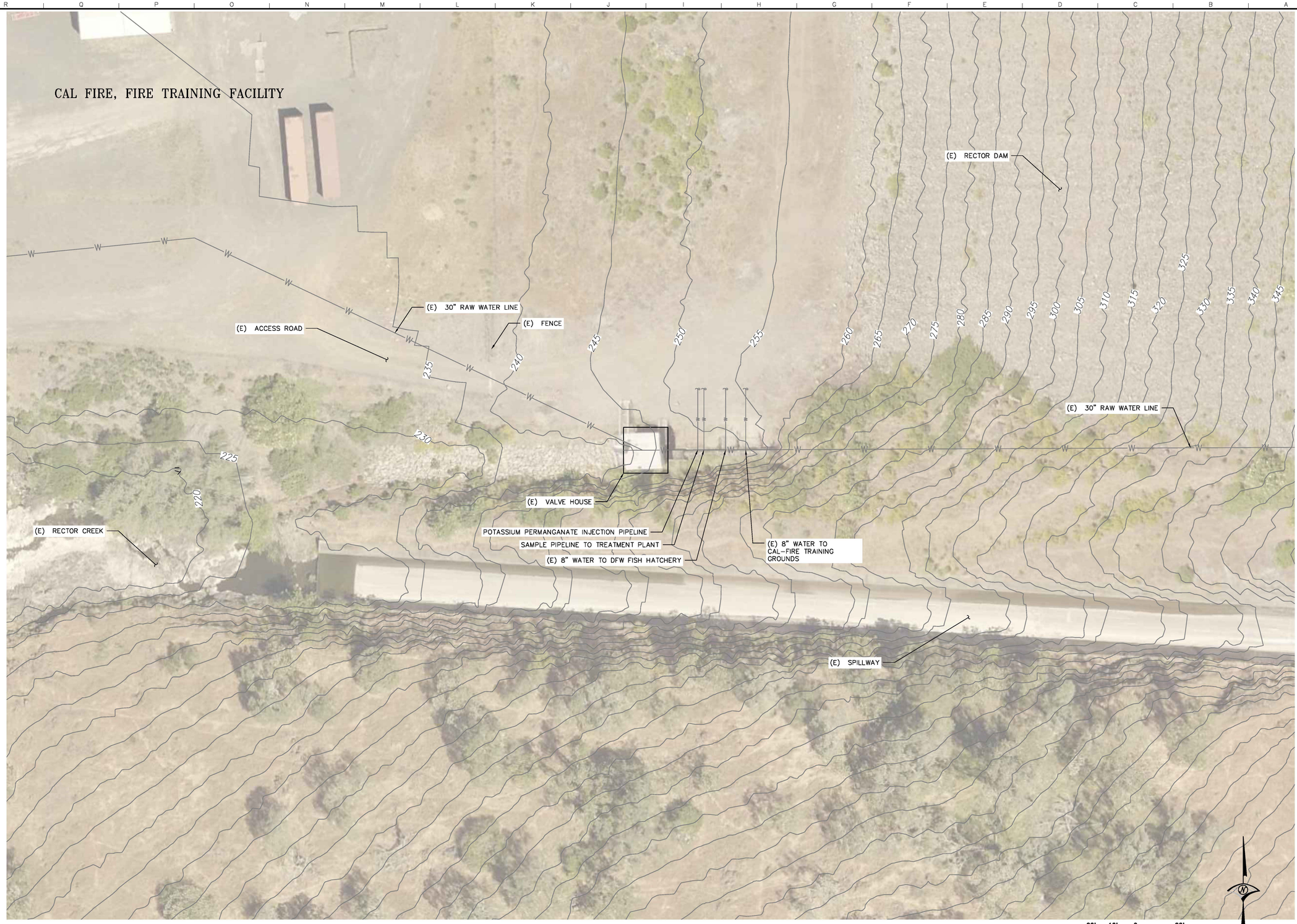
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Vault File Number: -

Sheet Title
GENERAL SYMBOLS AND ABBREVIATIONS

DSA Building Number: -
Work Order:
Reference North
Sheet Scale:
Sheet Number: G-02
2 of 07

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EXISTING SITE PLAN

20' 10' 0 20'

SCALE: 1" = 20'

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Real Estate Services Division
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Architecture & Engineering Section
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DGS Project Manager: Michele Leong
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Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

File Date	Vault File Number
-	-

Sheet Title
EXISTING SITE PLAN

DSA Building Number	Work Order
-	

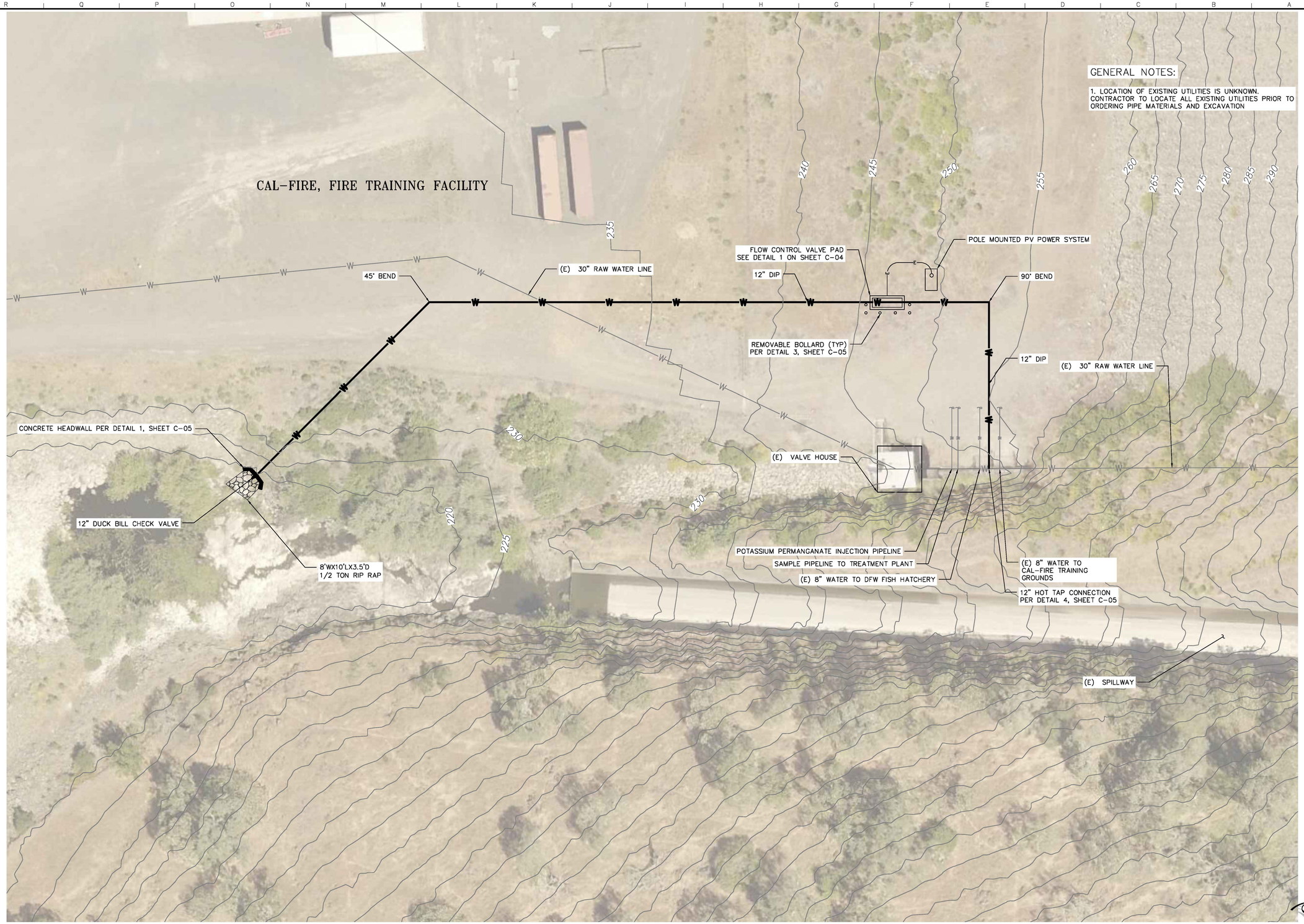
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Sheet Scale

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C-01
3 of 07

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SITE PLAN

20' 10' 0 20'

SCALE: 1" = 20'

30% SUBMITTAL

State of California
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No.	Date	Description
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Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

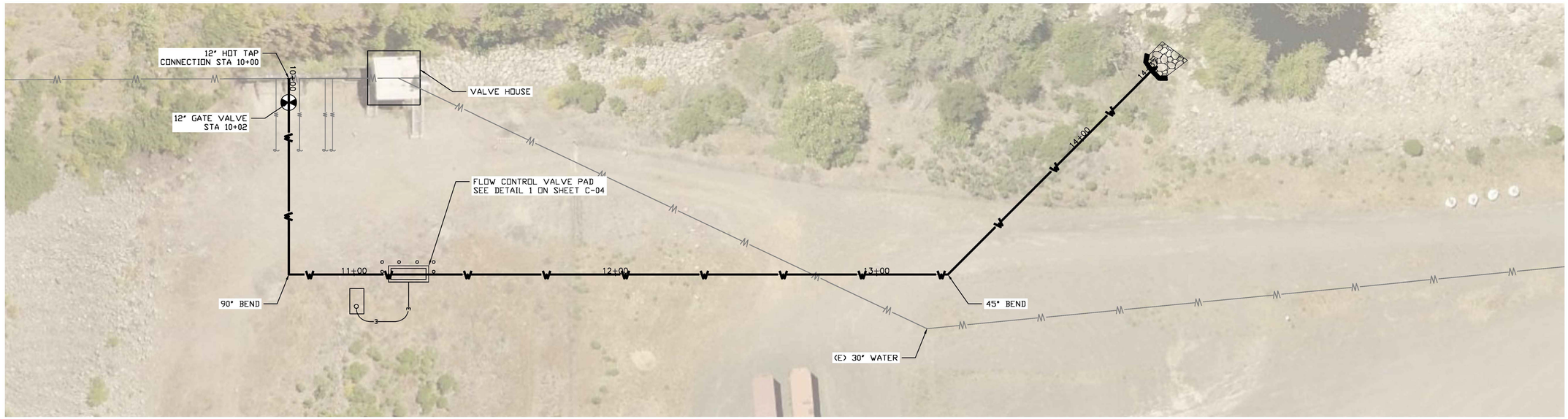
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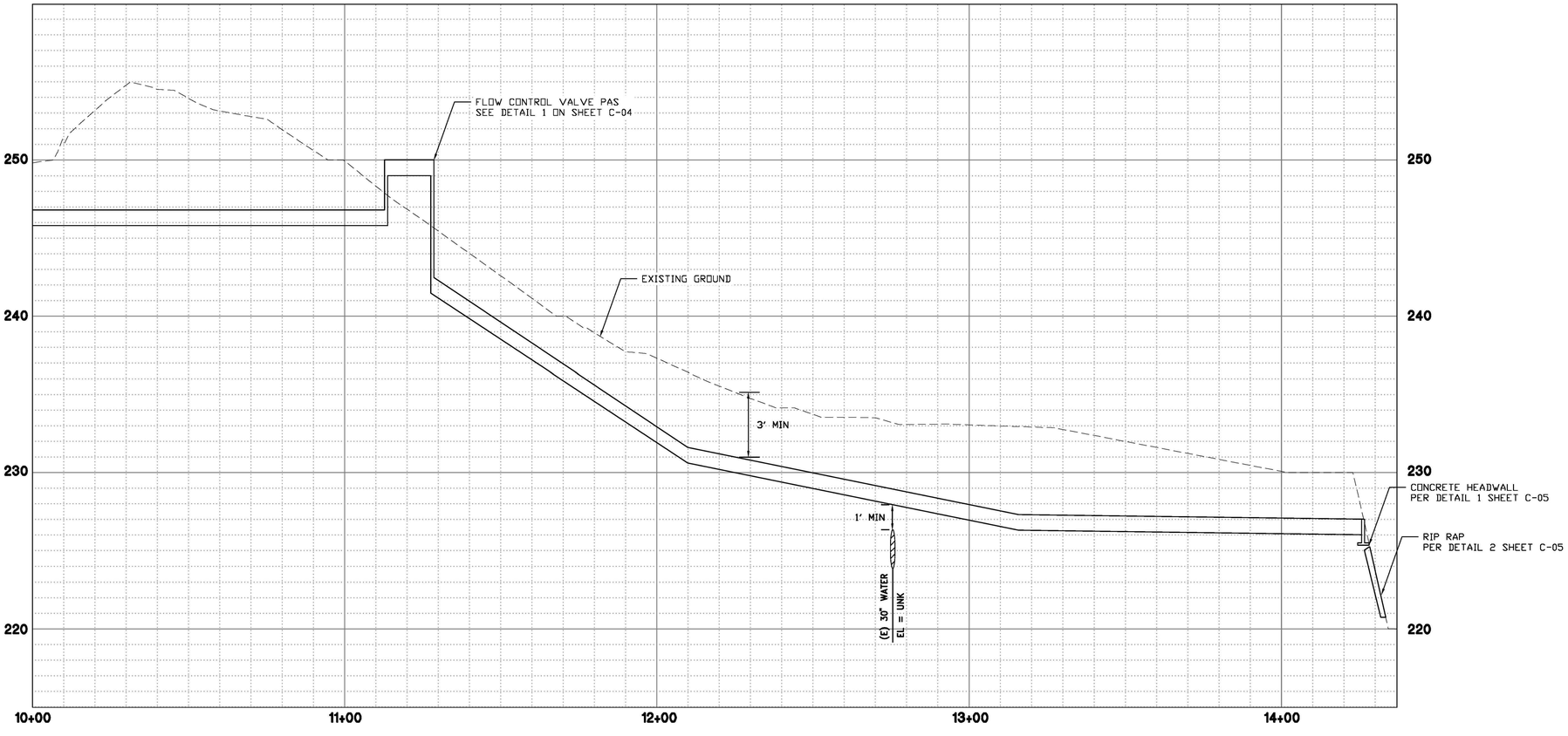
Sheet Title
SITE PLAN

DSA Building Number	Work Order
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Reference North	Sheet Scale
	Sheet Number C-02
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Sacramento, CA 95816 Fax: 916.341.7767

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD

App. No.:

Reviewed by:

Date :

California State Fire Marshal
APPROVED

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

App.No.:

Reviewed by:

Date :

Issue

No.	Date	Description
1	07/15/20	30% PRELIMINARY DESIGN

Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

File Date	Vault File Number
-	-

Sheet Title
DIVERSION PIPELINE PLAN AND PROFILE

DSA Building Number	Work Order
-	

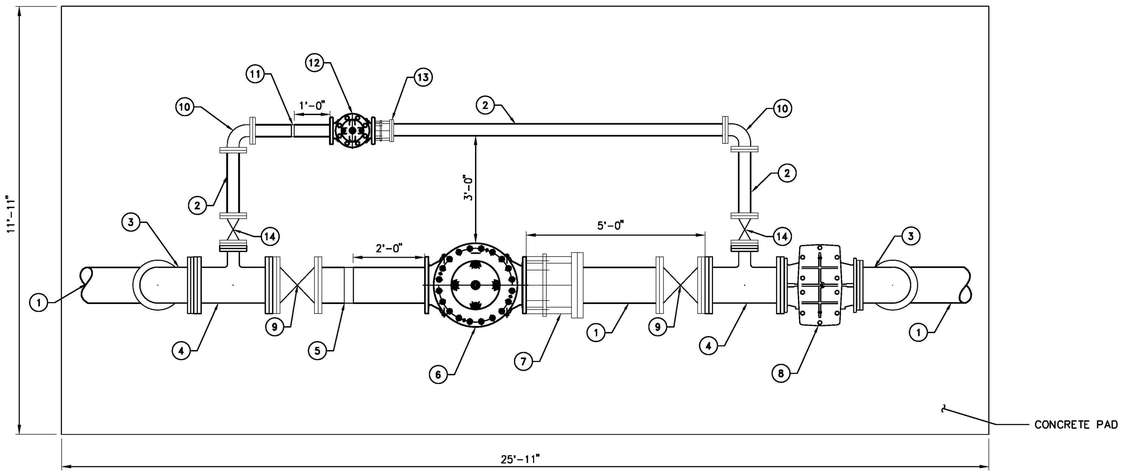
Reference North

Sheet Scale

Sheet Number
C-03
5 of 07

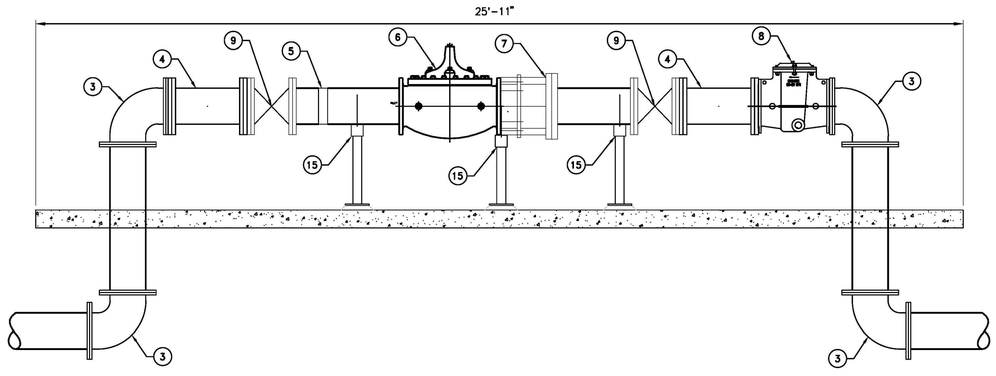
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J:\Jobs\18482_DGS_Retwine\065_Rector Dam Diversion Valve\Civil\Dwg\W-03-PROFILE.dwg 7/10/2020 4:42 PM Jason Connell



FLOW CONTROL FACILITY PLAN

SCALE: 1/2"=1'



FLOW CONTROL FACILITY

SECTION VIEW

SCALE: 1/2"=1'

CONSTRUCTION NOTES

1. 12" DIP
2. 4" DIP
3. 12" 90° BEND
4. 12X12X4 TEE
5. 12" ORIFICE PLATE WITH 6.5" BORE
6. 12" CLA-VAL 40-01 FLOW CONTROL VALVE WITH X144D METER
7. 12" DISMANTLING JOINT
8. 12" STRAINER
9. 12" FULL PORT GATE VALVE
10. 4" 90° BEND
11. 4" ORIFICE PLATE WITH 2.8" BORE
12. 4" CLA-VAL 40-01 FLOW CONTROL VALVE WITH X144D METER
13. 4" DISMANTLING JOINT
14. 4" FULL PORT GATE VALVE
15. PIPE SUPPORT

30% SUBMITTAL

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
3301 C Street, Bldg 100-B Tel: 916.341.7760
Sacramento, CA 95816 Fax: 916.341.7767

Division of the State Architect
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RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

File Date	Vault File Number
-	-

Sheet Title
FLOW CONTROL PLAN AND SECTION

DSA Building Number	Work Order
-	

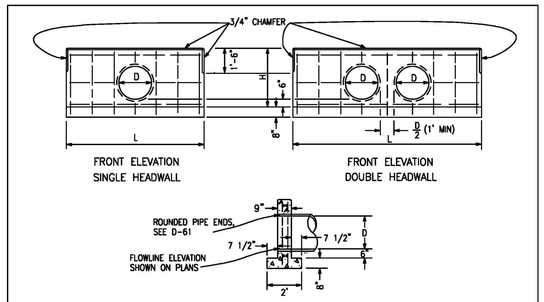
Reference North

Sheet Scale

Sheet Number
C-04
6 of 07

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J:\Jobs\8482_DGS_Retainer\063_Rector Dam Diversion Valve\Mech\Dwg\W-04-VAULT.dwg 7/10/2020 4:51 PM Jason Gornoll



D	H	SINGLE L	SINGLE STEEL (POUNDS)	SINGLE CONCRETE (C.Y.)	DOUBLE L	DOUBLE STEEL (POUNDS)	DOUBLE CONCRETE (C.Y.)
12"	2'-8"	5'	35	0.60	8'	50	0.94
15"	2'-11"	6'	40	0.75	9'-6"	60	1.17
18"	3'-2"	7'	50	0.91	10'-6"	75	1.35
21"	3'-5"	7'-6"	60	1.02	11'-6"	90	1.52
24"	3'-8"	8'-6"	75	1.20	12'-6"	100	1.72
27"	3'-11"	9'-6"	85	1.39	14'	115	2.00
30"	4'-2"	10'	85	1.52	15'	126	2.21
33"	4'-5"	11'	100	1.73	16'	130	2.42
36"	4'-8"	12'	105	1.95	17'	145	2.65
39"	4'-11"	12'-6"	130	2.09	18'	170	2.88
42"	5'-2"	13'-6"	140	2.34	19'	185	3.13
45"	5'-5"	14'-6"	150	2.60	20'	195	3.38
48"	5'-8"	15'	160	2.75	21'	200	3.64
51"	5'-11"	16'	180	3.03	22'-6"	225	4.02
54"	6'-2"	17'	190	3.31	23'-6"	240	4.30

NOTES
1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS @ 18" MAXIMUM SPACING.
3. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS

1 C-02 C-03 CONCRETE HEADWALL

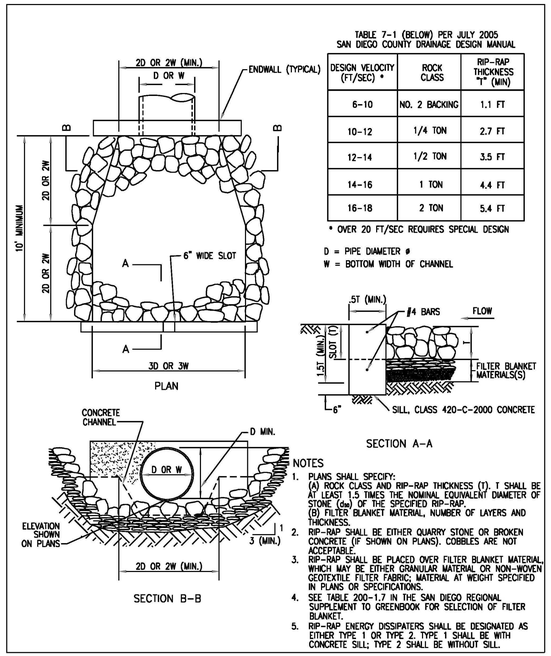


TABLE 7-1 (BELOW) PER JULY 2005
SAN DIEGO COUNTY DRAINAGE DESIGN MANUAL

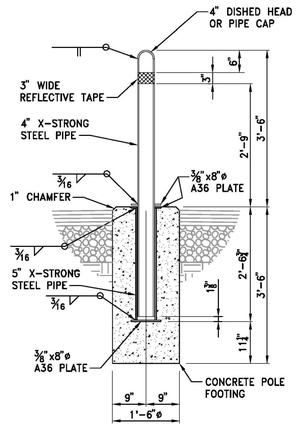
DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP-RAP THICKNESS "T" (MIN)
6-10	NO. 2 BACKING	1.1 FT
10-12	1/4 TON	2.7 FT
12-14	1/2 TON	3.5 FT
14-16	1 TON	4.4 FT
16-18	2 TON	5.4 FT

* OVER 20 FT/SEC REQUIRES SPECIAL DESIGN

D = PIPE DIAMETER ø
W = BOTTOM WIDTH OF CHANNEL

NOTES
1. PLANS SHALL SPECIFY:
(A) ROCK CLASS AND RIP-RAP THICKNESS (T). T SHALL BE AT LEAST 1.5 TIMES THE NOMINAL EQUIVALENT DIAMETER OF STONE (da) OF THE SPECIFIED RIP-RAP.
(B) FILTER BLANKET MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP-RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
3. RIP-RAP SHALL BE PLACED OVER FILTER BLANKET MATERIAL, WHICH MAY BE EITHER GRANULAR MATERIAL OR NON-WOVEN GEOTEXTILE FILTER FABRIC; MATERIAL AT WEIGHT SPECIFIED IN PLANS OR SPECIFICATIONS.
4. SEE TABLE 200-1.7 IN THE SAN DIEGO REGIONAL SUPPLEMENT TO GREENBOOK FOR SELECTION OF FILTER BLANKET.
5. RIP-RAP ENERGY DISSIPATERS SHALL BE DESIGNATED AS EITHER TYPE 1 OR TYPE 2. TYPE 1 SHALL BE WITH CONCRETE SILL; TYPE 2 SHALL BE WITHOUT SILL.

2 C-02 C-03 RIP RAP ENERGY DISSIPATER



NOTES:
1. ALL TRAFFIC BOLLARD STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
2. AFTER GALVANIZING, PAINT ALL ABOVE GRADE BOLLARD STEEL SAFETY YELLOW.

3 C-02 C-03 REMOVABLE BOLLARD

NOT INCLUDED IN 30% SUBMITTAL

4 C-02 C-03 12" HOT TAP

30% SUBMITTAL

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

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Sacramento, CA 95816 Fax: 916.341.7767

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD

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RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked

File Date: -
Vault File Number: -

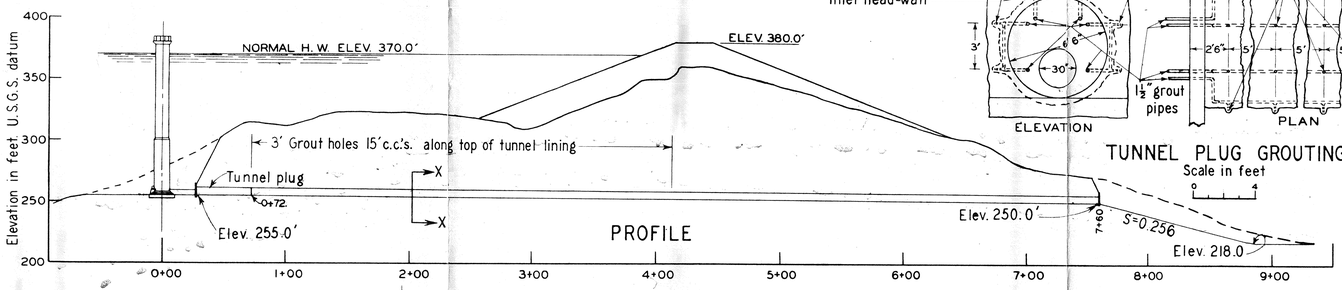
Sheet Title
CIVIL DETAILS

DSA Building Number: -
Work Order:
Reference North:
Sheet Scale:
Sheet Number: C-05
7 of 07

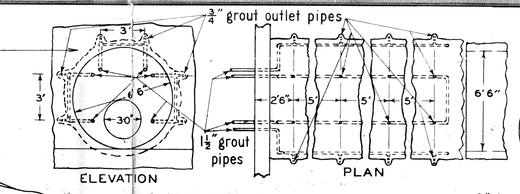
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J:\Jobs\84482_DGS_Retainer\063_Rector Dam Diversion Valve\Civil\Dwg\W-05-DETAILS.dwg 7/10/2020 4:42 PM Jason Gornall

Appendix B – Record Drawings

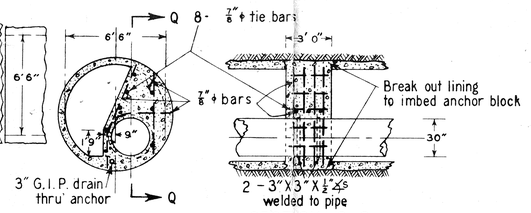


PROFILE



TUNNEL PLUG GROUTING

Scale in feet

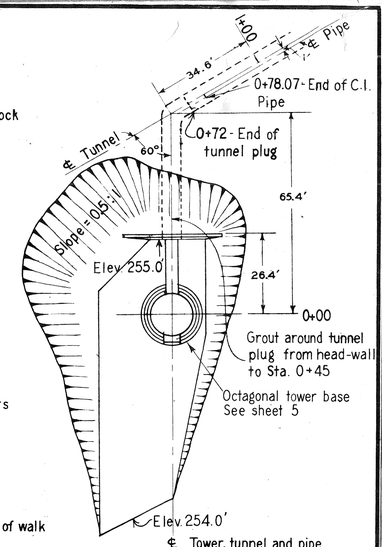


SECTION Q-Q

PIPE ANCHOR AT STATION 6+60

Looking downstream

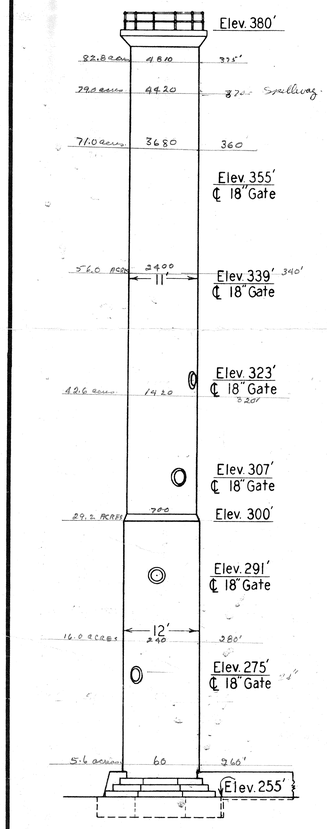
Scale in feet



INLET

Scale in feet

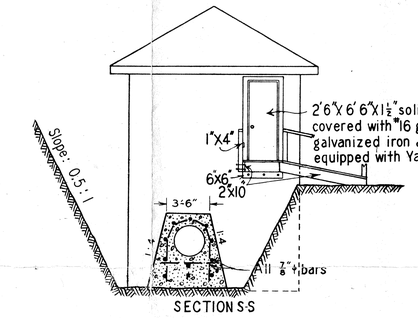
0 20 40



ELEVATION OF TOWER

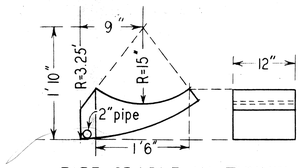
Scale in feet

0 5 10



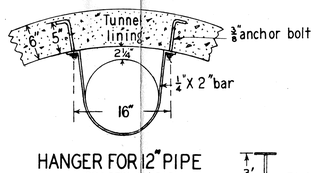
CROSS SECTION OF TUNNEL SECTION X-X

Scale in feet



PIPE CRADLE IN TUNNEL

SPACED 10' C.C.



HANGER FOR 12" PIPE

SPACED 10' C.C.

Scale in inches

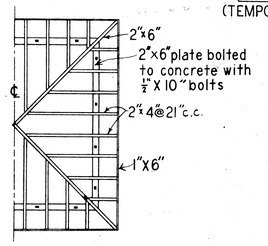
0 5 10

(TEMPORARY)

UPSTREAM ELEVATION

Scale in feet

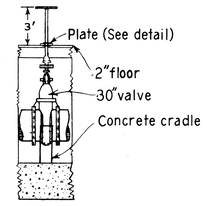
0 5



ROOF FRAMING PLAN

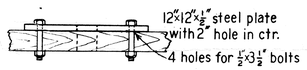
Scale in feet

0 5

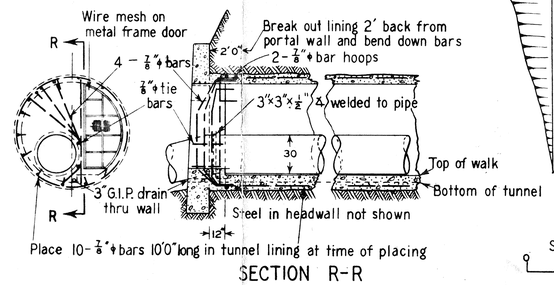


SECTION C-C

Scale in feet



FLOOR PLATE

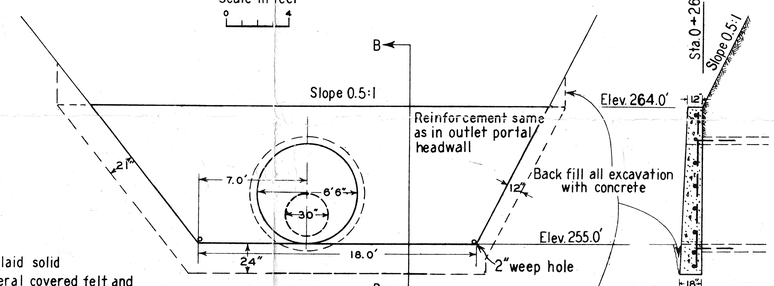


SECTION R-R

PIPE ANCHOR AT STATION 7+60

Looking upstream

Scale in feet

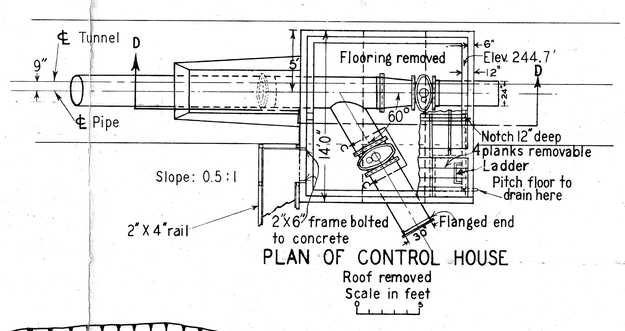


INLET PORTAL

Scale in feet

0 4

SECTION B-B

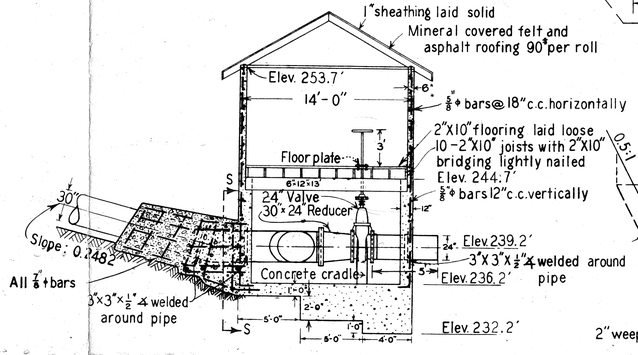


PLAN OF CONTROL HOUSE

Roof removed

Scale in feet

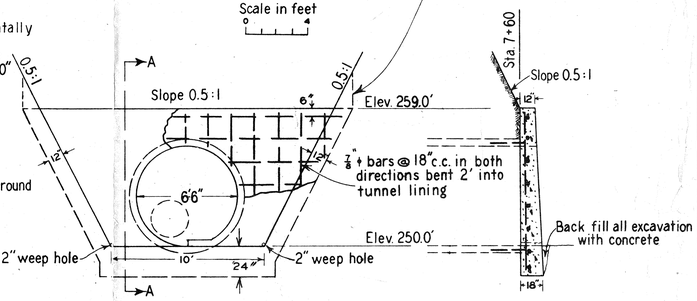
0 5



SECTION D-D

Scale in feet

0 5

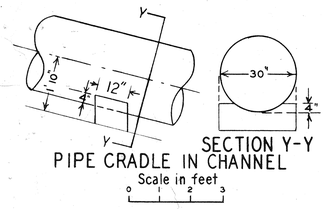


OUTLET PORTAL

Scale in feet

0 4

SECTION A-A

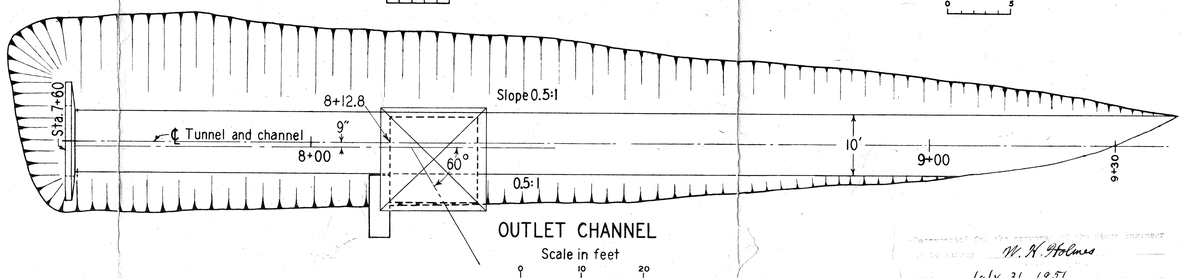


SECTION Y-Y

PIPE CRADLE IN CHANNEL

Scale in feet

0 1 2 3



OUTLET CHANNEL

Scale in feet

0 10 20

W. K. Holmes

July 31, 1951

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

APPLICATION NO. 1-21

APPROVED AS TO SAFETY

AUG. 10, 1951

A. D. Edmonston
STATE ENGINEER

SHEET 4 OF 7

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

RECTOR CREEK RESERVOIR

OUTLET TUNNEL, TOWER AND CONTROL HOUSE

AS CONSTRUCTED

RECOMMENDED:

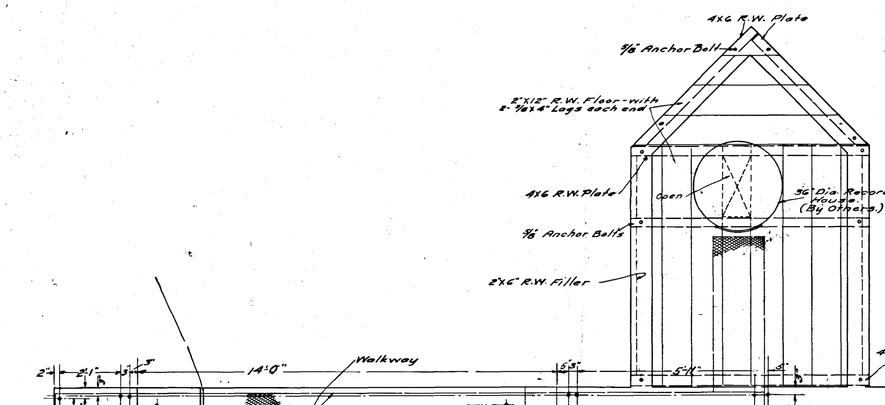
STATE ENGINEER - LICENSE NO. 7

NOVEMBER 6, 1945

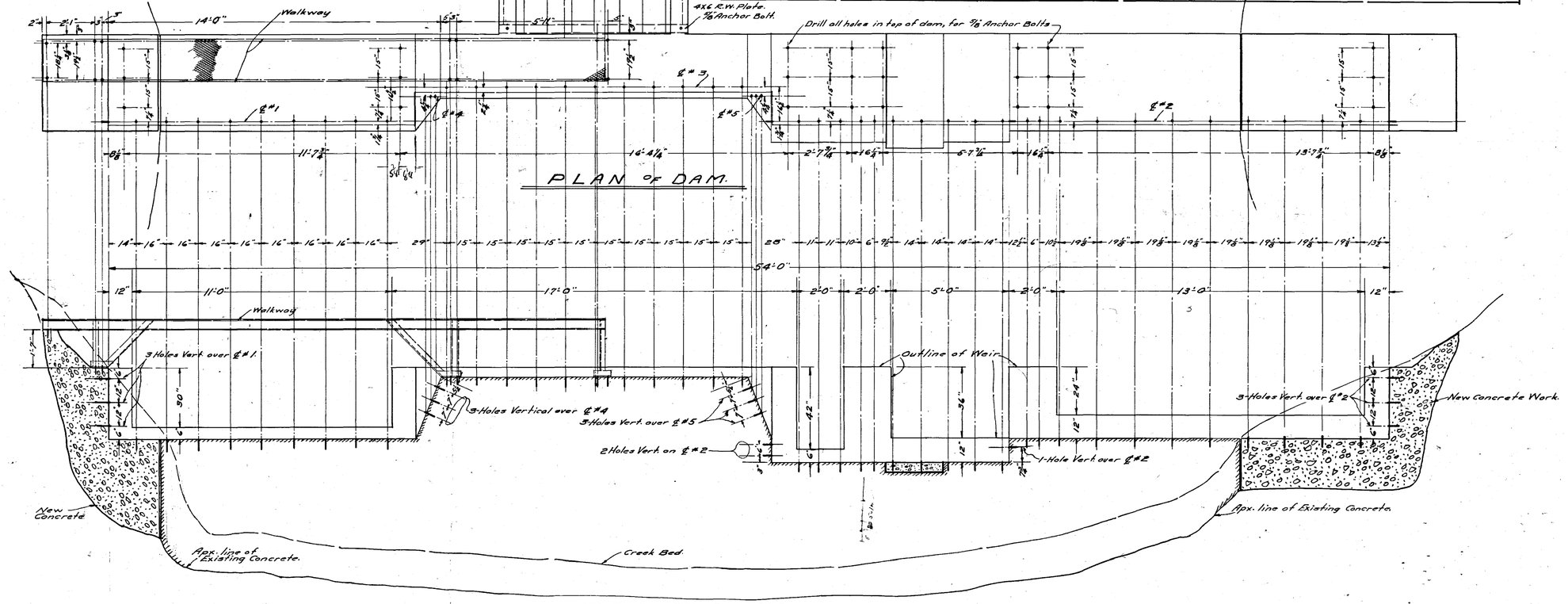
APPROVED

DIRECTOR OF PUBLIC WORKS

DIRECTOR OF FINANCE



PLAN OF DAM.



ELEVATION OF DAM
1/8" = 1'-0"

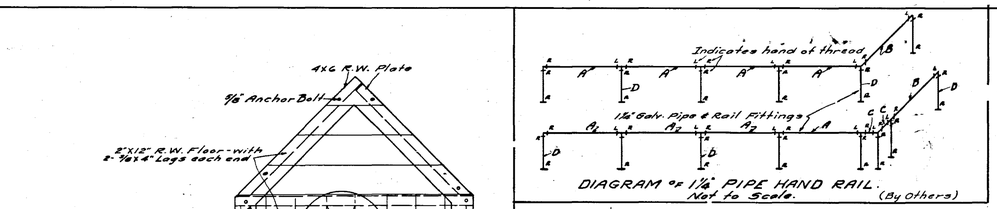
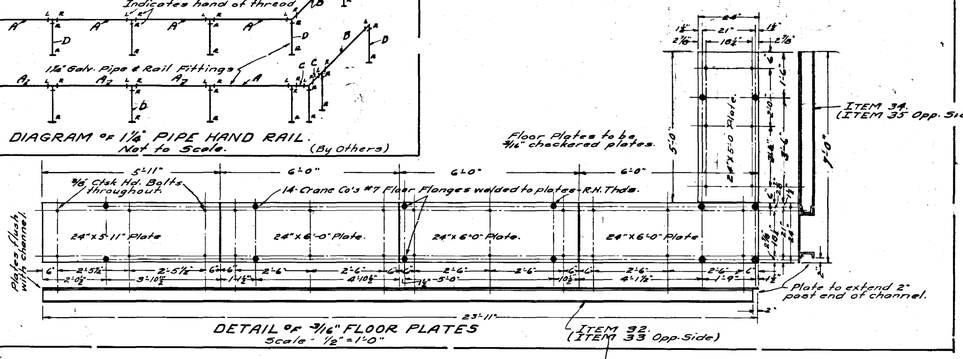
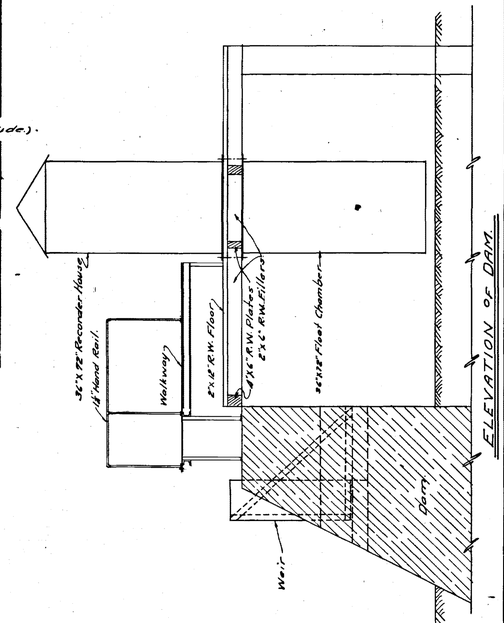
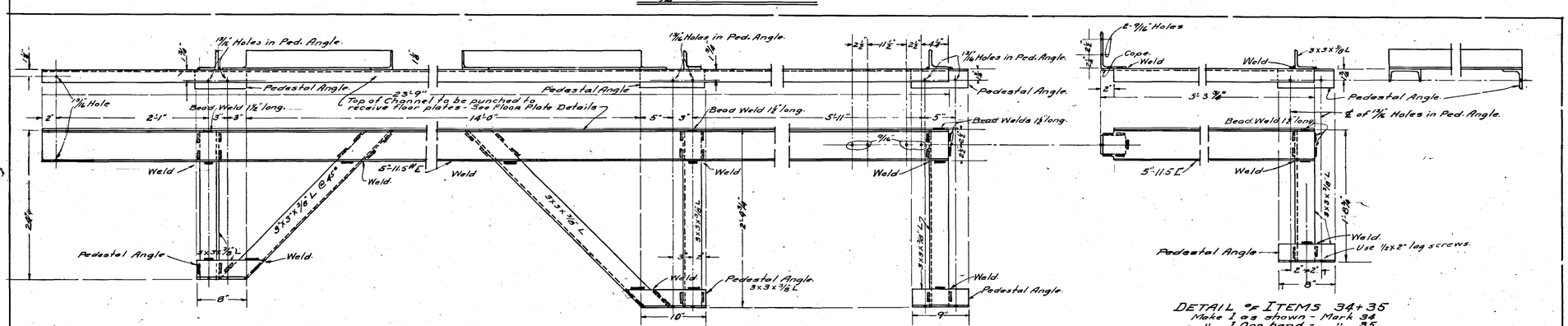


DIAGRAM of 1 1/2" PIPE HAND RAIL.
Not to Scale. (By Others)



DETAIL of 3/16" FLOOR PLATES
Scale - 1/2" = 1'-0"





DETAIL of ITEMS 32+33.
Make 1 as shown - Mark 32.
" 1 Opp. Hand - " 33.
Scale - 1 1/2" = 1'-0"

DETAIL of ITEMS 34+35
Make 1 as shown - Mark 34.
" 1 Opp. Hand - " 35.
Scale - 1/2" = 1'-0"

NOTE -
Req. #M27536 includes the furnishing and delivery of Items 1 to 31 incl. on Sheet M-2 and Items 32-33-34-35 and Thr. 5 Floor Plates on Sheet M-1. All bolts will be furnished by others. Erection will be done by others.

1. All steel shall be Structural Grade ASTM Standard for Bridges, Serial Designation A7-34 as last amended.
2. All steel shall be thoroughly cleaned of rust, scale, etc. by wire brushing or otherwise.
3. All welding shall be by the electric shielded arc process.
4. All fillet welds shall be 5/16"x1 1/2"
5. All steel shall be given one good shop coat of Dutch Boy Red Lead or equal, before leaving shop.

PLAN AND DETAILS.

THIS DRAWING IS HEREBY ACKNOWLEDGED TO BE PART OF THE PLANS REFERRED TO IN MY CONTRACT WITH THE STATE DEPARTMENT OF PUBLIC WORKS, DIVISION OF ARCHITECTURE, DATED
DATE: [redacted] CONTRACTOR: [redacted]

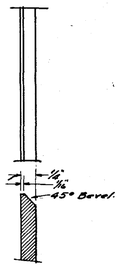
BUILDING RECTOR DAM WEIR
INSTITUTION VETERANS HOME
LOCATION YOUNTVILLE CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ARCHITECTURE
SACRAMENTO
GEO. B. McMILLAN, STATE ARCHITECT

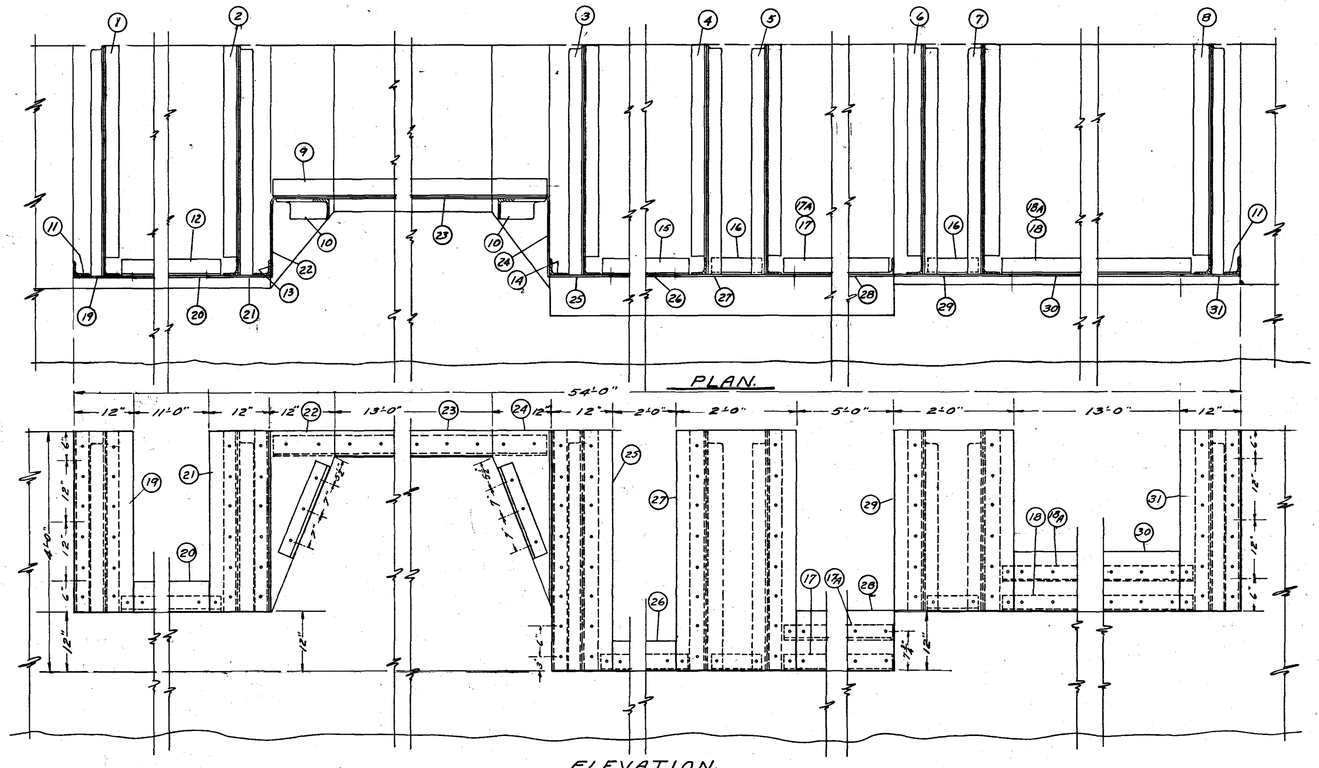
DRAWN WHE | TRACED WHE | CHECKED [illegible] | SHEET M-1 | NUMBER SHEETS THIS SET Two

11/21-37 | Blue Print No. 60 149 | Negative No. 177

28-C-35

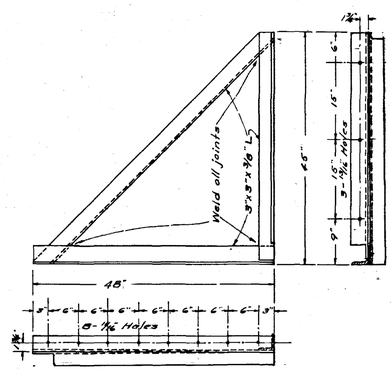


DETAIL of BEVEL
Full Size.

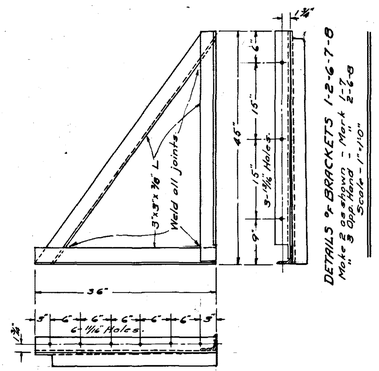


PLAN.

ELEVATION.
Scale 1"=1'-0"



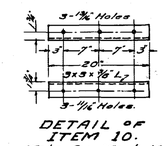
DETAIL of BRACKETS 3-4-5
Make 2 as shown: Mark 3
" 1 Opp hand " 4
Scale-1"=1'-0"



DETAILS of BRACKETS 1-2-6-7-8
Make 2 as shown: Mark 1-2-6
" 2 Opp hand " 7-8
Scale-1"=1'-0"



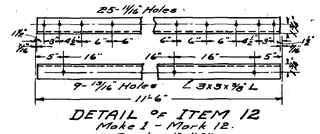
DETAIL of ITEM 9
Make 1 as shown - Mark 9.
Scale-1"=1'-0"



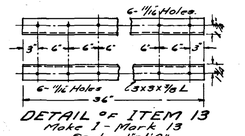
DETAIL of ITEM 10.
Make 2 - Mark 10.
Scale-1"=1'-0"



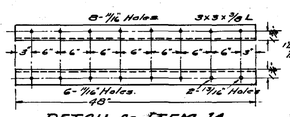
DETAIL of ITEM 11
Make 2 - Mark 11
Scale-1"=1'-0"



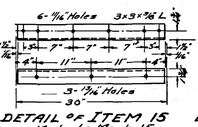
DETAIL of ITEM 12
Make 1 - Mark 12.
Scale-1"=1'-0"



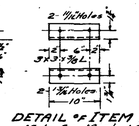
DETAIL of ITEM 13
Make 1 - Mark 13
Scale-1"=1'-0"



DETAIL of ITEM 14.
Make 1 - Mark 14
Scale-1"=1'-0"



DETAIL of ITEM 15
Make 1 - Mark 15
Scale-1"=1'-0"



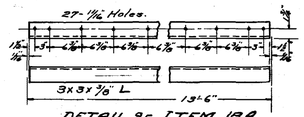
DETAIL of ITEM 16
Make 2 - Mark 16
Scale-1"=1'-0"



DETAIL of ITEM 17A
Make 1 - Mark 17A
Scale-1"=1'-0"



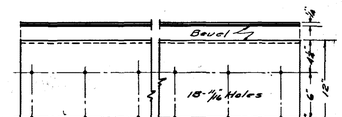
DETAIL of ITEM 17
Make 1 - Mark 17
Scale-1"=1'-0"



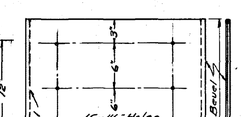
DETAIL of ITEM 18A
Make 1 - Mark 18A
Scale-1"=1'-0



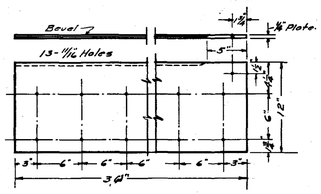
DETAIL of ITEM 18
Make 1 - Mark 18
Scale-1"=1'-0"



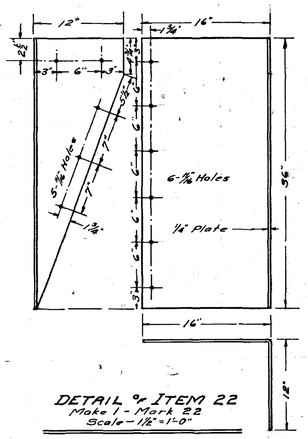
DETAIL of ITEM 28
Make 1 - Mark 28
Scale-1½"=1'-0"



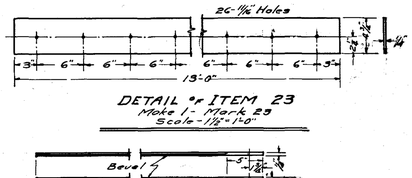
DETAIL of ITEM 29
Make 1 - Mark 29.
Scale-1½"=1'-0"



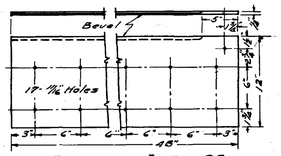
DETAIL of ITEMS 19 + 21.
Make 1 as shown - Mark 19
" 1 Opp hand " 21
Scale-1½"=1'-0"



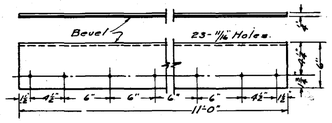
DETAIL of ITEM 22
Make 1 - Mark 22
Scale-1½"=1'-0"



DETAIL of ITEM 23
Make 1 - Mark 23
Scale-1½"=1'-0"



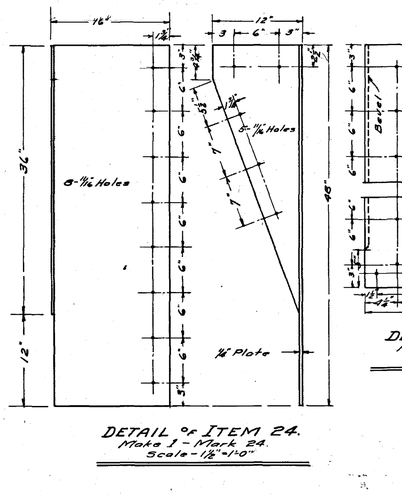
DETAIL of ITEM 25
Make 1 - Mark 25
Scale-1½"=1'-0"



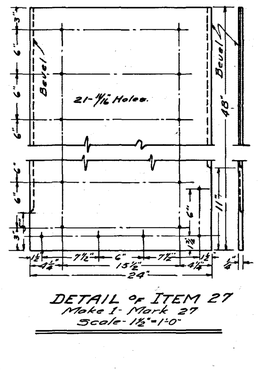
DETAIL of ITEM 20
Make 1 - Mark 20
Scale-1½"=1'-0"



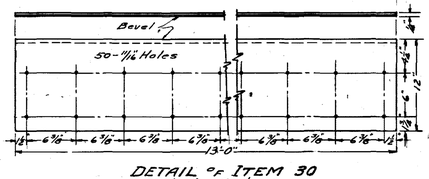
DETAIL of ITEM 26.
Make 1 - Mark 26
Scale-1½"=1'-0"



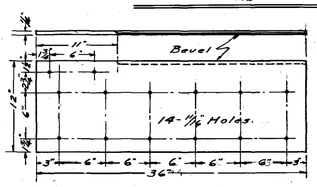
DETAIL of ITEM 24.
Make 1 - Mark 24.
Scale-1½"=1'-0"



DETAIL of ITEM 27
Make 1 - Mark 27
Scale-1½"=1'-0"



DETAIL of ITEM 30
Make 1 - Mark 30
Scale-1½"=1'-0"



DETAIL of ITEM 31.
Make 1 - Mark 31.
Scale-1½"=1'-0"

DETAILS

THIS DRAWING IS HEREBY ACKNOWLEDGED TO BE PART OF THE PLANS REFERRED TO IN MT CONTRACT WITH THE STATE DEPARTMENT OF PUBLIC WORKS, DIVISION OF ARCHITECTURE, DATED

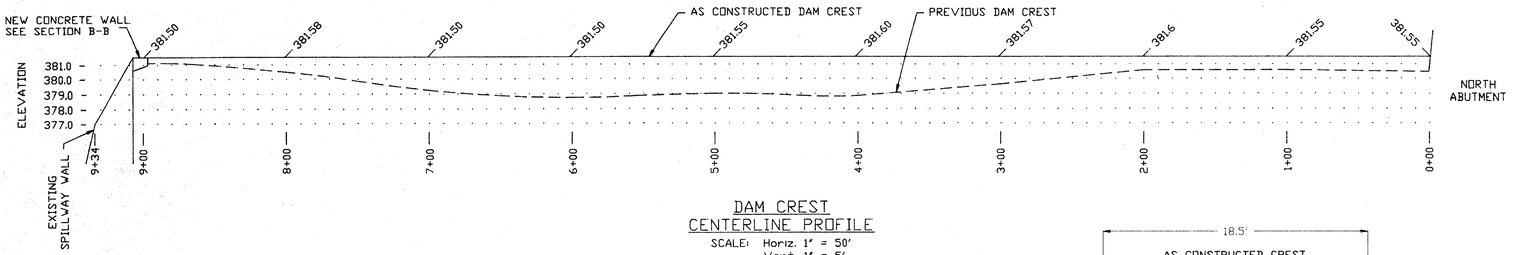
DATE _____ CONTRACTOR _____

BUILDING RECTOR DAM WEIR
INSTITUTION VETERANS HOME
LOCATION YOUNTVILLE CALIFORNIA

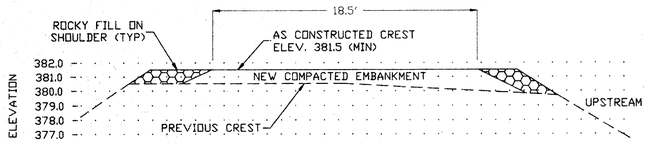
DRAWN WHE	STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF ARCHITECTURE SACRAMENTO	SHEET M-2
TRACED WHE		NUMBER
CHECKED	H. H. McDONALD, STATE ARCHITECT	SHEETS IN SET
QUANTITIES	By _____ Assistant State Architect	Two

DATE 11-21-32 REVISED _____ Chkd. No. 50149 W. O. No. 177

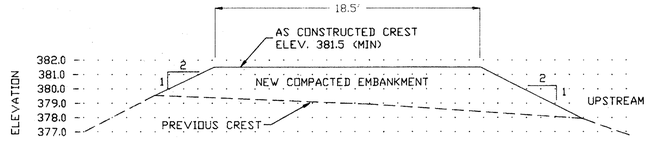
28-C-31



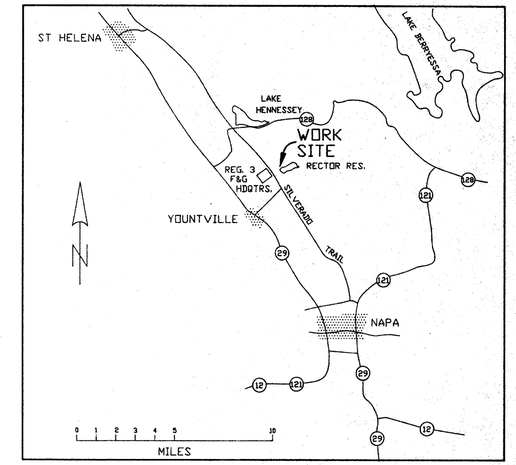
DAM CREST
CENTERLINE PROFILE
SCALE: Horiz. 1" = 50'
Vert. 1" = 5'



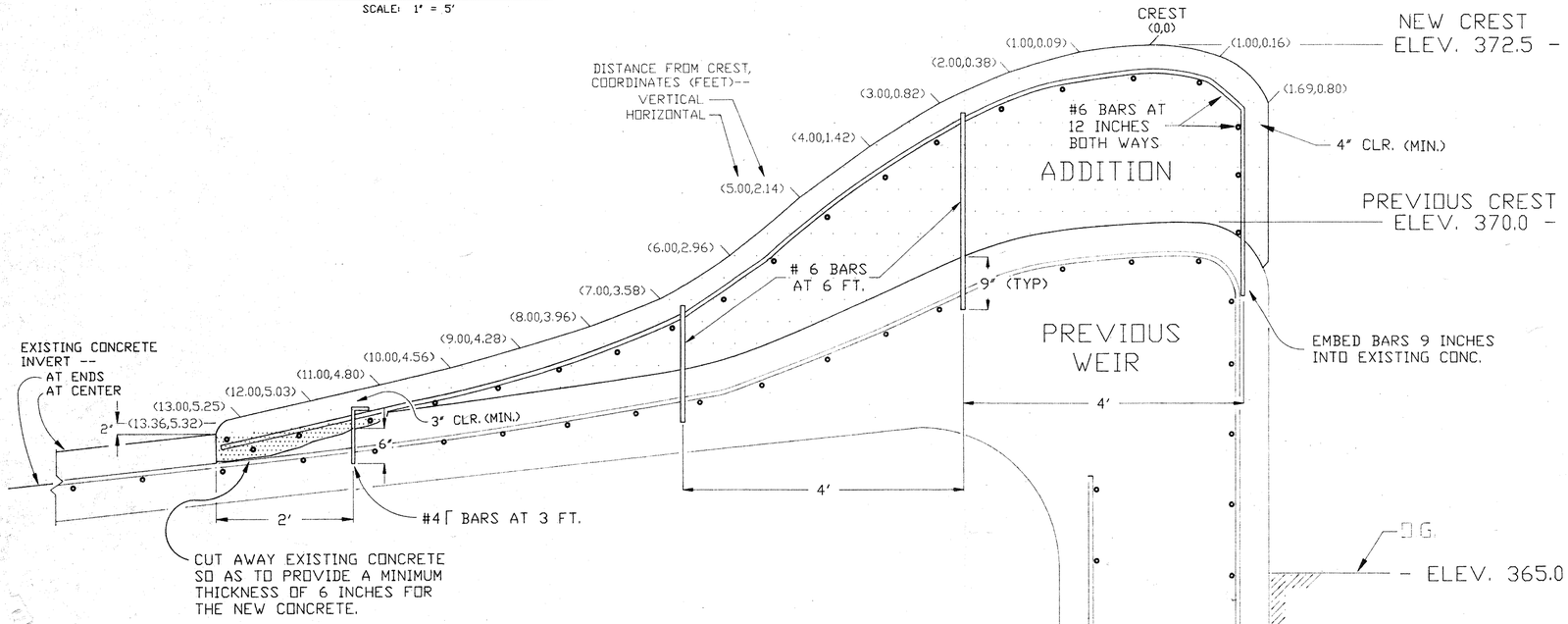
DAM CREST SECTION
AT STATION 8+00 (TYP. AT ENDS)
SCALE: 1" = 5'



DAM CREST SECTION
AT STATION 4+00
SCALE: 1" = 5'

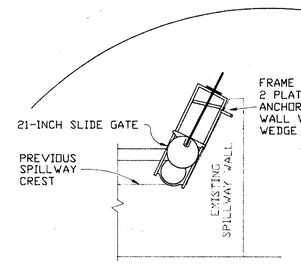


LOCATION MAP



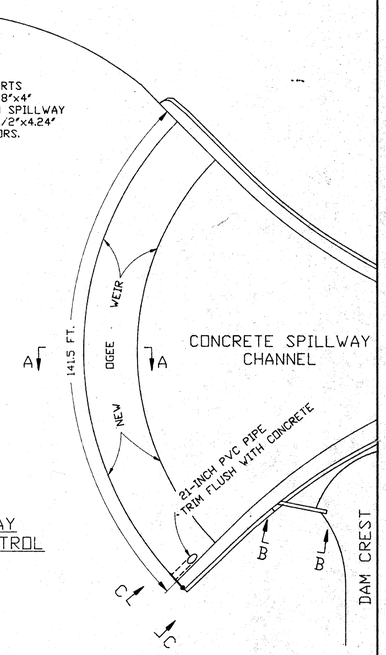
CENTER SECTION ONLY
SHOWN

SECTION A-A
SPILLWAY WEIR
SCALE: 1" = 1'

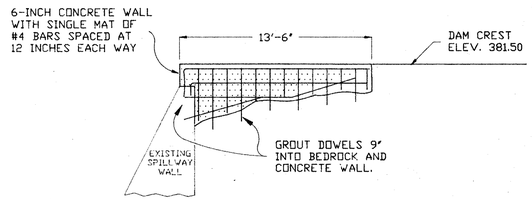


SECTION C-C
SCALE: 1" = 5'

RESERVOIR



PLAN - SPILLWAY
APPROACH and CONTROL
SCALE: 1" - 20'



SECTION B-B
SCALE: 1" = 5'

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF SAFETY OF DAMS
APPLICATION NO. 1-21
APPROVED AS TO SAFETY
AS CONSTRUCTED
MAR 9 1990
JAMES O. FITZGERALD
CHIEF, DIVISION OF SAFETY OF DAMS C.E. NO. 11593

REGISTERED PROFESSIONAL ENGINEER
GLEN H. SWANSON
No. 16397
Exp. 6-30-93
CIVIL
STATE OF CALIFORNIA

AS CONSTRUCTED
December 1989
Glen H. Swanson
Project Engineer

DESIGNED BY SWANSON DATE 4/10/89	CHECKED BY MENA DATE 4/10/89
DRAWN BY SWANSON DATE 4/10/89	APPROVED LARRY NELSON R.C.E. 18410 EXP. 6-30-93 DATE 4/10/89

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
ENGINEERING SECTION

Veterans Home of California
RECTOR CREEK DAM ENLARGEMENT
Region 3 - Napa County

Sheet 1 of 1
DRAWING NO.
53-13

I-21

BASIS OF COORDINATES AND ELEVATION:

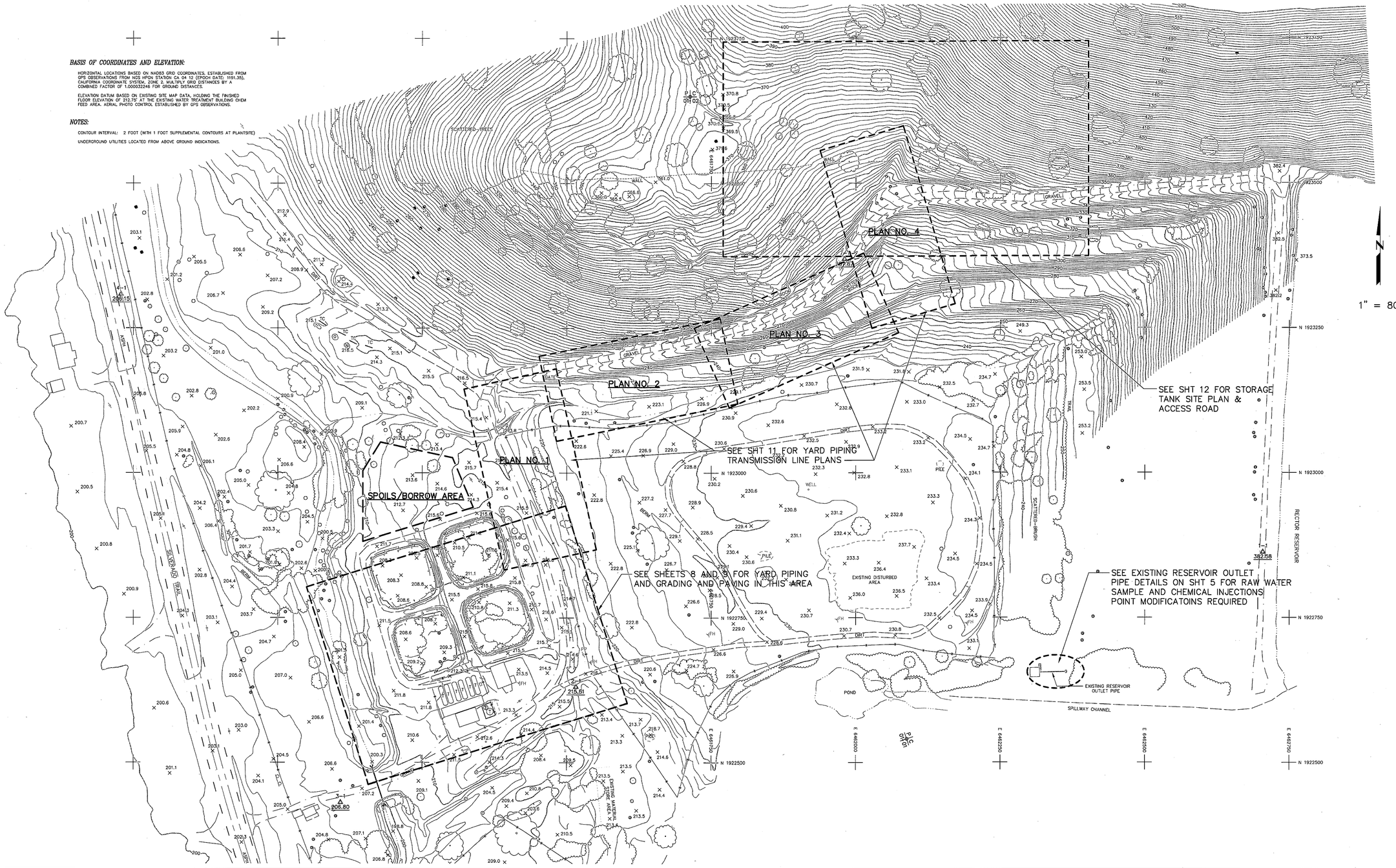
HORIZONTAL LOCATIONS BASED ON NAD83 GRID COORDINATES, ESTABLISHED FROM GPS OBSERVATIONS FROM NGS HPGN STATION CA 04 12 (EPOCH DATE: 1991.35), CALIFORNIA COORDINATE SYSTEM, ZONE 2, MULTIPLY GRID DISTANCES BY A COMBINED FACTOR OF 1.000032246 FOR GROUND DISTANCES.

ELEVATION DATUM BASED ON EXISTING SITE MAP DATA, HOLDING THE FINISHED FLOOR ELEVATION OF 212.75' AT THE EXISTING WATER TREATMENT BUILDING CHEM FEED AREA. AERIAL PHOTO CONTROL ESTABLISHED BY GPS OBSERVATIONS.

NOTES:

CONTOUR INTERVAL: 2 FOOT (WITH 1 FOOT SUPPLEMENTAL CONTOURS AT PLANTSITE)

UNDERGROUND UTILITIES LOCATED FROM ABOVE GROUND INDICATIONS.



Issue No.	Description	Date	Drwn.	Chkd.
0	DRAWINGS REVISED PER CONSTRUCTION RECORDS	5/9/01	DGC	RTR
..		.	.	.

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
02 101216
AC DATE

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SPH associates
Consulting Engineers
Cameron Park CA 95682 (530) 677 0935

REGISTERED PROFESSIONAL ENGINEER
SIGURD P. HANSEN
No.28876
Exp.3-31-03
CIVIL
STATE OF CALIFORNIA

Project Manager	SPH
Civil	RTR
Structural	WJO
Mechanical	RTR
Electrical	AB

STATE OF CALIFORNIA
Department of General Services
Real Estate Services Division - Project Management Branch
400 R Street, Suite 5100, Sacramento, Ca 95814
OPDM # 0891

RECTOR RESERVOIR
WATER TREATMENT PLANT UPGRADES
Veterans Home of California
Yountville, California
DEPARTMENT OF VETERANS AFFAIRS

EXISTING OVERALL SITE PALN

Drawn By: DGC/PVM	Date: JUNE 1999	Drawing No.: 7
Scale: AS NOTED	Project No.: 98123	

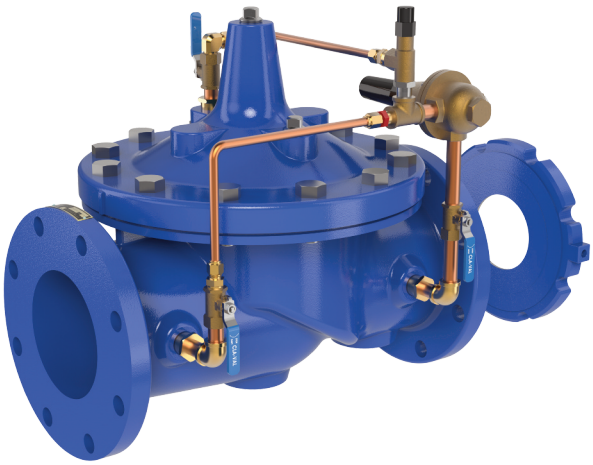
D:\YOUNTVILLE\EX05241T99 05/24/1999 DGC

Appendix C – Equipment Cutsheets

CLA-VAL®

MODEL 40-01

Rate of Flow Control Valve



- **Accurately Limits Flow Rate**
- **Completely Automatic Operation**
- **Includes Orifice Plate with Holder**
- **Optional Check Feature**
- **Easily Adjusted**

The Cla-Val Model 40-01 Rate of Flow Control Valve prevents excessive flow by limiting flow to a preselected maximum rate, regardless of changing line pressure. It is a hydraulically operated, pilot controlled, diaphragm valve. The pilot control responds to the differential pressure produced across an orifice plate installed downstream of the valve. Accurate control is assured as very small changes in the controlling differential pressure produce immediate corrective action of the main valve. Flow rate adjustments are made by turning an adjusting screw on the pilot control.

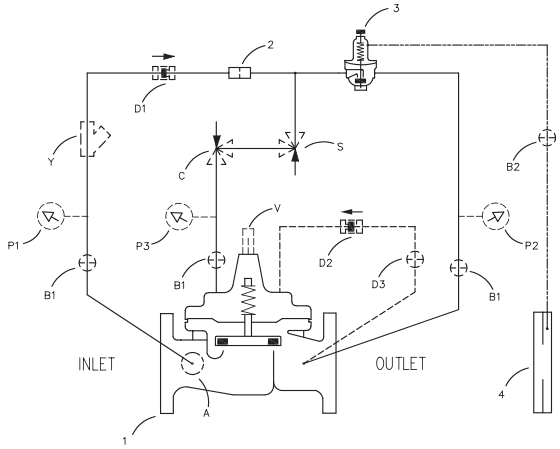
The Model 40-01 includes an orifice plate with a holder that should be installed one to five pipe diameters downstream of the valve. If the check feature option is added and a pressure reversal occurs, the downstream pressure is admitted into the main valve cover chamber and the valve closes to prevent return flow. See X52E data sheet for sizing selection.

Schematic Diagram

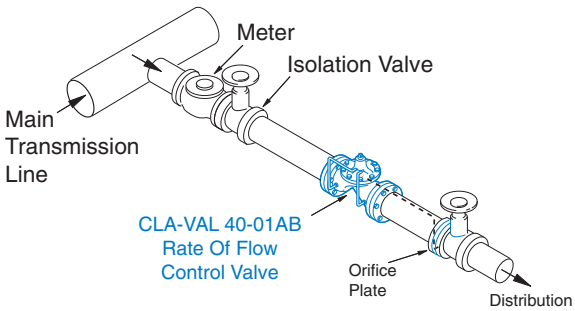
Item	Description
1	100-01 Hytrol Main Valve
2	X58C Restricting Fitting
3	CDHS18 Differential Control
4	X52E Orifice Plate Assembly

Optional Features

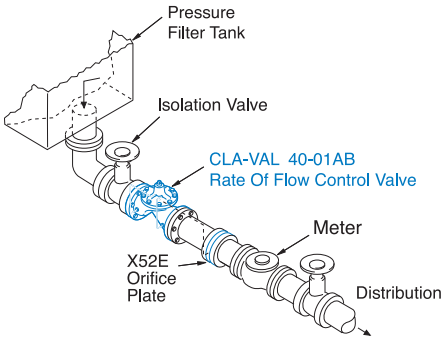
Item	Description
A	X46A Flow Clean Strainer
B	CK2 Isolation Valve
C	CV Flow Control (Closing)
D	Check Valves with Isolation Valve
P	X141 Pressure Gauge
S	CV Speed Control (Opening)
V	X101 Valve Position Indicator
Y	X43 "Y" Strainer



Typical Applications



The 40-01 is typically installed where water supply to a system must be limited to a preset maximum flow rate. The valve is easily set to maintain the maximum allowable flow rate.



The 40-01 is typically installed as a pressure type filter effluent control valve where a constant flow rate is maintained as head loss through the filter varies.

Model 40-01 (Uses 100-01 Hytrol Main Valve)

Pressure Ratings (Recommended Maximum Pressure - psi)

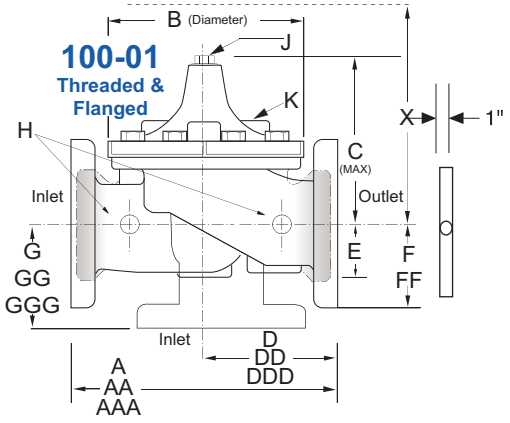
Valve Body & Cover		Pressure Class				
		Flanged			Grooved	Threaded
Grade	Material	ANSI Standards*	150 Class	300 Class	300 Class	End‡ Details
ASTM A536	Ductile Iron	B16.42	250	400	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400	400
UNS 87850	Bronze	B16.24	225	400	400	400

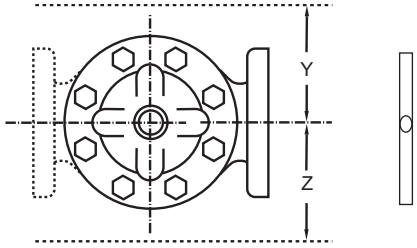
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
‡ End Details machined to ANSI B2.1 specifications.
Valves for higher pressure are available; consult factory for details

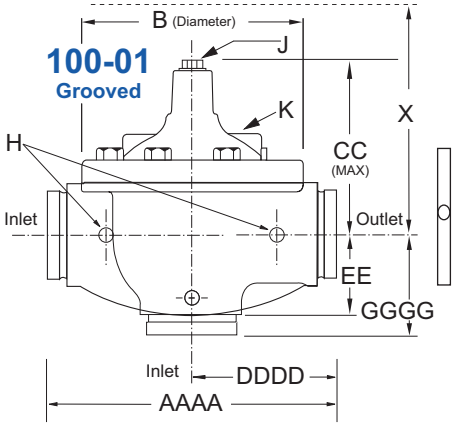
Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	1-1/2" - 36"	1-1/2" - 16"	1-1/2" - 16"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is Optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		
For material options not listed, consult factory. Cla-Val manufactures valves in more than 50 different alloys.			

Notes: The top two flange holes on valve size 36 are threaded to 1 1/2"-6 UNC.
- For Sizes 16 and smaller use X52E
- For Sizes 18 and larger use X52A-1



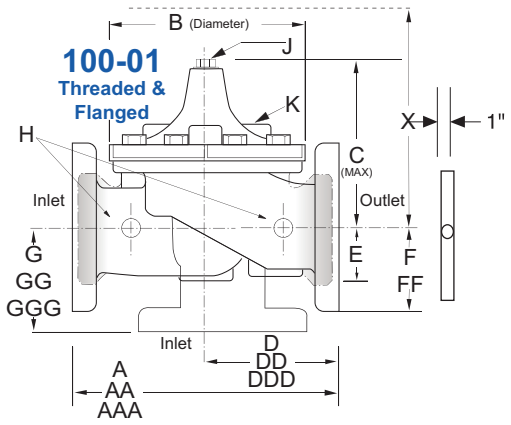


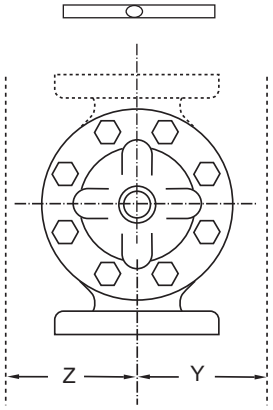


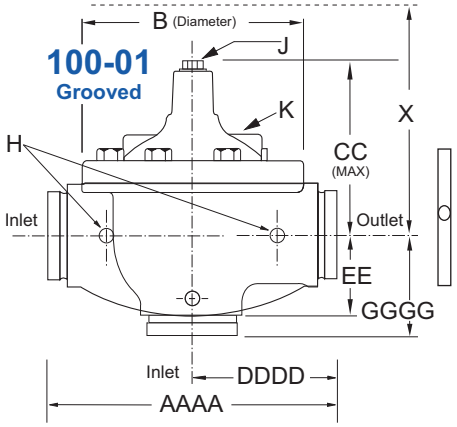
Model 40-01 Dimensions (In Inches)

Valve Size (Inches)	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
A Threaded	7.25	9.38	11.00	12.50	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38	46.00	52.00	61.50	63.00	72.75
AAA 300 ANSI	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50	47.64	53.62	63.24	64.50	74.75
AAAA Grooved End	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
B Diameter	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	35.50	41.50	45.00	53.16	56.00	66.00
C Maximum	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12	20.88	24.19	25.00	39.06	41.90	43.93	54.60	59.00
CC Maximum Grooved End	4.75	5.75	6.88	7.25	9.31	12.12	14.62	—	—	—	—	—	—	—	—	—
D Threaded	3.25	4.75	5.50	6.25	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	4.00	4.75	5.50	6.00	7.50	10.00	12.69	14.88	17.00	19.50	20.81	—	—	30.75	—	—
DDD 300 ANSI	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	21.62	—	—	31.62	—	—
DDDD Grooved End	—	4.75	—	6.00	7.50	—	—	—	—	—	—	—	—	—	—	—
E	1.12	1.50	1.69	2.06	3.19	4.31	5.31	9.25	10.75	12.62	15.50	12.95	15.00	17.75	21.31	24.56
EE Grooved End	2.00	2.50	2.88	3.12	4.25	6.00	7.56	—	—	—	—	—	—	—	—	—
F 150 ANSI	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.50	11.75	15.00	16.50	19.25	22.50	28.50
FF 300 ANSI	3.06	3.25	3.75	4.13	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.00	16.50	19.25	24.00	30.00
G Threaded	1.88	3.25	4.00	4.50	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	15.69	—	—	22.06	—	—
GGG 300 ANSI	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	16.50	—	—	22.90	—	—
GGGG Grooved End	—	3.25	—	4.25	5.00	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	0.40	0.60	0.70	0.80	1.10	1.70	2.30	2.80	3.40	4.00	4.50	5.10	5.63	6.75	7.50	8.50
Approx. Ship Weight (lbs)	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
Approx. **X** Pilot System	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Approx. **Y** Pilot System	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
Approx. **Z** Pilot System	9	9	10	11	12	20	22	24	26	29	30	32	34	39	42	47

Model 40-01 Metric Dimensions (Uses 100-01 Main Valve)









Model 40-01 Dimensions (In mm)

Valve Size (mm)	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
A Threaded	184	238	279	318	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	216	238	279	305	381	508	645	756	864	991	1051	1168	1321	1562	1600	1848
AAA 300 ANSI	229	254	295	337	397	533	670	790	902	1029	1105	1210	1326	1606	1638	1899
AAAA Grooved End	216	228	279	318	381	508	645	—	—	—	—	—	—	—	—	—
B Diameter	143	168	203	232	292	400	508	600	711	832	902	1054	1143	1350	1422	1676
C Maximum	140	165	192	208	270	340	406	435	530	614	635	992	1064	1116	1387	1499
CC Maximum Grooved End	120	146	175	184	236	308	371	—	—	—	—	—	—	—	—	—
D Threaded	83	121	140	159	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	102	121	140	152	191	254	322	378	432	495	528	—	—	781	—	—
DDD 300 ANSI	108	127	149	162	200	267	337	395	451	514	549	—	—	803	—	—
DDDD Grooved End	—	121	—	152	191	—	—	—	—	—	—	—	—	—	—	—
E	29	38	43	52	81	110	135	235	273	321	394	329	381	451	541	624
EE Grooved End	52	64	73	79	108	152	192	—	—	—	—	—	—	—	—	—
F 150 ANSI	64	76	89	95	114	140	171	203	241	267	298	381	419	489	572	724
FF 300 ANSI	78	83	95	105	127	159	191	222	260	292	324	381	419	489	610	762
G Threaded	48	83	102	114	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	102	83	102	102	127	152	203	219	349	378	399	—	—	560	—	—
GGG 300 ANSI	102	89	110	111	135	165	216	236	368	397	419	—	—	582	—	—
GGGG Grooved End	—	83	—	108	127	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	10	15	18	20	28	43	58	71	86	102	114	130	143	171	190	216
Approx. Ship Weight (kgs)	7	16	23	32	64	129	227	354	528	726	1027	1353	1769	2812	3494	5316
Approx. **X** Pilot System	280	331	356	381	432	737	788	839	915	1016	1016	1093	1194	1728	2007	2159
Approx. **Y** Pilot System	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1016	1143
Approx. **Z** Pilot System	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1067	1194

40-01 Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																
	Inches	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
	mm	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
Basic Valve 100-01	Pattern	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G	G	G, A	G	G
	End Detail	T, F, Gr*	T, F, Gr	T, F, Gr*	T, F, Gr	F, Gr	F, Gr*	F, Gr*	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	125	210	300	460	800	1800	3100	4900	7000	8400	11000	14000	17000	25000	42000	50000
	Maximum Intermittent	160	260	370	580	990	2250	3900	6150	8720	10540	13700	17500	21700	31300	48000	62500
	Minimum	1	1	2	2	4	10	15	35	50	70	95	120	150	275	450	650
Suggested Flow (Liters/Sec)	Maximum	8	13	19	29	50	113	195	309	442	530	694	883	1073	1577	2650	3150
	Maximum Intermittent	10	16	23	37	62	142	246	387	549	664	863	1104	1369	1972	3028	3940
	Minimum	.03	.06	.09	0.13	0.25	0.63	0.95	2.2	3.2	4.4	6.0	7.6	9.5	17.4	28.4	41.0

100-01 Series is the full internal port Hytrol. **For Lower Flows Consult Factory** *Globe Grooved Only

Pilot System Specifications



Adjustment Range

Low flow equals one-fourth of maximum flow stated in the X52E Orifice Plate bore chart. See X52E Engineering Data Sheet for orifice bore chart for suggested flow rates.

Temperature Range

Water: to 180°F

Materials

Standard Pilot System Materials

Pilot Control: Low Lead Bronze
Trim: Stainless Steel 303
Orifice Plate: Stainless Steel 303
Rubber: Buna-N® Synthetic Rubber

Optional Pilot System Materials

Pilot systems are available with optional Aluminum, Stainless Steel or Monel.

X52E Orifice Plate Assembly Data



- **Wafer Design**
- **Fits ANSI 125, 150, 250, 300**
- **Orifice Plate portion of assembly is made of 302 Stainless Steel**
- **Optional Materials Available**
- **See X52E Engineering Data Sheet for Bore Sizing Selections Chart (E-X52E)**

When Ordering, Please Specify

1. Catalog No. 40-01
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded or Flanged
6. Trim Material
7. Adjustment Range/Orifice Bore
8. Desired Options
9. When Vertically Installed

Note: Orifice plate assembly (X52E) may be attached to the main valve outlet flange, however, better control is obtained if it is located one to five pipe diameters downstream. Orifice plate sensing connection should be located in the pipeline on the side of the orifice plate assembly. The orifice plate assembly should not be mounted directly to a butterfly valve. See E-X52E Data Sheet for Orifice Bore adjustment range.

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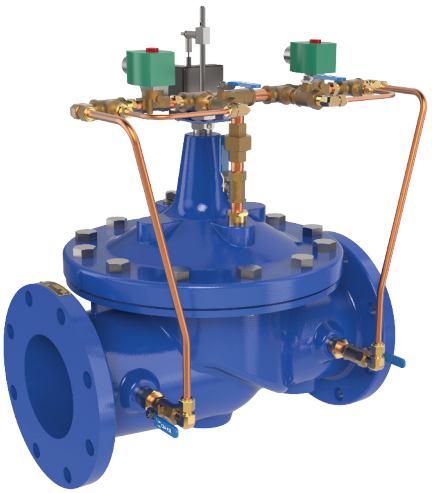
CLA-VAL™

MODEL

131 Series

Electronic Control Valves





- **Simple Proven Design**
- **Quality Solenoid Pilot Controls**
- **Ideal For SCADA Systems**
- **Multi-Function Capability; Hydraulic Backup**
- **Security System to Prevent Unauthorized Changes**
- **Easy to Maintain**

The Cla-Val Series 131 Electronic Control Valves are designed specifically for applications where remote control of the valve is preferred. It is a hydraulically operated, pilot controlled, diaphragm valve. The solenoid pilot controls are actuated by electrical signals from the optional VC-22D Electronic Valve Controller. The solenoid pilots either add or relieve line pressure from the cover chamber of the valve, causing it to open or close as directed by the electronic controller.

Series 131 Electronic Control valves can be configured to perform a wide range of functions, such as; pressure reducing, pressure sustaining, flow control, or level control. The electric controls can also be combined with hydraulic controls to create dual function, or fail-safe capability.

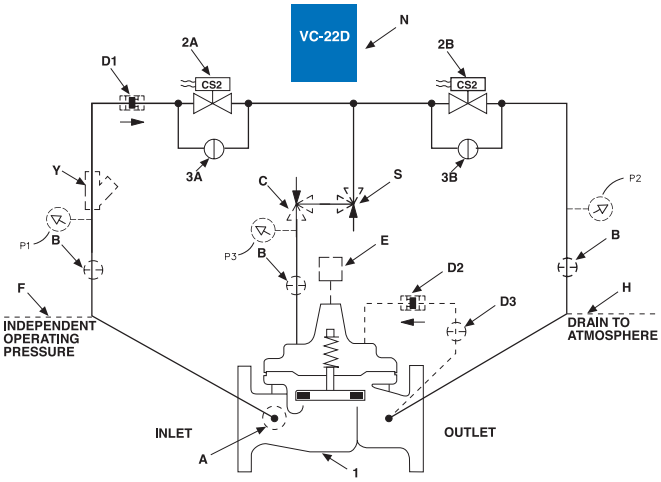
The basic 131-01 Electronic Control Valve (Schematic shown below) includes the main valve and solenoid pilot controls. Optional features include the VC-22D Electronic Valve Controller and the X117 Series Valve Position Transmitter. If the check feature option is added, and a pressure reversal occurs, the downstream pressure is admitted into the cover, closing the valve.

Schematic Diagram

Item	Description
1	100-01 Hytrol Main Valve
2	CS2 Solenoid Control
3	CK2 Solenoid Bypass Valve

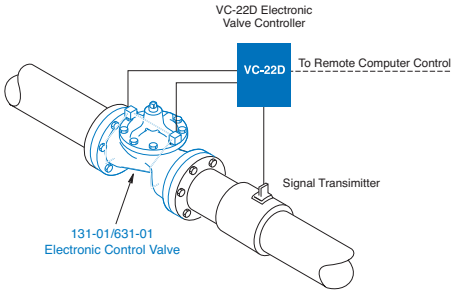
Optional Features

Item	Description
A	X46A Flow Clean Strainer
B	CK2 Isolation Valve
C	CV Flow Control (Closing)
D	Check Valves With Isolation Valve
E	X117 Series Position Transmitter
F	Independent Operating Pressure
H	Atmospheric Drain
N	Electronic Controller
P	X141 Pressure Gauge
S	CV Flow Control (Opening)
Y	X43 "Y" Strainer



Typical Applications

This data sheet contains typical applications that are modifications to the basic 131-01 Electronic Control Valve shown here. It is typically installed in a pipeline with a VC-22D Series Controller that receives a process variable signal that is compared to a set point and adjusts the main valve's capacity until the signals match. There are many different variations not shown in this brochure. Contact us with your specific application and we will provide a field proven solution.



131 Series (Uses 100-01 Hytrol Main Valve)

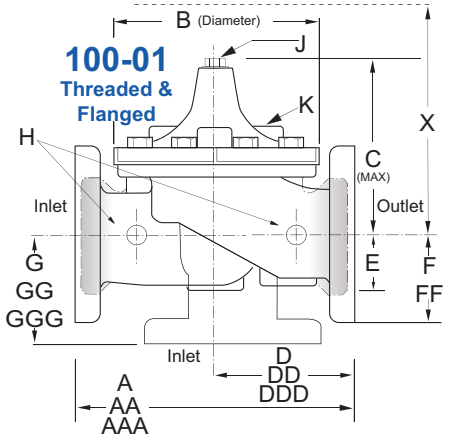
Pressure Ratings (Recommended Maximum Pressure - psi)

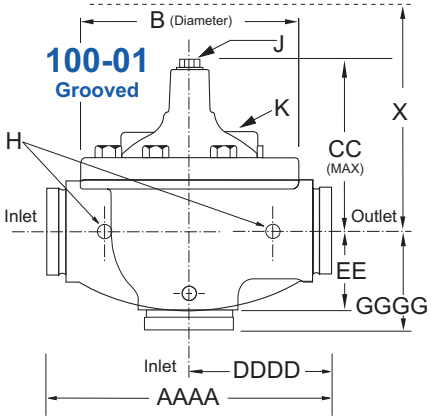
Valve Body & Cover		Pressure Class				
		Flanged			Grooved	Threaded
Grade	Material	ANSI Standards*	150 Class	300 Class	300 Class	End‡ Details
ASTM A536	Ductile Iron	B16.42	250	400	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400	400
UNS 87850	Bronze	B16.24	225	400	400	400

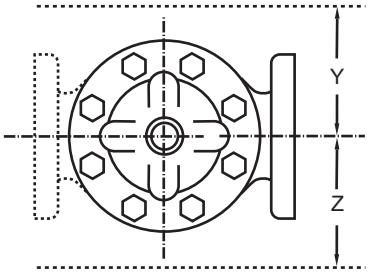
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
‡ End Details machined to ANSI B2.1 specifications.
Valves for higher pressure are available; consult factory for details

Materials

Component	Standard Material Combinations		
Valvve Body & Cover	Ductile Iron	Cast Steel	Bronze
100-01 Available Sizes	1" - 36" 25 - 900 mm	1" - 16" 25 - 400 mm	1" - 16" 25 - 400 mm
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is Optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		
For material options not listed, consult factory. Cla-Val manufactures valves in more than 50 different alloys.			



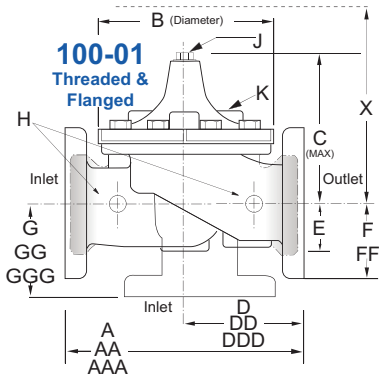


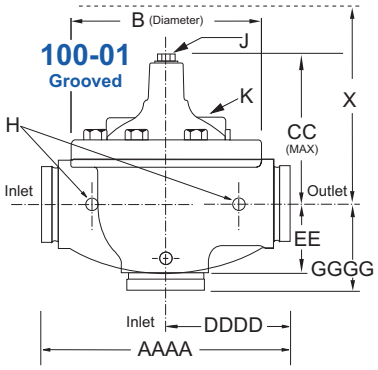


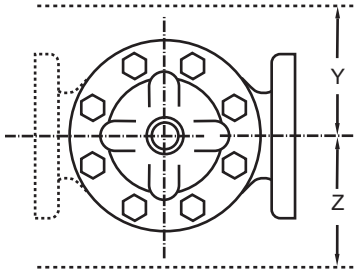
131 Series Dimensions (In Inches)

Valve Size (Inches)	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36
A Threaded	7.25	7.25	7.25	9.38	11.00	12.50	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38	46.00	52.00	61.50	63.00	72.75
AAA 300 ANSI	—	—	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50	47.64	53.62	63.24	64.50	74.75
AAAA Grooved End	—	—	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
B Diameter	5.62	5.62	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	35.50	41.50	45.00	53.16	56.00	66.00
C Maximum	5.50	5.50	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12	20.88	24.19	25.00	39.06	41.90	43.93	54.60	59.00
CC Maximum Grooved End	—	—	4.75	5.75	6.88	7.25	9.31	12.12	14.62	—	—	—	—	—	—	—	—	—
D Threaded	3.25	3.25	3.25	4.75	5.50	6.25	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	4.00	4.75	5.50	6.00	7.50	10.00	12.69	14.88	17.00	19.50	20.81	—	—	30.75	—	—
DDD 300 ANSI	—	—	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	21.62	—	—	31.62	—	—
DDDD Grooved End	—	—	—	4.75	—	6.00	7.50	—	—	—	—	—	—	—	—	—	—	—
E	1.12	1.12	1.12	1.50	1.69	2.06	3.19	4.31	5.31	9.25	10.75	12.62	15.50	12.95	15.00	17.75	21.31	24.56
EE Grooved End	—	—	2.00	2.50	2.88	3.12	4.25	6.00	7.56	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.50	11.75	15.00	16.50	19.25	22.50	28.50
FF 300 ANSI	—	—	3.06	3.25	3.75	4.13	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.00	16.50	19.25	24.00	30.00
G Threaded	1.88	1.88	1.88	3.25	4.00	4.50	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	15.69	—	—	22.06	—	—
GGG 300 ANSI	—	—	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	16.50	—	—	22.90	—	—
GGGG Grooved End	—	—	—	3.25	—	4.25	5.00	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	0.40	0.40	0.40	0.60	0.70	0.80	1.10	1.70	2.30	2.80	3.40	4.00	4.50	5.10	5.63	6.75	7.50	8.50
Approx. Ship Weight (lbs)	15	15	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
Approx. **X** Pilot System	11	11	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Approx. **Y** Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
Approx. **Z** Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	42	47

131 Series Metric Dimensions (Uses 100-01 Hytrol Main Valve)



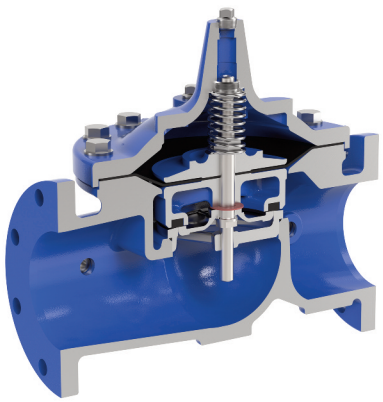




Model 131 Series Dimensions (In mm)

Valve Size (mm)	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**750**	**900**
A Threaded	184	184	184	238	279	318	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	216	238	279	305	381	508	645	756	864	991	1051	1168	1321	1562	1600	1848
AAA 300 ANSI	—	—	229	254	295	337	397	533	670	790	902	1029	1105	1210	1326	1606	1638	1899
AAAA Grooved End	—	—	216	228	279	318	381	508	645	—	—	—	—	—	—	—	—	—
B Diameter	143	143	143	168	203	232	292	400	508	600	711	832	902	1054	1143	1350	1422	1676
C Maximum	140	140	140	165	192	208	270	340	406	435	530	614	635	992	1064	1116	1387	1499
CC Maximum Grooved End	—	—	120	146	175	184	236	308	371	—	—	—	—	—	—	—	—	—
D Threaded	83	83	83	121	140	159	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	102	121	140	152	191	254	322	378	432	495	528	—	—	781	—	—
DDD 300 ANSI	—	—	108	127	149	162	200	267	337	395	451	514	549	—	—	803	—	—
DDDD Grooved End	—	—	—	121	—	152	191	—	—	—	—	—	—	—	—	—	—	—
E	29	29	29	38	43	52	81	110	135	235	273	321	394	329	381	451	541	624
EE Grooved End	—	—	52	64	73	79	108	152	192	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	64	76	89	95	114	140	171	203	241	267	298	381	419	489	572	724
FF 300 ANSI	—	—	78	83	95	105	127	159	191	222	260	292	324	381	419	489	610	762
G Threaded	48	48	48	83	102	114	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	102	83	102	102	127	152	203	219	349	378	399	—	—	560	—	—
GGG 300 ANSI	—	—	102	89	110	111	135	165	216	236	368	397	419	—	—	582	—	—
GGGG Grooved End	—	—	—	83	—	108	127	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	10	10	10	15	18	20	28	43	58	71	86	102	114	130	143	171	190	216
Approx. Ship Weight (kgs)	7	7	7	16	23	32	64	129	227	354	528	726	1027	1353	1769	2812	3494	5316
Approx. **X** Pilot System	280	280	280	331	356	381	432	737	788	839	915	1016	1016	1093	1194	1728	2007	2159
Approx. **Y** Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1016	1143
Approx. **Z** Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1067	1194

Model 100-01 Full Port Hytrol Main Valve





for applications requiring a reduced port valve, please refer to the 631 Series Engineering Data Sheet

131 Series (Uses 100-01 Hytrol Main Valve)

131 Series Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																		
	Inches	1	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
	mm	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
Main Valve 100-01	Pattern	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G	G	G, A	G	G
	End Detail	T	T	T, F, Gr*	T, F, Gr	T, F, Gr*	T, F, Gr	F, Gr	F, Gr*	F, Gr*	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	55	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000	14000	17000	25000	42000	50000
	Maximum Intermittent	68	120	160	260	370	580	990	2250	3900	6150	8720	10540	13700	17500	21700	31300	48000	62500
	Minimum	1	1	1	1	2	2	4	10	15	35	50	70	95	120	150	275	450	650
Suggested Flow (Liters/Sec)	Maximum	3.5	6	8	13	19	29	50	113	195	309	442	530	694	883	1073	1577	2650	3150
	Maximum Intermittent	4.3	7.6	10	16	23	37	62	142	246	387	549	664	863	1104	1369	1972	3028	3940
	Minimum	.03	.03	.03	.06	.09	0.13	0.25	0.63	0.95	2.2	3.2	4.4	6.0	7.6	9.5	17.4	28.4	41.0

100-01 Series is the full internal port Hytrol. **For Lower Flows Consult Factory** *Globe Grooved Only

131 Series Pilot System Specifications

Temperature Range

Water: to 180°F

Rubber Parts:

Buna-N® Rubber Synthetic

Solenoid Control

Body:

Brass ASTM B283

Enclosure:

NEMA Type 1,2,3,3S,4,4X general purpose watertight*

NEMA Type 6,6P,7,9 Watertight Explosion-Proof available.

Please consult factory for pilot system adjustment ranges

Voltages:

110, 220, -50Hz Ac

24, 120, 240, 480 - 60Hz AC

6, 12, 24, 120, 240 - DC

Others available at extra cost

Max. operating pressure differential: 200 psi unless otherwise specified

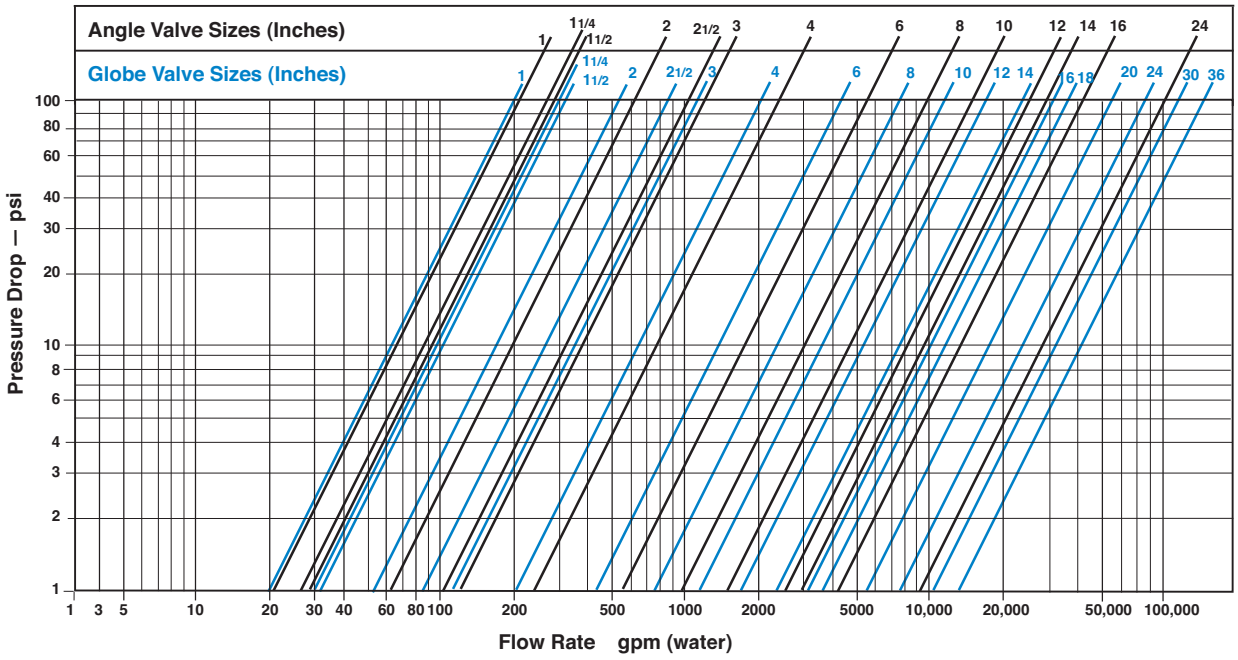
Coil:

Insulation molded Class	F
Watts AC	6
AC Volt Amps Inrush	30
AC Volt Amps Holding	16
Watts DC	10.6

When Ordering, Specify:

1. Catalog No. 131 Series
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded, Flanged or Grooved
6. Trim Material
7. Adjustment Range
8. Desired Options
9. When Vertically Installed

131 Series Flow Data



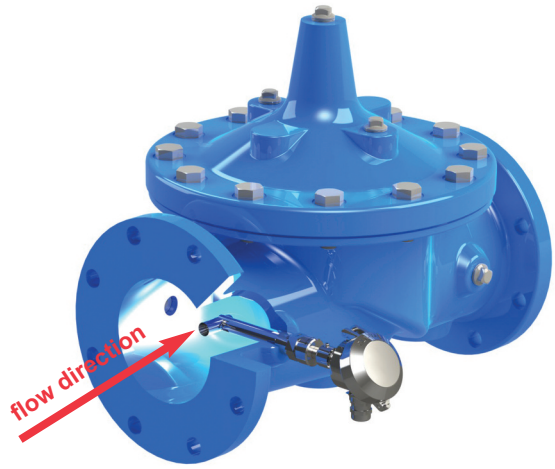
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MODEL X144D

e-FlowMeter with Display



- **Plug and Play Metering**
- **Built-In LCD Touch Screen**
- **Can be factory assembled on a new valve**
- **Alleviates the need for an in-line meter and the associated installation costs**
- **IP68 Submersible**
- **Stainless Steel Construction**
- **Independent laboratory tested:**
  - **Utah State University, Imperial College - London**



Installation view of the X144D e-FlowMeter
Note: Consult Factory for Angle Pattern Applications

The Cla-Val Model X144D e-FlowMeter is a vortex shedding insertion flow meter designed to be retrofitted into a Cla-Val Automatic Control Valve to provide accurate flow measurement data without the need to install a separate meter.

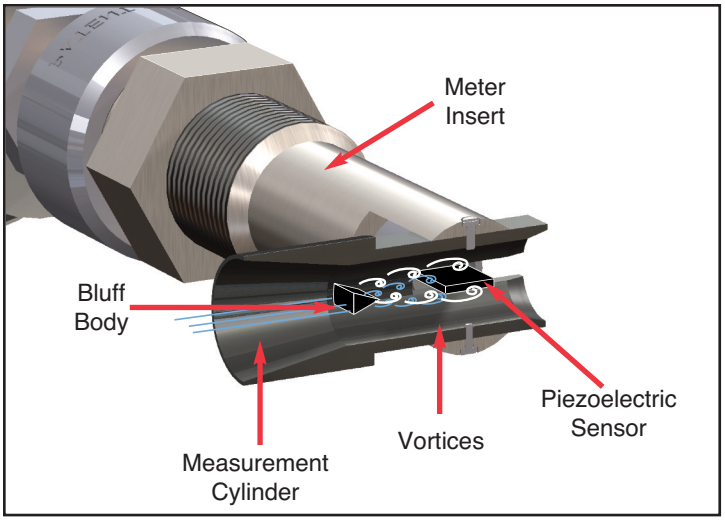
Configured for installation in the inlet tapping of a Cla-Val Automatic Control Valve, the X144D can be used in valves directly downstream of a flow disturbance such as elbows, valves or a reducer. (See page 2 for installation guidelines)

The X144D e-FlowMeter employs an innovative swivel mechanism which allows the meter to be inserted into tappings as small as 1/2-inch. For applications involving installation in close proximity to pump discharge, please consult factory with details.

Frequency Measurement

The X144D e-FlowMeter uses the vortex shedding method to measure flow. The meter is inserted into the inlet tapping of the valve and the measurement cylinder is oriented parallel to the direction of flow. The flow enters the measurement cylinder where it encounters the bluff body, generating vortices, which in turn, deflects off the piezoelectric sensor.

The sensor counts the vortices and communicates the data to the meter's integral circuit board. The flow data signal is converted to 4-20mA, or transistor (NPN) pulse, depending on the desired application.

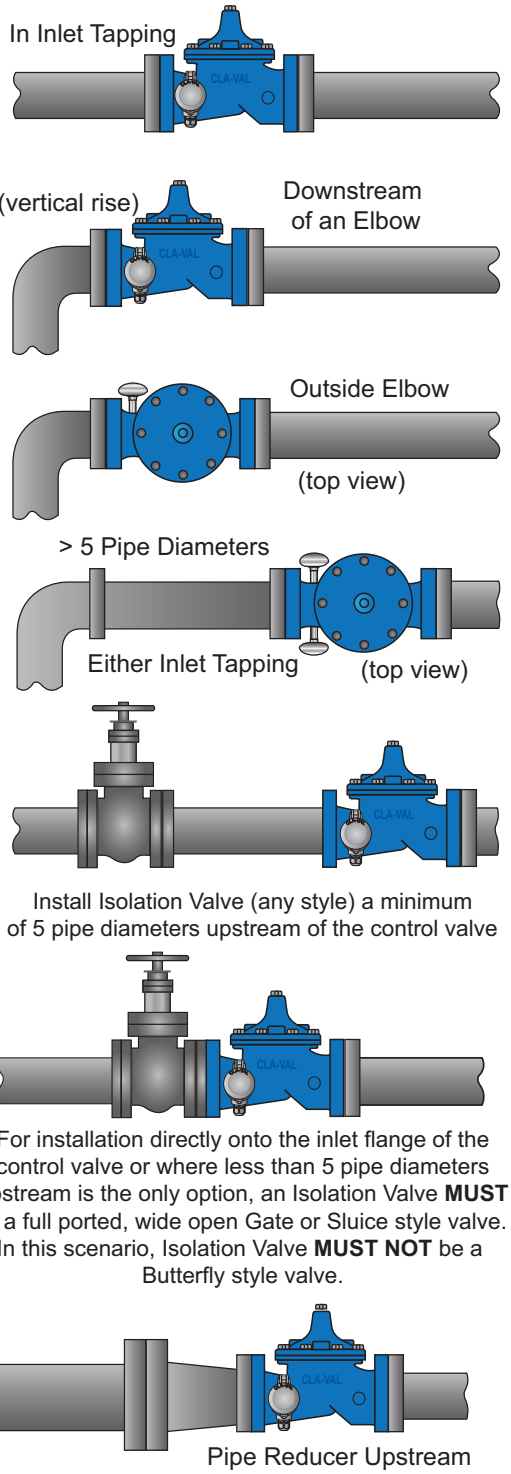


Installation Guidelines and Typical Applications

Installation Locations

For optimum performance, it is recommended that the valve in which the X144D e-FlowMeter is installed be located as shown below.

Optimum Installations

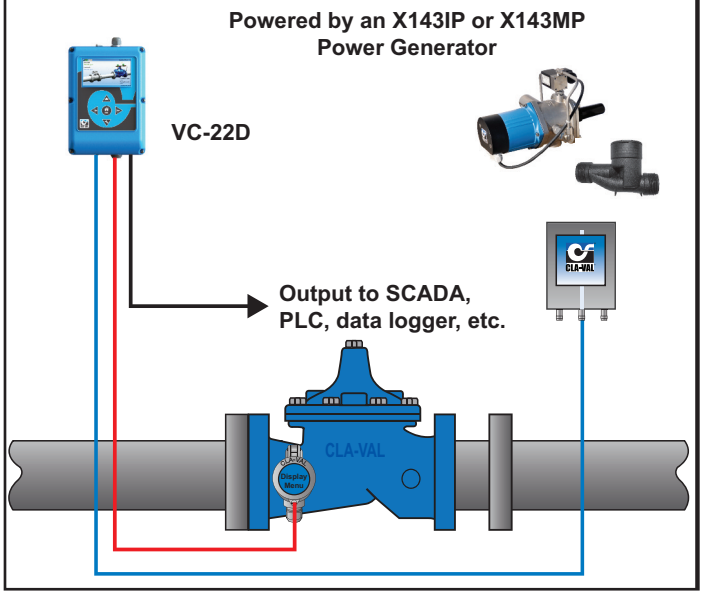


Typical Applications

The X144D e-FlowMeter is ideal for installation in any application where metering is desired.

Combining additonal Cla-Val electronic products with the X144D e-FlowMeter provides even more access to valve performance data installed in remote locations.

Data Acquisition and Storage plus Power



Data Acquisition and Storage using Cla-Val Power Generator

- The X144D e-FlowMeter connects to most commercially available loggers with the choice of 4-20mA or pulse output
- The VC-22D Controller and X145 e-Display are ideal companions to the X144D e-flowMeter, providing access to real-time data
- The VC-22D Controller, e-Display and e-FlowMeter can be powered by the X143 Series Power Generators

Typical Menus



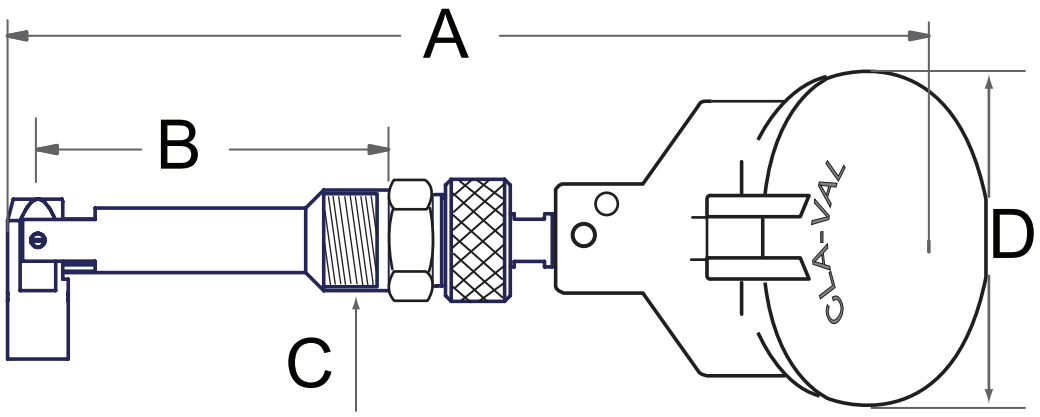
Display Menu **Settings Menu**

Installation Notes:

- Consult factory for other installation configurations
- Do not use butterfly valves as isolation valves adjacent to X144D installations

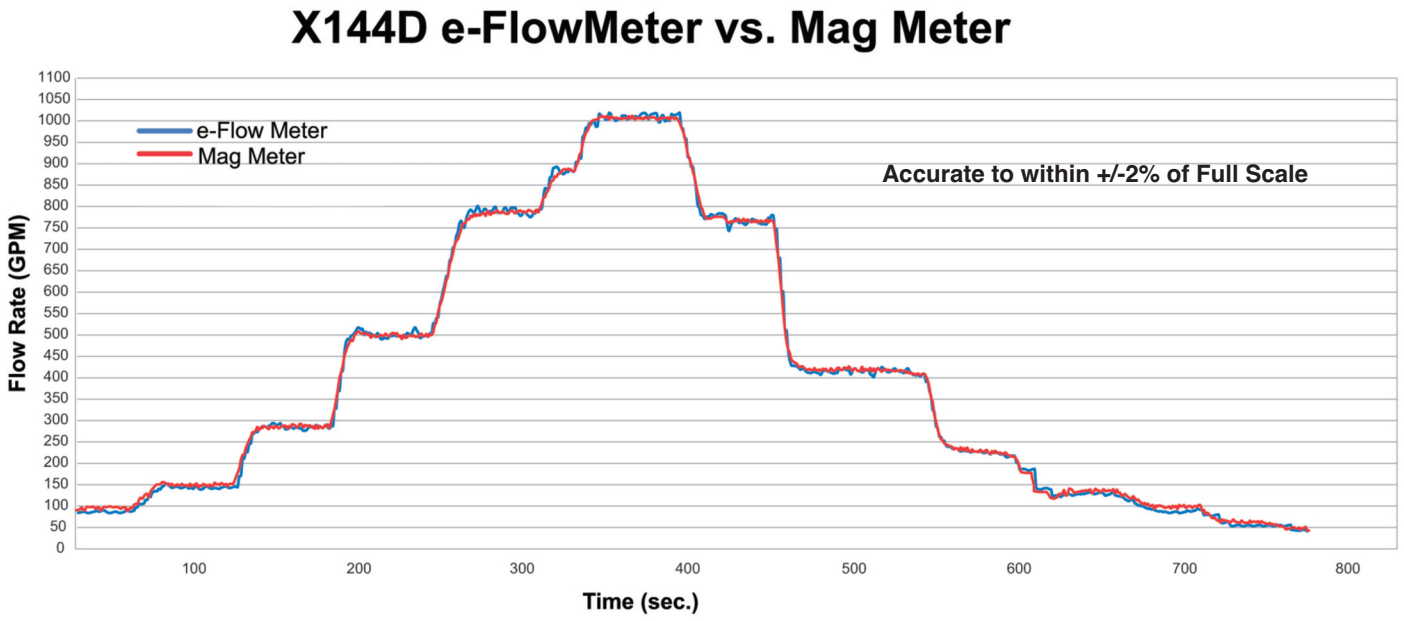
X144D Dimensions

X144D Sizes		1			2		3		4						
Full Port Valve Sizes (inches)		2	2-1/2	3	4	6	8	10	12	14	16	18	20	24	30
Reduced Port Valve Sizes (inches)		4	4	4	6	8	10	12	14	16	18	20	24	CF	CF
Overall Length (in inches)	A	8.85	8.85	8.85	9.45	9.45	13.18	13.18	17.91	17.91	17.91	17.91	17.91	17.91	17.91
Insertion Length (in inches)	B	2.3	2.3	2.3	2.8	2.8	6.8	6.8	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Pipe Thread (NPT)	C	1/2	1/2	1/2	3/4	3/4	1	1	1	1	1	1	1	1	1
Overall Width (in inches)	D	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25



*2" X144D e-FlowMeter may be installed on new valves only. Consult factory for larger applications

Typical Performance



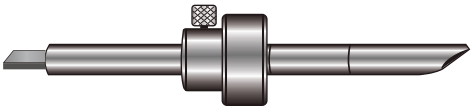
Product Details

Insertion Tool and Locking Ring

- Required for installation
- Tool allows the proper installation and alignment of the bluff body to be parallel to upstream flow

Power Requirement

- 12/24 VDC, 1.0 Watts minimum



X144D Insertion Tool

X144D e-Flow Meter Sizing

- The X144D threads directly into the inlet tapping of a Cla-Val Control Valve. The size of the e-FlowMeter is dependent on the specific valve size for which it has been calibrated - no additional fittings are required. **See dimension chart on previous page.**

Cabling

- The unit is supplied with 30 feet of shielded cable.

Maximum Operating Pressure : 400 PSI

X144D e-FlowMeter Operational Flow Range = from 0.5 ft/s to 20 ft/s

X144D e-FlowMeter Analog Range (4-20mA Scaling): Factory Settings

Port Style	Line Size inches (mm)	**2" (50) (100-49 Body)	2-1/2" (65)	3" (80)	4" (100)	6" (150)	8" (200)	10" (250)	12" (300)	14" (350)	16" (400)	18" (450)	20" (500)	24" (600)	30" (750)
Full Port Valves 4mA = 0 (GPM - l/s)	20mA Range (GPM)	260	375	575	1000	2250	3900	6000	8750	10500	14000	17500	22000	31000	52000
	20mA Range (l/s)	16.4	23.7	36.3	63.1	140	245	380	550	660	880	1100	1390	1950	3280
Full Port Pulse Weight*	Gal/Pulse	5	6.5	9.5	17	38	65	100	150	175	235	290	365	515	865
	l/Pulse	19	25	36	65	145	245	380	565	660	890	1100	1380	1950	3275
Reduced Port Valves 4mA = 0 (GPM- l/s)	20mA Range (GPM)	**Not Available**			675	1600	2900	4500	5650	7750	9350	**Consult Factory**			
	20mA Range (l/s)				42.5	100	180	285	355	490	590				
Reduced Port Valves Pulse Weight*	Gal/Pulse				11.5	26	48	75	95	130	155				
	l/Pulse				44	99	180	285	360	495	585				

* Pulse Width = 250ms

**2" X144D e-FlowMeter may be installed on new valves only

CLA-VAL

1701 Placentia Avenue • Costa Mesa, CA 92627

800-942-6326 • Fax: 949-548-5441 • www.cla-val.com • info@cla-val.com

CLA-VAL CANADA
4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
Fax: 905-563-4040
E-mail sales@cla-val.ca

CLA-VAL EUROPE
Chemin des Mésanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
E-mail: cla-val@cla-val.ch

CLA-VAL UK
Dainton House, Goods Station Road
Tunbridge Wells
Kent TN1 2 DH England
Phone: 44-1892-514-400
E-mail: info@cla-val.co.uk

CLA-VAL FRANCE
Porte du Grand Lyon 1
ZAC du Champ du Périer
France - 01700 Neyron
Phone: 33-4-72-25-92-93
E-mail: cla-val@cla-val.fr

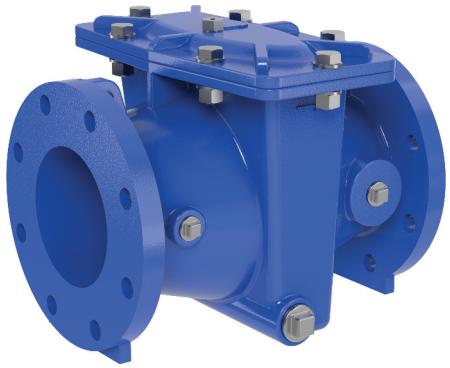
E-X144D (R 05/2019)

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CLA-VAL™

— MODEL — X43H

H Style Strainer

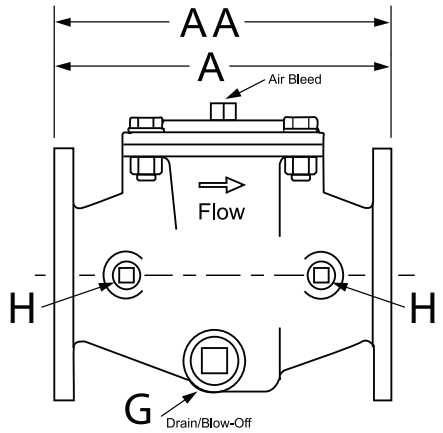


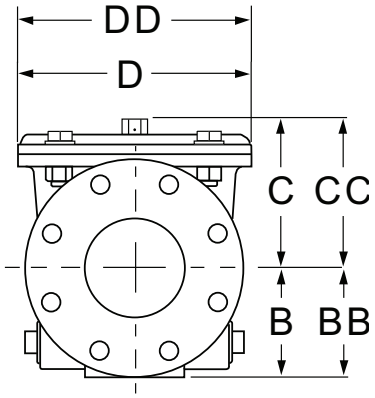
- **Low Pressure Drop**
- **Ductile Iron with NSF/ANSI 61 Fusion Bonded Epoxy Coating Construction with a 316 Stainless Steel Strainer**
- **Large Flow Area H-Style Design**
- **Service Without Removal From Line**

The Cla-Val Model X43H Strainer offers an effective means of removing unwanted solid particles in pipeline flow. These strainers are ideal for preventing fouling, debris and particle buildup in Cla-Val Automatic Control Valves. The large flow area design, with a flat stainless steel strainer mesh perpendicular to flow, is optimized for low pressure drop applications.

Optional accessories that can be added to the X43H Strainer include the Differential Pressure Switch and the X141DP Differential Pressure Gauge Assembly.

Maintenance is fast and easy with the compact H-pattern, requiring only top cover removal. Though the strainer may be installed in any position, installation with the cover up is recommended.





Dimensions

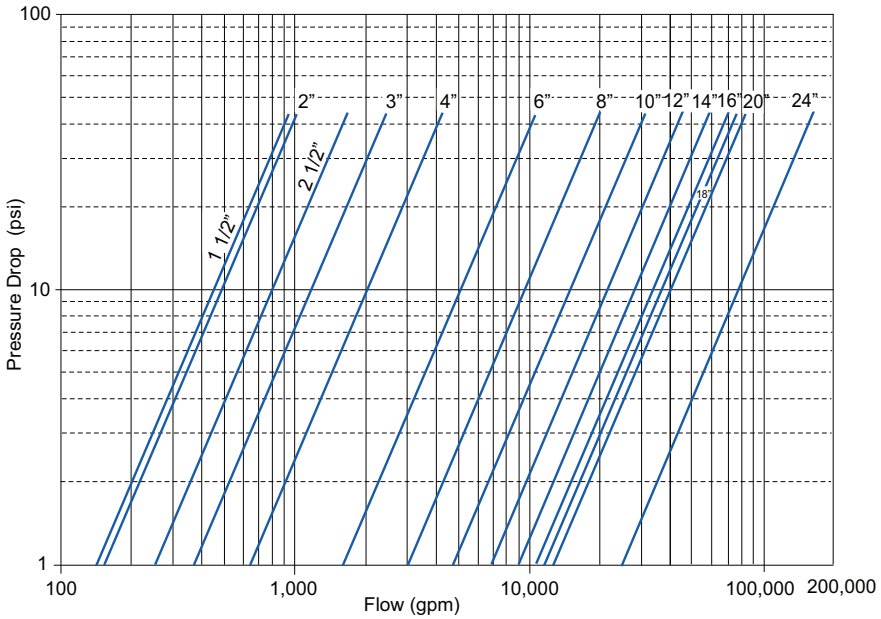
Strainer Size (inches)	**1 ½**	**2**	**2 ½**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**48**
A 150 ANSI	9.06	9.06	9.06	11.81	11.81	15.75	19.69	22.83	24.02	25.59	31.50	31.50	37.40	43.31	45.27	45.67	45.67
AA 300 ANSI	9.13	9.13	9.13	11.89	11.89	15.83	19.76	22.91	24.09	25.67	31.57	31.57	37.48	43.39	- -	- -	- -
B 150 ANSI	2.50	3.26	3.66	4.06	4.33	5.63	6.69	8.40	9.40	10.24	12.20	13.18	19.09	19.09	22.49	26.00	34.00
BB 300 ANSI	3.26	3.26	3.66	4.06	5.02	5.63	7.50	8.86	10.20	10.94	12.70	15.00	19.09	19.09	- -	- -	- -
C Max. 150 ANSI	3.78	3.78	3.78	5.91	5.91	7.52	8.82	11.61	15.16	14.96	19.69	19.69	23.98	23.98	25.10	36.20	34.11
CC Max. 300 ANSI	5.20	5.20	5.35	6.22	6.22	7.99	9.33	12.79	15.67	15.67	19.69	19.69	23.98	23.98	- -	- -	- -
D Dia. 150 ANSI	7.87	7.87	7.87	9.25	9.25	15.74	18.11	22.05	26.77	26.77	35.43	35.43	46.85	46.85	46.85	61.65	61.65
DD Dia. 300 ANSI	7.99	7.99	7.99	9.37	9.37	15.86	18.23	22.17	26.85	26.85	35.43	35.43	46.85	46.85	- -	- -	- -
H Inlet/Outlet Plugs NPT	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½
G Drain/Blow-off Plug NPT	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	2	2	2	2	2	2	2	2	2
Approx. Ship Wt. Lbs.	33	36	39	59	73	143	212	432	626	683	970	1073	1175	1962	2249	4123	4828

Strainer Size (mm)	**40**	**50**	**65**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**750**	**900**	**1200**
A 150 ANSI	230	230	230	300	300	400	500	580	610	650	800	800	950	1100	1150	1160	1160
AA 300 ANSI	232	232	232	302	302	402	502	582	612	652	802	802	952	1102	- -	- -	- -
B 150 ANSI	64	83	93	103	110	143	170	213	240	260	310	335	485	485	571.5	660.5	862.5
BB 300 ANSI	83	83	93	103	128	143	191	225	259	278	321	380	485	486	- -	- -	- -
C Max. 150 ANSI	96	96	96	150	150	191	224	295	385	380	500	500	609	609	637.5	919.5	866.5
CC Max. 300 ANSI	132	132	136	158	158	203	237	325	398	398	500	500	609	609	- -	- -	- -
D Dia. 150 ANSI	200	200	200	235	235	400	460	560	680	680	900	900	1190	1190	1190	1566	1566
DD Dia. 300 ANSI	203	203	203	238	238	403	463	563	682	682	900	900	1190	1190	- -	- -	- -
H Inlet/Outlet Plugs NPT	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½
G Drain/Blow-off Plug NPT	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	2	2	2	2	2	2	2	2	2
Approx. Ship Wt. (kg)	15	16	18	27	33	65	96	196	284	310	440	600	810	890	1020	1870	2190

Specifications

Sizes (Inches):	1½, 2, 2½, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30, 36 and 48
Sizes (mm):	40, 50, 65, 80,100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 750, 900, 1200
Ends:	Flanged, ANSI Class 150 and 300 (**Note:** 300# Flanges are Raised Face)
Max Pressure Rating:	150# - 250 psi • 300# - 400 psi
Temperature:	Maximum 175°F
Materials:	
Body & Cover:	Ductile Iron ANSI B16.42; Fusion Bonded Epoxy Coating Standard
Cover Seal:	Buna-N® Synthetic Rubber
Strainer:	316 Stainless Steel; Ductile Iron, Epoxy Coated Frame
Strainer Mesh Sizes:	Standard 10 mesh / 2000 Micron / Openings 0.078 inch • Optional .039 and .059 inch openings available
Drain/Blow-Off:	Connection furnished with Standard Stainless Steel Plug
Cover Fasteners:	Stainless Steel

Model X43H Flow Chart



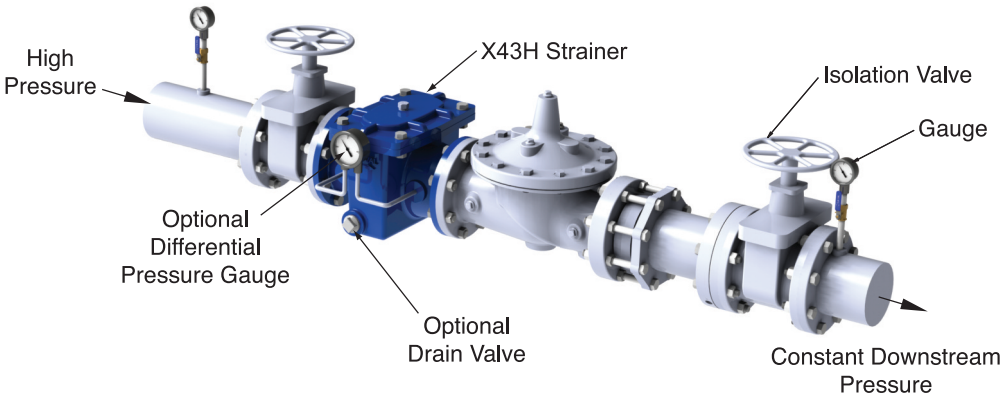
C_V Factor

Size (inches)	1 ½	2	2 ½	3	4	6	8	10	12	14	16	18	20	24	*30	*36	*48
Size (millimeters)	**40**	**50**	**65**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**750**	**900**	**1200**
C_V (Gal/Min. - gpm.)	96	150	254	367	654	1644	3922	4566	6800	8949	11692	12796	18264	26302	CF	CF	CF
C_V (Litres/Sec - l/s.)	23	36	61	88	157	395	942	1097	1634	2150	2809	3074	4388	6319	CF	CF	CF

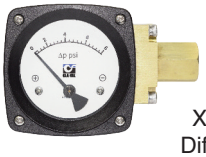
C_V in gpm = gpm @ 1psid head loss • C_V in l/s = l/s @ 1bar head loss

*Consult factory to confirm flow data for 30-inch/750mm and larger strainers

Model X43H Strainer Typical Application



Strainer Options



X141DP Differential Pressure Gauge



Differential Pressure Switch

1701 Placentia Ave • Costa Mesa CA 92627 • Phone: 949-722-4800 • Fax: 949-548-5441 • E-mail: info@cla-val.com • www.cla-val.com
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DJ400 DISMANTLING JOINT 3" - 12"
W/ TIE RODS

SUBMITTAL INFORMATION



MATERIALS

FLANGED SPOOL
AWWA C207 Class D Steel Ring Flange, compatible with ANSI Class 125 and 150 bolt circles. Pipe is STD Weight Class per ASTM A53.

END RING AND BODY
The end ring and body are made from ASTM A536 65-45-12 Ductile Iron.

GASKETS
Compounded for water and sewer service meeting the requirements of ASTM D 2000. Other compounds available on request.

BOLTS AND NUTS
ASTM A588 HSLA bolt material. Ten inch uses a ductile iron through bolts per ASTM A536 with HSLA heavy hex nuts. Stainless Steel, Types 304 or 316 is optional.

TIE RODS
High tensile steel per ASTM A193 grade B7. Stainless steel, type 304 or 316 is optional.

COATINGS
Fusion bonded epoxy, NSF 61 certified. All surfaces are coated, including flange faces.

PRESSURE

When properly installed on a pipe that is within the coupling manufacturer's tolerances, Romac style DJ400 Dismantling Joint can work at pressures up to the maximum rating of the flange. AWWA Class D flanges are rated for 175 psig. Higher working pressures can be accommodated. Consult your representative.

ASSEMBLY TOLERANCE

Two inch adjustment. For a different length, contact Romac Engineering.

SIZE

3" – 12", See drawing B1970-A. Larger sizes available see catalog.

STANDARD

The DJ400 meet the specifications set forth in the AWWA C219 Standard.

1/17
Document # 20-8-0026

This information is based on the best data available at the date printed above. Please check with Romac for any updates or changes.

ROMAC INDUSTRIES, INC.
www.romac.com
21919 20th Avenue SE • Suite 100 • Bothell, WA 98021
Phone (425) 951-6200 • 1-800-426-9341 • Fax (425) 951-6201



350 psi Resilient Wedge Gate Valves

Meets AWWA, UL Listed/FM Approved Certified to ANSI/NSF 61, ANSI/NSF 372

Mueller Co.

Reliable Connections™

Mueller® 350 psi Resilient Wedge A-2361 Gate Valves

Sizes 3"-12"

1 Triple O-rings and dirt seal

A dirt seal at the top keeps out debris. Two O-rings above the stem thrust collar bearing area isolate it from ground contaminants, and one below isolates it from the waterway. The two upper O-rings and the dirt seal can easily be replaced in the line while the valve is under pressure in the fully open position.

2 Forged bronze stem and thrust collar

This time-tested Mueller design has two thrust washers and has repeatedly proven its superior strength over cast stems.

3 O-ring

Provides a superior bonnet seal.

4 Bronze stem nut

The nut is electrically isolated from the iron in the wedge for corrosion resistance. The nut is held tightly in place to resist stem binding.

5 Polymer wedge guide bearing caps

Provides a bearing surface between the encapsulated wedge and the interior epoxy coating, lowering operating torque and extending the service life of the valve.

6 Oversized, full port opening, smooth waterway

The bottom of the waterway has no grooves or recesses to collect sediment or debris and compromise the seal. It accommodates full-sized shell cutters with ample clearance during tapping operations.

7 Mueller PRO-GARD® epoxy coating system

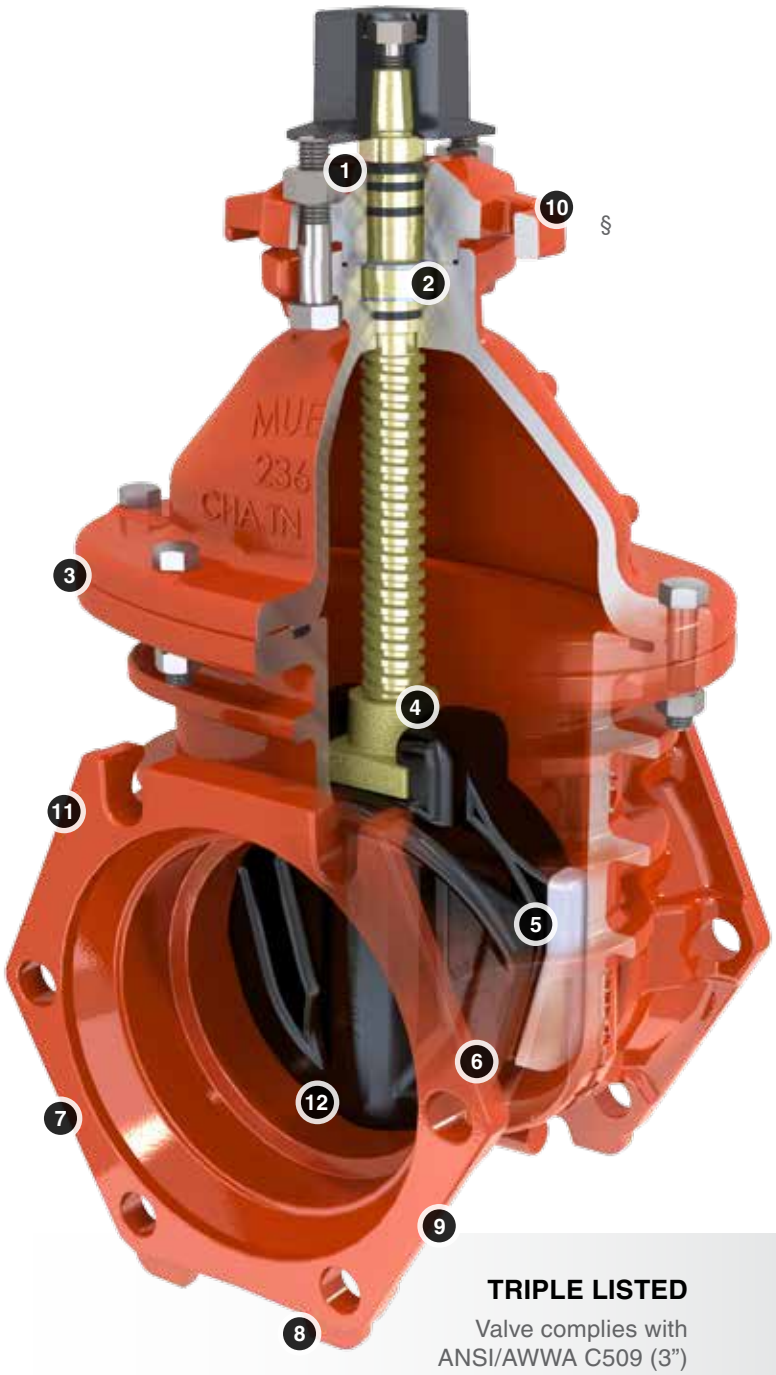
The superior fusion-bonded (thermosetting) powder epoxy covers the interior and exterior with a thickness of 10 mils nominal. The powder epoxy coating fully complies with ANSI/AWWA Standard C550.

8 Integral legs

Flats cast in the bottom of the valve body let the valve stand upright in storage or during installation.

9 Available end connections

FL x FL, MJ x FL, MJ x MJ, SL x SL, and FL x SL.



TRIPLE LISTED

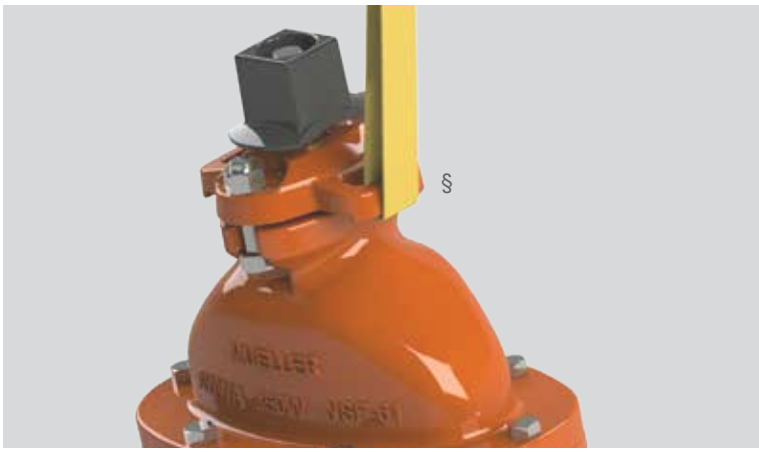
Valve complies with
ANSI/AWWA C509 (3")
ANSI/AWWA C515 (4"-12")

Listed by Underwriters Laboratory Inc. and ULC

Approved by Factory Mutual Corp.

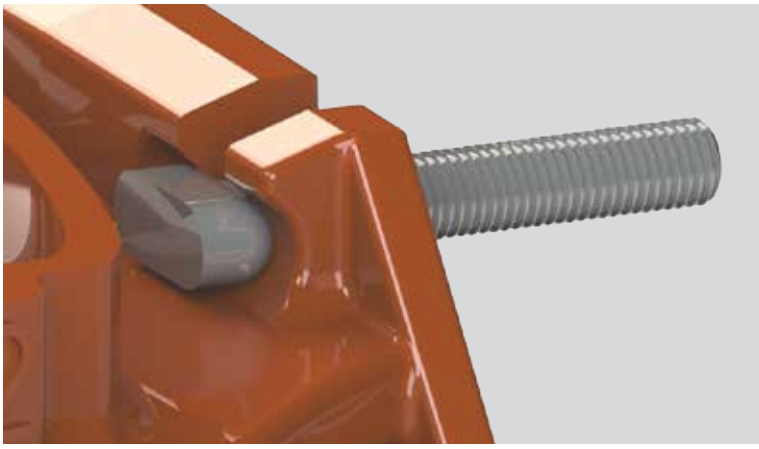
10 Integrated lift lugs

The A-2361 resilient wedge gate valves also feature dual-purpose lifting lugs. The ductile iron lugs provide stability and alignment for the valve box. They instantly align the valve box (up to 8" valve size) and eliminate the need for a valve box adaptor (standard 7-1/2" I.D.). The lugs can accommodate straps or hooks, providing the contractor with options for lifting and installing while increasing site safety and ease of installation.



11 T-head bolt retention

On all A-2361 resilient wedge gate valves with MJ flange connections, Mueller has designed a nesting area for T-head bolts to prevent rotation during pipe installation. This unique feature improves site safety, speeds installation, eliminates the need for special anti-rotation bolts, and results in a water-tight connection.



12 Self-activating wedge seal

The shape of the iron wedge casting and the elastomeric encapsulation are specifically designed to provide positive stop, without overstressing the elastomer or epoxy lining. The maximum operating torque at 350 psi is comparable to current values at 250 psi.



Forged bronze stem and thrust collar manufacturing process



Bronze bar stock



Bar stock is cut to length



Stem is electrically heated and thrust together to create the thrust collar



Stem threads and thrust collar are robotically machined and sorted



Our Products

Mueller Co. has built its reputation on producing innovative water distribution products of superior quality – a reputation that is literally "on the line" every day throughout the world. Mueller Co. products and those of its affiliates are used throughout the water system from the source to the consumer. We are committed to continuing research and development of new products and services to meet the growing needs of the water infrastructure industry. Mueller Co. is the largest and only full-line supplier of potable water distribution products in North America and its markets continue to expand globally.

Our People

The capacity to deliver the widest array of products and stand behind those products to ensure your satisfaction is our strength. The success of Mueller Co. is dependent upon the success of those who are involved, both inside and outside our company. Therefore, we feel our future is wholly dependent on long-term relationships with our employees, customers and suppliers. This is why we strive to be proactive and responsive to their needs, always looking for a "better way". It's an approach that has set us apart since 1857 and will assure our mutual achievement and prosperity in the future.

For more information about Mueller Co. or to view our full line of water products, please visit www.muellercompany.com or call Mueller Customer Service at 1.800.423.1323.

Follow Us:



Other Innovative Mueller Products

Mueller® Super Centurion 350™ Hydrant

- 350 psig (2400 kPa/24 Barg) working pressure, 700 psig (4800 kPa/48 Barg) test pressure
- Sealed oil reservoir with automatic pressure lubrication
- Entire hydrant - epoxy coating inside and out inhibits corrosion
- Convenient, reversible main valve doubles service life
- Efficient hydraulic design provides maximum flow
- Certified to ANSI/NSF 61, ANSI/NSF 372
- 10-year limited warranty

Mueller Co.
Reliable Connections™

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633 Chestnut St., Suite 1200
Chattanooga, TN 37450
www.muellercompany.com
moreinfo@muellercompany.com

Toll Free: 1.800.423.1323
Canada: 1.705.719.9965
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Form 12937 - Rev 7/17

JCM 412 Fabricated Carbon Steel Tapping Sleeves

Built-in benefits make these heavy fabricated steel sleeves increasingly popular for making larger taps on all types of pipe. By placing the design emphasis on eliminating problems inherent with older pipe and field installations, JCM 412 Tapping Sleeves have taken the complexity out of tapping larger pipe.

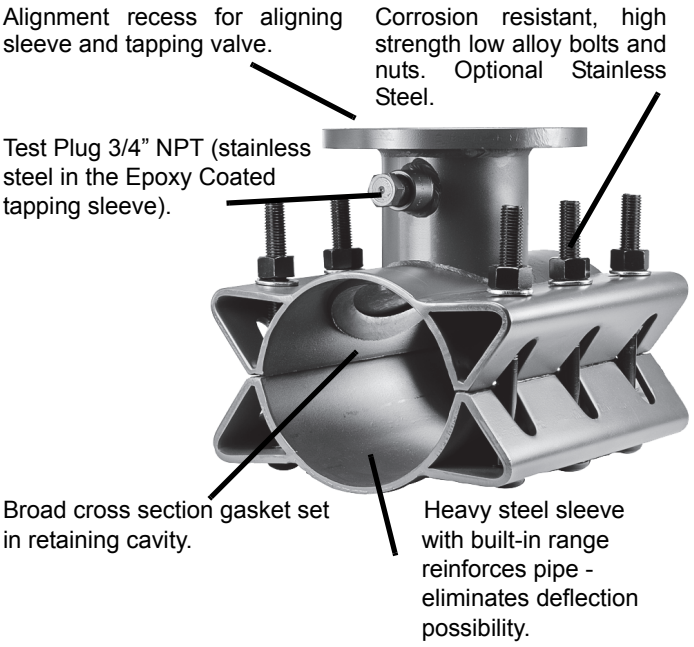
Built in range assures proper fit on more than one class of pipe - reducing inventory requirements and the chance of not having the right size sleeve.

Ease of assembly eliminates extra equipment, time and specially trained personnel.

Ready availability means taps can be made without long delays - even taps on special sizes of pipe - or services requiring high pressure flanges.

Direct reinforcement of the pipe by the sleeve eliminates flexing or deflection of pipe opposite the tap. Less weight than heavy cast iron sleeves reduces the load on the pipe.

Most important, **JCM 412 Tapping Sleeves assure a safe dependable tap**. A large gasket cross section provides a positive initial seal which increases with increases in line pressure.



MATERIAL SPECIFICATIONS - JCM 412 FABRICATED TAPPING SLEEVE

Body: ASTM A285 Grade C or ASTM A-36 Steel

Bolts: Corrosion Resistant, high strength low alloy (AWWA C-111, ANSI A21.11). Optional Stainless Steel 18-8 Type 304.

Flange: AWWA C207 Class D, ANSI 150lb. Drilling, recessed for tapping valve MSS-SP60. Other flanges and outlets available upon request.

Gasket: Nitrile Butadiene Rubber (NBR, Buna-N) per ASTM D2000. Molded virgin rubber with a pressure activated hydromechanical design. Gasket is bonded into a cavity for internal and external retention. Gasket temperature range -40°F to 212°F (-40°C - 100°C) Gasket suitable for water, salt solutions, mild acids, bases, and sewage. Optional gasket materials available.

Finish: Heavy coat of corrosion resistant metal primer. Optional Fusion Epoxy Coating available.

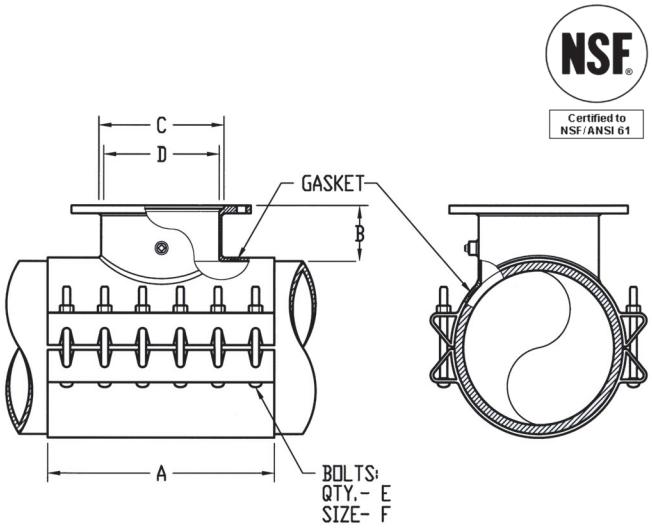
Service Rating: 4" to 12" Outlets: 175 PSI. Higher service rating available for specific applications and sizes.

JCM Industries Tapping Sleeves meet or exceed the ANSI/AWWA C-223 and the MSS-SP 124 Standards as applicable.

412 TAPPING SLEEVE DIMENSIONS

Flange Size*	A	B	C	D	E	F
3	12	5	4-1/32	3-1/2	6	3/4
4	12	5	5-1/32	4-1/2	6	3/4
6	12	5	7-1/32	6-1/2	6	3/4
8	16	5-1/8	9-1/32	8-1/8	8	3/4
10	20	5-1/2	11-1/16	10-1/4	10	3/4
12	24	5-3/4	13-1/16	12-1/4	12	3/4

For outlets 14" and larger the manufacturer of the tapping valve must be specified to assure proper alignment recess dimension.
Size on size tapping sleeve requires 1/2" undersize cutter to assure proper cutter clearance and complete severance of the coupon.
On nominal pipe size 07.45 and smaller dimension D is 6-1/8".
On nominal pipe sizes 07.45 and smaller dimensions: E = 8, F= 5/8"



JCM 412 Fabricated Carbon Steel Tapping Sleeves

NOM. PIPE SIZE (IN.)	SLEEVE O.D. RANGE (IN.)	CATALOG NUMBER X ANY OUTLET	OUTLET SIZES AVAILABLE	APPR. WT. EACH (LBS.)
6**	6.63 (SEE 422)			
	6.83 - 7.16	412-0690	X 3	74
	7.05 - 7.40	412-0720	X 4	76
	7.40 - 7.73	412-0745	X 6	82
8	8.63 (SEE 422)		X 3	83
	8.98 - 9.37	412-0905	X 4	85
	9.27 - 9.69	412-0940	X 6	88
			X 8	118
10	9.83 - 10.25*	412-1000	X 3	90
	10.64 - 10.86	412-1075	X 4	92
	11.03 - 11.47	412-1110	X 6	96
	11.36 - 11.80	412-1140	X 8	125
	11.76 - 12.24	412-1200	X 10	168
12			X 3	98
	12.62 - 12.88	412-1275	X 4	100
	13.13 - 13.60	412-1320	X 6	104
	13.60 - 14.09	412-1392	X 8	140
	14.08 - 14.56	412-1420	X 10	176
			X 12	216
14			X 3	113
	14.59 - 15.08	412-1475	X 4	115
	15.23 - 15.80	412-1530	X 6	116
	15.73 - 16.22	412-1600	X 8	150
	16.30 - 16.73	412-1650	X 10	190
			X 12	220
16			X 3	113
	16.74 - 17.26	412-1684	X 4	115
	17.33 - 17.87	412-1740	X 6	120
	17.88 - 18.43	412-1800	X 8	162
	18.62 - 19.19	412-1875	X 10	210
			X 12	230
18			X 3	120
	18.87 - 19.45	412-1920	X 4	122
	19.41 - 20.01	412-1950	X 6	126
	20.00 - 20.60	412-2000	X 8	180
	20.29 - 20.94	412-2050	X 10	240
	20.93 - 21.57	412-2130	X 12	245
20	21.51 - 22.15	412-2160	X 3	131
	22.16 - 22.81	412-2254	X 4	133
	22.78 - 23.45	412-2294	X 6	140
	23.46 - 24.16	412-2400	X 8	185
	24.15 - 24.85	412-2450	X 10	245
	24.82 - 25.52	412-2502	X 12	255
24			X 3	143
	25.71 - 26.41	412-2580	X 4	143
	26.55 - 27.25	412-2715	X 6	160
	27.26 - 27.96	412-2746	X 8	215
	28.14 - 28.84	412-2834	X 10	280
			X 12	312
30			X 3	163
	29.78 - 30.48	412-3000	X 4	165
	30.48 - 31.18	412-3075	X 6	175
	31.52 - 32.22	412-3200	X 8	226
			X 10	295
			X 12	310

Pipe sizes 72” and larger available upon request
*These sizes not available with size on size outlets.
**These sizes incorporate (8) - 5/8 bolts.
For size on size outlets a 1/2” undersize shell cutter is required.
Larger Sizes: For outlets 14” and larger, the tapping valve to be used must be specified to assure proper alignment recess dimension.
JCM 412 Tapping Sleeves furnished with test plugs unless otherwise specified.

NSF
Certified to NSF/ANSI 61

Series 35-1

- Eccentric flat bottom design
- Integral, all-rubber flange
- Lightweight, all-elastomer design
- Shorter length in sizes 42″ and larger

Materials of Construction

Neoprene, Hypalon®, Buna-N, EPDM, Viton®.

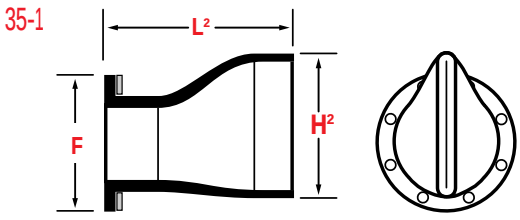
Backup Rings

Galvanized steel or stainless steel.

The flat-bottom Series 35-1 feature an integral rubber flange, allowing them to be mounted to flanged outfall pipes or directly to headwalls where the pipe is flush.

The flange size drilling conforms to ANSI B 16.10, Class 150#, or can be constructed with DIN, 2632 and other standards. The Series 35 Check Valve is furnished complete with steel or stainless steel backup rings for installation.

The Series 35-1 is often a direct replacement for flanged flapgates. Hinge pins rust and corrode if not routinely lubricated, causing the flapper to hang open and allow backflow. Small debris that collects in the seating area of the valve will also keep the flapper open. Tideflex® Series 35-1 valves 18" and larger are constructed with a curved bill as standard.





Series 35-1

Flange Size (ANSI)	Flange O.D. (F)	SERIES 35-1 Length (L²)	SERIES 35-1 Bill Height (H²)
4	9	10	8
5	10	10	8
6	11	16	12
8	13 1/2	18	16
10	16	23	19
12	19	28	23
14	21	30	27
16	23 1/2	35	30
18	25	40	34
20	27 1/2	48	37
24	32	52	44
30	38 3/4	62	55
32	41 3/4	66	59
36	46	72	70
42	53	69	73
48	59 1/2	75	81
54	66 1/4	79	90
60	73	82	94
72	86 1/2	95	120

Dimensions are subject to change due to customized construction

"Making Solar Simple"

MADE IN USA

MAPPS SPECIFICATIONS

Photovoltaic Modules

- High Efficiency Crystalline Silicon
- Meet JPL Block V Durability Criteria
- Tempered Glass and Aluminum Frame
- Module Warranty up to 25 Years

Gel Cell Sealed Batteries

- Sealed Maintenance-Free
- Excellent Deep-Cycling Performance
- Immobilized Electrolyte, Non-Spillable
- Transports Easily and Safely

Charge/Load System Controller

- Field Proven High Efficiency Design
- Temperature Compensated Charging
- Low Voltage Load Disconnect
- Most Models UL Listed and FM Approved

Balance of System Components

- Weatherproof Battery/Controller Enclosure
- Heavy Duty Aluminum Mounting Structures
- Color-Coded, Pre-Cut Wiring Harness
- Easy-to-Follow Manual/System Schematics

Optional Equipment Specifications

Lighting Control

- Ten field adjustable lighting control options
- Manı
- Detects day and night using the PV array

DC/AC Inverter for 120 VAC Systems

- Pure Sine Wave 120 VAC Power
- Low Battery Cutout Protection
- Overload & overtemp protection

Optional Accessories

Frangible Couplings

- Designed for Aviation and Roadside Apps
- Omni-directional breakaway support system

Aluminum shelf and backpanel

- DIN RAIL for customer load (s)
- Polyphaser surge protection for radios

DC to DC Voltage Converters

- Prewired on backpanel
- 12-24, 24-12, 24-24, 48-24, 12-48, 48-12 and more available

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SINCE 1996
TOLL FREE (877)297-0014
DIRECT (831)462-8243
FAX (831)462-8246

MAPPS Remote Photovoltaic Power System Datasheet

Model Number: MAPPS 20-36-12

MAPPS Solar System Specifications	
Solar Array Wattage, Standard Test Conditions, STC	20 W
Nominal System Voltage	12 VDC
Battery System Storage, 100 hour rate	36 Amp-Hrs
Battery Type	Sealed Lead Acid Gel
Solar Module Certifications	ETL Listed to UL 1703, Class I Division 2, Group A, B, C, D
Battery Enclosure Rating	NEMA 3R
MAPPS System Weight	60.6 lbs

MAPPS Upgrades	
Dusk/dawn Light Controller	Not Included
Frangible Coupling	Not Included
Radio Shelf	Not Included

MAPPS System Electrical Specifications	
Solar Array Max Power Current, Imp	1.19 A
Solar Array Short Circuit Current, Isc	1.3 A
Solar Array Vmp	16.8 VDC
Solar Array Voc	21.0 VDC
Solar Temperature Coefficient (Voc/°C)	-0.360%
Solar Charge Controller Amp Rating	10.0 A
Solar Charge Controller Voltage	12 VDC
Optional Dc to AC Sine Wave Inverter Wattage	N/A
Optional Dc to AC Sine Wave Inverter Nom. DC Voltage	N/A

MAPPS Solar Array Mechanical Specifications	
Solar Array Total Area	2.29 sq.ft (0.22sq.m)
Solar Array & Mounting Structure Total Weight	12.6 lbs
Solar Mounting Structure Mounting Method	Side-of-Pole
Solar Mounting Structure Wind Speed Rating	90 MPH
Solar Mounting Structure Material	Milled Aluminum

MAPPS Battery and Equipment Enclosure	
Mounting Method	Standard Pole Mount
Material	Milled Aluminum
Enclosure Finish	Glossy Urethane Enamel White
Dimensions (LxWxH)	18 in. x 16 in. x 10.8 in. (1.68 m x 1.49 m x 1.01 m)
Weight (with Batteries)	48lbs (21.8kg)

MAPPS Optional Accessories	
Wind Speed Upgrade	No
Optional DC-DC Converter	No

Solar Electric Supply
104 Whispering Pines Dr #101
Scotts Valley Ca 05066
Tel: 831-462-8243 Fax: 831-462-8246

Appendix D – Hydraulic Calculations

Project: **Rector Dam Diversion**
Client: **Department of General Services**
Subject: **Hydraulic Calculations**
Performed By: Jason Gornall

WOOD RODGERS

Inputs and Constants

Z1	372.5	Elevation at Reservior
Z2	220.0	Elevation at Discharge
d1	30.0	inside diameter of pipe 1, inches
D1	2.5	inside diameter of pipe 1, feet
d2	12.0	inside diameter of pipe 2, inches
D2	1.0	inside diameter of pipe 2, feet
L1	900.0	length of pipe 1, feet
L2	440.0	length of pipe 2, feet
Q	10.0	flow rate, ft3/sec
Q	4488.3	flow rate, gal/min
g	32.2	gravitational constant, feet per second per second
π	3.14	constant
V1	2.0	velocity of water in pipe 1, feet per second
V2	12.7	velocity of water in pipe 2, feet per second
C1	130.0	Hazen William friction coefficent (pipe 1)
C2	130.0	Hazen William friction coefficent (pipe 1)

Headloss from Pipe

Fiction Headloss in Pipe 1 (30" Steel)
0.43 ft

Fiction Headloss in Pipe 2 (12" DIP)
18.06 ft

Headloss from Fittings

	K	Cv	No. of fittings	**headloss (ft)**
30" 90 Degree Bend	0.35		1	0.02
30"x30"x12" Tee	1		1	2.52
12" Gate Valve (open)	0.2		3	1.51
12" Cla-Val (from Cal-Val Calc)		1725		15.63
12" 45 Degree Bend	0.15		1	0.38
12" Tide Flex Valve (from manufacturer)				4
12" Strainer		2200	1	9.61
Orifice Plate	0.65		1	1.64
12" 90 Degree Bend	0.4		5	5.03

Results / Summary

Total Headloss	58.82	ft
Total Pressure Drop	25.50	psi
Resultant Pressure	93.68	ft
at Discharge	40.61	psi

Valve Selection WorkSheet

Minimum flow rate (cfs)	0.25
Minimum flow rate (gpm)	112.21
Maximum flow rate (cfs)	10.00
Minimum flow rate (gpm)	4488.30

	Min Flow (gpm)	Max Flow (gpm)	Min Flow (cfs)	Max Flow (cfs)
Desired Range	112	4488		
4" Valve with 2.8" Bore	170	680	0.38	1.52
12" Valve with 6.5" Bore	840	3360	1.87	7.49
Valve Combination	115	4040	0.38	9.00

Desired Flow (gpm)	Desired Flow (cfs)	4"	12"	Actual Flow (gpm)	Actual Flow (cfs)	Differencial (gpm)	Differencial (cfs)
0	0.00	0	0	0	0.00	0	0.00
25	0.06	0	0	0	0.00	25	0.06
50	0.11	0	0	0	0.00	50	0.11
75	0.17	0	0	0	0.00	75	0.17
100	0.22	0	0	0	0.00	100	0.22
125	0.28	0	0	0	0.00	125	0.28
150	0.33	0	0	0	0.00	150	0.33
175	0.39	170	0	170	0.38	5	0.01
200	0.45	200	0	200	0.45	0	0.00
225	0.50	225	0	225	0.50	0	0.00
250	0.56	250	0	250	0.56	0	0.00
275	0.61	275	0	275	0.61	0	0.00
300	0.67	300	0	300	0.67	0	0.00
325	0.72	325	0	325	0.72	0	0.00
350	0.78	350	0	350	0.78	0	0.00
375	0.84	375	0	375	0.84	0	0.00
400	0.89	400	0	400	0.89	0	0.00
425	0.95	425	0	425	0.95	0	0.00
450	1.00	450	0	450	1.00	0	0.00
475	1.06	475	0	475	1.06	0	0.00
500	1.11	500	0	500	1.11	0	0.00
525	1.17	525	0	525	1.17	0	0.00
550	1.23	550	0	550	1.23	0	0.00
575	1.28	575	0	575	1.28	0	0.00
600	1.34	600	0	600	1.34	0	0.00
625	1.39	625	0	625	1.39	0	0.00
650	1.45	650	0	650	1.45	0	0.00
675	1.50	675	0	675	1.50	0	0.00
700	1.56	680	0	680	1.52	20	0.04
725	1.62	680	0	680	1.52	45	0.10
750	1.67	680	0	680	1.52	70	0.16
775	1.73	680	0	680	1.52	95	0.21
800	1.78	680	0	680	1.52	120	0.27
825	1.84	680	0	680	1.52	145	0.32
850	1.89	0	850	850	1.89	0	0.00
875	1.95	0	875	875	1.95	0	0.00
900	2.01	0	900	900	2.01	0	0.00
925	2.06	0	925	925	2.06	0	0.00
950	2.12	0	950	950	2.12	0	0.00
975	2.17	0	975	975	2.17	0	0.00
1000	2.23	0	1000	1000	2.23	0	0.00
1025	2.28	0	1025	1025	2.28	0	0.00
1050	2.34	0	1050	1050	2.34	0	0.00
1075	2.40	0	1075	1075	2.40	0	0.00
1100	2.45	0	1100	1100	2.45	0	0.00
1125	2.51	0	1125	1125	2.51	0	0.00
1150	2.56	0	1150	1150	2.56	0	0.00
1175	2.62	0	1175	1175	2.62	0	0.00
1200	2.67	0	1200	1200	2.67	0	0.00
1225	2.73	0	1225	1225	2.73	0	0.00
1250	2.79	0	1250	1250	2.79	0	0.00
1275	2.84	0	1275	1275	2.84	0	0.00
1300	2.90	0	1300	1300	2.90	0	0.00
1325	2.95	0	1325	1325	2.95	0	0.00
1350	3.01	0	1350	1350	3.01	0	0.00
1375	3.06	0	1375	1375	3.06	0	0.00
1400	3.12	0	1400	1400	3.12	0	0.00
1425	3.17	0	1425	1425	3.17	0	0.00
1450	3.23	0	1450	1450	3.23	0	0.00
1475	3.29	0	1475	1475	3.29	0	0.00
1500	3.34	0	1500	1500	3.34	0	0.00
1525	3.40	0	1525	1525	3.40	0	0.00

1550	3.45	0	1550	1550	3.45	0	0.00
1575	3.51	0	1575	1575	3.51	0	0.00
1600	3.56	0	1600	1600	3.56	0	0.00
1625	3.62	0	1625	1625	3.62	0	0.00
1650	3.68	0	1650	1650	3.68	0	0.00
1675	3.73	0	1675	1675	3.73	0	0.00
1700	3.79	0	1700	1700	3.79	0	0.00
1725	3.84	0	1725	1725	3.84	0	0.00
1750	3.90	0	1750	1750	3.90	0	0.00
1775	3.95	0	1775	1775	3.95	0	0.00
1800	4.01	0	1800	1800	4.01	0	0.00
1825	4.07	0	1825	1825	4.07	0	0.00
1850	4.12	0	1850	1850	4.12	0	0.00
1875	4.18	0	1875	1875	4.18	0	0.00
1900	4.23	0	1900	1900	4.23	0	0.00
1925	4.29	0	1925	1925	4.29	0	0.00
1950	4.34	0	1950	1950	4.34	0	0.00
1975	4.40	0	1975	1975	4.40	0	0.00
2000	4.46	0	2000	2000	4.46	0	0.00
2025	4.51	0	2025	2025	4.51	0	0.00
2050	4.57	0	2050	2050	4.57	0	0.00
2075	4.62	0	2075	2075	4.62	0	0.00
2100	4.68	0	2100	2100	4.68	0	0.00
2125	4.73	0	2125	2125	4.73	0	0.00
2150	4.79	0	2150	2150	4.79	0	0.00
2175	4.85	0	2175	2175	4.85	0	0.00
2200	4.90	0	2200	2200	4.90	0	0.00
2225	4.96	0	2225	2225	4.96	0	0.00
2250	5.01	0	2250	2250	5.01	0	0.00
2275	5.07	0	2275	2275	5.07	0	0.00
2300	5.12	0	2300	2300	5.12	0	0.00
2325	5.18	0	2325	2325	5.18	0	0.00
2350	5.24	0	2350	2350	5.24	0	0.00
2375	5.29	0	2375	2375	5.29	0	0.00
2400	5.35	0	2400	2400	5.35	0	0.00
2425	5.40	0	2425	2425	5.40	0	0.00
2450	5.46	0	2450	2450	5.46	0	0.00
2475	5.51	0	2475	2475	5.51	0	0.00
2500	5.57	0	2500	2500	5.57	0	0.00
2525	5.63	0	2525	2525	5.63	0	0.00
2550	5.68	0	2550	2550	5.68	0	0.00
2575	5.74	0	2575	2575	5.74	0	0.00
2600	5.79	0	2600	2600	5.79	0	0.00
2625	5.85	0	2625	2625	5.85	0	0.00
2650	5.90	0	2650	2650	5.90	0	0.00
2675	5.96	0	2675	2675	5.96	0	0.00
2700	6.02	0	2700	2700	6.02	0	0.00
2725	6.07	0	2725	2725	6.07	0	0.00
2750	6.13	0	2750	2750	6.13	0	0.00
2775	6.18	0	2775	2775	6.18	0	0.00
2800	6.24	0	2800	2800	6.24	0	0.00
2825	6.29	0	2825	2825	6.29	0	0.00
2850	6.35	0	2850	2850	6.35	0	0.00
2875	6.41	0	2875	2875	6.41	0	0.00
2900	6.46	0	2900	2900	6.46	0	0.00
2925	6.52	0	2925	2925	6.52	0	0.00
2950	6.57	0	2950	2950	6.57	0	0.00
2975	6.63	0	2975	2975	6.63	0	0.00
3000	6.68	0	3000	3000	6.68	0	0.00
3025	6.74	0	3025	3025	6.74	0	0.00
3050	6.80	0	3050	3050	6.80	0	0.00
3075	6.85	0	3075	3075	6.85	0	0.00
3100	6.91	0	3100	3100	6.91	0	0.00
3125	6.96	0	3125	3125	6.96	0	0.00
3150	7.02	0	3150	3150	7.02	0	0.00
3175	7.07	0	3175	3175	7.07	0	0.00
3200	7.13	0	3200	3200	7.13	0	0.00
3225	7.19	0	3225	3225	7.19	0	0.00
3250	7.24	0	3250	3250	7.24	0	0.00
3275	7.30	0	3275	3275	7.30	0	0.00
3300	7.35	0	3300	3300	7.35	0	0.00
3325	7.41	0	3325	3325	7.41	0	0.00
3350	7.46	0	3350	3350	7.46	0	0.00
3375	7.52	0	3360	3360	7.49	15	0.03
3400	7.58	0	3360	3360	7.49	40	0.09
3425	7.63	0	3360	3360	7.49	65	0.14

3450	7.69	0	3360	3360	7.49	90	0.20
3475	7.74	0	3360	3360	7.49	115	0.26
3500	7.80	0	3360	3360	7.49	140	0.31
3525	7.85	170	3360	3530	7.86	-5	-0.01
3550	7.91	190	3360	3550	7.91	0	0.00
3575	7.97	215	3360	3575	7.97	0	0.00
3600	8.02	240	3360	3600	8.02	0	0.00
3625	8.08	265	3360	3625	8.08	0	0.00
3650	8.13	290	3360	3650	8.13	0	0.00
3675	8.19	315	3360	3675	8.19	0	0.00
3700	8.24	340	3360	3700	8.24	0	0.00
3725	8.30	365	3360	3725	8.30	0	0.00
3750	8.36	390	3360	3750	8.36	0	0.00
3775	8.41	415	3360	3775	8.41	0	0.00
3800	8.47	440	3360	3800	8.47	0	0.00
3825	8.52	465	3360	3825	8.52	0	0.00
3850	8.58	490	3360	3850	8.58	0	0.00
3875	8.63	515	3360	3875	8.63	0	0.00
3900	8.69	540	3360	3900	8.69	0	0.00
3925	8.74	565	3360	3925	8.74	0	0.00
3950	8.80	590	3360	3950	8.80	0	0.00
3975	8.86	615	3360	3975	8.86	0	0.00
4000	8.91	640	3360	4000	8.91	0	0.00
4025	8.97	665	3360	4025	8.97	0	0.00
4050	9.02	680	3360	4040	9.00	10	0.02
4075	9.08	680	3360	4040	9.00	35	0.08
4100	9.13	680	3360	4040	9.00	60	0.13
4125	9.19	680	3360	4040	9.00	85	0.19
4150	9.25	680	3360	4040	9.00	110	0.25
4175	9.30	680	3360	4040	9.00	135	0.30
4200	9.36	680	3360	4040	9.00	160	0.36
4225	9.41	680	3360	4040	9.00	185	0.41
4250	9.47	680	3360	4040	9.00	210	0.47
4275	9.52	680	3360	4040	9.00	235	0.52
4300	9.58	680	3360	4040	9.00	260	0.58
4325	9.64	680	3360	4040	9.00	285	0.63
4350	9.69	680	3360	4040	9.00	310	0.69
4375	9.75	680	3360	4040	9.00	335	0.75
4400	9.80	680	3360	4040	9.00	360	0.80
4425	9.86	680	3360	4040	9.00	385	0.86
4450	9.91	680	3360	4040	9.00	410	0.91
4475	9.97	680	3360	4040	9.00	435	0.97

Appendix E – Cost Estimate

Wood Rodgers, Inc.
Prepared By: J.Gornall
7/15/2020

State of California
DGS - Rector Dam Diversion Pipeline
Opinion of Probable Cost - 30% Submittal Set
DGS Project #

ITEM NO.	DESCRIPTION	QUANITY	UNIT	UNIT PRICE	COST
SITE WORK					
1	Mobilization	1	LS	$ 25,000.00	$ 25,000.00
2	Clearing and Grubbing	1	LS	$ 5,000.00	$ 5,000.00
3	12"x30" Hot Tap	1	EA	$ 8,000.00	$ 8,000.00
4	12" Ductile Iron Pipe	440	LF	$ 200.00	$ 88,000.00
5	12" Gate Valve	3	EA	$ 3,500.00	$ 10,500.00
6	12" Strainer	1	EA	$ 5,000.00	$ 5,000.00
7	12" Flow Control Valve (with Meter)	1	EA	$ 30,000.00	$ 30,000.00
8	4" Ductile Iron Pipe	20	EA	$ 100.00	$ 2,000.00
9	4" Gate Valve	2	EA	$ 2,000.00	$ 4,000.00
10	4" Flow Control Valve (with Meter)	1	EA	$ 10,000.00	$ 10,000.00
11	12" Check Valve	1	EA	$ 8,000.00	$ 8,000.00
12	Concrete Headwall	1	CY	$ 2,800.00	$ 2,800.00
13	Concrete Flow Control Pad	6	CY	$ 500.00	$ 3,000.00
14	1/2 Ton Rip Rap	11	CY	$ 300.00	$ 3,300.00
15	Pole Mounted PV System	1	EA	$ 7,500.00	$ 7,500.00
16	Ductile Iron Fittings / Appurtenances	1	LS	$ 10,500.00	$ 10,500.00
17	Misc. Electrical	1	LS	$ 2,500.00	$ 2,500.00

SUBTOTAL SITE COST	**$ 225,100.00**
CONTRACTOR OH AND PROFIT 20%	**$ 45,020.00**
CONTINGENCY 25%	**$ 56,275.00**
TOTAL ESTIMATED CONSTRUCTION COST	**$ 326,395.00**

APPENDIX 3.6-C

100% Design Drawings
Rector Reservoir Bypass Valve Project

SCOPE OF WORK

CONSTRUCT A FLOW DIVERSION PIPELINE AND FLOW CONTROL FACILITY TO DIVERT WATER FROM THE RECTOR RESERVOIR, AND DISCHARGE TO RECTOR CREEK.

CONSTRUCTION IMPROVEMENTS INCLUDE THE FOLLOWING:

- HOT TAP CONNECTION TO AN EXISTING 30" PIPELINE
- INSTALLATION OF APPROXIMATELY 420 FT OF 12" DUCTILE IRON PIPE
- CONSTRUCT FLOW CONTROL FACILITY ON A CONCRETE PAD, INCLUDING A FLOW CONTROL VALVES, A WATER STRAINER, AND ISOLATION VALVES
- CONSTRUCT A DISCHARGE HEADWALL AND ENERGY DISSIPATER
- CONSTRUCT POWER AND COMMUNICATION LINES FROM EXISTING WATER TREATMENT PLANT TO THE FLOW CONTROL FACILITY

ENVIRONMENTAL NOTES

1. THE CONTRACTOR SHALL COMPLY ALL ENVIRONMENTAL RESTRICTIONS AND/ OR MITIGATIONS AS SPECIFIED BY THE PROJECTS ENVIRONMENTAL (401, 404, 1602) PERMITS.

GENERAL NOTES:

1. CONTRACTOR SHALL EXECUTE WORK MONDAY THROUGH FRIDAY 8:00AM TO 5:00PM; WORK ON SATURDAYS, SUNDAYS, AND HOLIDAYS IS SUBJECT TO AUTHORIZATION BY THE STATE.

2. CONTRACTOR SHALL HAUL AWAY AND DISPOSE OF RUBBLE AND WASTE IN A STATE APPROVED LANDFILL. CONTRACTOR TO PAY ALL FEES.

3. CONTRACTOR TO PROTECT EXISTING UTILITIES AND IMPROVEMENTS DURING CONSTRUCTION. REPAIR AND RESTORE DAMAGES CAUSED BY CONSTRUCTION BACK TO ORIGINAL CONDITIONS AND TO STATE'S SATISFACTION.

4. CONTRACTOR SHALL COMPLY WITH 2019 CALIFORNIA FIRE CODE, CHAPTER 14, FIRE SAFETY DURING CONSTRUCTION.

DEFERRED SUBMITTALS LIST

1. SEE PROJECT SPECIFICATIONS FOR ALL REQUIRED SUBMITTALS

BUILDING CODES

2019 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE
2019 CALIFORNIA BUILDING CODE
2019 CALIFORNIA ELECTRICAL CODE
2019 CALIFORNIA MECHANICAL CODE
2019 CALIFORNIA PLUMBING CODE
2019 CALIFORNIA ENERGY CODE
2019 CALIFORNIA FIRE CODE
2019 CALIFORNIA GREEN BUILDING STANDARDS CODE
2019 CALIFORNIA REFERENCE STANDARDS CODE
CCR TITLE 19. PUBLIC SAFETY: DIVISION 1. STATE FIRE MARSHAL

SHEET INDEX:

G-1	TITLE SHEET
G-2	GENERAL SYMBOLS AND ABBREVIATIONS
C-1	EXISTING SITE PLAN
C-2	SITE IMPROVEMENT PLAN
C-3	DIVERSION PIPELINE PLAN AND PROFILE
C-4	FLOW CONTROL PLAN AND SECTION
C-5	CIVIL DETAILS 1
C-6	CIVIL DETAILS 2
E-01	SYMBOL LIST AND GENERAL NOTES - ELECTRICAL
E-10	SITE PLAN- POWER
E-20	DETAIL, PANEL SCHEDULE, AND PARTIAL SINGLE LINE DIAGRAM

BASIS OF BEARINGS:

BASIS OF BEARING AND COORDINATES: NAD 83 ZONE II. HELD COORDINATES OF N 1933684.606 E 6462220.232 AT MONITORING POINT 6 AS SHOWN ON SHEET C1.0 OF PLANS FOR RIP RAP REPAIR AT RECTOR DAM, DGS PROJECT NUMBER 00000004362 DATED FEBRUARY 18, 2020

VERTICAL DATUM: NAVD 33, HELD ELEVATION OF 239.41 AT MONITORING POINT 6 AS SHOWN ON SHEET C1.0 OF PLANS FOR RIP RAP REPAIR AT RECTOR DAM, DGS PROJECT NUMBER 0000004362 DATED FEBRUARY 18, 2020

REGISTERED PROFESSIONAL ENGINEER
JASON "ALAN" GORNALL
No. 79942
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

State of California
Department of General Services

Real Estate Services Division
Project Management and Development Branch
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

Project Manager: MICHELE LEONG
(916) 376 - 5432 Voice

MICHELE.LEONG@dgs.ca.gov

PROJECT TITLE: RECTOR DIVERSION VALVE REPLACEMENT

CLIENT AGENCY: DEPARTMENT OF VETERAN AFFAIRS

PROJECT LOCATION: RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

PROJECT NUMBER: 000000000006907

PROJECT MANAGER: KEVIN J. GUSTORF, P.E. - (916) 341-7425

PROJECT ENGINEER: JASON GORNALL, P.E., (619) 819-9240

CSFM APPLICATION NO.: 19-S-2295-CP-NW

California State Fire Marshal
APPROVED
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.
CSFM FILE No.
Reviewed by: _____
Date : _____
FILE DATE -

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD
App. No.:
SS: _____ AC: _____
Date: _____
VAULT FILE NUMBER -

Issue		
No.	Date	Description
1	7/15/20	30% PRELIMINARY DESIGN
2	12/22/20	50% DESIGN
3	03/08/21	100% DESIGN
4		
5		
6		

LOCATION MAP:



NO SCALE

1 OF 11 SHEETS

SHEET NUMBER G-1

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ABBREVIATIONS

A	AIR
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
ADPTR	ADAPTER
AGG	AGGREGATE
AL	ALUMINUM
ALT	ALTERNATE
APPROX	APPROXIMATE
AUX	AUXILIARY
AL, ALUM	ALUMINUM
APN	ASSESSOR'S PARCEL NUMBER
ARCH	ARCHITECTURAL
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS
AR/AV	AIR RELEASE/VACUUM VALVE
AWG	AMERICAN WIRE GAUGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BC	BEGIN CURVE
BF	BLIND FLANGE
BFV	BUTTERFLY VALVE
BKFL	BACKFILL
BL	BASELINE
BLDG	BUILDING
BM	BENCH MARK
BO	BLOWOFF
BOT	BOTTOM
BOW	BACK OF WALK
BVC	BEGIN VERTICAL CURVE
CARV	COMBINATION AIR VALVE
CB	CATCH BASIN
CFM	CUBIC FEET PER MINUTE
C&G	CURB & GUTTER
CI	CAST IRON
℄	CENTER LINE
CL	CLASS
CL2	SODIUM HYPOCHLORITE
CLR	CLEARANCE
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CML&C	CEMENT MORTAR LINED & COATED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNTRL	CONTROL
CO	CLEAN OUT
CONC	CONCRETE
COND	CONDUIT
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTROLLED
COORD	COORDINATE
CORP	CORPORATION
CP	CONTROL POINT
CPLG	COUPLING
CR	CURB RETURN
CTR	CENTER
CU	COPPER
CV	CHECK VALVE
CW	COLD WATER
CY	CUBIC YARD
D	DEPTH OR DRAIN
DBL	DOUBLE
DEG	DEGREE
DEPT	DEPARTMENT
DET	DETAIL
DI	DRAINAGE INLET OR DUCTILE IRON
DIA OR ⌀	DIAMETER
DIM	DIMENSION
DIP/DI	DUCTILE IRON PIPE
DMH	DRAIN MANHOLE
DN	DOWN
DS	DOWNSTREAM
DWG	DRAWING
DWY	DRIVEWAY
E	EAST OR EXISTING
EA	EACH
EC	END CURVE
ECC	ECCENTRIC
EF	EACH FACE
EFF	EFFLUENT
EL/ELEV	ELEVATION
ELL/ELB	ELBOW
ELEC	ELECTRICAL
EMERG	EMERGENCY
EP	EDGE OF PAVEMENT
EW	EACH WAY
EX/EXST	EXISTING
EXT	EXTERIOR
EVC	END VERTICAL CURVE
EW	EACH WAY
EXP	EXPANSION
(F)	FUTURE
FA	FOUL AIR
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FCV	FLOW CONTROL VALVE
FD	FLOOR DRAIN
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
FIG(S)	FIGURE(S)
FIN	FINISHED
FLEX	FLEXIBLE
FLG	FLANGED
FL	FLOWLINE
FLR	FLOOR
FM	FORCE MAIN
FND	FOUNDATION
FT	FEET OR FOOT
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GIP	GALVANIZED IRON PIPE
GND	GROUND (ELEC)
GPM	GALLONS PER MINUTE
GS(P)	GALVANIZED STEEL (PIPE)
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
H	HEIGHT
HA	HIGH PRESSURE AIR
HB	HOSE BIBB
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HL	HIGH LEVEL
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPT	HIGH POINT
HR	HOUR
HT	HEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
HWL	HIGHWATER LEVEL
HYDR	HYDRAULIC
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
INT	INTERIOR
INVT	INVERT
IPS	IRON PIPE SIZE
JCT	JUNCTION
JT	JOINT
L	LENGTH OR LEFT
LA	LOW PRESSURE AIR
LB	POUND
LF	LINEAR FEET
LPT	LOWPOINT
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
LT	LEFT OR LIGHT
LWL	LOW WATER LEVEL
MAG	MAGNETIC
MATL	MATERIAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MFR	MANUFACTURER
MG	MILLION GALLONS
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MRGWB	MOISTURE RESISTANT GYPSUM WALL BOARD
MSTR	MASTER
N	NEW OR NORTH
NIC	NOT IN CONTRACT
NO OR #	NUMBER
NPT	NATIONAL PIPE THREAD
NRS	NON-RISING STEM
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
(OH)	OVERHEAD
OPNG	OPENING
OS&Y	OUTSIDE STEM & YOKE
P	POWER
P&ID	PROCESS & INSTRUMENTATION DIAGRAM
PC	PIECE
PE	PLAIN END OR POLYETHYLENE PIPE
PERF	PERFORATED
PG	PRESSURE GAGE
PI	PRESSURE INDICATOR OR POINT OF INTERSECTION
PL OR ℄	PLATE OR PROPERTY LINE
PLC	PROGRAMABLE LOGIC CONTROLER
PM	PRESSURE MAIN
P/P	POWER POLE/UTILITY POLE
PRESS	PRESSURE
PS	PIPE SUPPORT
P/S	PUMPING STATION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RED	REDUCER
REINF	REINFORCING
REL	RELATIVE
REQD	REQUIRED
RESTR	RESTRAINED
REV	REVISION
ROW	RIGHT OF WAY
RPBP	REDUCED PRESSURE
RPPA	BACKFLOW PREVENTER
RT	RIGHT
RW	RAW WATER
S	SOUTH, SLOPE
SA	SAMPLE
SCH	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SEC	SECTION
SHT	SHEET
SHWR	SHOWER
SMH	SEWER MANHOLE
SPEC	SPECIFICATIONS
SQ	SQUARE
SS	SANITARY SEWER
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STRUCT	STRUCTURAL
SUBM	SUBMERSION
SV	SOLENOID VALVE
SW	SOUTHWEST, SWITCH, OR SIDEWALK
T OR TEL	TELEPHONE
T&B	TOP & BOTTOM
TBC	TOP BACK OF CURB
TEMP	TEMPORARY
THD	THREADED
TOC	TOP OF CONCRETE OR CURB
TOF	TOP OF FOOTING
TOGE	TOP OF GROUND ELEVATION
TOPE	TOP OF PAVEMENT ELEVATION
TOS	TOP OF SLAB
TOSE	TOP OF SLAB ELEVATION
TP	TEST PIT
TRANS	TRANSFORMER OR TRANSITION
TW	TREATED WATER
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
VAR	VARIOUS
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
-V	-VOLT
VB	VALVE BOX
VTR	VENT THROUGH ROOF
W	WATER, WATT, WEST, OR WIDTH
W	WATER LINE OR WATER
WA	WASTE
WH	WHARF HYDRANT, WATER HEATER
WP	WEATHERPROOF
WS	WATER SURFACE, WATER STOP
WSP	WELDED STEEL PIPE
WT	WEIGHT
WTP	WATER TREATMENT PLANT
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
XING	CROSSING
YD	YARD
@	AT
&	AND
℄	CENTER LINE
ℙ	PLATE OR PROPERTY LINE
W/	WITH
W/O	WITHOUT

ARCHITECTURAL STRUCTURAL

- CONCRETE
- REINFORCEMENT IN SECTION
- PRECAST CONCRETE
- MORTAR, GROUT OR PLASTER
- GRATING SPAN
- WOOD
- BATT INSULATION
- OPENING OR DEPRESSION IN SLAB OR WALL
- OPENING WITH GRATING COVER

GENERAL

- WATER SURFACE
- NATURAL GROUND OR GRADE
- AGGREGATE BASE
- ASPHALT CONCRETE

CIVIL LEGEND

EXISTING	PROPOSED	DESCRIPTION
○	●	DRAIN MANHOLE
○	●	SEWER MANHOLE
□	■	DRAIN INLET
— —○	—●	CLEAN OUT
		CENTERLINE
S	S	SEWER LINE
SD	SD	DRAIN LINE
W	W	WATER LINE
	W	WATER SERVICE
X	X	CHAIN LINK FENCE
		DRIVEWAY
		TRAFFIC SIGN AS NOTED
	S	SEWER SERVICE
		R.P. BACKFLOW PREVENTER
	W	DOUBLE CHECK VALVE
	W	AIR RELEASE VALVE
	W	BLOW-OFF
G T E	G T E	GAS, TELEPHONE OR ELECTRIC
		PROPERTY LINE
		MONUMENT
		STREET LIGHT
		FLUSHING BRANCH
		SIDEWALK RAMP
		TREE TO BE REMOVED/RELOCATED
31.25	31.25	SPOT ELEVATION
		STREET NAME SIGN (PERMANENT)
		30" R1 SIGN (STOP)
P=	P=	PAD GRADE ELEVATION
	115	FINISH GRADE CONTOURS
	120.0 X	FINISH GRADE SPOT ELEVATION
		TEST PIT LOCATIONS
	WV	WATER VALVE
		FIRE HYDRANT

MECHANICAL

VALVES AND DEVICES

- GATE VALVE (NORMALLY OPEN)
- GATE VALVE (NORMALLY CLOSED)
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- PINCH VALVE
- NEEDLE VALVE
- DOUBLE LEAF CHECK VALVE
- CHECK VALVE
- BALL CHECK VALVE
- FLAP GATE
- PRESSURE AND VACUUM RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- IN-LINE, SPRING LOADED RELIEF VALVE
- PRESSURE REDUCING VALVE
- BACK PRESSURE REDUCING VALVE
- SOLENOID VALVE
- MUD VALVE
- RELIEF VALVE WEIGHTED
- SOLENOID METERING PUMP

PIPE LINE DEVICE SYMBOLS

- STRAINER
- REDUCER OR INCREASER
- TRAP
- DRAIN
- PI — PRESSURE INDICATOR
- PS — PRESSURE SWITCH
- M — FLOW METER

PIPE AND FITTINGS

SINGLE LINE / DOUBLE LINE		SINGLE LINE / DOUBLE LINE	
	FLANGED JOINT		UNION
	PLAIN OR GROOVED END MECHANICAL COUPLING	W	ELBOW UP
	PUSH ON MECHANICAL OR, BALL AND SOCKET JOINT	W	ELBOW DOWN
	WELD JOINT	W	TEE UP
	SLEEVE TYPE MECHANICAL COUPLING		TEE DOWN
	RESTRAINED SLEEVE TYPE MECHANICAL COUPLING		LATERAL UP
	FLANGED COUPLING ADAPTER		LATERAL DOWN
	RESTRAINED FLANGED COUPLING ADAPTER		CONCENTRIC REDUCER
	GROOVED END ADAPTER FLANGE		ECCENTRIC REDUCER

REFERENCE SYMBOL

1 / C-2 — SECTION DESIGNATION; DRAWN ON DWG NO. C2

1 / C-2 — DETAIL DESIGNATION; DRAWN ON DWG NO. C2

DETAIL SYMBOL

1 / C-2 — DETAIL DESIGNATION; FIRST SHEET WHERE DETAIL IS REFERENCED

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PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER — JASON ALAN HARRELL — No. 79942 — Exp. 9-30-22 — CIVIL — STATE OF CALIFORNIA

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
3301 C Street, Bldg 100-B Tel: 916.341.7760
Sacramento, CA 95816 Fax: 916.341.7767

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Issue		
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2	12/22/20	50% DESIGN
3	03/08/21	100% DESIGN

Project
RECTOR DIVERSION VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

DEPARTMENT OF VETERAN AFFAIRS

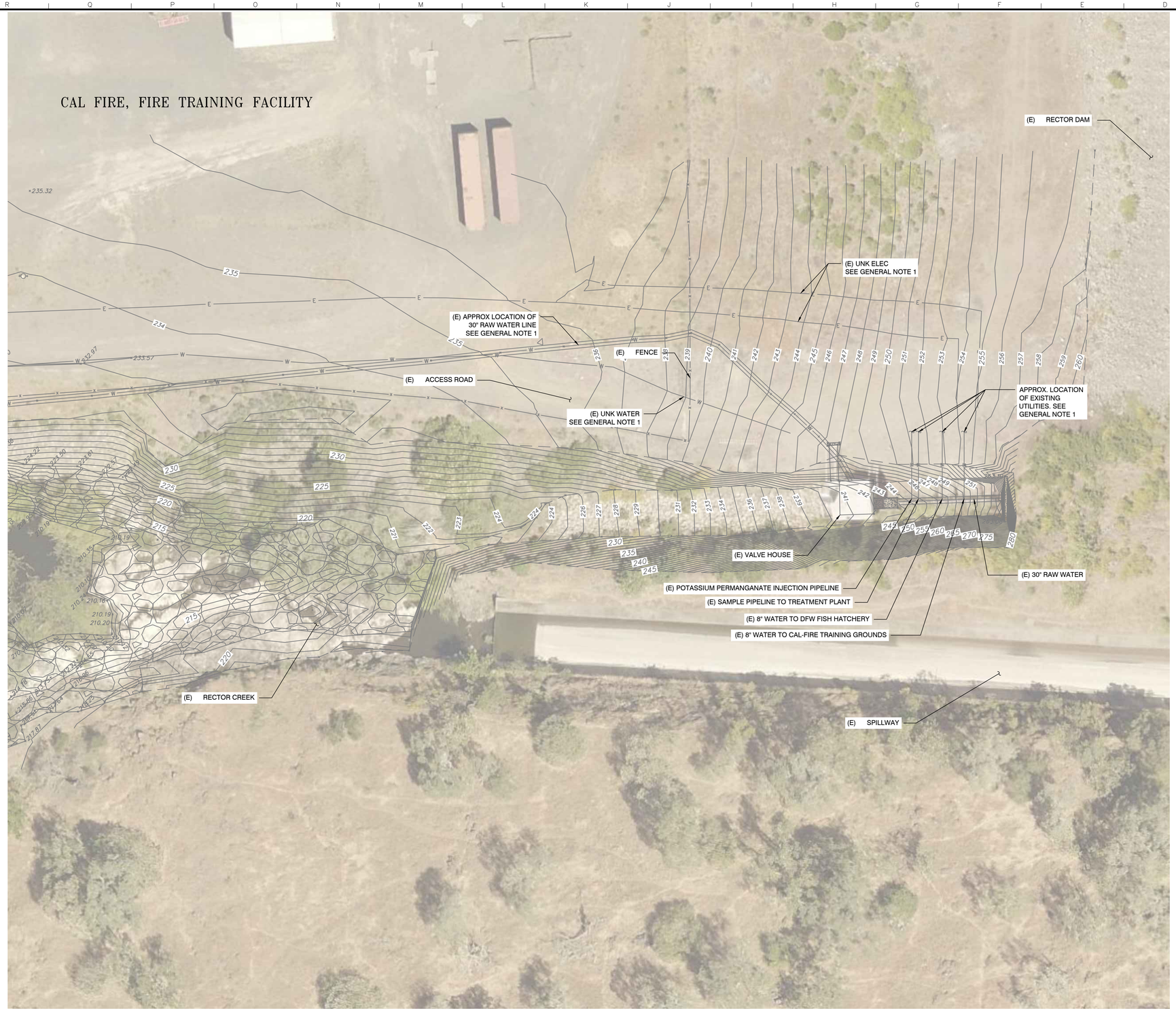
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	JG	DV	KM
File Date		Vault File Number	
-		-	

Sheet Title
GENERAL SYMBOLS AND ABBREVIATIONS

DSA Building Number	Work Order
-	
Reference North	Sheet Scale: AS SHOWN
	Sheet Number: G-2
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EXISTING SITE PLAN

GENERAL NOTES:

1. LOCATION OF EXISTING UTILITIES IS UNKNOWN. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO PROCURING PIPELINE MATERIAL AND/OR EXCAVATION.
2. CONTRACTOR SHALL PROTECT IN PLACE ALL EXISTING IMPROVEMENTS UNLESS OTHERWISE SHOWN, AND SHALL MAINTAIN ACCESS TO EXISTING VALVE HOUSE AND WATER TREATMENT PLANT.
3. GEOTECHNICAL INFORMATION AND TEST PIT (TP) DATA IS AVAILABLE IN THE PROJECTS GEOTECHNICAL REPORT "GEOTECHNICAL INVESTIGATION REPORT, RECTOR DAM DIVERSION VALVE AND PIPELINE PROJECT, NAPA COUNTY, CALIFORNIA" DATED 12/4/2020, PREPARED BY FUGRO

20' 10' 0 20'

SCALE: 1" = 20'

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Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER
JASON ALAN ROBERTS
No. 79942
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
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2	12/22/20	50% DESIGN
3	03/08/21	100% DESIGN

Project
RECTOR DIVERSION
VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

DEPARTMENT OF
VETERAN AFFAIRS

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	JG	DV	KM

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Sheet Title
EXISTING SITE PLAN

DSA Building Number -
Work Order

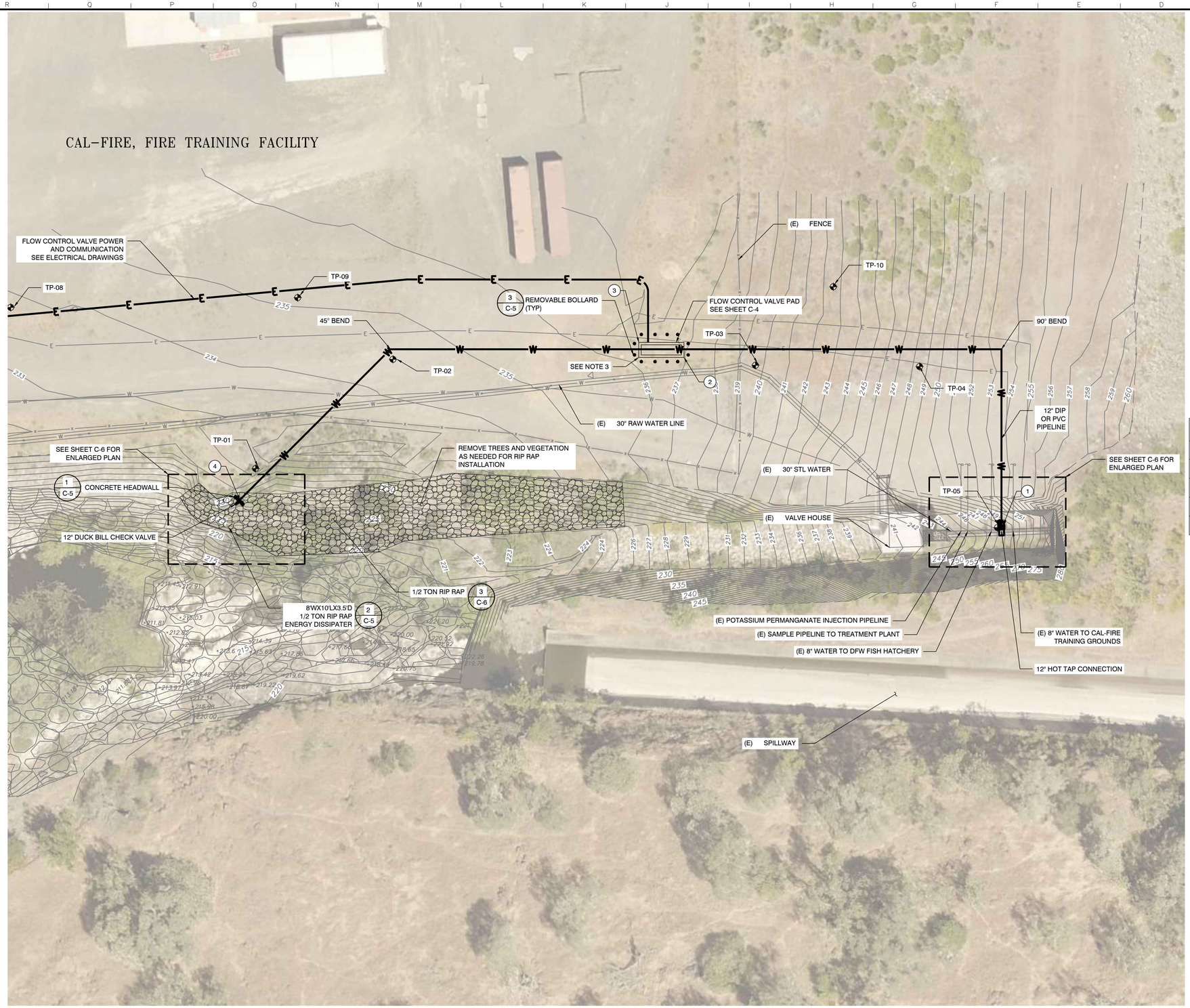
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SITE PLAN

20' 10' 0 20'

SCALE: 1" = 20'

GENERAL NOTES:

1. LOCATION OF EXISTING UTILITIES IS UNKNOWN. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO PROCURING PIPELINE MATERIAL AND/OR EXCAVATION.
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CONSTRUCTION NOTES:

1. ADJUSTMENTS IN HORIZONTAL OR VERTICAL PIPELINE ALIGNMENT SHALL BE LIMITED TO 4 DEGREES MAXIMUM AT EACH JOINT FOR DUCTILE IRON PIPE. JOINT DEFLECTIONS FOR PVC PIPE SHALL AT USE HIGH DEFLECTION COUPLINGS.
2. CONCRETE THRUST BLOCKS SHALL BE INSTALLED AT ALL PIPELINE FITTINGS AND CHANGES IN DIRECTION THAT EXCEEDS 11.25 DEGREES.
3. CONTRACTOR SHALL GRADE PAD AREA AS NEEDED TO PROVIDE FLAT SURFACE FOR FLOW CONTROL PAD

HORIZONTAL CONTROL DATA

#	NORTHING	EASTING	DESCRIPTION
1	1922656.4680	6462348.9394	PIPELINE CONNECTION
2	1922727.4512	6462217.9205	FLOW CONTROL PAD
3	1922733.6506	6462199.2577	FLOW CONTROL PAD
4	1922668.6401	6462034.6533	DISCHARGE HEADWALL

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DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

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3	03/08/21	100% DESIGN

Project
RECTOR DIVERSION VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

DEPARTMENT OF VETERAN AFFAIRS

Supervisor	Designed	Drawn	Checked
	JG	DV	KM

File Date -

Vault File Number -

Sheet Title
SITE IMPROVEMENT PLAN

DSA Building Number -

Work Order

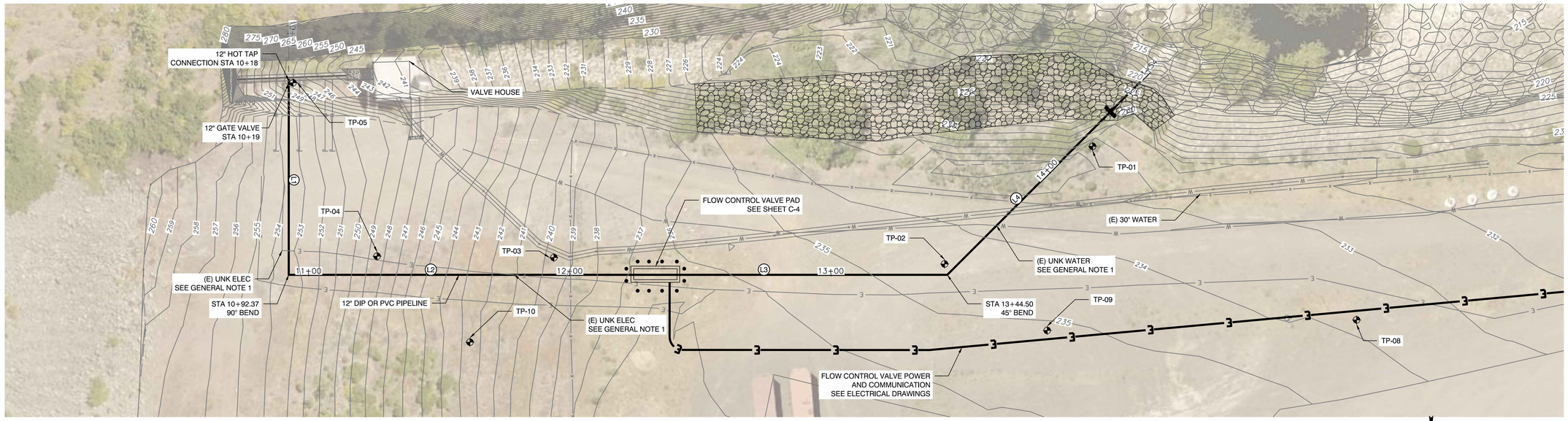
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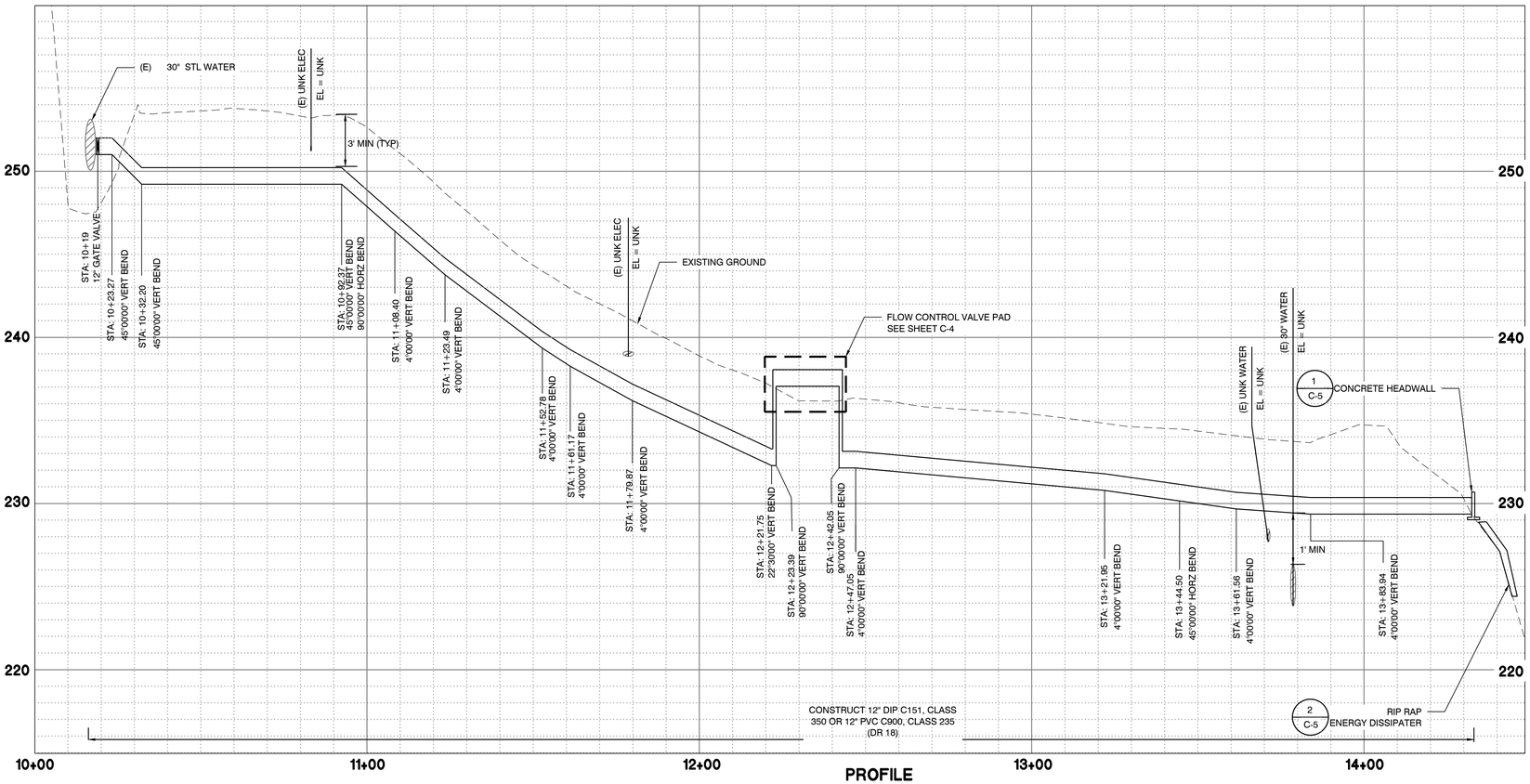
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PLAN
SCALE: 1"=20'



PROFILE
HORZ: 1"=20'
VERT: 1"=4'

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2. CONCRETE THRUST BLOCKS SHALL BE INSTALLED AT ALL PIPELINE FITTINGS AND CHANGES IN DIRECTION THAT EXCEED 11.25 DEGREES.

ALIGNMENT TABLE

SEGMENT	LENGTH	BEARING	START	END
L1	74.32'	N0° 00' 00.00"E	STA 10+18.05 N: 1922656.47 E: 6462348.94	STA 10+92.37 N: 1922730.79 E: 6462348.94
L2	131.02'	N90° 00' 00.00"W	STA 10+92.37 N: 1922730.79 E: 6462348.94	STA 12+23.39 N: 1922730.79 E: 6462217.92
L3	102.45'	N90° 00' 00.00"W	STA 12+42.05 N: 1922730.79 E: 6462199.26	STA 13+44.50 N: 1922730.79 E: 6462096.80
L4	87.89'	S45° 00' 00.00"W	STA 13+44.50 N: 1922730.79 E: 6462096.80	STA 14+32.40 N: 1922668.64 E: 6462034.65

NOTE: ALIGNMENT TABLE DOES NOT INCLUDE PIPING RELATED TO ABOVE GROUND FLOW CONTROL FACILITY. SEE SHEET C-4 FOR DETAILS.

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Architecture & Engineering Section
707 Third Street, Suite 4-105
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REGISTERED PROFESSIONAL ENGINEER
JOHNSON ALAN ROBERTS
No. 79942
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

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Project
RECTOR DIVERSION
VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA
DEPARTMENT OF
VETERAN AFFAIRS

Supervisor	Designed	Drawn	Checked
	JG	DV	KM

File Date: -
Vault File Number: -

Sheet Title
DIVERSION PIPELINE
PLAN AND PROFILE

DSA Building Number: -
Work Order:

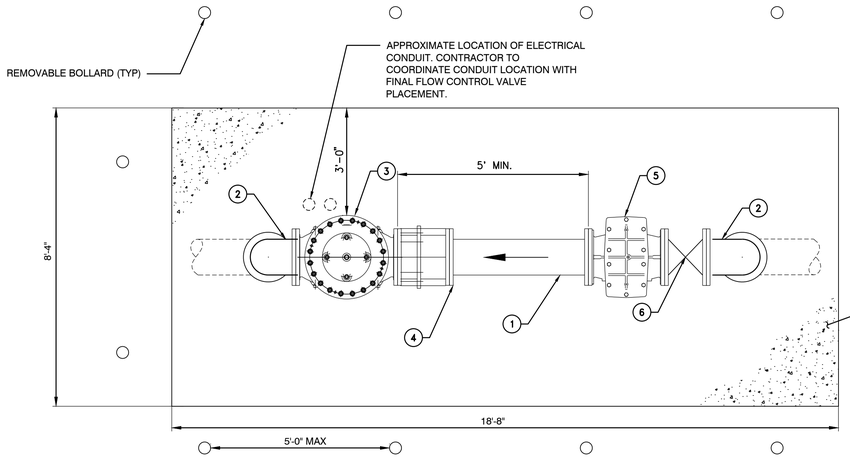
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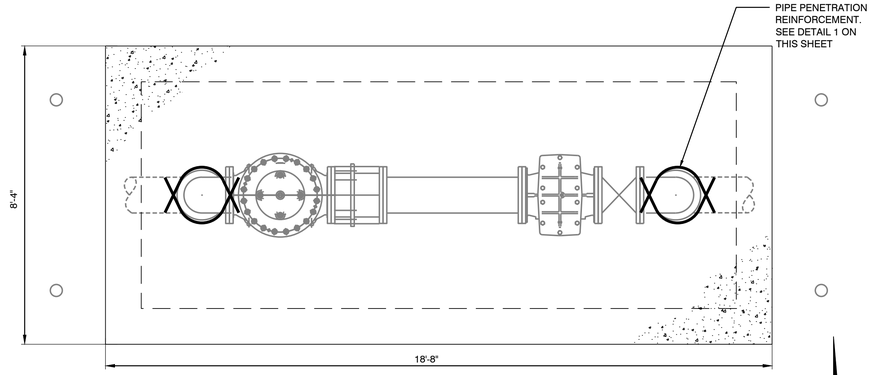


CONSTRUCTION NOTES

1. 12" DIP
2. 12" 90° DIP BEND
3. 12" CLA-VAL 631 FLOW CONTROL VALVE WITH X144D METER OR EQUAL.
4. 12" DISMANTLING JOINT
5. 12" STRAINER
6. 12" FULL PORT GATE VALVE
7. PIPE SUPPORT PER DETAIL 4 ON SHEET C-4

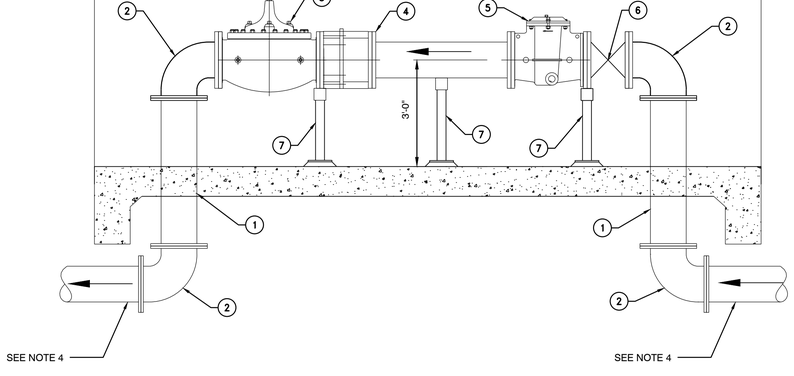
FLOW CONTROL FACILITY PLAN

SCALE: 1/2"=1'



FLOW CONTROL FACILITY PAD PLAN

SCALE: 1/2"=1'



FLOW CONTROL FACILITY SECTION

SCALE: 1/2"=1'

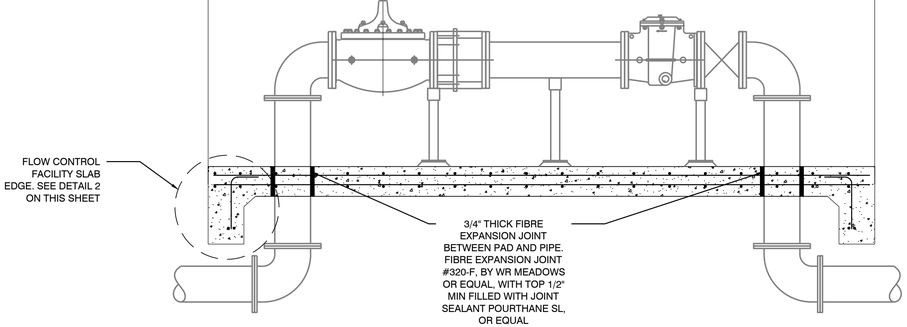
NOTES:

1. ALL ABOVE GROUND PIPING SHALL BE DIP WITH FLANGED CONNECTIONS.

2. INSTALL THRUST BLOCKS AT ALL BURIED FITTINGS. MECHANICALLY RESTRAIN ALL ABOVE GROUND FITTINGS AND APPURTENANCES.

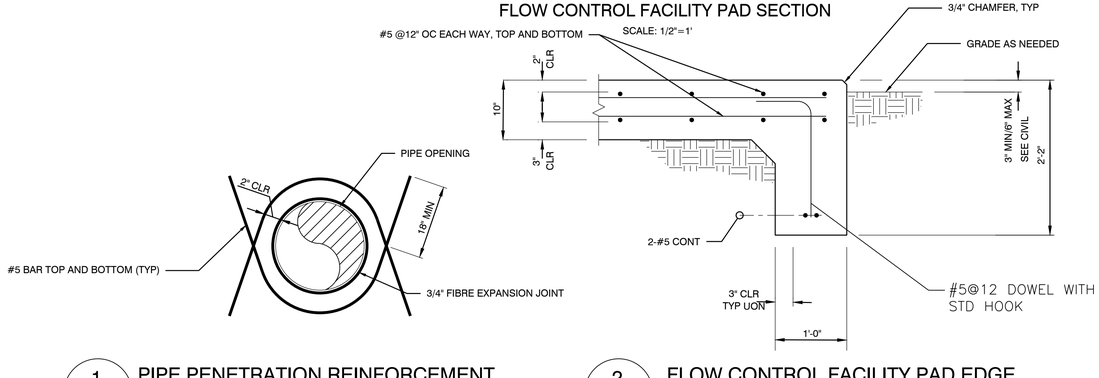
3. ALL MECHANICAL JOINTS SHALL BE EQUIPPED WITH RESTRAINT SYSTEMS.

4. IF PVC PIPE IS SUPPLIED, PROVIDE FLANGE X MECHANICAL JOINT ADAPTOR TO CONNECT PVC TO FITTING.



FLOW CONTROL FACILITY PAD SECTION

SCALE: 1/2"=1'



1 C-4 PIPE PENETRATION REINFORCEMENT

2 C-4 FLOW CONTROL FACILITY PAD EDGE

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App.No.:

Reviewed by:

Date :

Issue

No.	Date	Description
1	07/15/20	30% PRELIMINARY DESIGN
2	12/22/20	50% DESIGN
3	03/08/21	100% DESIGN

Project
RECTOR DIVERSION VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

DEPARTMENT OF VETERAN AFFAIRS

Supervisor	Designed	Drawn	Checked
	JG	DV	KM

File Date	Vault File Number
-	-

Sheet Title
FLOW CONTROL PLAN AND SECTION

DSA Building Number	Work Order
-	

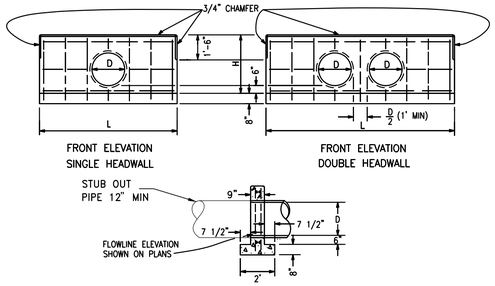
Reference North

Sheet Scale
AS SHOWN

Sheet Number
C-4
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SECTION, SINGLE &
DOUBLE HEADWALLS

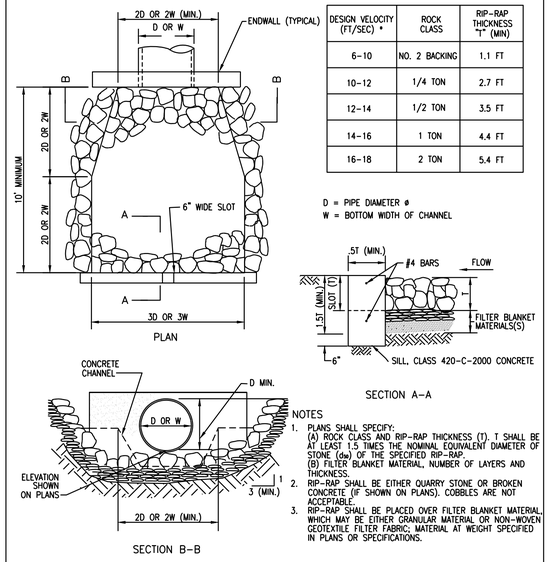
D	H	SINGLE			DOUBLE		
		L	STEEL (POUNDS)	CONCRETE (C.Y.)	L	STEEL (POUNDS)	CONCRETE (C.Y.)
12"	2'-8"	5'	35	0.60	8'	50	0.94

NOTES

1. CONCRETE SHALL BE 560-C-3250.
2. ALL REINFORCING SHALL BE #4 BARS. ALL VERTICAL AND HORIZONTAL TIE BARS @ 18" MAXIMUM SPACING.
3. EXPOSED CORNERS SHALL BE 3/4" CHAMFERED.

LEGEND ON PLANS

1 CONCRETE HEADWALL
VAR

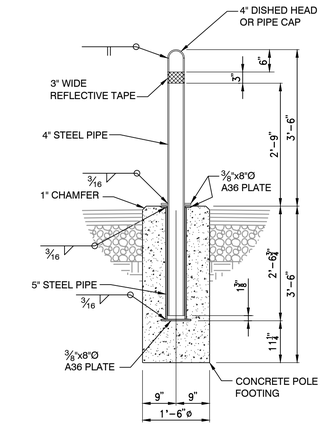


DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP-RAP THICKNESS "T" (MIN)
6-10	NO. 2 BACKING	1.1 FT
10-12	1/4 TON	2.7 FT
12-14	1/2 TON	3.5 FT
14-16	1 TON	4.4 FT
16-18	2 TON	5.4 FT

D = PIPE DIAMETER ø
W = BOTTOM WIDTH OF CHANNEL

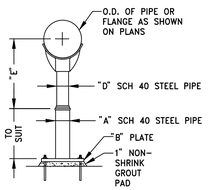
NOTES
1. PLANS SHALL SPECIFY:
   (A) ROCK CLASS AND RIP-RAP THICKNESS (T). T SHALL BE AT LEAST 1.5 TIMES THE NOMINAL EQUIVALENT DIAMETER OF STONE (d_{50}) OF THE SPECIFIED RIP-RAP.
   (B) FILTER BLANKET MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP-RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
3. RIP-RAP SHALL BE PLACED OVER FILTER BLANKET MATERIAL, WHICH MAY BE EITHER GRANULAR MATERIAL OR NON-WOVEN GEOTEXTILE FILTER FABRIC. MATERIAL AT WEIGHT SPECIFIED IN PLANS OR SPECIFICATIONS.

2 RIP RAP ENERGY DISSIPATER
VAR



NOTES:
1. ALL TRAFFIC BOLLARD STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
2. AFTER GALVANIZING, PAINT ALL ABOVE GRADE BOLLARD STEEL SAFETY YELLOW.

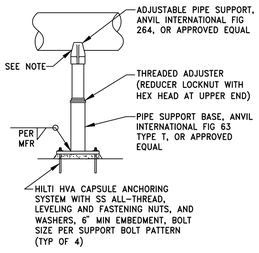
3 REMOVABLE BOLLARD
VAR



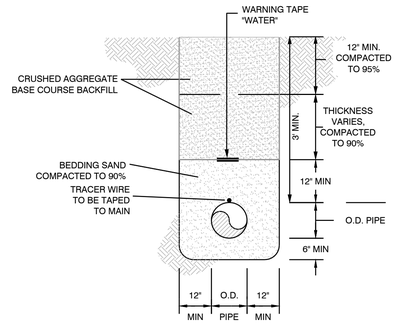
PIPE SIZE	DIMENSIONS (INCHES) A	B	D	E MIN	E MAX	MAX LOAD (LBS)
2-1/2	2-1/2	3/8X8X8	1-1/2	8	13	1,800
3				8-1/4	13-1/4	
3-1/2				8-1/2	13-1/2	
4	3	3/8X10X10	2-1/2	9-1/4	14	3,800
5				10	14-3/4	
6				10-1/2	15-1/4	
8		1/2X12X12		11-3/4	16-1/2	
10				13-1/2	18-1/4	
12				15	19-3/4	
14	4		3	16-1/4	20-3/4	5,300
16				17-3/4	22-1/4	
18	6	3/4X12X12	3-1/2	19-1/2	24	6,700
20				21	25-1/2	
22			4	21-5/16	25-13/16	7,300
24				23-3/4	28-1/4	
26				24-5/16	28-13/16	
30				27	31-1/2	
32				28-1/4	32-3/4	
36				30-1/4	34-3/4	

NOTES:

1. ALL COMPONENTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION, UNLESS NOTED OTHERWISE.

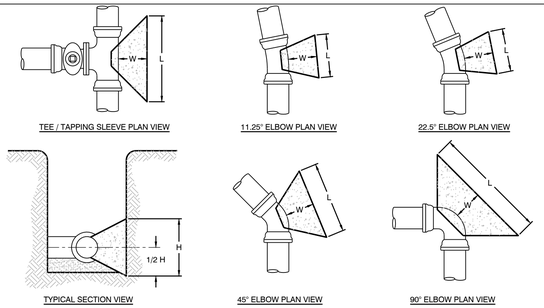


4 PIPE SUPPORT
C-4



NOTES:
1. ALL TRENCHES MUST CONFORM TO APPLICABLE CITY, STATE, COUNTY, AND OSHA SPECIFICATIONS AND REQUIREMENTS. IN THE CASE OF CONFLICT, THE MORE RIGID SPECIFICATION OR STANDARD SHALL APPLY.
2. BEDDING SAND SHALL BE COMPACTED TO 90% MAXIMUM DENSITY AND SHALL BE A MINIMUM OF 12" ABOVE AND 6" BELOW THE MAIN.
3. CRUSHED AGGREGATE BASE COURSE BACKFILL SHALL BE PLACED IN 12" MAXIMUM LOOSE LIFTS. THE TOP 12" SHALL BE COMPACTED TO 95% MAXIMUM DENSITY. THE AREA ABOVE THE BEDDING SAND & BELOW 12" FROM FINISH GRADE SHALL BE COMPACTED TO 90% MAXIMUM DENSITY. NON-METALLIC BLUE WARNING TAPE SHALL BE PLACED IN ALL TRENCHES AT LEAST 12" ABOVE THE WATER MAIN.
4. FIBER OPTIC AND/OR COMMUNICATION CONDUITS SHALL NOT BE PLACED IN THE SAME TRENCH AS WATER.
5. TRACER WIRE SHALL BE #14 COPPER CLAD STAINLESS STEEL CORE WITH 30 MILS BLUE HDPE INSULATION. ALL WIRE SPLICES SHALL BE MADE USING A SPLIT BOLT CONNECTOR WRAPPED WITH AQUASEAL AND ELECTRIC TAPE.

5 TRENCH DETAIL



THRUST BLOCK DIMENSIONS																
TEE, TAP, OR DEAD END					11.25° ELBOW			22.5° ELBOW			45° ELBOW			90° ELBOW		
BRANCH SIZE (INCHES)	L (FEET)	H (FEET)	W MIN. (FEET)	ELBOW SIZE (INCHES)	L (FEET)	H (FEET)	W MIN. (FEET)	L (FEET)	H (FEET)	W MIN. (FEET)	L (FEET)	H (FEET)	W MIN. (FEET)	L (FEET)	H (FEET)	W MIN. (FEET)
4	1.5	1	1	4	1	1	1	1	1	1	1.5	1	1	2	1	1
6	2	2	1	6	1	1	1	1.5	1	1	2	1.5	1	2.5	2	1
8	3	2	1	8	1.5	1	1	1.5	1.5	1	2.5	2	1	4	2	1
10	3.5	2.5	1	10	2	1	1	2	2	1	3	2.5	1	5	2.5	1
12	4.5	3	1	12	2	1.5	1	2.5	2	1	4	2.5	1	6	3	1

THRUST BLOCK DESIGN CRITERIA:

THRUST BLOCK SIZES HAVE BEEN CALCULATED USING THE METHOD AND EQUATIONS PUBLISHED IN *THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE, SIXTH EDITION 2006* BY THE DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA) UTILIZING THE FOLLOWING DESIGN PARAMETERS:
DESIGN PRESSURE = 150 PSI, SOIL BEARING CAPACITY = 2,000 PSF,
SAFETY FACTOR = 1.5, AND NOMINAL PIPE DIAMETER

THRUST BLOCK NOTES:

1. CONCRETE FOR THRUST BLOCKS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,000 PSI. BAG CONCRETE MIX IS NOT ACCEPTABLE.
2. ALL FITTINGS SHALL BE WRAPPED WITH POLYETHYLENE WRAP PER AWWA C105. MASTIC (BRUSH-ON) SHALL BE APPLIED TO ALL BOLTS, ETC.
3. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED SOIL. IN CASES WHERE THIS IS NOT PRACTICAL, BACKFILL AREA BEHIND WHERE THRUST BLOCK WILL BE POURED WITH CLASS 2 AGGREGATE BASE COMPACTED TO 95% MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY PROCEDURES SET FORTH IN ASTM D 1557, CUT-BACK COMPACTED AGGREGATE BASE TO EXPOSE A FIRM SURFACE, THEN POUR THRUST BLOCK.

6 THRUST BLOCK
VAR

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER
DESIGN ALAN ROSALES
No. 79942
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
3301 C Street, Bldg 100-B Tel: 916.341.7760
Sacramento, CA 95816 Fax: 916.341.7767

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD

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Date :

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Project
RECTOR DIVERSION
VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA

DEPARTMENT OF
VETERAN AFFAIRS

Supervisor	Designed	Drawn	Checked
	JG	DV	KM

File Date: -
Vault File Number: -

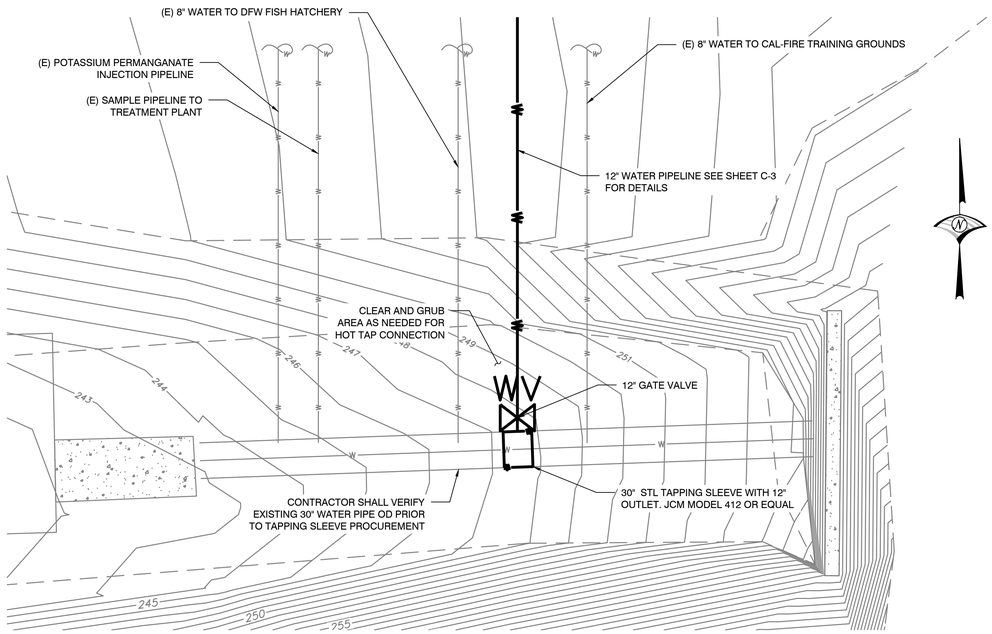
Sheet Title
CIVIL DETAILS 1

DSA Building Number: -
Work Order:

Reference North
Sheet Scale: AS SHOWN
Sheet Number: C-5
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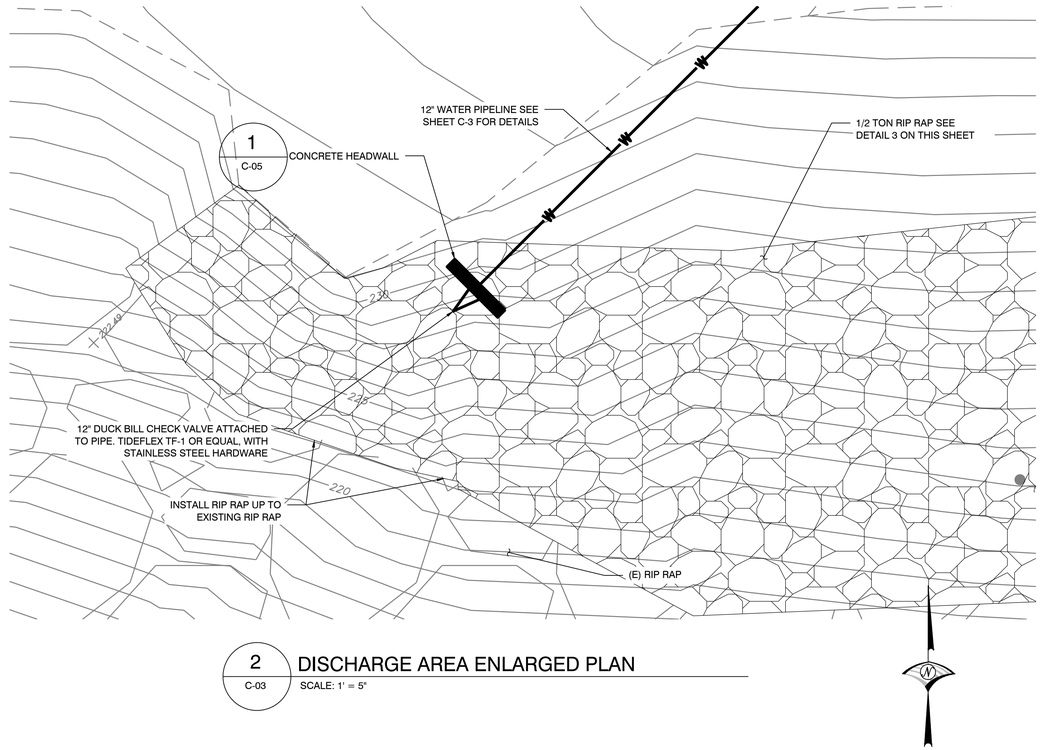
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1 / C-2 HOT TAP CONNECTION ENLARGED PLAN

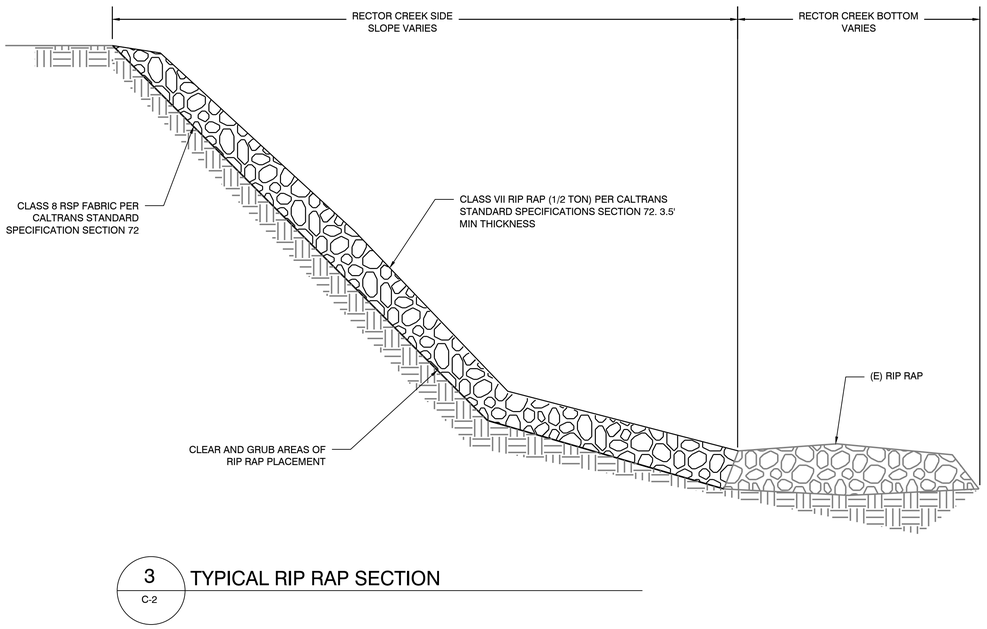
SCALE: 1' = 5"

CONSTRUCTION NOTES:
1. CONTRACTOR SHALL NOTIFY STATE IN WRITING 7-DAYS IN ADVANCE OF HOT TAP



2 / C-03 DISCHARGE AREA ENLARGED PLAN

SCALE: 1' = 5"



3 / C-2 TYPICAL RIP RAP SECTION

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER
JASON ALAN GRIGSBY
No. 79942
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

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Project
RECTOR DIVERSION VALVE REPLACEMENT

RECTOR RESERVOIR
7300 SILVERADO TRAIL
YOUNTVILLE, CA
DEPARTMENT OF VETERAN AFFAIRS

Supervisor	Designed	Drawn	Checked
	JG	DV	KM

File Date -
Vault File Number -

Sheet Title
CIVIL DETAILS 2

DSA Building Number -
Work Order
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Sheet Number C-6
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ELECTRICAL SYMBOL LIST

NOTE: This is a standard symbol list and not all items listed may be used.

Abbreviations

(E)	EXISTING
A	AMPERES, AMBER
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AVAILABLE INTERRUPTING CAPACITY
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AWG	AMERICAN WIRE GAUGE
C	CONDUIT, CLOSE, CONTROL
CA	CABLE
COORD	COORDINATE
CU	COPPER
DIA	DIAMETER
DIM	DIMENSION
DTL	DETAIL
DWG	DRAWING
E	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
FBO	FURNISHED BY OTHERS
FMC	FLEXIBLE METAL CONDUIT
FT	FOOT, FEET
G, GND	GROUND
HT	HEIGHT
ID	IDENTIFICATION
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IN	INCH, INCHES
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
MCA	MINIMUM CIRCUIT AMPS
MIN	MINIMUM
MISC	MISCELLANEOUS
MT, MTD	MOUNT, MOUNTED
N.I.C.	NOT IN CONTRACT
N/A	NOT APPLICABLE
N	NEUTRAL
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NESC	NATIONAL ELECTRIC SAFETY CODE
NTS	NOT TO SCALE
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
PH	PHASE
PNL	PANEL
PVC	POLY-VINYL-CHLORIDE
PWR	POWER
QTY	QUANTITY
REQD	REQUIRED
RFI	REQUEST FOR INFORMATION
RM	ROOM
RMC	RIGID METAL CONDUIT
SHT	SHEET
STD	STANDARD
TBD	TO BE DETERMINED
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
UON	UNLESS OTHERWISE NOTED
V	VOLTS, VOLTAGE
W/	WITH
W/O	WITHOUT

Connections / Equipment

WALL-MOUNTED JUNCTION BOX

General

NEW WORK

DETAIL NUMBER AND SHEET LOCATION

KEYED NOTE

Miscellaneous

#10
B-27,29,31.

BRANCH CIRCUIT WIRING. ARROW INDICATES HOME RUN TO PANEL WITH CIRCUITS AS NOTED. WIRE SIZE IS #12 AWG MINIMUM UNLESS NOTED OTHERWISE. SHORT TICK MARKS INDICATE PHASE CONDUCTORS. LONG TICK MARKS INDICATE NEUTRAL CONDUCTORS. A SINGLE CURVED TICK MARK INDICATES INSULATED GREEN GROUND CONDUCTOR. SECOND CURVED TICK MARK INDICATES "ISOLATED GROUND" (GREEN INSULATION WITH YELLOW STRIPE) CONDUCTOR.

CIRCUIT BREAKER

DRY TYPE TRANSFORMER

MAIN DISTRIBUTION PANEL / SUB DISTRIBUTION PANEL

Raceways

CONDUIT CONCEALED IN WALL OR CEILING SPACE

CONDUIT ROUTED BELOW FLOOR / GRADE

CONDUIT/WIRING CONTINUATION

CONDUIT/WIRING STUBBED OUT WITH END CAP OR INSULATED PLASTIC BUSHING

GENERAL ELECTRICAL NOTES

A. DO NOT COMMENCE INSTALLATION OF ELECTRICAL SYSTEMS AND EQUIPMENT WITHOUT RELATED SHOP DRAWING APPROVALS.

B. ELECTRICAL CIRCUITS SHALL BE INTERRUPTED ONLY WITH PRIOR WRITTEN CONSENT. SUCH INTERRUPTIONS SHALL BE PRECEDED BY ALL POSSIBLE PREPARATIONS BY THE CONTRACTOR WHICH ARE NECESSARY TO KEEP THE ELECTRICAL CIRCUITS OFF FOR A MINIMUM PERIOD IN AN EXPEDITIOUS MANNER PURSUANT WITH GOOD WORKMANSHIP. THIS INCLUDES CIRCUIT TRACING TO IDENTIFY THE ELECTRICAL LOAD BEING SERVED AND THE ORIGIN OF THE CIRCUIT.

C. PROVIDE TEMPORARY SUPPORT FOR ELECTRICAL SYSTEMS THAT REMAIN IN PLACE.

D. PROVIDE BLANK COVER PLATE FOR ABANDONED FLUSH OUTLETS.

E. WHERE DRAWINGS INDICATE EXISTING ELECTRICAL EQUIPMENT OR DEVICES TO BE RELOCATED AND/OR REUSED, REFURBISH THEM. THOROUGHLY CLEAN SUCH ITEMS. NOTIFY ENGINEER OF ANY DEFECTS IN SUCH INSTALLATIONS. REPAIR ANY DAMAGE CAUSED BY DEMOLITION OR CONSTRUCTION PERFORMED UNDER THIS CONTRACT.

F. OFFER REMOVED LUMINAIRES, WIRING DEVICES, PANELBOARDS AND EQUIPMENT TO THE OWNER. IF OWNER CHOOSES TO RETAIN THESE ITEMS, RETURN SUCH ITEMS TO OWNER. CAREFULLY REMOVE AND DISPOSE OF ITEMS REJECTED BY OWNER FROM PROJECT SITE AND IN A LEGAL MANNER.

G. PROVIDE SUITABLE ANCHORAGE AND SUPPORT FOR ELECTRICAL EQUIPMENT IN RATED WALLS, SLABS AND CEILINGS. MOUNT DEVICES AND RACEWAYS IN ACCORDANCE WITH ESTABLISHED CODES AND SPECIFICATIONS.

H. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

I. DRAWINGS AND SPECIFICATIONS COMPLEMENT EACH OTHER. REQUIREMENT BY EITHER INFERS REQUIREMENT BY BOTH.

J. CONNECT EQUIPMENT AND DEVICES FURNISHED UNDER OTHER DIVISIONS OF THIS CONTRACT, BY OWNER OR BY OTHER CONTRACTS.

K. UNLESS OTHERWISE NOTED, PROVIDE CONCEALED AND FLUSH MOUNTED INSTALLATION OF DEVICES AND EQUIPMENT IN AREAS.

L. PROVIDE SEPARATE EQUIPMENT GROUNDING CONDUCTOR IN 120 VOLT, MULTI-WIRE CIRCUITS.

M. FOR 120 VOLT, 20 AMP CIRCUITS, WHERE CIRCUIT DISTANCE FROM PANELBOARD TO FARTHEST DEVICE/FIXTURE EXCEEDS 70 FEET, PROVIDE #10 SIZE CONDUCTOR. WHERE CIRCUIT DISTANCE FROM PANELBOARD TO FARTHEST DEVICE/FIXTURE EXCEEDS 100 FEET, PROVIDE #8 SIZE CONDUCTOR.

N. RUN ELECTRICAL CONDUIT CONCEALED AND PARALLEL TO EXISTING BUILDING LINES. VERIFY WITH ENGINEER.

O. RECEPTACLE OUTLETS SHALL COMPLY WITH CEC SECTIONS 210.7 AND 210.50.

P. BRACE ELECTRICAL EQUIPMENT TO RESIST A HORIZONTAL FORCE THAT ACT IN ANY DIRECTION. COMPLY WITH TITLE 24 REQUIREMENTS.

Q. INSTALL COMPLETE SYSTEM OF CONDUCTORS IN RACEWAY SYSTEM THROUGHOUT BUILDING FOR FEEDERS, BRANCH CIRCUITS, ETC.

R. MINIMUM SIZE FOR EXTERIOR BELOW GRADE CONDUIT SHALL BE 1".

SHEET INDEX

E-01	SYMBOL LIST AND GENERAL NOTES - ELECTRICAL
E-10	SITE PLAN - POWER AND SIGNAL
E-20	DETAIL, PANEL SCHEDULE, AND PARTIAL SINGLE LINE DIAGRAM

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER
THOMAS B. JUN
No. E19320
Exp:12/31/22
ELECTRICAL
STATE OF CALIFORNIA

Signed:
3/12/21

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

INTERFACE ENGINEERING
PROJECT 2020-0377
CONTACT Thomas Jun
135 Main Street, Suite 400
San Francisco, CA 94105
TEL 415.489.7240
www.interfaceengineering.com

Division of the State Architect
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Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked
TJ	BH	BH	TJ

File Date: -
Vault File Number: -

Sheet Title
SYMBOL LIST AND GENERAL NOTES - ELECTRICAL

DSA Building Number: -
Work Order:

Reference North

Sheet Scale: NO SCALE

Sheet Number: E-01
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GENERAL SHEET NOTES

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ELECTRICAL DEVICES WITH ENGINEER PRIOR TO INSTALLATION.

B. COORDINATE EXACT LOCATION AND POWER REQUIREMENTS OF CONTROL VALVE EQUIPMENT WITH DIVISION 22 PRIOR TO INSTALLATION.

SHEET KEYNOTES

1 PROVIDE POWER CONNECTION FROM CIRCUIT 'A-29.' TO X144D E-FLOW METER WITH DISPLAY AND CLA-VAL 631 SERIES ELECTRONIC CONTROL VALVES. COORDINATE POWER AND WIRING REQUIREMENTS TO PLACE INTO SERVICE WITH MANUFACTURER PRIOR TO INSTALLATION. REFER TO DETAIL 3 ON SHEET E-20 FOR ADDITIONAL INFORMATION. PERFORM VOLTAGE DROP CALCULATION TO ENSURE FEEDER SIZES ARE ACCEPTABLE BASED ON FEEDER LENGTH.

2 TRENCH FROM THE FLOW CONTROL FACILITY TO EXISTING PANEL 'A' IN THE TREATMENT PLANT. THE EXACT ROUTING WILL BE MEANS AND METHOD. MAINTAIN 3' CLEARANCE FROM ALL EXISTING PIPELINES. COORDINATE WITH UTILITY AND EXISTING CONDITIONS TO AVOID ALL EXISTING UNDERGROUND PIPING.

3 ELECTRONIC FLOW CONTROLLER WILL BE FED FROM THE TOP OF PANEL 'A'. PENETRATE CONDUIT THROUGH THE WALL AND PROVIDE UNDERGROUND TRENCH FOR THE EXTERIOR PATH. REFER TO SHEET 2/E-20 FOR PENETRATION DETAIL.

4 EXISTING PANEL 'A' IS PART OF EXISTING MAIN SWITCHBOARD 'MSB-1'. REFER TO SHEET 1/E-20 FOR EXACT LOCATION OF PANEL 'A'.

5 PROVIDE CIRCUIT 'A-29.' TO ELECTRONIC FLOW CONTROLLER #VC-22D LOCATED IN THE LAS/CONTROL ROOM. COORDINATE POWER AND WIRING REQUIREMENTS TO PLACE INTO SERVICE WITH MANUFACTURER PRIOR TO INSTALLATION.

6 CONTRACTOR TO PROVIDE A SINGLE TWISTED-PAIR CABLE WITH AN OVERALLSHIELD PER EACH INSTRUMENT BEING INSTALLED. CABLE SHALL BE SIZED ACCORDINGLY ACCOUNTING FOR VOLTAGE DROP AND PROVIDING THE MANUFACTURER REQUIRED VOLTAGE AT THE INPUT INTERFACE. CABLE MUST BE ABLE CARRY A MINIMUM OF A 4-20MA SIGNAL BETWEEN THE VC-22D VALVE CONTROLLER AND THE CLA-VAL 631 SERIES VALVES. FOR FINAL INSTALLATION REQUIREMENTS REFER TO THE MANUFACTURER INSTALLATION REQUIREMENTS.

1 SITE PLAN - POWER AND SIGNAL

NORTH

0 40' 80'

SCALE: 1"=40'-0"

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER
THOMAS B. JUN
No. E19320
Exp:12/31/22
ELECTRICAL
STATE OF CALIFORNIA

Signed:
3/12/21

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

INTERFACE ENGINEERING
PROJECT 2020-0377
CONTACT Thomas Jun
135 Main Street, Suite 400
San Francisco, CA 94105
TEL 415.489.7240
www.interfaceengineering.com

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD

App. No.:
Reviewed by:
Date :

California State Fire Marshal
APPROVED

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

App.No.:
Reviewed by:
Date :

Issue

No.	Date	Description
1	07/15/20	30% PRELIMINARY DESIGN
2	10/30/20	50% CONSTRUCTION DESIGN
3	03/08/20	100% DESIGN

Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked
TJ	BH	BH	TJ

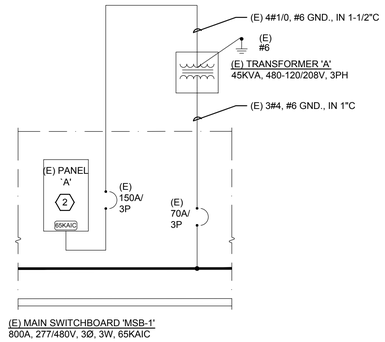
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Vault File Number: -

Sheet Title
SITE PLAN - POWER AND SIGNAL

DSA Building Number: -
Work Order:

Reference North
Sheet Scale: AS INDICATED
Sheet Number: E-10
10 of 11

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1 PARTIAL SINGLE LINE DIAGRAM

NO SCALE

(E) Panel 'A' 120/208V, 3 Ph., 4 W.; 225A Bus with Main Lug Only Flush Mounted Panelboard

2020-0377

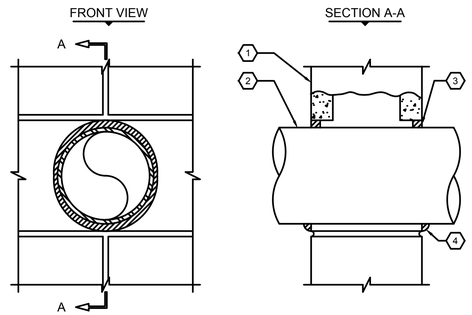
Ckt. No.	Description / Location	Load (VA)	Type	C.B. A/Pole	Note	Ph.	Note	C.B. A/Pole	Load (VA)	Type	Description / Location	Ckt. No.
1	(E) LOAD			20/1		A		20/1			(E) LOAD	2
3	(E) LOAD			20/1		B		20/1			(E) LOAD	4
5	(E) LOAD			20/1		C		20/1			(E) LOAD	6
7	(E) LOAD			20/1		A		20/1			(E) LOAD	8
9	(E) LOAD			20/1		B		20/2			(E) LOAD	10
11	(E) LOAD			20/1		C		-			-	12
13	(E) LOAD			20/1		A		20/2			(E) LOAD	14
15	(E) LOAD			20/1		B		-			-	16
17	(E) LOAD			20/1		C		20/1			(E) LOAD	18
19	(E) LOAD			20/1		A		20/1			(E) LOAD	20
21	(E) LOAD			20/1		B		20/1			(E) SPARE	22
23	(E) LOAD			20/1		C		20/1			(E) SPARE	24
25	(E) LOAD			20/1		A		20/1			(E) LOAD	26
27	(E) LOAD			20/1		B		20/2			(E) LOAD	28
29	631 SERIES VALVE CONTROLLER	300	C	20/1		C		-			-	30
31	(E) LOAD			20/1		A		20/1			(E) LOAD	32
33	(E) LOAD			20/1		B		20/2			(E) LOAD	34
35	(E) LOAD			30/1		C		-			-	36
37	(E) LOAD			20/1		A		20/1			(E) LOAD	38
39	(E) LOAD			20/1		B		20/1			(E) LOAD	40
41	(E) SPARE			20/1		C		20/1			(E) SPARE	42

Total Connected Load:	Ph. A	0 VA	0 Amps	Panel Connected Load:	0.3 KVA	0.8 Amps
Total Connected Load:	Ph. B	0 VA	0 Amps	Sub-Fed Connected Load:	0.0 KVA	0.0 Amps
Total Connected Load:	Ph. C	300 VA	2 Amps	**Total Demand Load:**	0.4 **KVA**	1.0 **Amps**

UL/cUL SYSTEM NO. W-J-1124

METAL PIPE THROUGH CONCRETE WALL OR BLOCK WALL ASSEMBLY

F-RATING = 1 AND 2-HR.
T-RATING = 0-HR.



DETAIL KEYNOTES

1 CONCRETE WALL ASSEMBLY (1-HR. OR 2-HR. FIRE-RATING):
- A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE WALL (MIN. 3-3/4" THICK, FOR 1-HR. FIRE- RATING).
- B. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE WALL (MIN. 5" THICK, FOR 2-HR. FIRE-RATING).
- C. ANY UL/ULC CLASSIFIED CONCRETE BLOCK WALL.

2 PENETRATING ITEM TO BE ONE OF THE FOLLOWING :
- A. MAXIMUM 4" DIAMETER STEEL PIPE (SCHEDULE 10 OR HEAVIER).
- B. MAXIMUM 4" DIAMETER CAST IRON PIPE.
- C. MAXIMUM 4" NOMINAL DIAMETER COPPER PIPE.
- D. MAXIMUM 4" NOMINAL DIAMETER STEEL CONDUIT.
- E. MAXIMUM 4" NOMINAL DIAMETER EMT.

3 MINIMUM 5/8" DEPTH HILTI CP 606 FLEXIBLE FIRESTOP SEALANT.

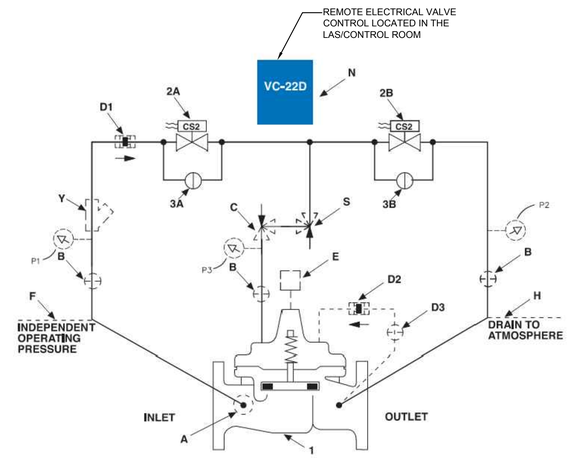
4 MINIMUM 1/2" BEAD HILTI CP 606 FLEXIBLE FIRESTOP SEALANT AT POINT OF CONTACT.

NOTES:

1. MAXIMUM DIAMETER OF OPENING = 5".
2. ANNULAR SPACE = MINIMUM 0", MAXIMUM 1/2".
3. PIPE MAY BE INSTALLED AT AN ANGLE NOT GREATER THAN 45° FROM PERPENDICULAR.

2 CONDUIT THROUGH CONCRETE WALL FIRESTOP ASSEMBLY DETAIL

NO SCALE



ITEM	DESCRIPTION
A	X46A FLOW CLEAN STRAINER
B	CK2 ISOLATION VALVE
C	CV FLOW CONTROL (CLOSING)
D	CHECK VALVES WITH ISOLATION VALVE
E	X117 SERIES POSITION TRANSMITTER
F	INDEPENDENT OPERATING PRESSURE
H	ATMOSPHERIC DRAIN
N	ELECTRONIC CONTROLLER
P	X141 PRESSURE GAUGE
S	CV FLOW CONTROL (OPENING)
Y	X43 "Y" STRAINER
1	100-20 HYTROL MAIN VALVE
2	CS2 SOLENOID CONTROL
3	CK2 SOLENOID BYPASS VALVE

NOTE: X144D E-FLOW METER IS INSERTED INTO THE INLET TAPPING OF THE VALVE TO MEASURE THE FLOW. REFER TO THE MANUFACTURER DATA SHEET FOR ADDITIONAL INFORMATION.

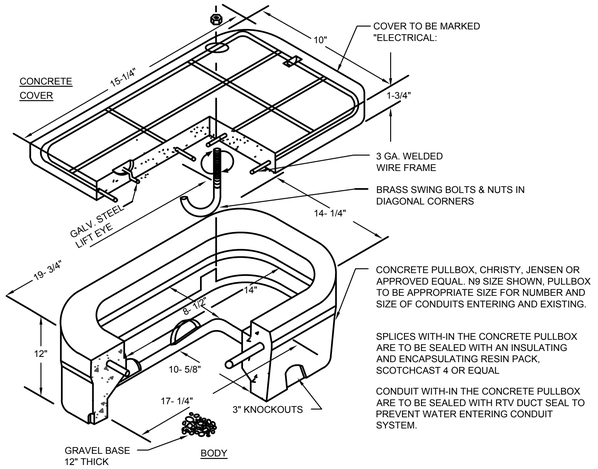
631 SERIES 3 ELECTRIC CONTROL VALVES WIRING DIAGRAM (FOR REFERENCE ONLY)

NO SCALE

SHEET KEYNOTES

1 LOAD SHOWN ARE FOR NEW LOADS ONLY.

2 PANEL 'A' IS PART OF MAIN SWITCHBOARD 'MSB-1' AS INDICATED BY THE AS-BUILT, PANEL 'A' IS PART OF SECTION 4.



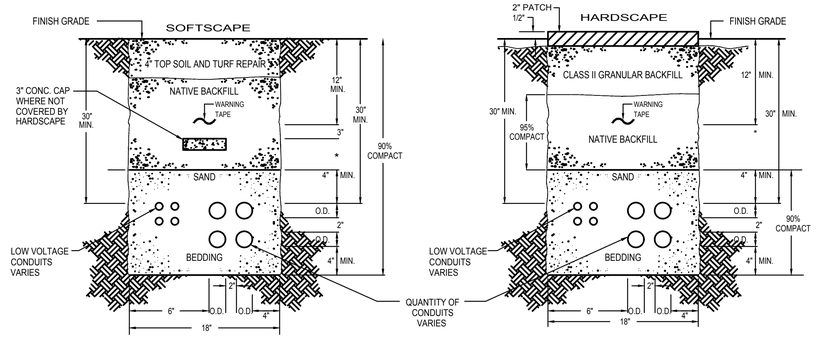
CONCRETE PULLBOX, CHRISTY, JENSEN OR APPROVED EQUAL. N9 SIZE SHOWN, PULLBOX TO BE APPROPRIATE SIZE FOR NUMBER AND SIZE OF CONDUITS ENTERING AND EXISTING.

SPLICES WITH-IN THE CONCRETE PULLBOX ARE TO BE SEALED WITH AN INSULATING AND ENCAPSULATING RESIN PACK, SCOTCHCAST 4 OR EQUAL

CONDUIT WITH-IN THE CONCRETE PULLBOX ARE TO BE SEALED WITH RTV DUCT SEAL TO PREVENT WATER ENTERING CONDUIT SYSTEM.

4 CONCRETE PULL BOX DETAIL

NO SCALE



MINIMUM CLEARANCE REQUIREMENTS (INCHES)

	PC	SC	G	TEL	TV	LV	W
PRIMARY CONDUIT (601V-22KV) (PC)	-	6	36	36	36	36	36
SECONDARY POWER CONDUIT (0-600V) (SC)	6	-	12	12	12	12	36
GAS (G)	36	12	-	12	12	12	36
TELEPHONE (TEL)	36	12	12	-	2	2	36
CATV (TV)	36	12	12	2	-	2	36
OTHER LOW VOLTAGE (LV)	36	12	12	2	2	-	36
WET UTILITES (W)	36	36	36	36	36	36	-

TABLE ONLY APPLIES TO CONDUITS AFTER THE UTILITY POINT OF CONNECTION.

NOTES:

1. ALL TRENCHES MUST CONFORM TO O.S.H.A. REQUIREMENTS.
2. PROVIDE 12" SEPARATION WHEN CROSSING "WET" UTILITIES. IF SEPARATION CANNOT BE CONTAINED ENCASE IN CONCRETE.
3. CRUSHED GRAVEL MATERIAL REQUIRES 95% COMPACTION MINIMUM.

* OPTIONAL AREA - CAN BE FILLED WITH EITHER CRUSHED GRAVEL OR SAND BEDDING MATERIAL.

5 CONDUIT TRENCHING

NO SCALE

State of California
DGS
Department of General Services
Real Estate Services Division
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH
Architecture & Engineering Section
707 Third Street, Suite 4-105
West Sacramento, California 95605

REGISTERED PROFESSIONAL ENGINEER THOMAS B. JUN No. E19320 Exp:12/31/22 ELECTRICAL STATE OF CALIFORNIA

Signed: 3/12/21

DGS Project Manager: Michele Leong
916 376 - 5432 Voice
Michele.Leong@dgs.ca.gov

INTERFACE ENGINEERING
PROJECT 2020-0377
CONTACT Thomas Jun
135 Main Street, Suite 400
San Francisco, CA 94105
TEL 415.489.7240
www.interfaceengineering.com

Division of the State Architect
ACCESS COMPLIANCE
DSA FILE NO.: RESD

App. No.:
Reviewed by:
Date :

California State Fire Marshal
APPROVED

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

App.No.:
Reviewed by:
Date :

Issue

No.	Date	Description
1	07/15/20	30% PRELIMINARY DESIGN
2	10/30/20	50% CONSTRUCTION DESIGN
3	03/08/20	100% DESIGN

Project
RECTOR DAM DIVERSION PIPELINE

RECTOR CANYON
YOUNTVILLE, CA 94558

DEPARTMENT OF GENERAL SERVICES

Supervisor	Designed	Drawn	Checked
TJ	BH	BH	TJ

File Date: -
Vault File Number: -

Sheet Title
DETAIL, PANEL SCHEDULE AND PARTIAL SINGLE LINE DIAGRAM

DSA Building Number: -
Work Order:

Reference North

Sheet Scale: NO SCALE

Sheet Number: E-20
11 of 11

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APPENDIX 3.8-A

Rector Creek Water Year Type and Watershed Model Technical Memorandum
Rector Reservoir Bypass Valve Project

TECHNICAL MEMORANDUM ◦ MAY 2021

Rector Creek Water Year Type and Watershed Model Technical Memorandum









PREPARED FOR

California Department of Veteran Affairs
1227 O Street
Sacramento CA, 95814

PREPARED BY

Stillwater Sciences
279 Cousteau Place, Suite 400
Davis, CA 95618

Stillwater Sciences

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Stillwater Sciences. 2021. Rector Creek water year type and watershed model technical memorandum. Prepared for the California Department of Veteran Affairs, Sacramento, CA. Prepared by Stillwater Sciences, Davis, CA. May.

Cover photos (counter-clockwise): Aerial photo of Napa Valley and the Town of Yountville (Source: Yountville Chamber of Commerce, 2017); Rector Creek, April 2018, mid reach; Rector Creek, April 2018, mid-reach; Pacific chorus frog observed in Rector Creek.

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1 INTRODUCTION

Rector Dam is located on Rector Creek east of the Silverado Trail in Napa Valley near the Town of Yountville, California. Rector Creek flows from the east side of Napa Valley and is a tributary to Conn Creek, which is a tributary to the Napa River. The State of California built Rector Dam in 1946, and the California Department of Veterans Affairs (CalVet) has operated the dam and reservoir since that time to supply drinking water to the Veterans Home of California in Yountville, Napa State Hospital, California Department of Fish and Wildlife's (CDFW) Bay-Delta Region office, Town of Yountville, and several local wineries. CalVet also supplies untreated water to the CDFW Silverado Fisheries Base (Fisheries Base) located along Rector Creek downstream of the dam, and to the Cal Fire training facility located near the base of Rector Dam. The Fisheries Base serves as a hatchery and CDFW's only fish quarantine station in the state. Water delivered to the Fisheries Base is returned to Rector Creek approximately 0.35 miles downstream of the spillway.

The License to operate Rector Dam[1] does not include specific instream flow release requirements, but California Fish and Game Code Section 5937 requires the owner or operator of any dam to allow sufficient flow to pass through or over the dam to keep fish downstream of the dam in good condition.

During 2018 and 2019, a preliminary interim instream flow release schedule for Rector Creek downstream of Rector Dam (lower Rector Creek) was developed based on existing information and preliminary assessments of the flows that would benefit fish ("environmental flows") (Stillwater Sciences 2019). A hydrologic assessment of the Rector Reservoir and Rector Creek watershed were conducted, including development of a Rector Reservoir water balance model, to identify whether there was sufficient water available for the environmental flows and sufficient information to assess any potential effects of environmental flows on other uses ("water availability"). Additional data requirements needed to evaluate whether the environmental flows were sufficient to keep fish downstream of the dam in good condition were also determined. The two most significant data limitations for the hydrologic assessment were: (a) water year type information specifically for the Rector Creek watershed was unavailable for most years; and (b) there was insufficient data to determine the Rector Creek watershed inflow to Rector Reservoir when there was flow over the Rector Dam spillway (i.e., during Rector Dam spill events). The Rector Creek watershed water year type information was needed to determine the water year appropriate amount of flow to release downstream of Rector Dam from the instream flow release schedule. Rector Reservoir inflow during spill events potentially comprises a significant portion of the total water yield from Rector Creek upstream of Rector Dam, so these inflows must be estimated to quantify the actual reservoir storage changes under release schedule flows and to assess the available water for releases downstream of Rector Reservoir. Thus, this Rector Creek watershed water year type analysis and Rector Creek watershed runoff modeling study were commissioned to address these data limitations.

[1] The State Water Resources Control Board issued CalVet a water rights license in 1970 (License No. 10911) that includes, as authorized places of use, the Veterans' Home, CDFW's Bay Delta Region office and Silverado Fisheries Base, Napa State Hospital, the Town of Yountville, and 670 irrigated acres.

2 STUDY GOALS AND OBJECTIVES

The overall goal for the Rector Creek watershed water year type analysis was to calculate the specific Rector Creek watershed water year type precipitation thresholds for estimating the Rector Creek watershed water year type for previous and future years. The Rector Creek water year type analysis results would also inform the development of a future Rector Reservoir Operations Plan by quantifying the historical frequency of different water year types in the watershed.

The overall goal of the Rector Creek watershed runoff modeling study was to estimate the inflow to Rector Reservoir from the Rector Creek watershed upstream of the reservoir, improving the estimate of the total water yield from the Rector Creek watershed upstream of Rector Dam available for water releases downstream of Rector Reservoir.

To reach these overall goals, this study will meet the following objectives:

- Calculate the water year type index for the Rector Creek watershed based on precipitation data from weather stations located in Napa Valley;
- Calculate a set of Rector Creek watershed precipitation thresholds for estimating the overall water year type before the end of the water year;
- Estimate the land-use/cover areas within the Rector Creek watershed upstream of Rector Dam;
- Develop a watershed runoff model for the Rector Creek watershed upstream of Rector Dam based on the rainfall-runoff method, land-use/cover mapping, and available Rector Creek watershed data;
- Estimate the Rector Creek watershed inflow to Rector Reservoir when sufficient hydrology data are available to calibrate and validate the Rector Creek watershed runoff model; and
- Quantify the Rector Creek watershed runoff model performance to evaluate whether the watershed runoff model needs to be refined or replaced with a more detailed model.

3 STUDY AREA

The study area is the approximately 10.7 square mile Rector Creek watershed upstream of Rector Dam (Figure 3-1 and Figure 3-2). The Rector Creek watershed upstream of Rector Dam has a mixture of land-uses, including vineyard, open space (i.e., undeveloped), and rural residential (California Department of Water Resources [DWR] 2000, 2013; Birkas et al. 2009) and includes the mainstem of Rector Creek as well as North Fork Rector Creek and South Fork Rector Creek (also known as Lorette Creek). Inflow to Rector Reservoir is primarily from the mainstem of Rector Creek, which is perennial upstream of the reservoir (Figure 3-1). The mainstem, North Fork, and South Fork contain about 77, 10, and 13 percent of the Rector Creek drainage area, respectively. The average annual precipitation in the watershed is approximately 36 inches, and the average annual inflow to Rector Reservoir is estimated at 14,240 acre-feet. The reservoir typically fills and spills during the winter and spring months corresponding with the majority of the precipitation in the area (DWR 2013).

Rector Dam is a 164-foot-high earth-fill structure with a crest elevation of 381.5 feet above Mean Sea Level (MSL). As built in 1946, the spillway crest elevation was 370.0 feet above MSL, but the spillway elevation was raised 2.5 feet in 1989 to increase water storage. The ogee spillway

currently has a crest elevation of 372.5 feet above MSL and a curvilinear crest length of 141.5 feet (DWR 2013).

Water is withdrawn from the reservoir by a tower with intake invert elevations of 270, 291, 307, 323, 335, and 339 feet above MSL. A 2000 bathymetric survey of Rector Reservoir conducted by DWR determined that the lowest intake at 270 feet above MSL was buried by sediment, so the lowest operational intake is at 291 feet above MSL (DWR 2000). The 2000 bathymetric survey also calculated stage-surface area and stage-storage volume curves for Rector Reservoir from 245 feet above MSL to 375 feet above MSL (DWR 2013). According to the stage-storage volume relationship, the minimum pool storage which is inaccessible below the lowest operational intake (291 feet above MSL) is approximately 478 acre-feet. At the spillway crest elevation (372.5 feet above MSL), the reservoir storage capacity is approximately 4,535 acre-feet (DWR 2013).

The 2000 bathymetric survey showed that approximately 245 acre-feet of sediment has accumulated in Rector Reservoir during the 54 years since the dam was constructed, an average sediment accumulation of 4.5 acre-feet/year (DWR 2000). While the sedimentation rate estimated in 2000 was consistent with the small deltas observed in 2011 at the three stream inlets to the reservoir, DWR (2013) noted that a comparison of the full pool surface areas estimates from the California Division of Safety of Dams, aerial photography, and full pool elevation contours suggested that sedimentation in the reservoir near the three stream inlets may be creating some uncertainty in the upper range of the stage-surface area and stage-storage volume relationships for Rector Reservoir. The largest volume of sediment input to the reservoir occurred during a period of high runoff following a fire, but the development of vineyards in the Rector Creek watershed above the dam since the early 1990s may also be contributing to the sediment entering the reservoir (DWR 2013).

Currently, water from Rector Reservoir is only able to pass downstream of the dam via the spillway, through emergency release valves at the base of the dam (which can only be operated as fully opened or closed), or as discharge from the Fisheries Base as part of its normal operations. The untreated water delivered to the Fisheries Base is discharged into Rector Creek approximately 0.35 miles downstream of the spillway. The Fisheries Base's operations are variable, and the facility is typically offline from the beginning of June to early October for maintenance. CalVet is evaluating options to install an additional release valve near the base of the dam that will be used to make the environmental flow releases.

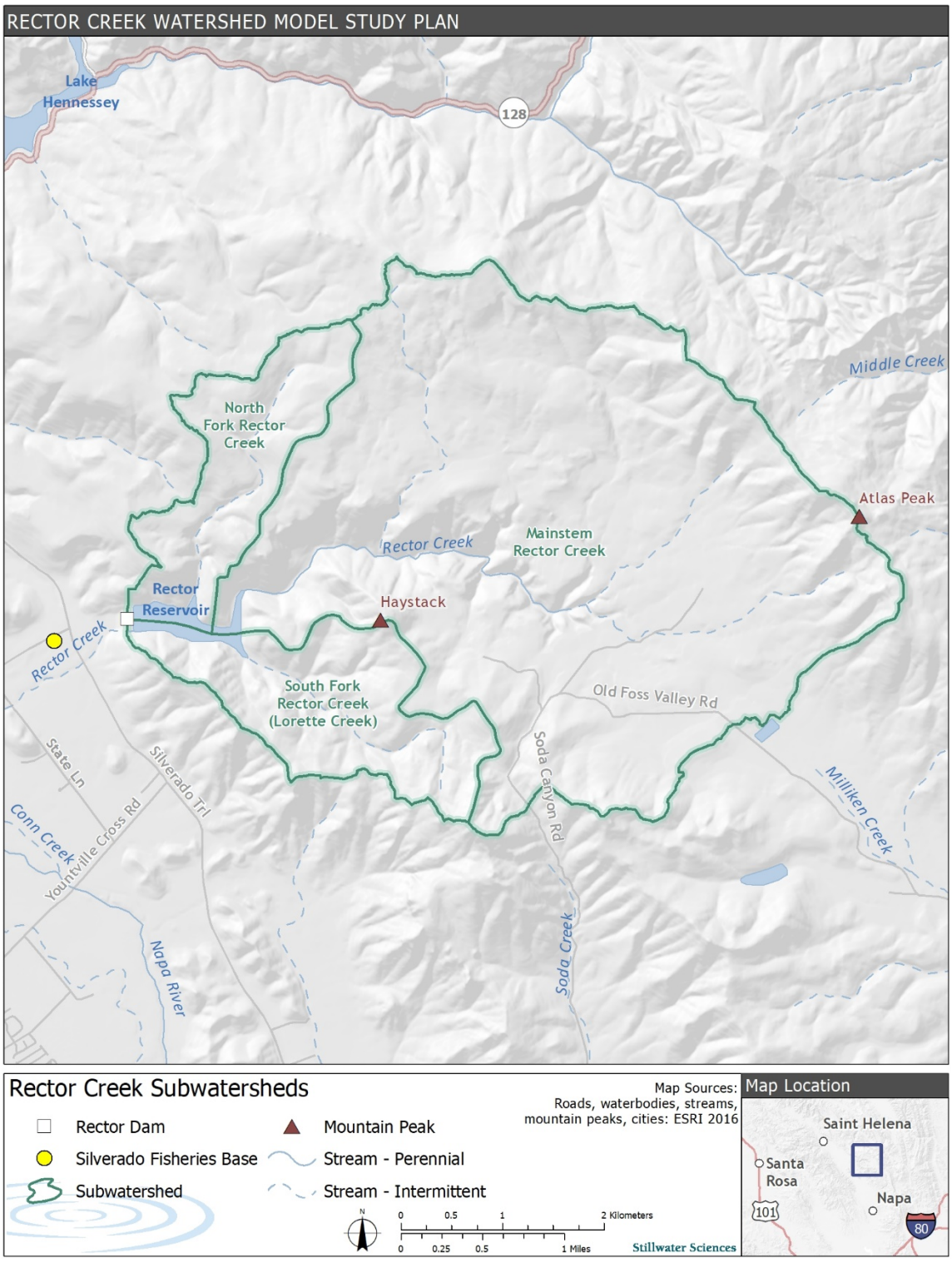


Figure 3-1. Rector Creek subwatersheds upstream of Rector Dam.

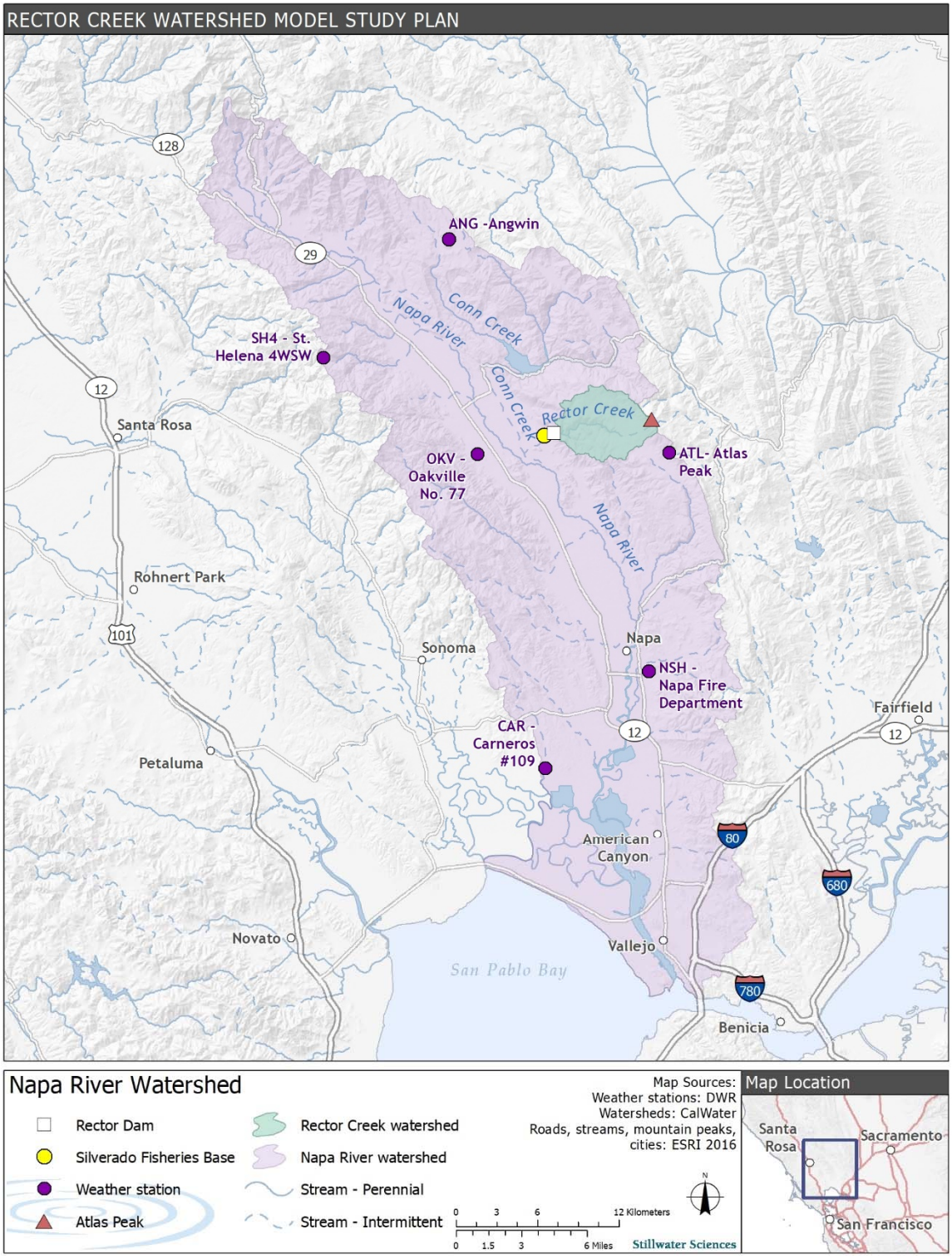


Figure 3-2. Napa River watershed and upper Rector Creek subwatershed.

4 METHODS

4.1 Water Year Type Analysis

Precipitation data from weather stations in the Napa Valley near or within the Rector Creek watershed were analyzed to calculate the water year type in the Rector Creek watershed and to determine the Rector Creek watershed precipitation thresholds necessary to designate the appropriate water year type for the water release schedule during future years. A "water year" (WY) is defined as beginning on October 1 of the preceding year and ending on September 30 (e.g., WY 2008 started on October 1, 2007 and ended on September 30, 2008). Water year classifications can be calculated from either runoff or precipitation, with water year classifications typically sub-divided into either three categories representing "Dry", "Average", and "Wet" water year types, or five categories representing "Very Dry", "Dry", "Average", "Wet", and "Very Wet" water year types. In the Rector Creek watershed there were not sufficient stream flow data to estimate the water year type from runoff, so the Rector Creek watershed water year type classification was calculated from precipitation data. Precipitation data at Napa State Hospital/Napa Fire Station (NSH), Oakville (OKV), Atlas Peak (ATL), Rector Reservoir (RES), St. Helena 4WSW (SH4), and Angwin (ANG) were collected for their entire period of record (Table 4-1). Water year types in the Rector Creek watershed were calculated by conducting an exceedance probability analysis of the precipitation data at these weather stations near the Rector Creek watershed to determine the water year precipitation thresholds defining Very Dry, Dry, Average, Wet, and Very Wet water year types.

A quality assurance/quality control (QA/QC) review of the precipitation data at each weather station was performed before the exceedance probability analysis to identify and exclude from further analysis precipitation data outliers due to gage malfunctions or errors in recording the precipitation data. The QA/QC review also identified and excluded water years when the availability of precipitation data was too limited to be confident that the recorded total water year precipitation accurately reflected the actual total water year precipitation. Infrequent recordings of precipitation or large gaps in precipitation data in a water year would likely result in inaccurate estimates of total precipitation during that water year, potentially resulting in a misclassification of the water year type and a shift in the water year precipitation thresholds for all water year types.

Precipitation data outliers were identified by: a) comparing the precipitation recorded at the individual weather stations to a probable maximum precipitation that would be recorded at the time-scale of the precipitation recordings (i.e., daily or monthly); and b) evaluating spatial precipitation variations between nearby weather stations. Precipitation data at the six weather stations were recorded at different time-scales, so the outlier filter analysis was first applied to the shorter daily time-scale precipitation data at OKV, ATL, RES, SH4, and ANG using daily maximum and spatial variation precipitation thresholds (Table 4-2). After excluding outliers in the daily precipitation data, individual water years at each weather station were evaluated for sufficient availability of daily precipitation data to estimate the water year type. Water years with less than 360 days of precipitation data were excluded from further analysis. Next, monthly precipitation totals were calculated from the filtered daily data. The outlier filter analysis was applied again to the monthly precipitation data at NSH, OKV, ATL, RES, SH4, and ANG using monthly maximum and spatial variation precipitation thresholds (Table 4-2). After excluding outliers in the monthly precipitation data, individual water years at each weather station were evaluated for sufficient availability of monthly precipitation data to estimate the water year type. Water years with less than 12 months of precipitation data were excluded from further analysis.

Table 4-1. Napa Valley weather stations and precipitation data availability.

Weather Station		Location		Operator	Precipitation Data Collection Period	Frequency of Recording Precipitation Data
Name	**Initials**	**Latitude**	**Longitude**			
Napa State Hospital/ Napa Fire Department	NSH	38.283	-122.267	Napa County	01/01/1905 to Present	Monthly
Oakville No. 77	OKV	38.428	-122.410	CIMIS[a]	03/01/1989 to Present	Hourly, Daily
Atlas Peak	ATL	38.428	-122.248	DWR	01/01/1987 to Present	Daily
Rector Reservoir	RES	n/a	n/a	CalVet	01/01/2003 to Present	Daily
St. Helena 4WSW	SH4	38.493	-122.540	DWR	01/01/1984 to Present	Daily
Angwin	ANG	38.571	-122.433	DWR	01/01/1987 to Present	Daily

[a] California Irrigation Management Information System

Table 4-2. Napa Valley weather station precipitation outlier filter thresholds.

Time-Step	Maximum Precipitation Per Time-Step (inches)	Maximum Precipitation Difference Between Weather Stations Per Time-Step (inches)	Minimum Number of Precipitation Recordings Per Time-Step
Daily	15	8	360
Monthly	36	10	12

After the QA/QC review, the weather station located closest to the Rector Creek watershed with the best data availability was determined for use in the exceedance probability analysis. RES and ATL were the two closest weather stations to the Rector Creek watershed and would likely best represent precipitation conditions and water year types in the watershed, but the number of years of precipitation data at these weather stations was more limited than other weather stations. The accuracy of water year type precipitation thresholds from an exceedance probability analysis generally improves as the length of the precipitation record increases since longer precipitation records better characterize the range of precipitation in a watershed. Therefore, least squares linear regression was used to extend the length of the precipitation record at the weather station located closest to the Rector Creek watershed that provided the best data availability (i.e., RES or ATL) by relating the longer measured precipitation records at NSH further from the Rector Creek watershed to the precipitation measured at the closer station. The regression equation relating precipitation at the weather station close to the Rector Creek watershed and NSH was used to

estimate the precipitation at the closer station from NSH precipitation data when measured precipitation was not available at the closer station. The original precipitation data at the station close to Rector Creek watershed and NSH along with the regression-extended precipitation at the closer station were then used in the precipitation exceedance probability analysis, so variations in the water year type thresholds between the original precipitation data at the closer station, NSH, and the regression-extended precipitation at the closer station could be evaluated.

The water year precipitation exceedance probability for each weather station was calculated by first sorting and ranking the total water year precipitation for all years with sufficient precipitation data. A rank of one was assigned to the year with the largest total water year precipitation, with the rank increasing for each water year with successively less total water year precipitation. The rank was the same for years with the same total water year precipitation. Once the rank was assigned for each year, the exceedance probability was calculated as follows:

$$P_{exceed,annual} = 100 * \frac{PPT_{annual,\ rank}}{n+1} \qquad \text{(Eqn. 4.1-1)}$$

where $P_{exceed,\ annual}$ is the exceedance probability (percent); $PPT_{annual,\ rank}$ is the rank of the total water year precipitation for an individual gage (dimensionless); and n is the number of years of precipitation data evaluated. Water years were sub-divided into Very Wet, Wet, Average, Dry, and Very Dry types with precipitation thresholds based on the total water year precipitation exceedance probability (**Table 4-3**). A Very Wet water year type was defined as the water years with the highest 10 percent of total water year precipitation. A Very Wet water year would occur when the total water year precipitation exceedance probability is less than or equal to 10 percent, since the highest 10 percent of total precipitation would be exceeded in 10 percent of the water years. The thresholds for the other water year types are defined similarly.

Table 4-3. Water year type precipitation exceedance probabilities.

Water year precipitation exceedance probability (%)	Water year type
≤10	Very Wet
>10–33	Wet
>33–66	Average
>66<90	Dry
≥90	Very Dry

Additionally, monthly precipitation thresholds were determined from the historical precipitation data to characterize the overall water year type before the end of the water year and to approximate natural Rector Creek hydrograph variations. Reservoir operations require estimates of the appropriate water year type for dam releases to Rector Creek. However, total water year precipitation is unknown until the end of the water year, so another metric is needed to estimate the appropriate water year type for reservoir operations during a water year. The water year cumulative precipitation can provide an estimate of the water year type during the water year since monthly increases in the water year cumulative precipitation tend to forecast the overall water year type. Lower water year cumulative precipitation and smaller increases over time typically indicate an overall drier water year, while higher water year cumulative precipitation and larger increases over time forecast an overall wetter water year. As the water year progresses and a larger percentage of the total water year precipitation has occurred, the cumulative

precipitation better characterizes the water year type. To quantify the typical increases in the water year cumulative precipitation that correspond to different water year types, historical precipitation data were analyzed to calculate average water year cumulative precipitation for each water year type (i.e., Very Wet, Wet, Average, Dry, and Very Dry). Historical precipitation data were first grouped by water year type. Water year cumulative precipitation was then calculated for each individual water year in the grouped precipitation data. Finally, the average water year cumulative precipitation for all years in each water year type group was calculated. The water year cumulative precipitation for any future year could be calculated at any time during the water year and compared with each average water year cumulative precipitation curve to estimate the water year type at that point in the water year. For example, a water year cumulative precipitation on January 1 greater than the average Very Dry water year cumulative precipitation on January 1 but less than the average Dry water year cumulative precipitation on January 1 would suggest the water year type at that point in time is Very Dry. Comparison of water year cumulative precipitation to the average water year cumulative precipitation for different water year types was used to estimate the water year type during the water year, but an additional set of precipitation thresholds were needed to estimate the monthly variations in precipitation that would influence natural Rector Creek flow variations.

Monthly precipitation exceedance probabilities for each month in the water year were calculated to determine appropriate monthly shifts in the instream flow release schedule and replicate a more natural Rector Creek hydrograph. In general, natural Rector Creek flow would be expected to be higher after a month with more precipitation than after a month with less precipitation. Total monthly precipitation at the end of a month can be used to assess how natural Rector Creek flow would be expected to change during the subsequent month (i.e., increase or decrease), with monthly precipitation exceedance probability thresholds determining what constitutes a wetter versus drier month. The monthly precipitation exceedance probabilities were calculated by grouping the total monthly precipitation for each month during the water year for all the years in the precipitation data record and estimating the precipitation thresholds during individual months that would indicate whether the month was Very Wet, Wet, Average, Dry, and Very Dry (i.e., a water month type). The monthly precipitation exceedance probability for each month was calculated by first sorting and ranking the total monthly precipitation in that individual month for all years with sufficient precipitation data. In other words, the total October precipitation from all years with sufficient precipitation data in October are grouped together, sorted, and ranked; the total November precipitation from all years with sufficient precipitation data in November are separately grouped, sorted, and ranked; and this is repeated for all months. For each month, a rank of one was assigned to the year with the largest total monthly precipitation, with the rank increasing for each year with successively less total monthly precipitation. The rank was the same for years with the same total monthly precipitation. Once the rank was assigned for each year, the exceedance probability was calculated for each month as follows:

$$P_{exceed,monthly} = 100 * \frac{PPT_{monthly,\ rank}}{n+1} \qquad \text{(Eqn. 4.1-2)}$$

where $P_{exceed,\ monthly}$ is the exceedance probability for the month (percent); $PPT_{monthly,\ rank}$ is the rank of the total monthly precipitation for an individual weather station (dimensionless); and n is the number of years of monthly precipitation data evaluated. Water months were sub-divided into Very Wet, Wet, Average, Dry, and Very Dry types with the precipitation thresholds between the water year types based on the total monthly precipitation exceedance probability (**Table 4-4**).

Table 4-4. Water month type precipitation exceedance probabilities.

Water month precipitation exceedance probability (%)	Water month type
≤10	Very Wet
>10–33	Wet
>33–66	Average
>66<90	Dry
≥90	Very Dry

The water year cumulative precipitation compared to average water year cumulative precipitation in conjunction with the monthly total precipitation compared to the monthly precipitation exceedance probabilities would provide an approach for Rector Reservoir operations to determine the monthly instream flow release water year type that replicates both the overall water year type and the monthly variations for Rector Creek flow. Specific details of the Rector Reservoir operations in relation to variations in the water year cumulative precipitation and the monthly precipitation exceedance probabilities will be discussed in a later reservoir operations plan.

4.2 Watershed Runoff Model

4.2.1 Watershed Baseflow Estimate

Rector Creek watershed runoff (i.e., inflow) into Rector Reservoir is comprised of baseflow and stormflow.

$$Q_{in} = Q_{base} + Q_{storm} \quad \text{(Eq. 4.2-1)}$$

where Q_{in} is the total watershed inflow to Rector Reservoir (acre-feet/day), Q_{base} is the total baseflow into Rector Reservoir (acre-feet/day), and Q_{storm} is the total stormflow into Rector Reservoir (acre-feet/day). The Rector Creek watershed runoff model was developed by first estimating the baseflow into Rector Reservoir. Baseflow is the stream flow due to the release of subsurface water (i.e., hyporheic water and groundwater) stored in the upstream river channels and adjoining riparian and floodplain aquifers in the absence of precipitation or other inputs (Brutsaert 2005). Baseflow typically depends on the geomorphology of the landscape and the stream network along with the hydraulic connectivity with riparian and floodplain aquifers. Baseflow is the primary inflow to Rector Reservoir during summer and early fall when no precipitation occurs, but it also contributes a portion of the stream flow throughout the year, including during storm events. As such, it was necessary to estimate the baseflow component of Rector Reservoir inflow to correctly estimate the relative contribution of baseflow and stormflow to the total watershed inflow to Rector Reservoir. There are many different approaches to estimating the relative contribution of baseflow and stormflow from analysis of precipitation and stream flow data (Tallaksen 1995; Sloto and Crouse 1996; Eckhardt 2008; Gonzales et al. 2009). However, all these methods rely on stream flow data that is not available for the Rector Creek watershed upstream of Rector Reservoir, so a more general approach was used to estimate baseflow with the available information.

4.2.1.1 Watershed baseflow during non-storm periods

During non-storm periods when there was no precipitation or stormflow from the surrounding landscape, the inflow into Rector Reservoir was equal to baseflow. While there were not continuous flow measurements of inflow into Rector Reservoir, the inflow into Rector Reservoir during these non-storm periods was estimated by the effective inflow, I_{eff} (acre-feet/day). Effective inflow to Rector Reservoir was calculated using a water balance approach that performs a mass balance of inflows, outflows, and changes in water stored in the reservoir over time (Hornberger et al. 1998). The overall water balance can be expressed by the equation:

$$\frac{dV}{dt} = I - O \qquad \text{(Eqn. 4.2-2)}$$

where *V* is the reservoir volume, *t* is time, *I* is the volume of water inflow for the time step *dt*, and *O* is the volume of water outflow for the time step *dt*. The effective inflow to Rector Reservoir was calculated by expanding the inflows and outflows based on available data and rearranging

$\frac{dV}{dt} = I - O$ (Eqn. 4.2-2 to solve for the effective inflow:

$$I_{eff} = \frac{dV}{dt} + O_{WTP} + O_{Hatchery} + O_{Cal\ Fire} + O_{evap} - I_{ppt} \qquad \text{(Eqn. 4.2-3)}$$

where *V* is the reservoir volume (acre-feet), *t* is time (day), O_{WTP} is the volume of water diverted to the water treatment plant (WTP) for the time step *dt* (acre-feet/day), $O_{Hatchery}$ is the volume of water diverted to the Fisheries Base for the time step *dt* (acre-feet/day), $O_{Cal\ Fire}$ is the volume of water diverted to the Cal Fire facility at the base of Rector Dam for the time step *dt* (acre-feet/day), O_{evap} is the volume of water outflow from evaporation for the time step *dt* (acre-feet/day), and I_{ppt} is the volume of water inflow from precipitation for the time step *dt* (acre-feet/day).

Reservoir Stage, Area, and Volume

Variations in the Rector Reservoir volume over time can be expressed by the following equation:

$$\frac{dV}{dt} = V(t+1) - V(t) \qquad \text{(Eqn. 4.2-4)}$$

The Rector Reservoir volume was calculated from the measured Rector Reservoir stage and a Rector Reservoir stage-volume relationship to estimate the effective inflow. Rector Reservoir stage and spill timing has been recorded at irregular intervals with 3,890 total measurements between January 1, 2003 and April 27, 2020.

A QA/QC review of the stage data was performed to identify and exclude recorded reservoir stages which were below the minimum elevation in the reservoir or otherwise anomalous. Decreases in the recorded stage greater than approximately 100 feet within 7 days were considered anomalous. For example, several stage measurements from December 2016 were excluded, since they showed this anomalous decrease when the recorded stage changed from 366.12 feet above MSL to 266.24 feet above MSL after 4 days. The QA/QC review also transformed reservoir stage recordings of "spilling" or "overflowing" into a numerical reservoir stage that can be used in calculations. Rector Reservoir stage was often not recorded during spill

events before 2018, with stage usually listed as "spilling" or "overflowing". The spillway elevation for Rector Reservoir has been 372.5 feet above MSL since 2003, so it was assumed that any stage greater than or equal to 372.6 feet above MSL was a spill event. When spilling or overflowing was noted in the data without a measurement of stage, the stage was noted as 372.6 feet above MSL for analysis purposes. When stage was recorded as greater than 372.6 feet above MSL, it was kept and used in the analysis, except a few stage recordings in 2005 that were greater than the dam crest (381.5 feet above MSL). Stages greater than the dam crest were assumed to be equal to the dam crest height. As a result of these assumptions, reservoir stage is conservatively estimated as 372.6 feet above MSL for most spill events in this analysis, but stage is occasionally greater than 372.6 feet above MSL.

After the QA/QC review, the 3,855 remaining measurements of reservoir stage (approximately 99% of the data) were used to estimate daily reservoir stage for all days during the analysis period by linearly interpolating between the measured stage data points (**Figure 4-1**).

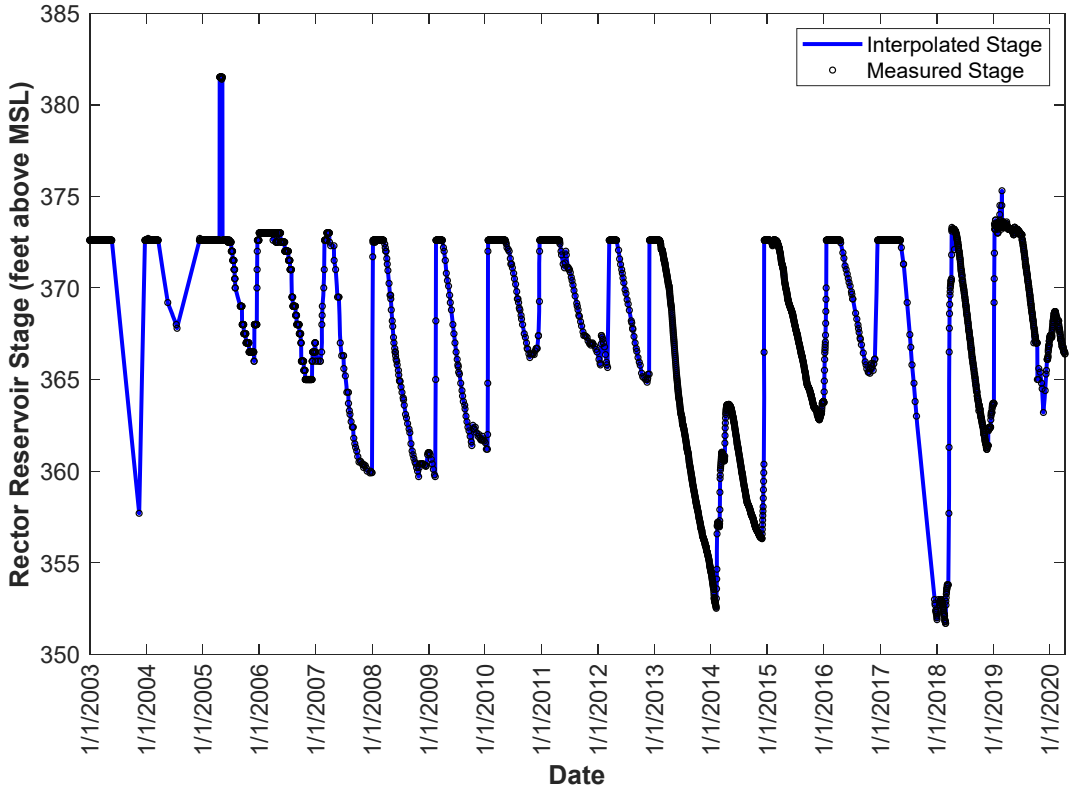


Figure 4-1. Rector Reservoir measured and interpolated stage after QA/QC review. The lowest operational intake occurs at 291 feet above MSL.

The volume of water passing over the Rector Reservoir spillway during spill events is generally not known because: (a) stage was not typically recorded during spill events; (b) there are no upstream or downstream flow gages on Rector Creek; (c) a verified stage-volume rating curve for the dam spillway was not available; and (d) sufficient data to estimate the flow during spill events were unavailable for most years (i.e., 2003, 2005–2020). The limited number of spillway flow estimates prevented the development of a daily estimate of spillway flows or volumes for additional years. When no stage was recorded during spill events, the change in reservoir volume would be zero even though there was flow entering and exiting the reservoir. When stage was

recorded during spill events, the change in reservoir volume would not accurately represent the flow through the reservoir since flow over the spillway would not be represented in the change in reservoir volume. As such, the calculated effective inflow would not accurately estimate the actual daily net inflow to Rector Reservoir when the dam was spilling. However, spill flows were the result of precipitation from storm events generating runoff, so spill flows were assumed to be primarily comprised of stormflow. During non-storm periods when Rector Reservoir was not spilling, the calculated effective inflow would sufficiently characterize baseflow.

The Rector Reservoir surface area associated with a measured stage was determined from the stage-surface area relationship developed by DWR from the 2000 bathymetric survey results for stages from 375 feet to 245 feet above MSL (DWR 2013) (**Figure 4-2**). Similarly, the Rector Reservoir storage volume associated with a measured stage was determined from stage-volume relationships developed by DWR from the 2000 bathymetric survey results for stages from 375 feet to 245 feet above MSL (DWR 2013) (Figure 4-3).

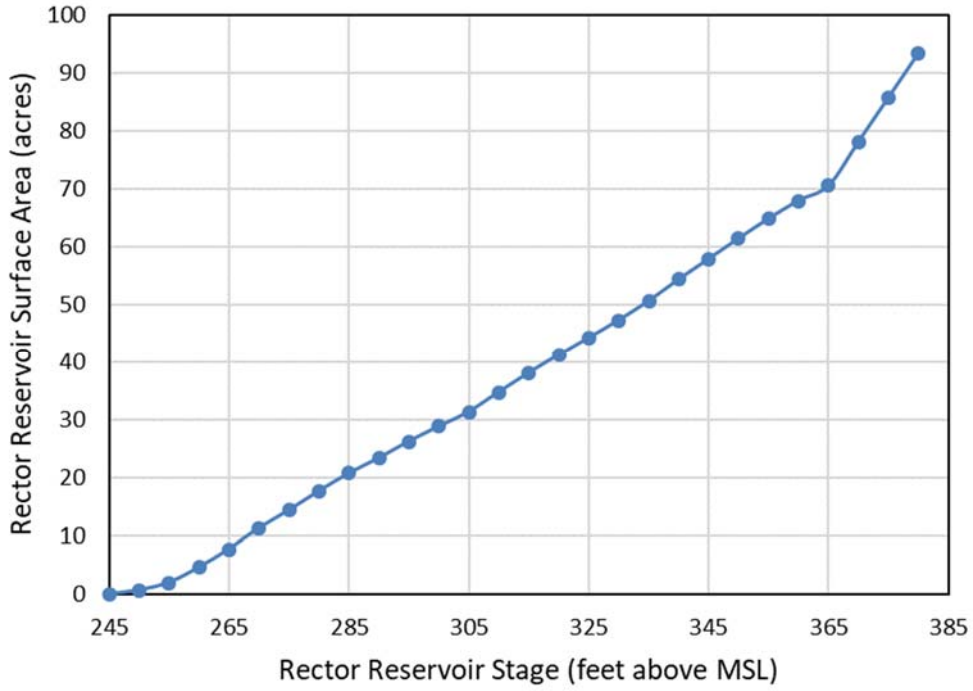


Figure 4-2. Rector Reservoir stage-surface area relationship.

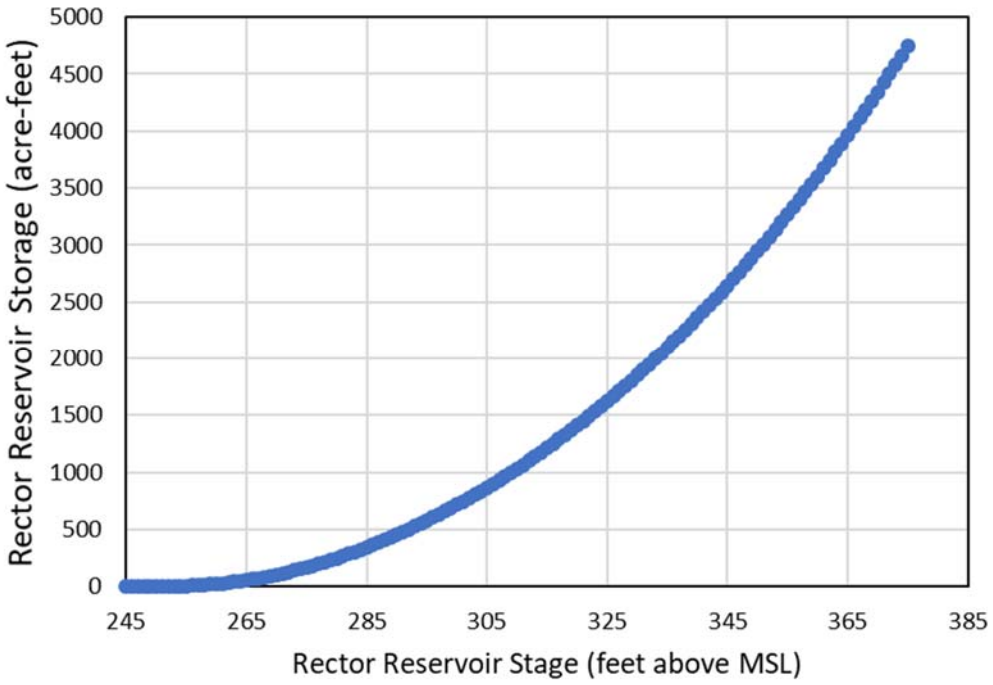


Figure 4-3. Rector Reservoir stage-storage volume relationship.

Diversions

Flows diverted from Rector Reservoir, including any interim environmental flow releases, to the WTP, Fisheries Base, and Cal Fire training facility were recorded daily from January 1, 2008 to April 27, 2020 (Figure 4-4). No flow was reported diverted to the Cal Fire training facility between January 1, 2008 and April 27, 2020. Any additional flows that were not included in these diversions (i.e., valve exercising flows) were not included in the modeling.

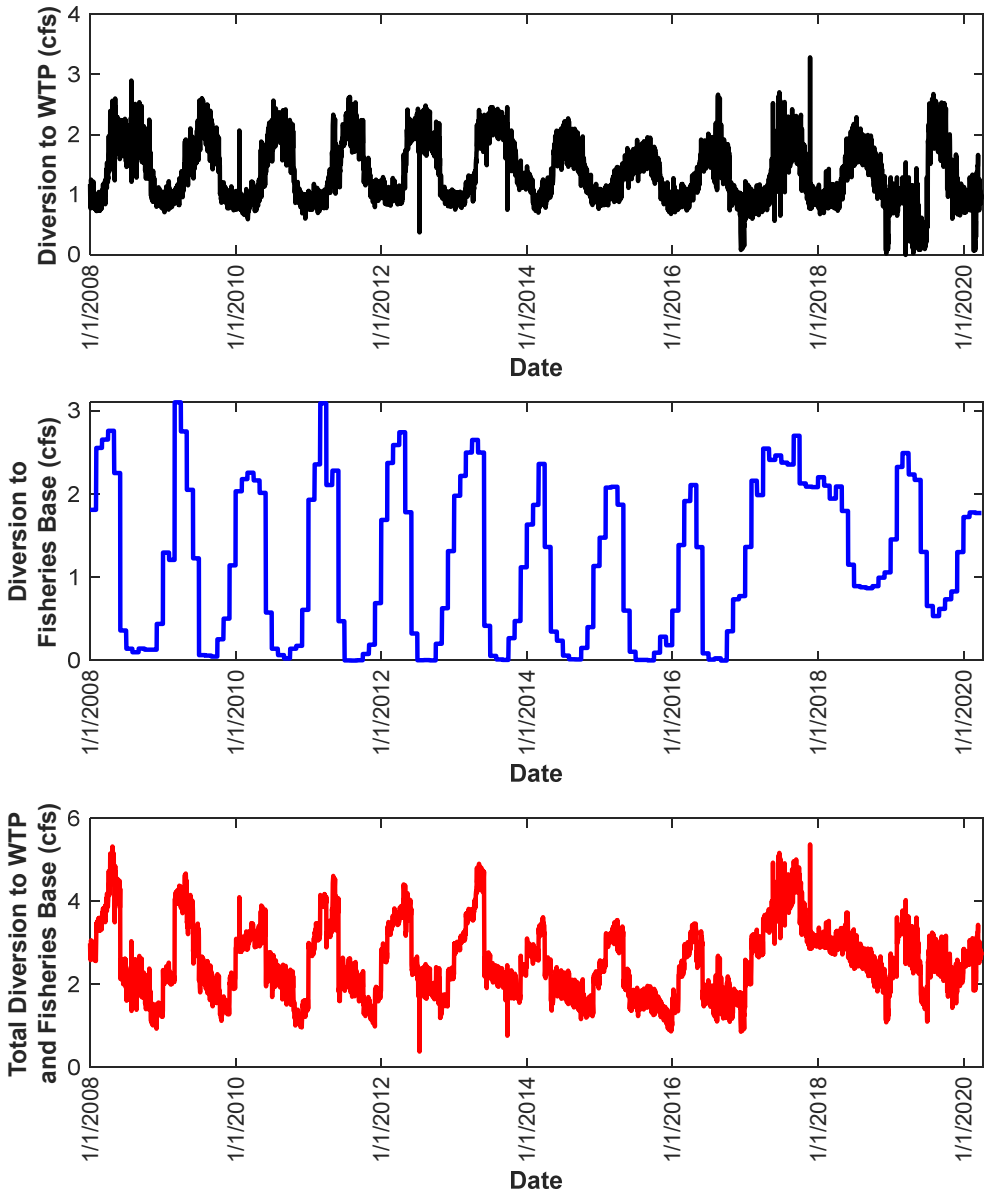


Figure 4-4. Rector Reservoir diversion to the WTP, diversion to the Fisheries Base, and total diversion to both the WTP and Fisheries Base.

Evaporation

Evaporation rates from the Oakville California Irrigation Management Information System (CIMIS) Station No. 77 near Yountville, California were used to estimate the evaporative losses from the Rector Reservoir surface in the water balance analysis. Evaporation rates from this CIMIS station were used because it was the nearest weather station with a complete record of estimated evaporation during the time period being analyzed. The CIMIS station computed the hourly evapotranspiration for grass and also provided evapotranspiration rates on average daily time-scales. In this analysis, average daily evapotranspiration rates (inches/day) were retrieved from CIMIS for 2008 to 2020, to match other data sources. Daily average evaporation rates for Rector Reservoir were calculated by multiplying the CIMIS station evapotranspiration for grass by an open water adjustment factor of 1.1 because water losses by evapotranspiration from open

water are greater than water losses by evaporation from grass (Figure 4-5) (University of California, Division of Agriculture and Natural Resources [UC DANR] 1994). The volume of water lost to evaporation from the surface of Rector Reservoir was then calculated by multiplying the daily average evaporation rate by the daily reservoir surface area.

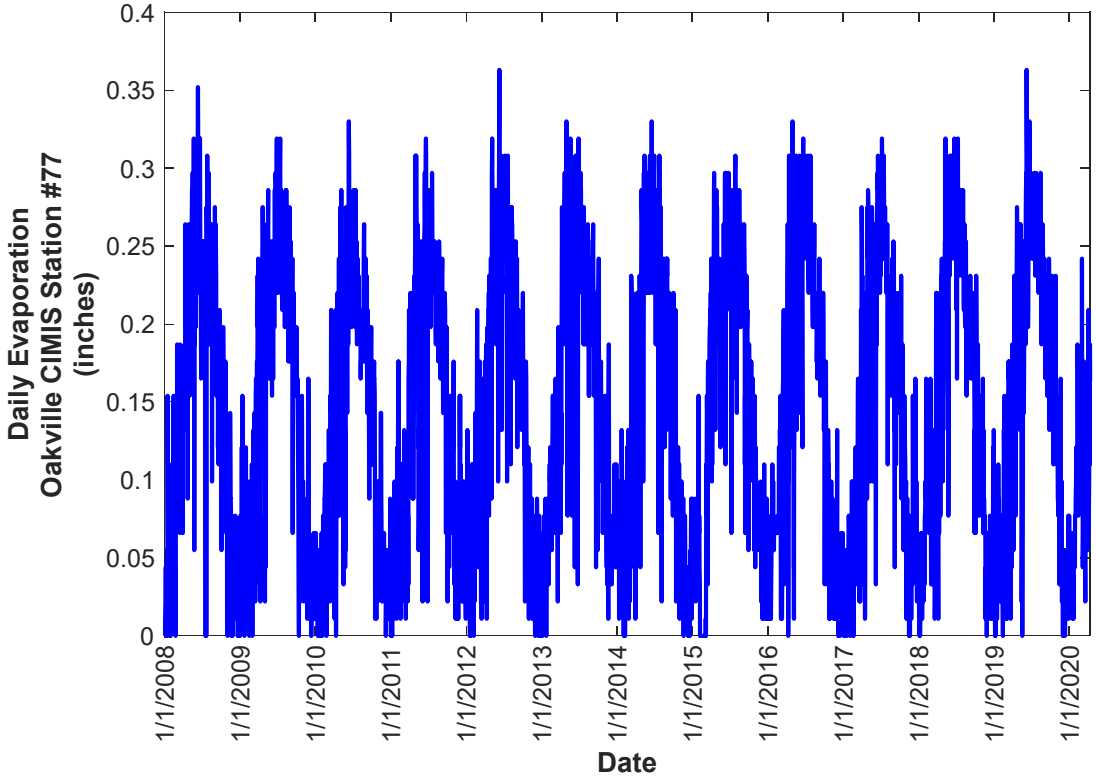


Figure 4-5. Daily evaporation calculated from the daily evapotranspiration record at the Oakville CIMIS Station No. 77.

Precipitation

Daily precipitation rates for the Rector Creek watershed were available from multiple weather stations near the reservoir. The DWR Atlas Peak weather station (ATL) was located approximately 5.3 miles southeast of Rector Dam near the upper reaches of the Rector Creek watershed. The Rector Reservoir weather station (RES) was located at Rector Dam. The Oakville CIMIS atmospheric monitoring station No. 77 (OAK) was located approximately 3.5 miles west of Rector Reservoir in the Napa Valley. ATL, RES, and OAK recorded precipitation in inches on an hourly or daily time-scale, and precipitation rates were available at either hourly or daily time-scales. ATL, RES, and OAK also each had a relatively complete precipitation record during the modeling time period (i.e., 2008 to 2020) with sufficient precipitation data for the watershed runoff model.

While analysis of data from multiple precipitation gages at different elevations in the Napa Valley documented only a limited orographic effect from the mountains in the Rector Creek watershed (DWR 2013), ATL was likely more representative of precipitation conditions in the upper Rector Creek watershed. RES and OAK were likely more representative of precipitation conditions in the lower Rector Creek watershed. It was assumed watershed runoff would be more accurately characterized by precipitation data measured in the upper watershed since this data would better

characterize the magnitude of precipitation in the headwaters that forms runoff and collects into the creeks as it flows downstream to Rector Reservoir. However, watershed runoff would still likely be reasonably characterized by precipitation data measured at the reservoir since there is a limited orographic effect in the Rector Creek watershed and the precipitation measured at the reservoir would accurately characterize conditions in the lower watershed near the reservoir. As such, daily precipitation rates at ATL from 2008 to 2020 were used to model watershed runoff (**Figure 4-6**).

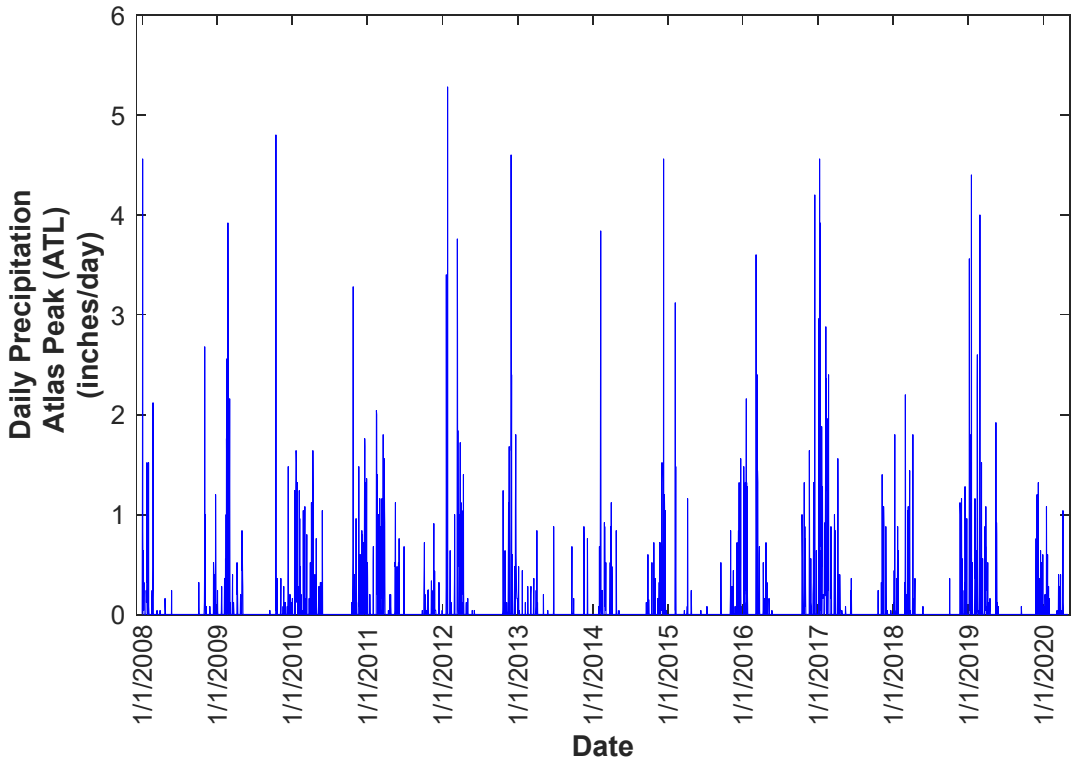


Figure 4-6. Daily precipitation recorded at the Atlas Peak (ATL) weather station.

The calculated effective inflow estimated the net inflow to Rector Reservoir from Rector Creek, North Fork Rector Creek, and South Fork Rector Creek, local runoff, and any potential inflows or outflows from groundwater. Uncertainty was introduced into the calculated effective inflow from: (a) the resolution of the reservoir stage measurements; (b) interpolation of daily stage between measured values of daily stage; (c) stage-surface area or stage-volume relationships; (d) reservoir stage measurements not quantifying inflow to the reservoir when the reservoir was full and there was no change in the reservoir volume; (e) spatial variations in the evaporation or precipitation between the weather station used for data and the Rector Creek watershed; and (f) potential groundwater inflows or outflows. Calculated effective inflow did not accurately estimate the actual daily net inflow to Rector Reservoir when the dam was spilling since the change in reservoir volume did not capture all the stream flow into the reservoir (i.e., the volume of water over the reservoir spillway was not part of the change in reservoir volume) and the calculated effective inflow was equal to only the diversions, evaporation, and precipitation. Additionally, one or more of the uncertainties above could result in negative effective total inflow during some periods. While a negative stream flow or baseflow was not possible physically, a negative effective inflow was possible due to the potential losses to groundwater being greater than

inflows. Negative effective inflows were preserved in the analysis to maintain the mass balance of the analysis.

4.2.1.2 Watershed baseflow during storm periods

During storm events, the calculated effective inflow was separated into baseflow and stormflow since the stream flow during storms was comprised of both of these components. Hydrograph separation into baseflow and stormflow was accomplished by first estimating the time period when a storm event contributed stormflow to the stream. Continuous stream flow data were not available in the Rector Creek watershed to identify the time periods stream flow increases indicated stormflow occurred, so precipitation data and watershed soil properties were used to estimate these time periods. During storm events, a portion of the precipitation infiltrated into the soil before runoff and stormflow were generated (Brutsaert 2005). A larger amount of precipitation typically infiltrated before stormflow occurred when the precipitation rate was less than or equal to the soil infiltration rate and the soil moisture was lower (i.e., there was more available soil water capacity). Precipitation rates exceeding the soil infiltration rate resulted in more runoff and stormflow since the precipitation in excess of the soil infiltration rate could not infiltrate into the soil and became runoff (United States Department of Agriculture, Natural Resources Conservation Service [USDA NRCS] 2004; Hawkins and Barreto Munoz 2016). Soil moisture conditions also determined how much precipitation infiltrated before stormflow was generated since some precipitation would continue to infiltrate throughout storm events until the soil moisture capacity was reached (i.e., the soil was saturated). After precipitation ceased, there also was a time period when stormflow was routed through the stream network and precipitation infiltrating into soils near a stream drained by gravity contributed to the stormflow response (USDA NRCS 2004). As such, estimates of the time period when a storm event caused stormflow in a stream took into account the precipitation rate, the soil infiltration and drainage rate, and the soil moisture conditions.

In this study, the time period when stream flow contained both stormflow and baseflow was estimated using a soil moisture model and an empirical relationship. During precipitation events, a soil moisture model was used to determine when the precipitation exceeded the soil infiltration capacity, the soil became saturated, and stormflow was generated. The proportion of the soil moisture that drained into streams after a storm event rather than infiltrating into deeper groundwater was unknown, so an empirical relationship was used to estimate the duration soil moisture drainage into the stream would contribute to stormflow after precipitation ends. The soil moisture was modeled using a mass balance approach calculated by the following equation:

$$\frac{dV_{soil\ water}}{dt} = I_{soil} - O_{soil} \qquad \text{(Eqn. 4.2-5)}$$

where $V_{soil\ water}$ is the soil water volume, t is time, I_{soil} is the potential volume of water infiltrating into the soil for the time step dt, and O_{soil} is the volume of water infiltrating into the soil for the time step dt. It was assumed that the upper soil layer controlled the infiltration rate for the entire soil column, so soil moisture conditions that influenced runoff and stream flow were represented by a single layer soil moisture model. It was also assumed that the lower soil layer was never saturated, so the soil moisture in the upper soil layer was continuously draining into the lower soil layer at the upper soil layer infiltration rate. The soil moisture in the upper soil layer of Rector Creek watershed was calculated by rearranging and expanding $\frac{dV_{soil\ water}}{dt} = I_{soil} - O_{soil}$ (Eqn. 4.2-5:

$$V_{soil\ water}(t+1) = V_{soil\ water}(t) + \sum_{i=1}^{n} PPT(t) A_{soil\ i}\, dt - \sum_{i=1}^{n} INF_{soil\ i} * A_{soil\ i} dt \quad \text{(Eqn. 4.2-6)}$$

where $V_{soil\ water}$ is the soil water volume (acre-feet), t is time (hour), n is the number of soil types in the watershed, $PPT(t)$ is the hourly precipitation (feet/hour), $A_{soil\ i}$ is the surface area of each soil type being considered in the analysis (acres), and $INF_{soil\ i}$ is the infiltration rate for each soil type being considered in the analysis (feet/hour).

It is assumed that precipitation infiltrated into the upper soil layer until the upper soil layer reached a maximum soil capacity (i.e., saturated) defined by the soil properties. The maximum soil moisture capacity was calculated by the following equation:

$$V_{soil\ water,max} = \sum_{i=1}^{n} A_{soil\ i} * DEP_{soil\ i} * CAP_{soil\ i} \quad \text{(Eqn. 4.2-7)}$$

where $V_{soil\ water,\ max}$ is the maximum soil moisture capacity (acre-feet), n is the number of soil types in the watershed, $A_{soil\ i}$ is the surface area of each soil type (acres), $DEP_{soil\ i}$ is the representative average depth of each soil type (feet), and $CAP_{soil\ i}$ is the soil water capacity of each soil type (unitless). Once the soil moisture was greater than the maximum soil capacity, any further precipitation ran off the watershed and contributed to stormflow in the stream. The soil moisture model calculated the soil water volume for each time-step, then compared the calculated soil water volume with the maximum soil moisture capacity to determines whether there was excess precipitation for that time-step. If the soil water volume for that time-step was less than the maximum soil moisture capacity, the excess precipitation volume was zero. If the soil water volume for that time-step was greater than the maximum soil moisture capacity, the excess precipitation volume was calculated as the soil water volume for that time-step minus the maximum soil moisture capacity and the soil water volume for that time-step was set as the maximum soil moisture capacity (i.e., the soil was saturated). At the end of each day, the total daily excess precipitation volume was summed from the calculated hourly excess precipitation volume. The duration stormflow contributed to the stream flow during a storm event was equal to the time period the soil moisture model estimated total daily excess precipitation volume was greater than zero.

The soil moisture model required estimates of the soil types, their properties, and their distribution in the Rector Creek watershed, so spatial data on soil types were overlaid in the Environmental Systems Research Institute [ESRI] ArcMap 10.7 Geographic Information System (GIS) and prepared as inputs for the soil moisture model. Soil types were determined using the hydrologic group determination from the Soil Survey Geographic Database (SSURGO), which was defined as "a group of soils having a similar runoff potential under similar storm and cover conditions" (USDA NRCS 2019). There was a range of soil infiltration rates associated with the soil types (McCuen 2004), so minimum soil infiltration rates for each soil type were initially input into the soil moisture model. Hambright was the dominant soil found in the Rector Creek watershed, so the soil depth and available water capacity for soils throughout the watershed were estimated based on a representative Hambright soil profile (United States Department of Agriculture [USDA] 1978; Barber 2017). There was a range of soil depths and available water capacities for Hambright soils (USDA 1978), so a range of soil depths and available water capacities were initially input into the soil moisture model to characterize the range of soil

conditions in the watershed. In assigning the initial range of soil depths and available water capacities, it was assumed that the soil depth and water capacity were larger for well-drained soils and smaller for poorly-drained soils. In this manner, well-drained soils required more precipitation to reach saturation in the soil moisture model and poorly-drained soils saturated with less precipitation. Soil infiltration rates, depths, and available water capacities were all fitting parameters that were adjusted during modeling to best represent average Rector Creek watershed conditions.

After estimating the time period stormflow occurred during a storm event from the soil moisture model, the duration of stormflow after precipitation has ended was calculated from the empirical equation:

$$N = A_{watershed}^{0.2} \quad \text{(Eqn. 4.2-8)}$$

where N is the number of days after precipitation has ceased that surface runoff from a storm event ends, $A_{watershed}$ is the watershed area (square miles). While the empirical relationship to estimate the duration of stormflow after precipitation has ended was developed for other watersheds (Sloto and Crouse 1996), it provided the best available estimate for the data limited Rector Creek watershed. The duration stormflow contributed to the stream flow after precipitation ends was estimated to be 2N rounded up to the nearest day. While the above empirical equation frequently characterizes the duration of stormflow after a precipitation event, additional conditions were necessary to represent the specific conditions in the Rector Creek watershed. A portion of the soil moisture adjacent to streams drained into the stream and contributed to stormflow following a precipitation event, but there were insufficient data in the Rector Creek watershed to determine the duration soil moisture drainage contributed to the stormflow. Thus, it was assumed that stream flow was influenced by stormflow for the time period when the soil moisture was greater than a percentage of the maximum soil moisture capacity. The specific maximum soil moisture capacity percentage was determined by iteratively adjusting the percentage to improve agreement between the modeled stormflow and the calculated effective inflow. Additionally, it was assumed spill over Rector Dam was always due to stormflow, so the time period when Rector Dam was recorded to spill after a precipitation event was included in the stormflow duration.

Once the entire stormflow time period was identified from the soil moisture model, the above empirical equation, and the additional conditions, the baseflow during the stormflow time period was estimated by linearly interpolating between the effective inflow at the beginning of the stormflow time period and the effective inflow at the end of the stormflow time period.

Multiple assumptions were necessary to estimate the baseflow during storm periods given the data limitations in the Rector Creek watershed, but these assumptions introduced uncertainty into baseflow estimate. Key assumptions causing uncertainty in the baseflow were: (a) average Rector Creek watershed soil properties sufficiently characterized soil moisture conditions and the timing of excess precipitation from storm events; (b) measured hourly precipitation at one weather station characterized the precipitation rate across the entire watershed; (c) excess precipitation occurred when a surface soil layer was saturated; (d) the stormflow duration after a storm event ended corresponded to the empirical $N = A_{watershed}^{0.2}$ (Eqn. 4.2-8; and (e) baseflow changed linearly during storm events. Assumptions of average soil properties and uniform precipitation were inherently necessary for watershed-scale modeling and the empirical duration of stormflow after a storm event, and linear changes in baseflow were part of standard baseflow

estimation approaches (Sloto and Crouse 1996; Bosch et al. 2017). However, variations between actual conditions in Rector Creek watershed and these assumptions contributed to differences between actual and estimated watershed baseflow into Rector Reservoir.

4.2.2 Watershed Stormflow Estimate

After estimating the baseflow component of stream flow during non-storm and storm periods, the stormflow component of stream flow into Rector Reservoir was estimated using the previously developed soil moisture model, the empirical rainfall-runoff method (i.e., the rational method), and a fitted curvilinear unit hydrograph. As previously discussed, the soil moisture model was used to determine the duration of discrete storm events. Once the discrete storm events were identified, the rational method was used to calculate the peak stormflow for each storm event using the following equation:

$$Q_{peak} = C_{weighted} I_{avg} A_{watershed} \quad \text{(Eqn. 4.2-9)}$$

where Q_{peak} is estimated peak stormflow (acre-feet/hour), $C_{weighted}$ is the area-weighted runoff coefficient (dimensionless), I_{avg} is the average rainfall intensity (feet/hour), and $A_{watershed}$ is the watershed drainage area (acres). The rational method is typically used by engineers and hydrologists to design hydraulic structures and predict peak flood flows since surface runoff during precipitation events forms stormflow when it concentrates in streams and stormflow comprises the majority of the stream flow during flood events (Blume et al. 2007). While the stormflow time period was estimated from an analysis of the precipitation rate, the soil infiltration rate, and the soil moisture, the amount of precipitation that will run off the ground surface during a storm event and contribute to stormflow was characterized by the runoff coefficient "C" in the rational method equation. The remaining amount of precipitation becomes infiltration, transpiration, evaporation, and depression storage (California Department of Transportation [Caltrans] 2018).

Runoff coefficients are typically estimated based on the land-use/cover, soil type, slope, and extent of open water in the area being considered, so spatial data on land-use/cover, soil type, slope, and open water extent were overlaid in GIS (ESRI ArcMap 10.7) and prepared as inputs for the watershed runoff model. Land-use/cover type was assigned using the National Land Cover Dataset classifications (NLCD) (Multi-Resolution Land Characteristics Consortium [MRLC] 2016). Soil types were determined using the SSURGO hydrologic group classification, which is defined as "a group of soils having a similar runoff potential under similar storm and cover conditions" (USDA NRCS 2019). Slope was generated using a 1-meter Light Detection and Ranging [LiDAR] dataset (National Center for Airborne Laser Mapping [NCALM] 2003) and classified into bins (0–5%, 5–10%, 10–30%, and >30%) as recommended by the Caltrans Highway Design Manual (Caltrans 2018). The extent of open water was digitized using 2018 imagery (ESRI 2018) to capture current conditions at a higher resolution than was available using the NLCD classifications. Initial runoff coefficient values for the each discrete land-use/cover, soil type, slope, and extent of open water units were estimated from the range of runoff coefficient values reported for different land-use/cover, soil type, slope, and extent of open water in the Caltrans Highway Design Manual. Runoff coefficient values are empirical parameters that assume uniform conditions throughout the area being considered, so an area-weighted runoff coefficient value was calculated for the entire Rector Creek watershed to take into account the range of land-uses/covers, soil types, slopes, and open water conditions (Bedient and Huber

1992). The area-weighted runoff coefficient, $C_{weighted}$, (unitless) was calculated using the following equation:

$$C_{weighted} = \frac{\sum_{i=1}^{n} C_i A_i}{\sum_{i=1}^{n} A_i} \quad \text{(Eqn. 4.2-10)}$$

where *n* is the number of discrete land-uses/covers, soil types, slopes, and extents of open water units in the Rector Creek watershed, C_i is the Caltrans Highway Design Manual runoff coefficient (unitless) for each discrete land-use/cover, soil type, slope, and extent of open water unit being considered, and A_i is the surface area (acres) of each discrete land-use/cover, soil type, slope, and extent of open water unit being considered. Caltrans Highway Design Manual runoff coefficients were a range of potential values for the different land-use/cover, soil type, slope, and extent of open water rather than a specific single value. Additionally, runoff coefficients were applicable for storms of up to 5- or 10-year frequencies (Lunsley et al. 1992; Blume et al. 2007). As such, the area-weighted runoff coefficient was a model fitting parameter when the model was calibrated to Rector Creek watershed conditions to help account for less frequent, higher intensity storms (i.e., greater than 10-year frequencies).

After determining the area-weighted runoff coefficient for the Rector Creek watershed, the average rainfall intensity during each storm event was estimated. The average rainfall intensity, I_{avg}, (feet/hour) was calculated as follows:

$$I_{avg} = \frac{PPT_{excess}}{t_{hydrograph}} \quad \text{(Eqn. 4.2-11)}$$

where PPT_{excess} is the total excess precipitation per storm event (feet) and $t_{hydrograph}$ is the duration of the storm event hydrograph (hour). During soil moisture modeling, the total excess precipitation per storm event was calculated by summing the total daily excess precipitation volume across the entire storm event and dividing by the Rector Creek watershed area. The limited flow data in the Rector Creek watershed prevented estimates of the time of concentration. Therefore, the time of concentration was assumed to be equal to the duration of precipitation, while the duration of the storm hydrograph was assumed to be equal to twice the time of concentration (i.e., twice the duration of precipitation) (Cleveland et al. 2011).

After estimating the peak stormflow, a curvilinear hydrograph was used to estimate the stormflow for each storm event. A curvilinear hydrograph shape provided a realistic representation of a natural hydrograph based on the gamma distribution (USDA NRCS 2007; Hawkins and Barreto-Munoz 2016) and could be approximated given the data limitations in the Rector Creek watershed. The stormflow assuming a curvilinear hydrograph was estimated by the following equation:

$$Q_{storm}(t) = \left(\frac{t}{\left(\frac{D_{storm}}{\alpha_{storm,Rector}}\right)}\right)^{m} \left(Q_{peak} e^{m\left(1-\left(\frac{t}{t_{peak}}\right)\right)}\right) \quad \text{(Eqn. 4.2-12)}$$

where $Q_{storm}(t)$ is the stormflow into Rector Reservoir (acre-feet/day), t is the time since precipitation began (days), D_{storm} is the storm duration (days), $\alpha_{storm,Rector}$ is an empirical constant relating the storm duration to the time of peak stormflow in the Rector Creek watershed, m is an empirical constant equal to 3.697, and Q_{peak} is the estimated peak stormflow (acre-

feet/day). The time to peak stormflow was generally unknown for the Rector Creek watershed because there was no continuous flow data from creeks upstream of Rector Reservoir. The calculated effective inflow to Rector Reservoir provided the best estimate of stormflow, but peak stormflows were still generally unknown from the calculated effective inflow due to peak stormflow typically passing over the dam spillway and not being represented by the calculated effective inflow. There were three storms between WY 2008 and WY 2019 where the dam did not spill during a storm and peak stormflow was known, so an average $\alpha_{storm,Rector}$ was estimated from these three storms.

Multiple assumptions were necessary given the data limitations in the Rector Creek watershed. These assumptions introduced uncertainty into modeled stormflow estimates that contributed to variations between the timing and magnitude of actual and modeled stormflows. Key assumptions introducing uncertainty were: (a) average Rector Creek watershed soil properties that influenced the estimate of the runoff coefficient, the soil moisture estimates, and the timing and magnitude of excess precipitation from storm events; (b) available land-use/cover, soil type, slope, and open water extent spatial data accurately represented variations in Rector Creek watershed conditions during the modeling period; (c) the hydrograph duration in the rainfall intensity estimate; (d) a curvilinear hydrograph for all storms; and (e) an average $\alpha_{storm,Rector}$ for all storms. Additionally, there were several assumptions inherent in the rational method approach to estimating stormflow. The rational method assumed: (a) precipitation was a uniform intensity over the entire watershed; (b) the runoff coefficient does not vary with antecedent soil moisture or storm intensity; (c) runoff is dominated by overland flow; (d) watershed storage effects are negligible; (e) the storm duration is equal to the time of concentration; and (f) the time of concentration is relatively short and independent of storm intensity. Many of these necessary assumptions were not met under natural conditions, contributing to differences between the actual and modeled stormflow.

4.2.3 Rector Creek Watershed Composite Inflow

The Rector Creek watershed inflow to Rector Reservoir was estimated by summing the baseflow calculated for the entire modeling period from 2008 to 2020 and the stormflow for each storm event between 2008 and 2020 according to $Q_{in} = Q_{base} + Q_{storm}$ (Eq. 4.2-1. While the Rector Creek watershed runoff model estimated the Rector Creek watershed daily inflow to Rector Reservoir, the effective inflow calculated from measured stage, diversion, evaporation, and precipitation data, the Rector Reservoir stage-surface area relationship, and the Rector Reservoir stage-volume relationship accurately characterized the net Rector Creek watershed daily inflow to Rector Reservoir during all periods except when the reservoir spilled. The uncertainty associated with the necessary assumptions and model simplifications for the Rector Creek watershed runoff model did not need to be introduced into the estimate of the Rector Creek watershed inflow except when Rector Reservoir was spilling. As such, the influence of the Rector Creek watershed runoff model uncertainty on estimates of inflow to Rector Reservoir was minimized by constructing a Rector Creek watershed composite inflow from the calculated effective inflow when the reservoir was not spilling (i.e., when the calculated effective inflow characterized the net inflow to Rector Reservoir) and the modeled Rector Creek watershed inflow when the reservoir was spilling (i.e., when the calculated effective inflow underestimated the inflow to Rector Reservoir).

Historical measurements of spill were used to determine the reservoir spill period when the Rector Creek watershed composite inflow was equal to the calculated effective inflow or the

watershed runoff model estimated Rector Creek watershed inflow. When Rector Reservoir stage data from January 1, 2008 to April 27, 2020 recorded the reservoir to not be spilling or stage less than the spillway elevation, the Rector Creek watershed composite inflow was equal to the calculated effective inflow. When Rector Reservoir stage data from January 1, 2008 to April 27, 2020 recorded the reservoir to be spilling or stage was greater than the spillway elevation, the Rector Creek watershed composite inflow was equal to the Rector Creek watershed inflow estimated by the watershed runoff model.

The Rector Creek watershed runoff model was calibrated by adjusting the various watershed runoff model fitting parameters to improve agreement between the modeled Rector Creek watershed inflow and the calculated effective inflow when the reservoir was not spilling and to improve agreement between the simulated and measured Rector Reservoir stage. Soil properties (i.e., soil infiltration rate, soil depth, soil available water capacity) were adjusted within the range reported for the USDA hydrologic soil types and the range reported for the Hambright soils that dominate the Rector Creek watershed. The soil moisture threshold above which stream flow is assumed to be influenced by stormflow was also adjusted to improve agreement between modeled Rector Creek watershed inflow and the calculated effective inflow and the simulated and measured Rector Reservoir stage. Model calibration also varied the area-weighted runoff coefficient for the Rector Creek watershed slightly to account for the potential range of runoff coefficients associated with the different land-uses/covers, soil types, slopes, and extents of open water. Modeled Rector Creek watershed inflow was initially compared with the calculated effective inflow since there was no measured Rector Reservoir inflow to compare with the modeled watershed inflow. After an initial watershed runoff model calibration that minimized the overall differences between the modeled Rector Creek watershed inflow to Rector Reservoir and the calculated effective inflow, the Rector Creek watershed composite inflow was used in the previously developed Rector Reservoir water-balance model to simulate the Rector Reservoir stage during the modeling period.

4.3 Rector Reservoir Water Balance

The daily time-scale Rector Reservoir water-balance model was used to estimate reservoir storage and stage with the Rector Creek watershed composite inflow from January 1, 2008 to April 27, 2020. The water-balance model calculated the reservoir storage volume from measured diversion flows, precipitation rates, and evaporation rates along with the modeled Rector Reservoir watershed composite inflow and the stage-surface area and stage-volume relationships. The reservoir storage volume for the next time-step, V_{t+1} (acre-feet), was calculated by using:

$$V_{t+1} = V_t + I_{watershed,t}dt + I_{ppt,t}dt - O_{release,t}dt - O_{Hatchery,t}dt - O_{evap,t}dt - O_{WTP,t}dt - O_{Cal\ Fire,t}\,dt \quad \text{(Eqn. 4.3-1)}$$

where the values of all the variables on the right of the equal sign are for the current time step, t. V_t is the reservoir storage volume (acre-feet); $I_{watershed,t}$ (acre-feet/day) is the Rector Creek watershed composite inflow to Rector Reservoir calculated by the watershed runoff model; dt (day) is the time-step of the model set equal to one day for the entire modeling period; $I_{ppt,t}$ (acre-feet/day) is the inflow from precipitation; $O_{release}$ (acre-feet/day) is the water released to Rector Creek downstream of the dam for interim flows; $O_{Hatchery}$ (acre-feet/day) is the water

diverted to the Fisheries Base before being released to Rector Creek approximately 0.35 miles downstream of the dam; O_{evap} (acre-feet/day) is the water outflow from evaporation; $O_{WTP,t}$ (acre-feet/day) is the water diverted to the WTP; and $O_{Cal\ Fire}$ (acre-feet/day) is the water diverted to the Cal Fire facility at the base of Rector Dam.

Rector Reservoir storage volume was modeled from January 1, 2008 to April 27, 2020 since that was the time period when data were available for all variables in $- O_{release,t}dt - O_{Hatchery,t}dt - O_{evap,t}dt$. While attempts were made to extend the water-balance modeling period (i.e., pre-2008), there were not sufficient daily data available for all the water-balance model parameters. Rector Reservoir diversions were generally only available at an average monthly time-scale, and downscaling the average monthly diversion flows to average daily diversion flows would have introduced substantial error into the reservoir water-balance model results. In the initial time-step of the model (i.e., January 1, 2008), the values of all the model parameters were set to the initial values recorded on that date. In each subsequent time-step (i.e., day) of the model simulation, the model parameter values were determined from the available data or calculated from the Rector Creek watershed runoff model (i.e., the Rector Creek watershed composite inflow). Flow diverted to the WTP, the Fisheries Base, interim releases, and the Cal Fire training facility for each time-step was equal to the amount of flow diverted for that specific time-step in the data. Outflow from evaporation in the current time-step was estimated by multiplying the surface area for the current time-step by the daily average evaporation rate for Rector Reservoir for the current time-step. Inflow from precipitation in the current time-step was determined similarly with the surface area for Rector Reservoir associated with the volume at the current time-step multiplied by the daily precipitation rate for the current time-step. The surface area of the reservoir was calculated for each time-step by using the stage-volume and stage-surface area relationships. Once all the model parameter values were determined for a time-step, the model simulated the reservoir storage volume for the next time-step and repeated the process until the end of the modeling period. The simulated Rector Reservoir storage using the water-balance model and the watershed composite inflow was converted into Rector Reservoir stage using the stage-volume relationship for Rector Reservoir developed by DWR from the 2000 bathymetric survey results for stages from 375 feet to 245 feet above MSL (DWR 2013) (Figure 4-3).

The Nash-Sutcliffe Efficiency (NSE), percent bias, and root mean square error-observations standard deviation ratio (RSR) were calculated for the measured and simulated Rector Reservoir stage from January 1, 2008 to April 27, 2020 to evaluate the Rector Reservoir water-balance and Rector Creek watershed runoff model performance. The optimum value for the NSE is one, percent bias is zero, and RSR is zero with acceptable values varying depending on the time-scale of the model and the parameter being modeled for percent bias. Moriasi et al. (2007) classified model performance as “very good” (the highest performance category) when NSE was greater than 0.75, percent bias was +/- 10 percent for stream flow, and RSR was less than 0.5.

5 RESULTS

5.1 Water Year Type Analysis

Precipitation data at Napa State Hospital/Napa Fire Station (NSH), Oakville (OKV), Atlas Peak (ATL), Rector Reservoir (RES), St. Helena 4WSW (SH4), and Angwin (ANG) were collected for their entire period of record, and a QA/QC review was performed. Precipitation data that did not

meet the QA/QC criteria specified in Table 4-2 were excluded from further analysis, typically reducing the number of water years available at each weather station (Table 5-1).

Table 5-1. Comparison of number of water years before and after QA/QC review.

Weather Station	Number of Water years of Data in Record[a]	Number of Water years Included in the Water year Type Analysis
NSH	114	109
OKV	30	26
ATL	32	16
RES	12	12
SH4	32	20
ANG	35	18

[a] Analysis includes data through WY 2019.

Comparison of the recorded monthly precipitation totals at NSH with the calculated monthly precipitation totals at other weather stations in the Napa Valley show precipitation in the Napa Valley generally increased from the southern to northern Napa Valley (Figure 5-1). Monthly precipitation totals at OKV, ATL, RES, SH4, and ANG were above the 1:1 line, indicating monthly precipitation totals at these weather stations were typically greater than monthly precipitation totals at NSH. While lower monthly precipitation totals were generally clustered together, the variability between the monthly precipitation totals at weather stations was greater at higher monthly precipitation totals. Monthly precipitation totals at NSH would consistently underpredict the monthly precipitation totals at weather stations near the Rector Creek watershed upstream of Rector Dam (i.e., ATL and RES), so NSH precipitation data were not considered suitable for determining the water year types in the Rector Creek watershed. OKV monthly precipitation totals were more similar to the monthly precipitation totals at ATL and RES near the Rector Creek watershed but tended to be slightly lower. A water year type analysis using OKV precipitation data would likely underpredict the water year conditions in the Rector Creek watershed, so it was not considered suitable for determining the water year types in the Rector Creek watershed. RES and ATL are located within or near the Rector Creek watershed and have very similar monthly precipitation totals. Precipitation data from either RES at the Rector Dam or ATL at Atlas Peak southwest of the upper Rector Creek watershed would characterize the water year types in the Rector Creek watershed. ATL was selected as the weather station for the water year type analysis since it had more water years of available precipitation data.

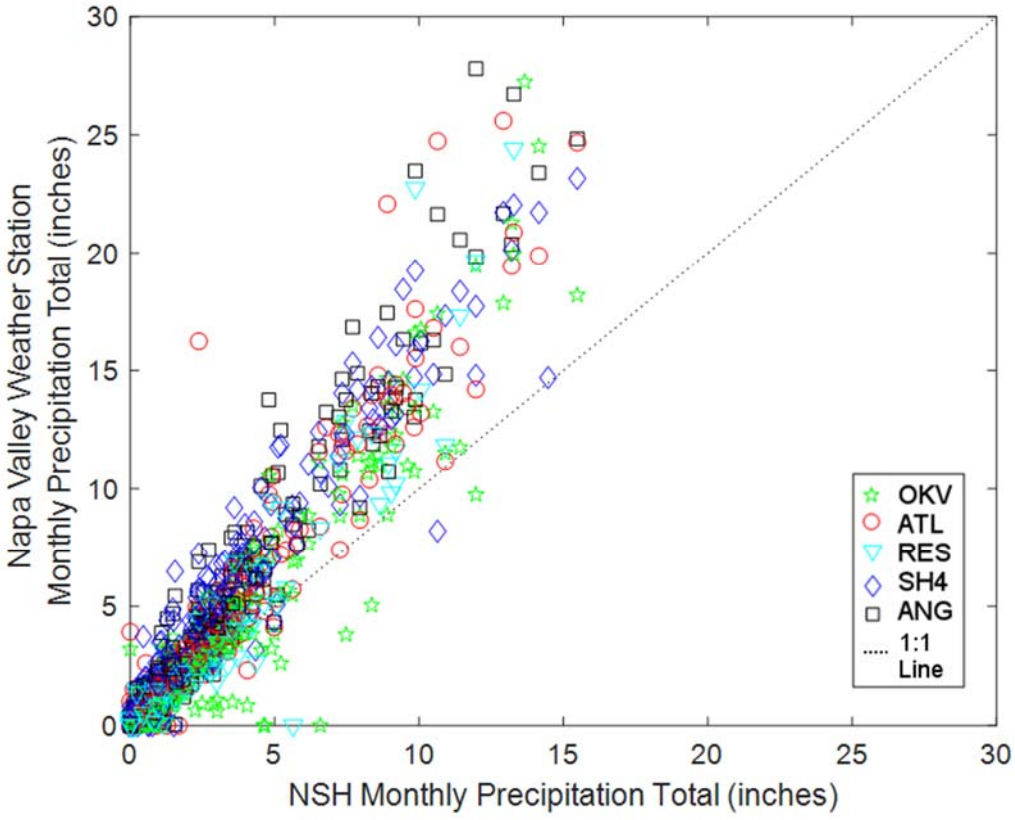


Figure 5-1. Comparison of NSH monthly precipitation totals from WY 1905 to WY 2020 with available monthly precipitation totals from Oakville (OKV), Atlas Peak (ATL), Rector Reservoir (RES), St. Helena (SH4), and Angwin (ANG) weather stations in the Napa Valley. Monthly precipitation totals at Napa Valley weather stations would align with the black dashed 1:1 line if they were similar to the NSH monthly precipitation totals.

While ATL monthly precipitation totals were typically greater than NSH monthly precipitation totals, least-squares regression was used to determine the equation for estimating ATL monthly precipitation totals from NSH data for years when ATL precipitation data was not available. A linear equation characterized the relationship between ATL and NSH monthly precipitation totals when the NSH monthly precipitation total was greater than 0.0462 inches:

$$ATL_{monthly\ PPT} = 1.5817\ NSH_{monthly\ PPT} - 0.0731 \qquad \text{(Eqn. 5.1-1)}$$

where $ATL_{monthly\ PPT}$ is the monthly precipitation total at ATL (inches) and $NSH_{monthly\ PPT}$ is the monthly precipitation total at NSH (inches). When the NSH monthly precipitation total was less than or equal to 0.0462 inches, ATL monthly precipitation was zero. As shown in Figure 5-2, the linear regression equation captured the general trend between ATL and NSH monthly precipitation, but the highest ATL monthly precipitations totals were consistently greater than the monthly precipitation totals estimated by the linear equation. ATL monthly precipitation totals during the wettest months would potentially be underestimated by $ATL_{monthly\ PPT} = 1.5817\ NSH_{monthly\ PPT} - 0.0731$ (Eqn. 5.1-1. The coefficient of determination (R^2) for $ATL_{monthly\ PPT} = 1.5817\ NSH_{monthly\ PPT} - 0.0731$ (Eqn. 5.1-1 was 0.917.

The linear relationship between ATL and NSH monthly precipitation had a sufficiently good fit that it was used to estimate ATL monthly precipitation totals in months when NSH precipitation data were available, but ATL precipitation data were not available. ATL monthly precipitation totals estimated by the linear regression equation were only used to supplement existing ATL precipitation data, so ATL precipitation data continued to be used when available. After calculating the ATL monthly precipitation totals using NSH precipitation data, the total number of water years available at ATL for the water year type analysis increased from 16 water years to 95 water years.

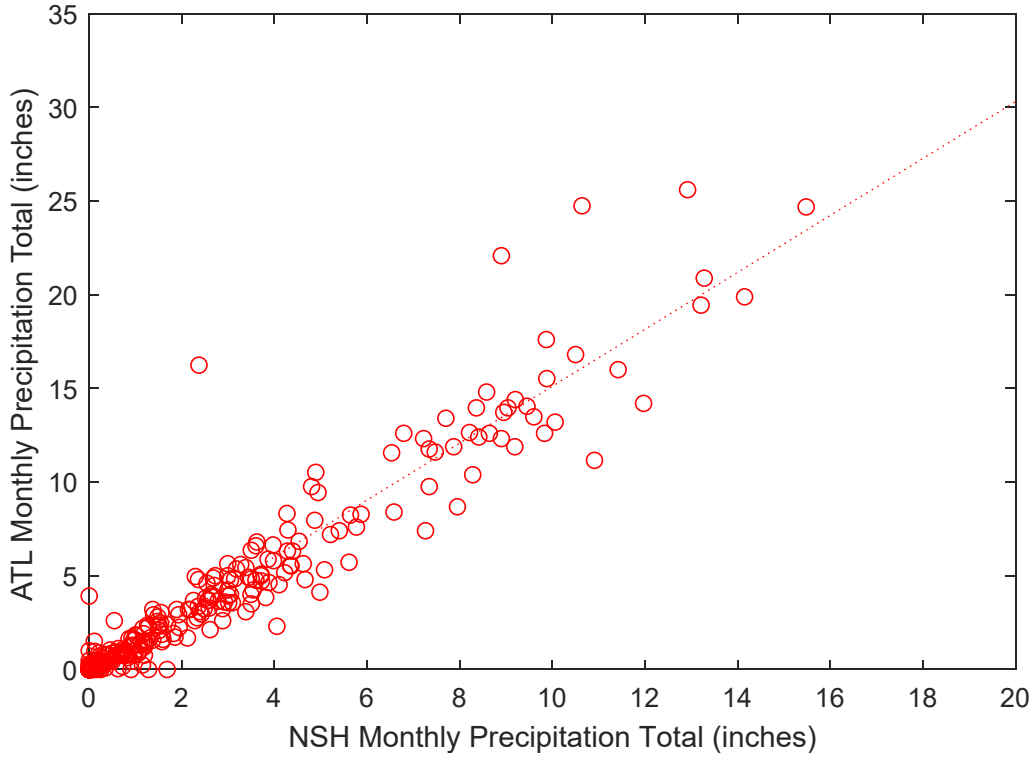


Figure 5-2. Comparison of NSH and ATL monthly precipitation totals from WY 1988 to WY 2020 (i.e., the time period when monthly precipitation totals were available for both weather stations) along with a red, dashed line calculating the monthly precipitation total from the linear regression equation (Eqn. 5.1-1).

5.1.1 Water Year Precipitation Exceedance Probability

Water year precipitation exceedance probabilities were calculated for the measured NSH precipitation dataset (NSH $_{Measured}$), the measured ATL precipitation dataset (ATL $_{Measured}$), and the combined (i.e., measured and regression) ATL precipitation dataset (ATL $_{Combined}$) to estimate the water year type in the Rector Creek watershed for all years with sufficient precipitation data and to determine whether the inclusion of linear regression estimated ATL precipitation skewed the overall ATL water year exceedance probabilities (Figure 5-3). As explained in Section 4.1, the precipitation exceedance probabilities were used to classify the water year types, with Very Wet water years occurring when the precipitation exceedance probability was less than or equal to 10 percent, Wet water years occurring when the precipitation exceedance probability was greater

than 10 percent and less than or equal to 33 percent, Average water years occurring when the precipitation exceedance probability was greater than 33 percent and less than or equal to 66 percent, Dry water years occurring when the precipitation exceedance probability was greater than 66 percent and less than 90 percent, and Very Dry water years occurring when the precipitation exceedance probability was greater or equal to 90 percent. Thus, the different water year types were defined by the water year precipitation at the 10, 33, 66, and 90 percent exceedance probabilities. Table 5-2 summarizes the water year precipitation thresholds associated with 10, 33, 66, and 90 percent exceedance probabilities for the NSH $_{Measured}$, ATL $_{Measured}$, and ATL $_{Combined}$ precipitation datasets.

ATL $_{Measured}$ and ATL $_{Combined}$ water year exceedance probability curves were similar, but the ATL $_{Measured}$ water year exceedance probability curve tended to be higher than the ATL $_{Combined}$ water year exceedance probability curve. Water year precipitation thresholds defining the different water year types were 0.21 to 5.00 inches higher for the ATL $_{Measured}$ water year exceedance probability curve than the ATL $_{Combined}$ water year exceedance probability curve. Differences in the estimated Rector Creek watershed water year precipitation thresholds for the ATL $_{Measured}$ and ATL $_{Combined}$ datasets were 2.13 inches or less for all water year types, except Very Wet water years when the difference between ATL $_{Measured}$ and ATL $_{Combined}$ precipitation thresholds was 5.00 inches. The linear regression equation used to estimate monthly precipitation at ATL from measured NSH precipitation data had a tendency to underestimate the ATL precipitation during wetter months, so the largest difference between ATL $_{Measured}$ and ATL $_{Combined}$ water year precipitation thresholds (5.00 inches) was potentially due to a combination of the longer time period in ATL $_{Combined}$ (i.e., 95 water years) better characterizing long-term water year trends in Rector Creek watershed than the shorter time period in ATL $_{Measured}$ (i.e., 16 water years) and underprediction of the total water year precipitation during wetter water years in the ATL $_{Combined}$ dataset. The more abrupt changes in the ATL $_{Measured}$ exceedance probability curve compared to the more gradual changes in the ATL $_{Combined}$ exceedance probability curve were primarily due to fewer water years being evaluated by the ATL $_{Measured}$ exceedance probability curve than the ATL $_{Combined}$ exceedance probability curve. While larger differences between ATL $_{Measured}$ and ATL $_{Combined}$ water year exceedance probability curves during wetter water years were potentially partially due to the linear regression used to estimate ATL precipitation from measured NSH precipitation, comparison of the ATL $_{Measured}$ and ATL $_{Combined}$ water year exceedance probability curves with the NSH $_{Measured}$ water year exceedance probability curve indicated the ATL $_{Combined}$ water year exceedance probability curve was not significantly skewed by the inclusion of ATL precipitation estimated by linear regression from NSH $_{Measured}$ precipitation data.

Table 5-2. Rector Creek watershed water year precipitation thresholds.

Exceedance Probability (%)	Water year Precipitation Thresholds (inches)		
	NSH $_{Measured}$	ATL $_{Measured}$	ATL $_{Combined}$
10	13.75	22.29	20.16
33	19.70	28.98	28.77
66	27.52	41.22	39.55
90	35.99	57.92	52.92

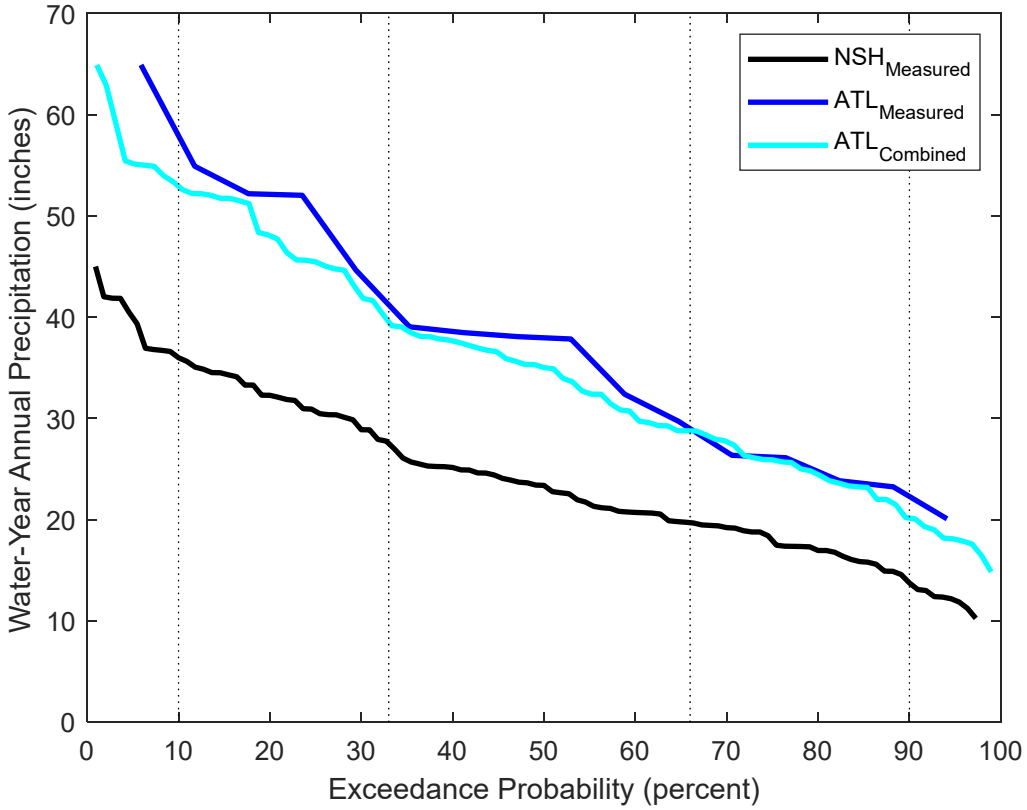


Figure 5-3. Water year precipitation exceedance probability curves for the measured NSH precipitation data, measured ATL precipitation data, and the measured and regression ATL precipitation data. Dashed vertical lines indicate the 10, 33, 66, and 90 percent exceedance probabilities.

Table 5-3 summarizes the Rector Creek watershed water year types for water years with sufficient precipitation data using the ATL $_{Measured}$ and ATL $_{Combined}$ water year precipitation thresholds listed in Table 5-2. ATL $_{Measured}$ water year precipitation thresholds were only used to determine water year types for the 16 water years where there was measured precipitation data at ATL, while the ATL $_{Combined}$ water year precipitation thresholds determined the water year types for the 95 water years in the ATL $_{Combined}$ precipitation dataset. While the ATL $_{Measured}$ and ATL $_{Combined}$ water year precipitation thresholds varied by 0.21 to 5.00 inches, the water year types determined from the two different sets of thresholds were the same in the water years where precipitation data were available for both the ATL $_{Measured}$ and ATL $_{Combined}$ datasets (i.e., the water years when precipitation was measured at ATL). Thus, the ATL $_{Combined}$ dataset and the associated water year precipitation thresholds provided the best characterization of long-term Rector Creek watershed precipitation conditions, and ATL $_{Combined}$ water year precipitation thresholds were selected as the water year type index for estimating future water year types in the Rector Creek watershed.

Table 5-3. Rector Creek watershed water year total precipitation and water year type for the measured ($ATL_{Measured}$) and combined ($ATL_{Combined}$) ATL weather station datasets.

Water year	ATL Measured		ATL Combined	
	Water year Total Precipitation (inches)[a]	Water year Type[a]	Water year Total Precipitation (inches)[a]	Water year Type[a]
1906	--	--	35.32	Average
1907	--	--	46.36	Wet
1908	--	--	22.01	Dry
1909	--	--	45.63	Wet
1910	--	--	30.73	Average
1911	--	--	37.51	Average
1912	--	--	22.00	Dry
1913	--	--	25.01	Dry
1914	--	--	51.74	Wet
1915	--	--	43.15	Wet
1916	--	--	41.65	Wet
1917	--	--	17.59	Very Dry
1918	--	--	19.31	Very Dry
1919	--	--	45.65	Wet
1920	--	--	18.17	Very Dry
1921	--	--	35.66	Average
1922	--	--	29.26	Average
1923	--	--	39.16	Average
1924	--	--	14.85	Very Dry
1925	--	--	47.71	Wet
1926	--	--	35.91	Average
1927	--	--	52.21	Wet
1928	--	--	37.25	Average
1929	--	--	20.21	Dry
1930	--	--	29.30	Average
1931	--	--	23.34	Dry
1932	--	--	34.91	Average
1933	--	--	24.37	Dry
1934	--	--	21.45	Dry
1935	--	--	38.10	Average
1936	--	--	36.60	Average
1937	--	--	32.39	Average
1938	--	--	51.24	Wet
1939	--	--	17.88	Very Dry
1940	--	--	45.06	Wet
1941	--	--	62.92	Very Wet
1942	--	--	55.02	Very Wet
1943	--	--	37.73	Average
1944	--	--	32.71	Average
1945	--	--	30.84	Average
1946	--	--	33.62	Average
1947	--	--	25.71	Dry
1948	--	--	28.79	Average
1949	--	--	25.95	Dry
1950	--	--	29.59	Average

Water year	ATL Measured		ATL Combined	
	Water year Total Precipitation (inches)[a]	Water year Type[a]	Water year Total Precipitation (inches)[a]	Water year Type[a]
1951	--	--	45.47	Wet
1952	--	--	48.35	Wet
1953	--	--	40.38	Wet
1954	--	--	27.79	Dry
1955	--	--	24.83	Dry
1956	--	--	51.74	Wet
1957	--	--	28.38	Dry
1958	--	--	55.13	Very Wet
1959	--	--	27.36	Dry
1960	--	--	25.91	Dry
1961	--	--	27.96	Dry
1962	--	--	28.78	Average
1963	--	--	52.60	Wet
1964	--	--	23.60	Dry
1965	--	--	36.75	Average
1966	--	--	28.76	Dry
1967	--	--	55.43	Very Wet
1968	--	--	25.65	Dry
1969	--	--	41.85	Wet
1970	--	--	44.77	Wet
1971	--	--	35.34	Average
1972	--	--	19.01	Very Dry
1973	--	--	51.48	Wet
1974	--	--	48.14	Wet
1975	--	--	33.95	Average
1976	--	--	18.11	Very Dry
1977	--	--	16.41	Very Dry
1978	--	--	59.15	Very Wet
1979	--	--	35.01	Average
1980	--	--	53.38	Very Wet
1981	--	--	--	--
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	36.97	Average
1985	--	--	31.46	Average
1986	--	--	54.00	Very Wet
1987	--	--	23.18	Dry
1988	--	--	--	--
1989	--	--	--	--
1990	--	--	--	--
1991	--	--	--	--
1992	--	--	--	--
1993	--	--	--	--
1994	--	--	--	--
1995	--	--	--	--
1996	--	--	--	--
1997	54.92	Wet	54.92	Very Wet

Water year	ATL $_{Measured}$		ATL $_{Combined}$	
	Water year Total Precipitation (inches)[a]	**Water year Type[a]**	**Water year Total Precipitation (inches)[a]**	**Water year Type[a]**
1998	--	--	--	--
1999	37.84	Average	37.84	Average
2000	38.48	Average	38.48	Average
2001	23.24	Dry	23.24	Dry
2002	--	--	--	--
2003	44.64	Wet	44.64	Wet
2004	--	--	--	--
2005	--	--	--	--
2006	--	--	--	--
2007	--	--	--	--
2008	26.36	Dry	26.36	Dry
2009	32.40	Average	32.40	Average
2010	39.04	Average	39.04	Average
2011	52.04	Wet	52.04	Wet
2012	--	--	--	--
2013	29.72	Average	29.72	Average
2014	20.08	Very Dry	20.08	Very Dry
2015	26.12	Dry	26.12	Dry
2016	38.08	Average	38.08	Average
2017	64.92	Very Wet	64.92	Very Wet
2018	23.84	Dry	23.84	Dry
2019	52.20	Wet	52.20	Wet

[a] Water years without sufficient precipitation data to calculate the water year total precipitation or the water year type are labeled as "--".

5.1.2 Monthly Precipitation Thresholds

Monthly precipitation thresholds were calculated to estimate the overall water year type before the end of the water year and to determine the appropriate monthly shifts in the instream flow release schedule. Average water year cumulative precipitation for each water year type was calculated using both the measured (ATL $_{Measured}$) and the combined (ATL $_{Combined}$) ATL precipitation datasets to evaluate variations in the average water year cumulative precipitation from the inclusion of regression estimated ATL precipitation data. Average water year cumulative precipitation for each water year type was calculated for each month from October to September for the ATL $_{Measured}$ (Figure 5-4) and the ATL $_{Combined}$ (Figure 5-5) datasets. The average water year cumulative precipitation for each month represents the cumulative precipitation at the end of the month (e.g., October represents the cumulative precipitation at the end of October 31). The predominant shapes of the ATL $_{Measured}$ and ATL $_{Combined}$ monthly average water year cumulative precipitation curves were similar, but the ATL $_{Measured}$ monthly average water year cumulative precipitation curves were more variable than the ATL $_{Combined}$ monthly average water year cumulative precipitation curves, with larger shifts in the cumulative precipitation between months. The limited number of water years with ATL $_{Measured}$ data along with the significant variability in the timing and magnitude of Rector Creek rainfall during the beginning of the water year produced these shifts. The larger shifts in the ATL $_{Measured}$ monthly average water year cumulative precipitation between months resulted in the ATL $_{Measured}$ average water year type cumulative precipitation not consistently increasing from October to December.

As a result, the ATL $_{Measured}$ average water year cumulative precipitation curves potentially indicate a wetter water year at lower precipitation between October and December, and the ATL $_{Measured}$ average water year cumulative precipitation curves would not be suitable for estimating the overall water year type from October to December.

The increased number of water years in the ATL $_{Combined}$ dataset smoothed out the larger shifts in the cumulative precipitation between months during the early part of the water year and resulted in the ATL $_{Combined}$ average water year cumulative precipitation curves consistently increasing between water year types (Figure 5-5). Differences between water year types during the early part of the water year were initially small and increased over the course of the water year. The ATL $_{Combined}$ monthly average water year cumulative precipitation for the different water year types (Table 5-4) can be compared to the calculated monthly water year cumulative precipitation for a future year to estimate the water year type up to that point in a future water year. The monthly estimate of water year type is equal to the largest monthly average water year cumulative precipitation exceeded by the calculated water year cumulative precipitation for a future year. The ATL $_{Combined}$ average water year cumulative precipitation curves would provide a set of suitable thresholds for estimating the water year type, but the relatively small difference between the ATL $_{Combined}$ monthly average water year cumulative precipitation curves in the earlier part of the water year would potentially result in a significant change in the estimated water year type before January.

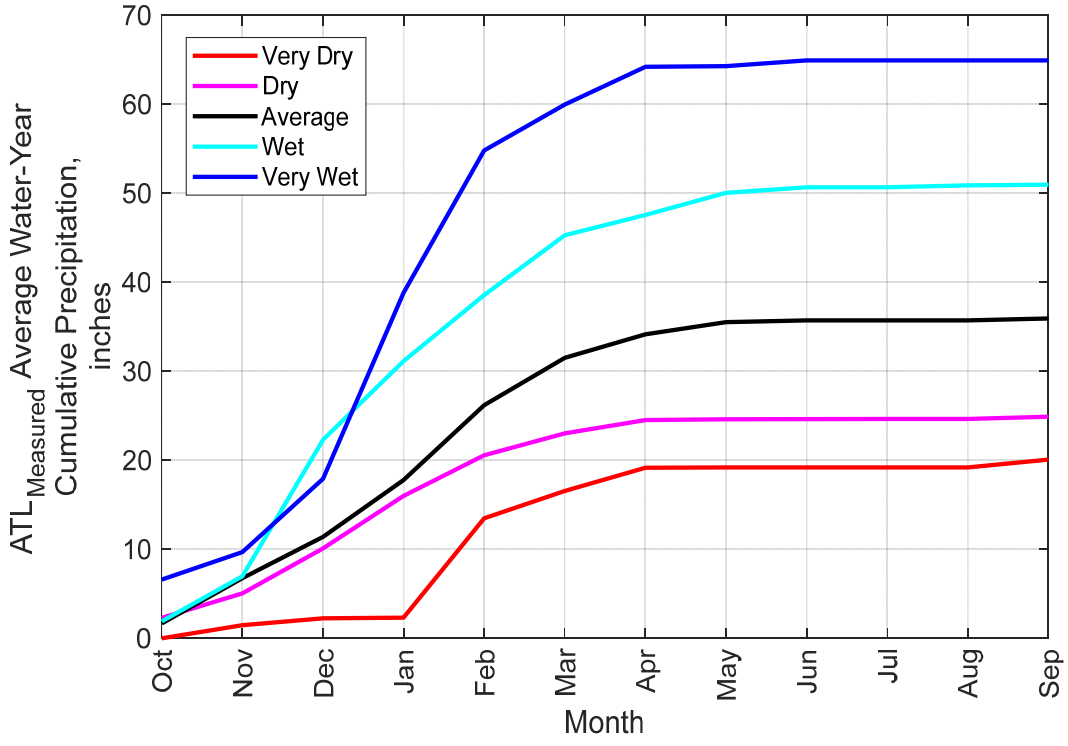


Figure 5-4. ATL $_{Measured}$ average water year cumulative precipitation at the end of each month from October to September.

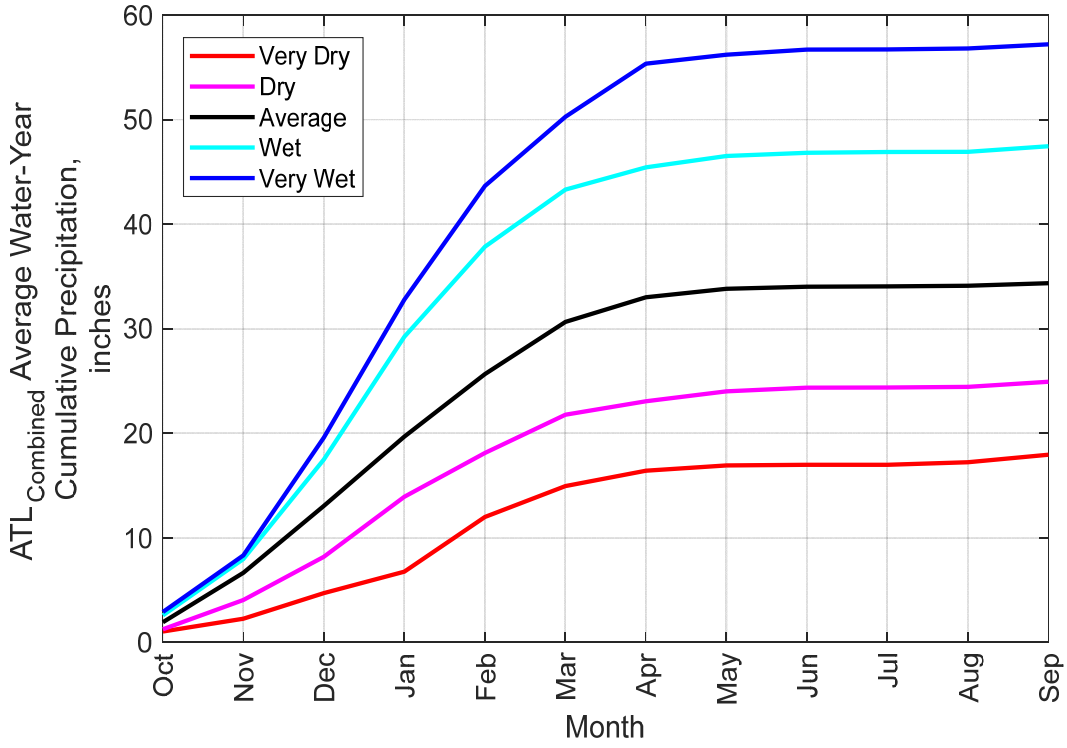


Figure 5-5. ATL $_{Combined}$ average water year cumulative precipitation at the end of each month from October to September.

Table 5-4. Rector Creek watershed ATL $_{Combined}$ average water year cumulative precipitation totals at the end of each month from October to September.

Month	ATL $_{Combined}$ Average Cumulative Precipitation (inches)				
	Very Dry	Dry	Average	Wet	Very Wet
Oct	0.99	1.21	1.87	2.52	2.85
Nov	2.12	3.99	6.55	7.85	8.21
Dec	5.27	7.77	12.89	17.29	19.39
Jan	7.44	13.39	19.45	28.92	32.50
Feb	11.56	17.95	25.37	37.46	43.29
Mar	14.41	21.57	30.30	42.86	49.85
Apr	15.86	22.82	32.62	44.95	54.86
May	16.33	23.73	33.41	46.02	55.69
Jun	16.69	23.96	33.60	46.31	56.17
Jul	16.69	23.97	33.62	46.38	56.18
Aug	16.93	24.02	33.68	46.39	56.27
Sep	17.52	24.53	33.91	46.91	56.65

In addition to the average water year cumulative precipitation for each water year type, the monthly precipitation exceedance probabilities for each month in the water year were calculated to characterize the relative wetness of each month in the water year (Figure 5-6) and to provide a second set of precipitation thresholds for estimating the appropriate monthly shifts in the instream flow release schedule. Monthly precipitation exceedance probabilities were calculated for both $ATL_{Measured}$ and $ATL_{Combined}$ precipitation datasets to evaluate variations in the monthly precipitation exceedance probabilities from the inclusion of regression estimated ATL precipitation data. During most months, the $ATL_{Measured}$ and $ATL_{Combined}$ monthly precipitation exceedance probability curves were very similar with negligible differences in the monthly exceedance probability precipitation thresholds. There were some variations between the $ATL_{Measured}$ and $ATL_{Combined}$ monthly precipitation exceedance probability curves during December, March, May, and August, but the differences between the curves was primarily associated with wetter conditions (Very Wet and/or Wet water years). In general, the $ATL_{Measured}$ monthly precipitation exceedance probability curves produced slightly higher precipitation thresholds than the $ATL_{Combined}$ monthly precipitation exceedance probability curves for Very Wet and/or Wet conditions during December, March, May, and August. Larger differences between $ATL_{Measured}$ and $ATL_{Combined}$ monthly exceedance probability curves during December, March, May, and August during wetter water years were potentially partially due to the linear regression used to estimate monthly precipitation in the $ATL_{Combined}$ dataset when measured ATL precipitation was unavailable due to the tendency of the linear regression to underestimate ATL precipitation during wetter months. Overall, the $ATL_{Combined}$ monthly precipitation exceedance probability curves were considered representative of the long-term monthly precipitation exceedance probability in the Rector Creek watershed and used as the second set of precipitation thresholds for estimating the appropriate monthly shifts in the instream flow release schedule (Table 5-5) since the $ATL_{Combined}$ dataset had more years of precipitation data and limited differences between the $ATL_{Measured}$ and $ATL_{Combined}$ monthly precipitation exceedance probability curves.

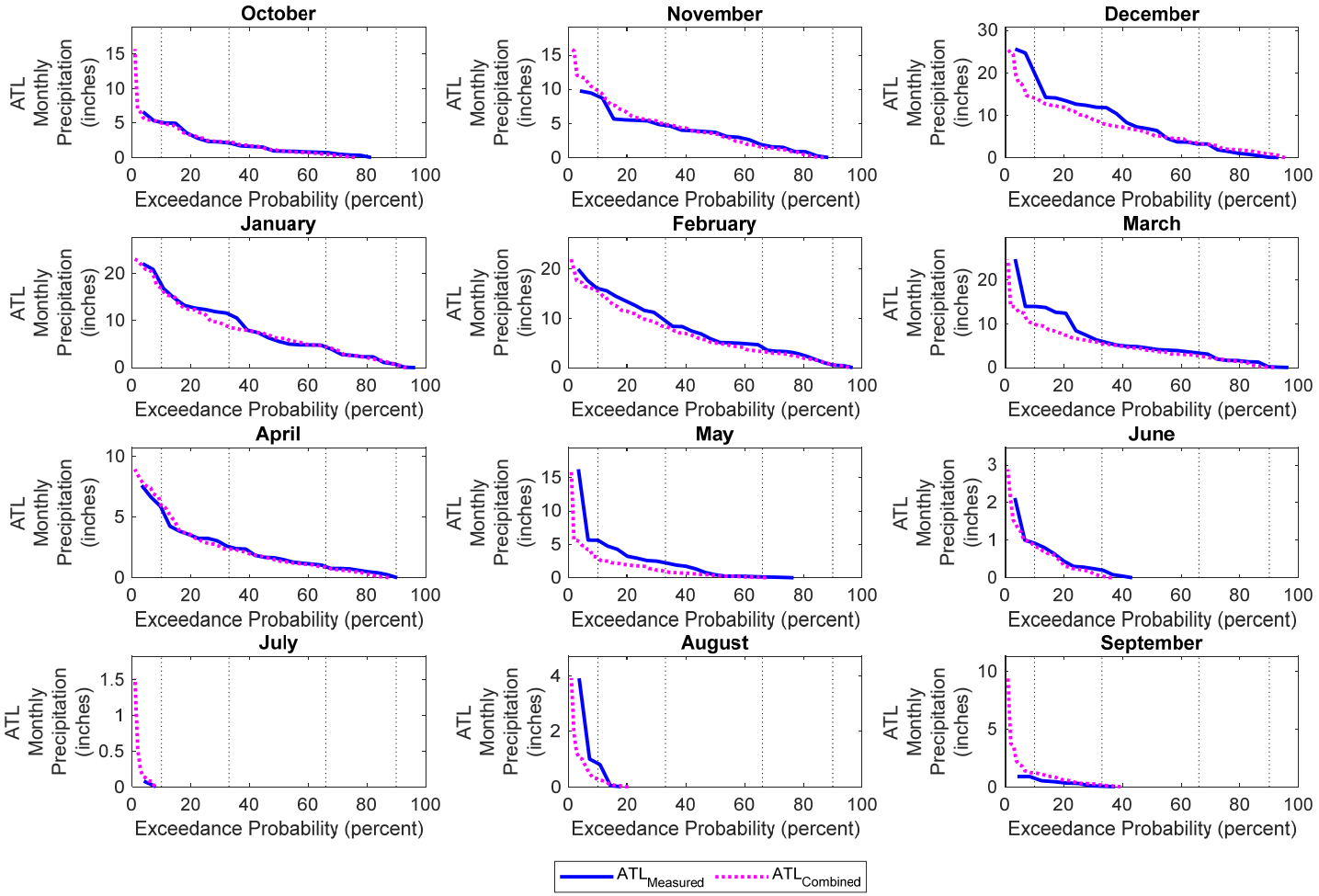


Figure 5-6. Monthly precipitation exceedance probability curves for the measured and combined ATL precipitation data. Dashed vertical lines indicate the 10, 33, 66, and 90 percent exceedance probabilities.

Table 5-5. Rector Creek watershed $ATL_{Combined}$ monthly precipitation exceedance probability.

Month	Monthly Precipitation Exceedance Probability			
	90	**66**	**33**	**10**
Oct	0	0.44	2.16	4.97
Nov	0	1.51	4.81	9.79
Dec	0.76	3.26	8.12	14.04
Jan	0.47	4.44	8.55	16.85
Feb	0.60	3.22	8.29	15.47
Mar	0.07	2.65	5.45	9.82
Apr	0	0.81	2.32	5.88
May	0	0.00	0.83	2.60
Jun	0	0	0.02	0.80
Jul	0	0	0	0
Aug	0	0	0	0.22
Sep	0	0	0.11	1.15

While additional criteria and specific details of how the various monthly precipitation thresholds would be used to determine the appropriate environmental flow releases from Rector Reservoir to lower Rector Creek will be discussed in a later reservoir operations plan, a general approach for using the monthly average water year cumulative precipitation thresholds (Table 5-4) and the monthly precipitation exceedance probability thresholds (Table 5-5) to estimate the overall water year type per month are summarized. At the beginning of the water year in October, the cumulative precipitation would always be zero. As such, the overall water year type in October would be assumed to be the same as the previous September or based on additional criteria discussed in a later reservoir operations plan. At the beginning of each month from November through September, the water year type would be estimated by first calculating the total monthly precipitation for the previous month and the cumulative precipitation from the beginning of the water year to the beginning of the month. Next, the cumulative precipitation would be compared with the monthly average water year cumulative precipitation thresholds to provide a first estimate of the water year type. Then the total monthly precipitation for the previous month would be compared with the associated monthly precipitation exceedance probability thresholds to provide a second estimate of the water year type. Finally, the overall water year type for the following month would be estimated from the two water year type estimates and any additional criteria introduced in a later reservoir operations plan.

5.2 Watershed Runoff Model

The Rector Creek watershed baseflow into Rector Reservoir was estimated from January 1, 2008 to April 27, 2020 when sufficient data were available to calculate the effective inflow and estimate the soil moisture model parameters (Figure 5-7). The calibrated soil moisture model parameters were summarized in **Table 5-6**. Model calibration determined that stream flow was typically influenced by stormflow for the time period when the soil moisture was greater than 25 percent of the maximum soil moisture capacity. The Rector Creek watershed baseflow into

Rector Reservoir was only estimated from January 1, 2008 to April 27, 2020 since daily diversion flow data were not available outside of this period to calculate the effective inflow used to estimate the baseflow during non-storm periods. During non-storm periods, the estimated baseflow was equal to the calculated effective inflow, so the variability in the calculated effective inflow produced similar variability in the estimated baseflow. Much of the large daily variability in the calculated effective inflow and the estimated baseflow occurred when the reservoir stage change abruptly varied from zero to non-zero between days rather than a continuous smooth decrease due to the resolution of the reservoir stage measurements and the stage-volume relationship. During storm periods, the Rector Creek watershed runoff model usually was successful at identifying the periods when stormflow contributed to stream flow using the calibrated soil moisture model and the estimate of excess precipitation. When the storm period was correctly identified, estimated baseflow was linearly interpolated from before the rise in stream flow from stormflow until after the flattening of the stream flow as the stormflow decreased to zero. However, there were several times when the watershed runoff model misidentified a storm period as a non-storm period and assigned the characteristic increase in stream flow to baseflow rather than stormflow. During these misidentified storm periods, baseflow was overestimated since some of the stream flow that was likely stormflow was assigned to baseflow. Misidentification typically occurred when the soil moisture model did not estimate excess precipitation during part of a storm event, but the increasing calculated effective inflow indicated there was sufficient precipitation to cause excess precipitation and a stormflow increase. In addition to overestimating baseflow during these periods, stormflow would be underestimated due to the underestimate of excess precipitation.

Multiple calibrations of the watershed runoff model and sensitivity testing of the model fitting parameters were performed to improve identification of the storm periods. Improvements in identifying some storm periods by adjustment of the soil properties (e.g., infiltration rate) and rainfall distribution in the watershed (e.g., using rainfall data from ATL vs. RES) typically resulted in misidentifying other storm periods, suggesting spatial variability in the soil properties and rainfall likely contributed to the misidentification of storm periods. The watershed runoff model calibration that identified the most storm periods was selected since there were not sufficient data in the Rector Creek watershed to more accurately characterize the spatial variability in the soil properties and rainfall distribution and an inherent assumption of the watershed runoff model is uniform rainfall across the watershed.

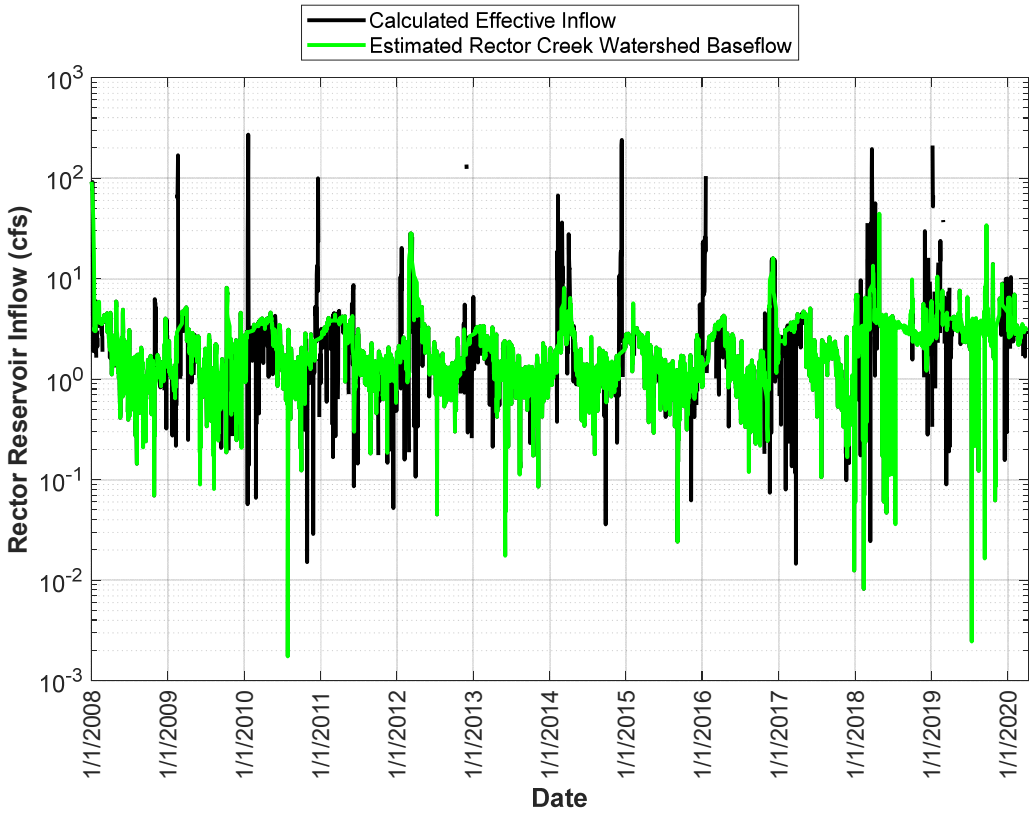


Figure 5-7. Rector Reservoir calculated effective inflow and estimated Rector Creek watershed baseflow into Rector Reservoir from January 1, 2008 to April 27, 2020. Negative calculated effective inflows and estimated Rector Creek watershed baseflows not shown on the graph since negative values cannot be plotted on log-scale plots.

Table 5-6. Rector Creek watershed soil moisture model calibrated average soil properties.

SSURGO Soil Type	Estimated Area (acres)	Estimated Infiltration Rate (inches/hour)	Estimated Soil Surface Layer Depth (inches)	Estimated Soil Water Capacity (inches)
A	0	0.300	12	2
B	21.77	0.150	12	2
C	1885.31	0.050	12	1
D	403455.58	0.003	6	0.6

The Rector Creek watershed runoff model estimated the stormflow component of Rector Reservoir inflow between January 1, 2008 to April 27, 2020 for 129 identified storm events using the previously developed soil moisture model, the empirical rainfall-runoff method (i.e., the rational method), and a fitted curvilinear unit hydrograph. The area-weighted runoff coefficient for the rainfall-runoff method, $C_{weighted}$, was estimated as 0.47 from the available spatial data in the Rector Creek watershed. The $\alpha_{storm,Rector}$ that produced the best fit between the curvilinear hydrograph and the calculated effective inflow was calculated from the three storms between WY

2008 and WY 2019 where the dam did not spill and peak stormflow was known. The $\alpha_{storm,Rector}$ for the three storms ranged from 1.69 to 1.75, with an average $\alpha_{storm,Rector}$ of approximately 1.71. The average $\alpha_{storm,Rector}$ was used in the curvilinear hydrograph to calculate the stormflow for all storm events in Rector Creek. During each storm event, the storm duration, the total excess precipitation that would contribute to stormflow, the average storm intensity, the peak stormflow, and the time to peak were estimated. The estimated stormflow for each storm event was added to the estimated baseflow during that period and the resulting modeled Rector Creek watershed inflow to Rector Reservoir was compared with the calculated effective inflow to Rector Reservoir during periods when the calculated effective inflow would include all of the stormflow (i.e., the reservoir was not spilling).

The watershed runoff model generally was successful at characterizing overall stream flow increases observed in the calculated effective inflow, but there was some variability in the magnitude and timing of the modeled Rector Creek watershed inflow to Rector Reservoir during storm events compared to the calculated effective inflow (Figure 5-8). Modeled Rector Creek watershed inflow to Rector Reservoir during storm events replicated the typical stream flow response to storm events (i.e., fast increase, peak, and slow decrease), but the modeled inflow did not replicate the more abrupt variations in the calculated effective inflow (Figure 5-9). Abrupt daily changes in the effective inflow were likely due to variability in the calculated effective inflow resulting from the resolution of reservoir stage measurements and the reservoir stage-volume relationship. In addition to this daily variability between the modeled Rector Creek watershed inflow to Rector Reservoir and the calculated effective inflow, there were slight shifts in the timing of the peak stormflow and the model tended to underpredict peak stormflow for some storm events and overpredict stormflow for other storm events (Figure 5-10). While multiple calibrations of the watershed runoff model and sensitivity testing of the model fitting parameters were performed to improve agreement in the timing and magnitude of stormflow peaks when the entire stormflow period was characterized by the calculated effective inflow, there was not one set of model fitting parameters that produced good agreement between the modeled peak Rector Creek watershed inflow to Rector Reservoir during all storm events and calculated effective inflow peaks. Spatial variability in the distribution of rainfall and the transport of stormflow across Rector Creek watershed, spatial variability in the soil properties across the watershed, and the lack of available data in the Rector Creek watershed to predict how these parameters varied during individual storm events prevented the determination of a single set of parameters that would model the timing and magnitude of all storms. Slight shifts in the timing of peak stormflow resulted from using an average $\alpha_{storm,Rector}$ when the timing of the actual peak stormflow varied, while the variability in the magnitude of peak stormflow likely resulted from the model using a single $C_{weighted}$ and uniform soil properties for each soil type in the watershed. Agreement between modeled Rector Creek watershed inflow to Rector Reservoir and calculated effective inflow improved for some storms by adjusting these parameters, but agreement deteriorated for other storms when parameters were changed. As such, the watershed runoff model was calibrated to minimize the overall differences between the modeled Rector Creek watershed inflow to Rector Reservoir and the calculated effective inflow and to maximize agreement between simulated and measured Rector Reservoir stage.

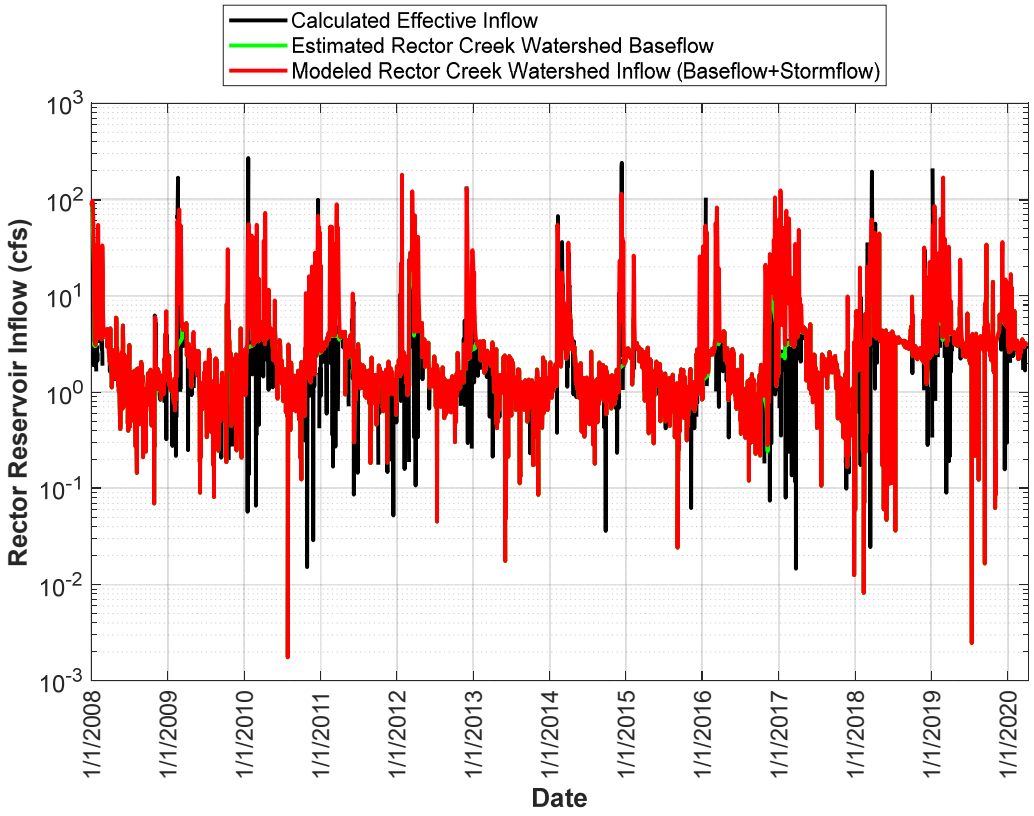


Figure 5-8. Rector Reservoir calculated effective inflow, estimated Rector Creek watershed baseflow, and modeled Rector Creek watershed inflow (i.e., baseflow plus stormflow) from January 1, 2008 to April 27, 2020. Negative calculated effective inflows, estimated Rector Creek watershed baseflows, and modeled Rector Creek watershed inflows not shown on the graph since negative values cannot be plotted on log-scale plots.

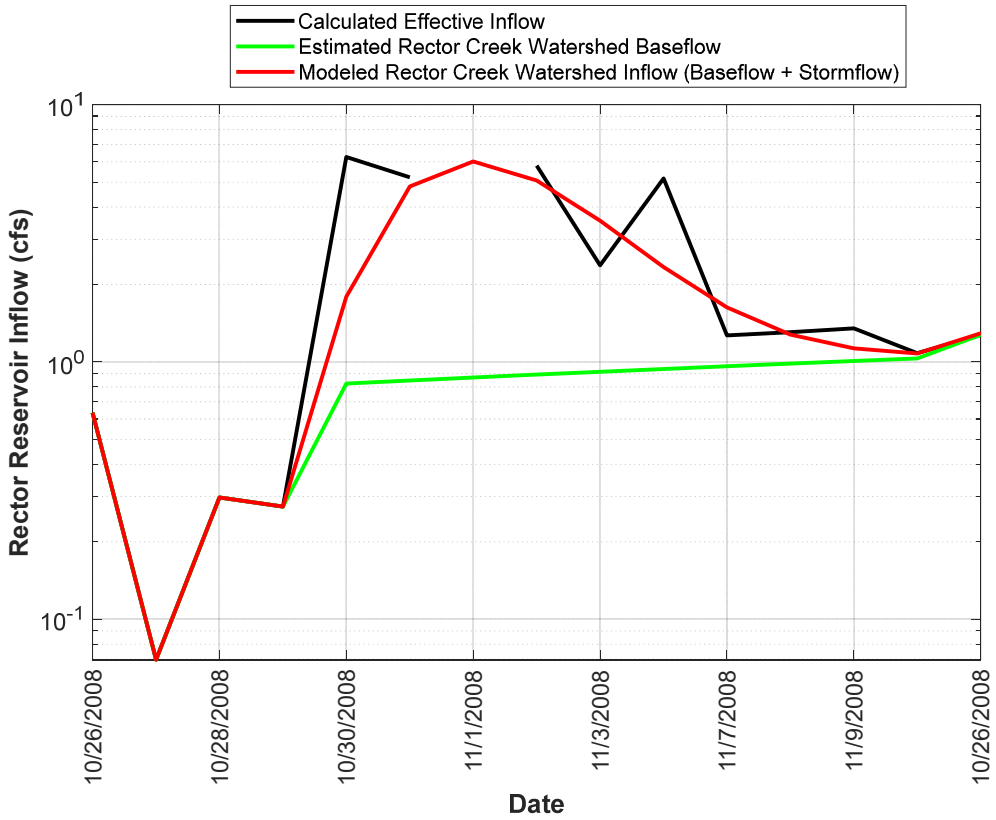


Figure 5-9. Rector Reservoir calculated effective inflow, estimated Rector Creek watershed baseflow, and modeled Rector Creek watershed inflow (i.e., baseflow plus stormflow) from October 26, 2008 to November 9, 2008 highlighting the variability of the calculated effective inflow compared to the modeled Rector Creek watershed inflow.

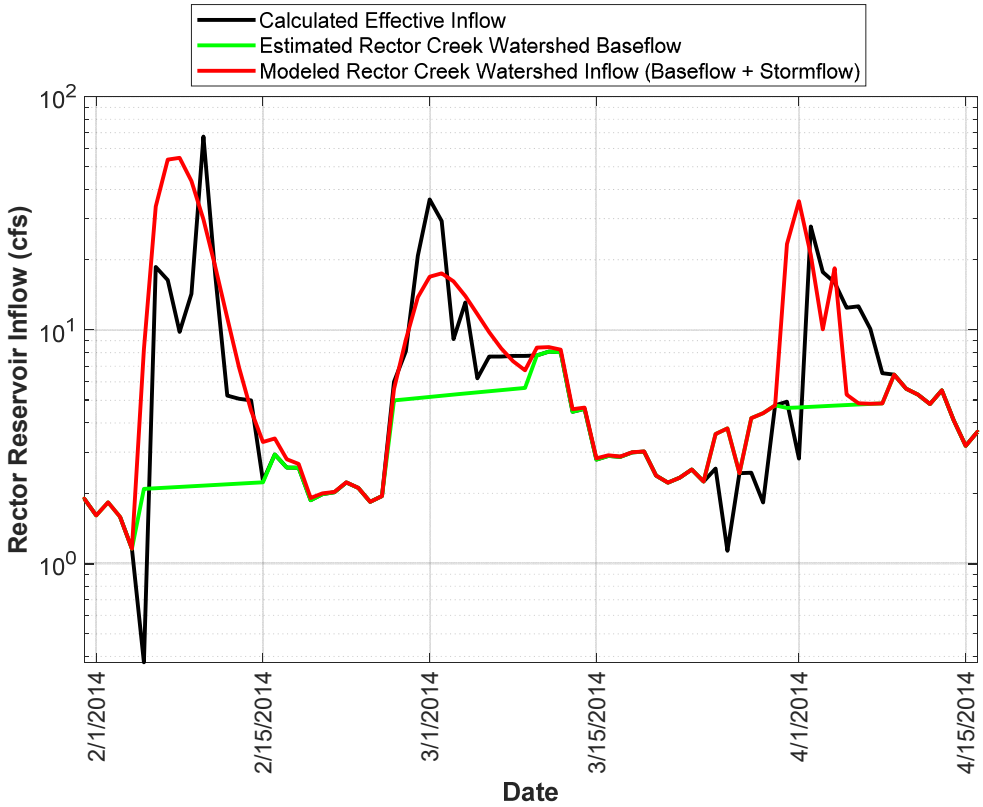


Figure 5-10. Rector Reservoir calculated effective inflow, estimated Rector Creek watershed baseflow, and modeled Rector Creek watershed inflow (i.e., baseflow plus stormflow) from February 1, 2014 to April 14, 2014 highlighting the variability in the timing and magnitude of the modeled Rector Creek watershed peak inflow compared to the calculated effective inflow.

Rector Reservoir stage was simulated for historical conditions from January 1, 2008 to April 27, 2020 using the modeled Rector Creek watershed composite inflow to Rector Reservoir and the previously developed Rector Reservoir water-balance model (Figure 5-11). The modeled Rector Creek watershed composite inflow to the reservoir was equal to the calculated effective inflow when Rector Reservoir stage data recorded the a reservoir level less than the spillway elevation (i.e., when the calculated effective inflow characterized the actual Rector Reservoir inflow) and equal to the modeled Rector Creek watershed inflow when reservoir stage data recorded the reservoir spilling or stage above the spillway elevation (i.e., when the calculated effective inflow underestimated the actual Rector Reservoir inflow). The time period when the modeled Rector Creek watershed inflow was used in the Rector Creek watershed composite inflow did not vary during modeling since the time period when the calculated effective inflow characterized all the inflow to Rector Reservoir was based on the historical measurements of reservoir stage. In this manner, the modeled Rector Creek watershed composite inflow minimized the uncertainty of the modeled Rector Creek watershed inflow by restricting its use to only the time period when the calculated effective inflow underestimated the total inflow to Rector Reservoir.

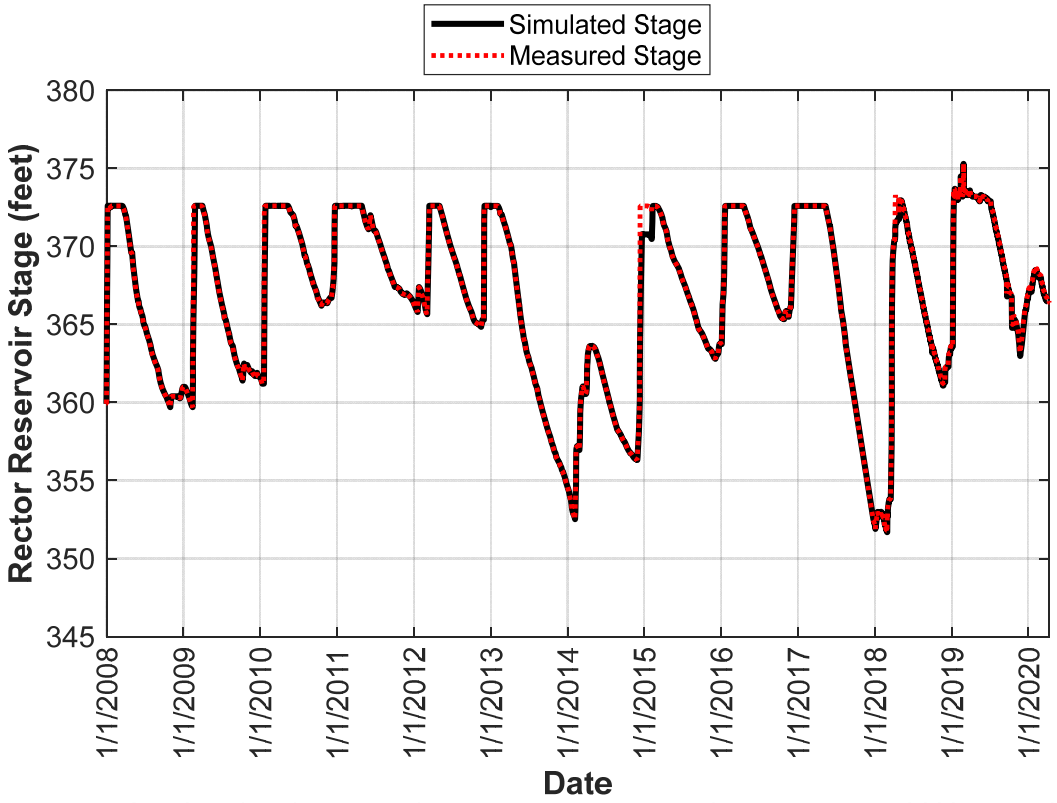


Figure 5-11. Simulated and measured Rector Reservoir stage from January 1, 2008 to April 27, 2020.

Simulated and measured Rector Reservoir stage had very good agreement during the majority of the modeling period, but the simulated reservoir stage initially filled slightly slower and the reservoir spilled several days later than the measured Rector Reservoir stage during some years. Comparison of simulated and measured Rector Reservoir stage indicated the modeled Rector Creek watershed inflow to Rector Reservoir tended to underpredict the inflow to the reservoir during larger storm events, resulting in the slower initial fill and spill of the reservoir during the winter wet season. Differences between simulated and measured Rector Reservoir stage typically lasted for only several days, but simulated stage was less than measured stage for several weeks to almost two months during WY 2015 and WY 2018 when modeled Rector Creek watershed inflow was underpredicted during an initial large storm event and another storm event did not occur for several weeks to approximately two months. In general, the duration of differences between simulated and measured reservoir stage corresponded to the duration between a large storm event where the peak inflow may be underpredicted and a subsequent storm event when the peak inflow would be better characterized by the watershed runoff model. Calibration of the Rector Creek watershed runoff model fitting parameters to improve agreement between simulated and measured reservoir stage would have increased the modeled Rector Creek watershed inflow during larger storm events, but this would have significantly worsened the overall agreement between modeled Rector Creek watershed inflow and calculated effective inflow during typical storm events. The final calibration for the Rector Creek watershed runoff model prioritized maximizing agreement between simulated and measured Rector Reservoir stage, while still minimizing the overall differences between the modeled Rector Creek watershed inflow and the calculated effective inflow.

The calibrated model performance statistics for simulated and measured Rector Reservoir stage from January 1, 2008 to April 27, 2020 were 0.99 for NSE, -0.03 percent for percent bias, and 0.01 for RSR. Model performance statistics were not calculated for a validation period. The available measured reservoir stage data necessary to calibrate the model were very limited (i.e., when the reservoir was rapidly filling during a storm event but the reservoir was not spilling), so all this measured stage data were needed to optimize the watershed runoff model calibration and there was no validation of the model performance outside of the calibration period. The optimum value for NSE is one, percent bias is zero, and RSR is zero with acceptable values varying depending on the time-scale of the model and the parameter being modeled for percent bias. Moriasi et al. (2007) classified model performance as "very good" (the highest performance category) when NSE was greater than 0.75, percent bias was +/- 10 percent for stream flow, and RSR was less than 0.5. While model performance statistics were different from the optimum values due to the modeled Rector Creek watershed composite inflow underestimating the total inflow to Rector Reservoir during larger storm events, the NSE, percent bias, and RSR statistics indicated the overall model performance was acceptable during the modeling period.

Additional refinements of the Rector Creek watershed runoff model or replacement of the model with a more detailed watershed model is not recommended because there currently is not sufficient watershed data from January 1, 2008 to April 27, 2020 to calibrate more refined or detailed models. There were multiple refinements that could have been added to the existing Rector Creek watershed model (e.g., spatial variation in rainfall across the watershed), but there were not sufficient data in Rector Creek watershed to reasonably calibrate these refinements to actual watershed conditions during the modeling period. While assumptions of watershed parameters could be made to incorporate these refinements, model uncertainty about whether these refinements were accurately replicating the processes in the watershed that contributed to peak inflow would increase. There was no measured watershed inflow to Rector Reservoir or dam spillway flow data during the modeling period to compare with the modeled inflow, so increases in model uncertainty by making assumptions to add more processes would not increase confidence that the watershed runoff model was accurately estimating peak inflow. More detailed models typically have extensive data requirements to determine boundary conditions and to calibrate the model to watershed conditions. A more detailed model would face similar data limitations and uncertainty about accurately replicating watershed processes. An extensive data collection effort would need to be undertaken to better characterize watershed conditions and to calibrate a more refined or detailed model. Installation of a Rector Reservoir elevation gage, installation of a flow gage at the new release value at the base of Rector Dam or in lower Rector Creek, and/or installation of a gage to measure flow over the Rector Dam spillway along with a reservoir stage/spillway flow rating curve is recommended instead of a Rector Creek watershed data collection effort since the data from these gages and rating curve would provide the most accurate quantification of the current and future Rector Creek watershed water yield.

6 CONCLUSION

Rector Creek watershed water year types were determined for all years with sufficient precipitation data. A precipitation exceedance probability analysis was used to calculate the Rector Creek watershed precipitation thresholds to classify water years as Very Dry, Dry, Average, Wet, and Very Wet. The Rector Creek watershed water year types were calculated for the 16 water years when sufficient measured precipitation data were available at the Atlas Peak weather station ($ATL_{Measured}$). Additionally, the Rector Creek watershed water year types were

calculated for a 95-water year precipitation dataset comprised of measured ATL precipitation (16 water years) and ATL precipitation estimated by a least-squares linear regression between ATL and NSH (79 water years) ($ATL_{Combined}$). Water year exceedance probability curves and Rector Creek watershed water year precipitation thresholds for $ATL_{Measured}$ and $ATL_{Combined}$ varied slightly, but differences were small enough that the Rector Creek watershed water year types were the same for both datasets. The $ATL_{Measured}$ water year exceedance probability curve and the associated Rector Creek watershed water year precipitation thresholds were generally higher than the $ATL_{Combined}$ water year exceedance probability curve and associated water year precipitation thresholds. Fewer water years in the $ATL_{Measured}$ dataset resulted in a more jagged exceedance probability curve for $ATL_{Measured}$ than $ATL_{Combined}$, but the shapes of the two exceedance curves were similar. Differences in the estimated Rector Creek watershed water year precipitation thresholds for the $ATL_{Measured}$ and $ATL_{Combined}$ datasets were 2.13 inches or less for all water year types, except Very Wet where the water year precipitation thresholds differed by 5 inches. While larger differences between $ATL_{Measured}$ and $ATL_{Combined}$ water year exceedance probability curves during wetter water years were potentially partially due to the linear regression used to estimate ATL precipitation from measured NSH precipitation, comparison of $ATL_{Measured}$ and $ATL_{Combined}$ water year exceedance probability curves with the measured NSH water year exceedance probability curve indicated the $ATL_{Combined}$ water year exceedance probability curve was not significantly skewed by the inclusion of ATL precipitation estimated by linear regression from measured NSH precipitation data. Thus, the $ATL_{Combined}$ dataset and the associated water year precipitation thresholds provided the best characterization of long-term Rector Creek watershed precipitation conditions and $ATL_{Combined}$ water year precipitation thresholds were selected as water year type index for estimating future water year types in the Rector Creek watershed.

In addition to the water year precipitation thresholds, the average water year type cumulative precipitation for each month and monthly precipitation exceedance probabilities were calculated to estimate the overall water year type before the end of the water year. Average water year cumulative precipitation for each water year type was calculated for the $ATL_{Measured}$ and $ATL_{Combined}$ precipitation datasets for each month from October to September to provide precipitation thresholds that can be compared with the monthly water year cumulative precipitation for any future year to estimate the water year type up to that point in the water year. The predominant shapes of the $ATL_{Measured}$ and $ATL_{Combined}$ average water year cumulative precipitation curves were similar, but the $ATL_{Measured}$ average water year cumulative precipitation curves were more variable than the $ATL_{Combined}$ average water year cumulative precipitation curves. $ATL_{Measured}$ average water year cumulative precipitation curves did not consistently increase with increasingly wet water years before January. $ATL_{Combined}$ average water year cumulative precipitation curves consistently increased between water year types, so $ATL_{Combined}$ average water year cumulative precipitation curves were selected as the better set of cumulative precipitation thresholds to characterize the long-term Rector Creek watershed water year conditions when estimating the overall water year type from monthly water year cumulative precipitation. However, the relatively small difference between the $ATL_{Combined}$ average water year cumulative precipitation curves before January would potentially result in more than one water year type shift between months when using the $ATL_{Combined}$ average water year cumulative precipitation thresholds. Monthly precipitation exceedance probabilities were also calculated for both the $ATL_{Measured}$ and $ATL_{Combined}$ precipitation datasets to characterize the relative wetness of each month in the water year and to provide a second set of precipitation thresholds for estimating the appropriate monthly shifts the water year type. The $ATL_{Measured}$ and $ATL_{Combined}$ monthly precipitation exceedance probability curves were very similar during most months, but $ATL_{Measured}$ monthly precipitation exceedance probability curves produced slightly higher precipitation thresholds than the $ATL_{Combined}$ monthly precipitation exceedance probability curves for Very Wet and/or Wet

conditions during December, March, May, and August. Overall, the $ATL_{Combined}$ monthly precipitation exceedance probability curves and associated precipitation thresholds were selected as more representative of the long-term monthly precipitation exceedance probability in the Rector Creek watershed since the $ATL_{Combined}$ dataset contained more years of precipitation data and the differences between the $ATL_{Measured}$ and $ATL_{Combined}$ monthly precipitation exceedance probability curves were limited.

The $ATL_{Combined}$ water year exceedance probability curve and associated water year precipitation thresholds, $ATL_{Combined}$ average water year cumulative precipitation curves and associated monthly water year cumulative precipitation thresholds, and the $ATL_{Combined}$ monthly precipitation exceedance probability curves and associated monthly precipitation thresholds comprise a water year type index that can be used to identify the Rector Creek watershed water year type from Atlas Peak (ATL) precipitation data. Both the overall water year type and the relative wetness of individual months can be evaluated throughout the water year from the precipitation thresholds in the water year type index. A future Rector Reservoir Operations Plan can use this water year type index to determine the appropriate monthly shifts in an instream flow release schedule.

Rector Creek watershed daily inflows to Rector Reservoir from January 1, 2008 to April 27, 2020 were estimated by a calibrated Rector Creek watershed runoff model. There were no Rector Creek watershed daily inflow measurements upstream of Rector Reservoir to compare with the modeled Rector Creek watershed daily inflows, but the net inflow to Rector Reservoir from Rector Creek watershed and any potential groundwater inflows and outflows were estimated by the calculated effective inflow when the reservoir was not spilling. Therefore, modeled Rector Creek watershed daily inflows from January 1, 2008 to April 27, 2020 were compared to the calculated effective inflow during the periods the reservoir historically did not spill to evaluate the Rector Creek watershed runoff model performance. Modeled Rector Creek watershed inflows successfully characterized overall inflow trends observed in the calculated effective inflow, but there were some differences in the daily variability, timing, and magnitude of the modeled Rector Creek watershed inflow during storm events compared to the calculated effective inflow. Modeled inflows had less daily variation than the calculated effective inflow. Variability in the effective inflow likely was produced by the resolution of the reservoir stage measurements and the reservoir stage-volume relationship used to calculate the effective inflow. Modeled peak inflows during storm events also were frequently slightly shifted compared to the calculated effective inflow and the model tended to underpredict peak inflows during some storm events and overpredict peak inflows during other storm events. Variations in the timing and magnitude of modeled peak inflows during storm events compared to the calculated effective inflows likely occurred because spatial variability in the Rector Creek watershed (e.g., distribution of rainfall, the transport of stormflow across Rector Creek watershed, soil properties) was greater than could be characterized by the average watershed runoff model fitting parameters determined during model calibration. Additionally, the spatial variability could not be quantified and incorporated into refinements of the Rector Creek watershed runoff model because there were not sufficient data in the Rector Creek watershed to evaluate how spatial variations in model parameters altered the timing and magnitude of modeled peak inflows during individual storm events.

Rector Reservoir stage was simulated for historical conditions from January 1, 2008 to April 27, 2020 using the previously developed Rector Reservoir water-balance model and a Rector Creek watershed composite inflow comprised of the modeled Rector Creek watershed inflow when the reservoir historically spilled during the modeling period and the calculated effective inflow used when the reservoir historically did not spill. Simulated and measured Rector Reservoir stage had

very good agreement during the majority of the modeling period, but the simulated reservoir stage typically increased slightly slower and the reservoir spilled later than the measured Rector Reservoir stage. Comparison of the simulated and measured Rector Reservoir stage indicated the Rector Creek watershed runoff model tended to underestimate watershed inflow to the reservoir during larger storm events. Differences between simulated and measured stage typically lasted for less than a week, but simulated stage was less than measured stage for several weeks to almost two months during WY 2015 and WY 2018 when the reservoir inflow was underpredicted during an initial large storm event and another storm event did not occur for several weeks to approximately two months. Calibration of the Rector Creek watershed runoff model to improve agreement between simulated and measured reservoir stage would have increased the modeled Rector Creek watershed inflow during larger storm events, but this would have significantly worsened the overall agreement between modeled Rector Creek watershed inflow and calculated effective inflow during typical storm events. The final calibration for the Rector Creek watershed runoff model prioritized maximizing agreement between simulated and measured Rector Reservoir stage, while still minimizing the overall differences between the modeled Rector Creek watershed inflow and the calculated effective inflow.

Model performance statistics for simulated and measured Rector Reservoir stage from January 1, 2008 to April 27, 2020 were 0.99 for NSE, -0.03 percent for percent bias, and 0.01 for RSR. The NSE, percent bias, and RSR statistics were within the "very good" (the highest performance category) model performance range indicating the overall Rector Creek watershed runoff model and the Rector Reservoir water balance model performance were acceptable during the modeling period. Overall, the Rector Creek watershed runoff model estimate of inflow into Rector Reservoir combined with the calculated effective inflow improved the estimate of Rector Creek watershed inflow to the reservoir, providing a better quantification of the total water yield from the Rector Creek watershed upstream of Rector Dam available for beneficial uses.

Additional refinements of the Rector Creek watershed runoff model or replacement of the model with a more detailed watershed model is not recommended because there is not sufficient watershed data from January 1, 2008 to April 27, 2020 to calibrate more refined or detailed models.

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APPENDIX 3.9-A

Noise Model Output
Rector Reservoir Bypass Valve Project

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Diversion Pipeline

Description	**Affected Land Use**
Diversion Pipeline	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Truck	No	40		75	1295
Excavator	No	40		80.7	1295
Tractor Trailer Delivery Truck	No	40		74.3	1295
Dump Truck	No	40		76.5	1295

Calculated (dBA)

Equipment	***Lmax**	**Leq**
3/4 Ton Truck	46.7	42.8
Excavator	52.4	48.5
Tractor Trailer Delivery Truck	46	42
Dump Truck	48.2	44.2
Total	**52.4**	**51.2**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Diversion Pipeline

Description	**Affected Land Use**
Diversion Pipeline	Industrial

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Truck	No	40		75	606
Excavator	No	40		80.7	606
Tractor Trailer Delivery Truck	No	40		74.3	606
Dump Truck	No	40		76.5	606

Calculated (dBA)

Equipment	***Lmax**	**Leq**
3/4 Ton Truck	53.3	49.4
Excavator	59	55.1
Tractor Trailer Delivery Truck	52.6	48.6
Dump Truck	54.8	50.8
Total	**59**	**57.8**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Bypass Valve

Description	**Affected Land Use**
Bypass Valve	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Tool Truck	No	40		75	1295
Excavator	No	40		80.7	1295
Tractor Trailer Delivery Truck	No	40		74.3	1295
Dump Truck	No	40		76.5	1295
Concrete Delivery Truck	No	40		78.8	1295
48" Trenching Machine	No	50		80.4	1295

Calculated (dBA)

Equipment	***Lmax**	**Leq**
3/4 Ton Tool Truck	46.7	42.8
Excavator	52.4	48.5
Tractor Trailer Delivery Truck	46	42
Dump Truck	48.2	44.2
Concrete Delivery Truck	50.5	46.6
48" Trenching Machine	52.1	49.1
Total	**52.4**	**54.1**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Bypass Valve

Description	**Affected Land Use**
Bypass Valve	Industrial

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Truck	No	40		75	606
Excavator	No	40		80.7	606
Tractor Trailer Delivery Truck	No	40		74.3	606
Dump Truck	No	40		76.5	606
Concrete Delivery Truck	No	40		78.8	606
48" Trenching Machine	No	50		80.4	606

Calculated (dBA)

Equipment	***Lmax**	**Leq**
3/4 Ton Truck	53.3	49.4
Excavator	59	55.1
Tractor Trailer Delivery Truck	52.6	48.6
Dump Truck	54.8	50.8
Concrete Delivery Truck	57.1	53.2
48" Trenching Machine	58.7	55.7
Total	**59**	**60.7**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Pipeline Outfall

Description	**Affected Land Use**
Pipeline Outfall	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Truck	No	40		75	1295
Excavator	No	40		80.7	1295
Tractor Trailer Delivery Truck	No	40		74.3	1295
Dump Truck	No	40		76.5	1295
Concrete Delivery Truck	No	40		78.8	1295
Tree Chipper	No	10		81.8	1295

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Pickup Truck	46.7	42.8
Excavator	52.4	48.5
Flat Bed Truck	46	42
Dump Truck	48.2	44.2
Concrete Mixer Truck	50.5	46.6
Tree Chipper	53.5	43.5
Total	**53.5**	**53**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 3/16/2021
Case Description: Pipeline Outfall

Description	**Affected Land Use**
Pipeline Outfall	Industrial

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
3/4 Ton Truck	No	40		75	606
Excavator	No	40		80.7	606
Tractor Trailer Delivery Truck	No	40		74.3	606
Dump Truck	No	40		76.5	606
Concrete Delivery Truck	No	40		78.8	606
Tree Chipper	No	10		81.8	606

Calculated (dBA)

Equipment	***Lmax**	**Leq**
3/4 Ton Truck	53.3	49.4
Excavator	59	55.1
Tractor Trailer Delivery Truck	52.6	48.6
Dump Truck	54.8	50.8
Concrete Delivery Truck	57.1	53.2
Tree Chipper	60.1	50.1
Total	**60.1**	59.6

*Calculated Lmax is the Loudest value.

