

Appendix 3H

Non-Project Water Transfer Analysis for Delta Conveyance

3H.1 Introduction

Non-project water is water that is not appropriated or acquired by either California Department of Water Resources (DWR) or Bureau of Reclamation (Reclamation). Export of non-project transfer water from the Sacramento–San Joaquin Delta (Delta) is primarily accomplished using State Water Project (SWP) and Central Valley Project (CVP) facilities, including the North Bay Aqueduct, and Harvey O. Banks (Banks) and C. W. “Bill” Jones (Jones) Pumping Plants. The majority of available export capacity for transfers is at Banks Pumping Plant. The Delta Conveyance Project (project) would similarly provide an opportunity to accommodate water transfers.

The purposes of this appendix are to:

1. Identify available export capacity for non-project water transfers with current facilities.
2. Determine if current export facilities (i.e., Banks Pumping Plant) limit transfer of non-project water.

CalSim 3 results are compared to other transfer information, including regulatory limitations, water supply limitations, and historical water transfers to identify available export capacity for non-project water transfers. This analysis considered whether the existing export facilities’ capacity currently limits water transfers and found that, even though the project may add additional export capacity, it is unlikely to increase the amount of water transfers because the current capacity is not fully utilized.

3H.2 Background

Water Code Section 1810 *et seq.* provides that a public entity may not deny a bona fide transferor of water access to available conveyance capacity if the conveyance of transfer water will not adversely affect the beneficial uses or quality of water in the facility and the conveyance can be provided without injuring any other legal user of water, without unreasonably affecting fish, wildlife, or other instream beneficial uses and without unreasonably affecting the overall economy or the environment of the county from which the water is being transferred.

DWR and Reclamation provide capacity for transfers of non-project water when the export can be done without affecting operations. DWR and other public agencies must allow bona fide transferors use of up to 70% of the unused capacity of a public conveyance facility in exchange for fair compensation. In determining the availability of unused capacity within the SWP or CVP for transferring water, DWR and Reclamation operators analyze annual hydrology, project operations, contractor requests, and regulatory and operational restrictions. Project operations are governed, in part, by the following regulatory requirements, which affect water transfer capacity.

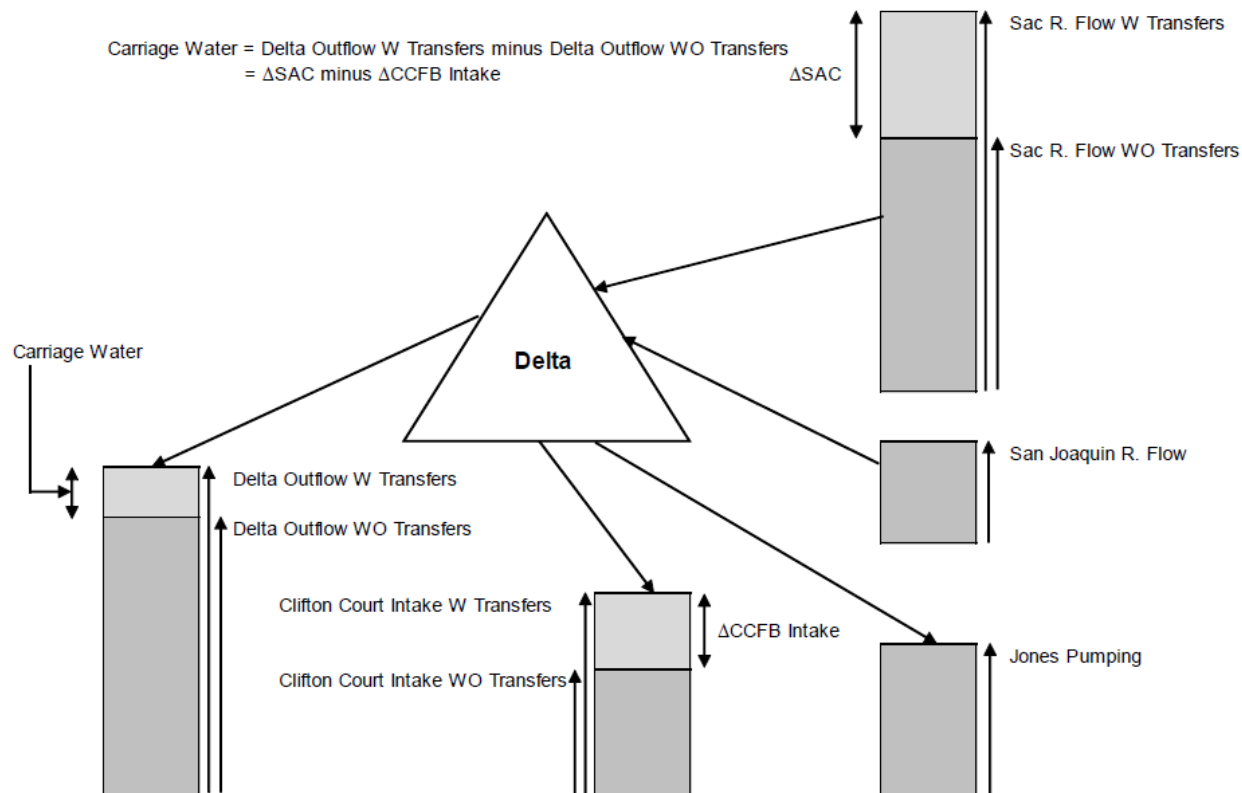
- State Water Resources Control Board Water Right Decision 1641 (D-1641)

- 1 • The 2019 National Marine Fisheries Service and U.S. Fish and Wildlife Service Biological
2 Opinions for the long-term operation of the CVP and SWP (hereinafter referred to as the 2019
3 BiOps) (National Marine Fisheries Service 2019; U.S. Fish and Wildlife Service 2019)
- 4 • The 2020 Incidental Take Permit from California Department of Fish and Wildlife for long-term
5 operation of the SWP (hereinafter referred to as 2020 ITP) (California Department of Fish and
6 Wildlife 2020)
- 7 • Permit issued by the U.S. Army Corps of Engineers (USACE)

8 Another operational consideration important for water transfers moving through the Delta is
9 carriage water. Carriage water is the portion of the water transfer dedicated as Delta outflow so as
10 to keep Delta salinity the same as it would have been if the transfer had not occurred. Carriage water
11 is expressed as a percentage of the amount of transfer water. For example, if a transferor provides
12 100 acre-feet as Delta inflow from the Sacramento River at Freeport, and 20 acre-feet is needed to
13 offset the incremental increase in Delta salinity, then the remaining 80 acre-feet of the transfer
14 water is available for export. The assessment of carriage water in this example would be 20%
15 (20/100). In other words, 20% of the transfer would be used to maintain Delta salinity conditions as
16 it would have been absent the 100-acre-feet transfer. Figure 3H-1 illustrates how carriage water is
17 calculated. DWR and Reclamation estimate carriage water based on annual hydrology, project
18 operations, and regulatory restrictions among other operational considerations. Carriage water
19 losses are a percentage reduction in export applied to the quantity of transfer water (California
20 Department of Water Resources 2019).

Carriage Water Calculation

EC or Chloride level remaining the same at control locations for both baseline and alternative



Note: A text description of this figure is provided in Chapter 39, *Description of Figures*.

Figure 3H-1. Illustration of Carriage Water Calculation

3H.3 Water Transfer Assumptions

The first step in the water transfer capacity analysis was to identify the maximum potential amount of water that could be exported given regulatory constraints, historical availability, and demand for transfer water.

3H.3.1 Permitted Water Transfer Amounts

The maximum permitted export amounts for water transfers under the 2019 BiOps and the 2020 ITP are shown in Table 3H-1. The 2019 BiOps and 2020 ITP permit water transfer only in the months of July through November.

Table 3H-1. 2019 BiOps and 2020 ITP Maximum Exports for Water Transfers

Sacramento Valley Water Year Hydrologic Classification ^a	Maximum Permitted Exports for Water Transfer in July through November (thousand acre-feet)
Critical	600
Consecutive Dry	600
Dry after Critical	600
All other years	360

2019 BiOps = 2019 National Marine Fisheries Service and U.S. Fish and Wildlife Service Biological Opinions for the long-term operation of the Central Valley Project and State Water Project; 2020 ITP = 2020 Incidental Take Permit from California Department of Fish and Wildlife for Long Term Operation of the State Water Project.

^a Water year hydrologic classification as implemented in State Water Resources Control Board Water Right Decision 1641.

3H.3.2 Assumed Available Water Transfer Supplies

The available water transfer amounts from the sellers were estimated using the Reclamation Long-Term Water Transfers (LT WT) Record of Decision (ROD) maximum seller amounts (Bureau of Reclamation 2021:7) plus the Feather River Service Area and the Long-Term Lower Yuba River Accord Water Transfer Program (Lower Yuba River Accord) assumed water transfer supplies.

The LT WT ROD has a maximum transfer volume of 250,000 acre-feet per year (Bureau of Reclamation 2021:7), which is less than the volumes in the 2019 BiOps and 2020 ITP. This LT WT ROD volume is based on buyer demand, but the LT WT EIR/EIS also identifies a longer list of potential sellers and transfer types that could contribute to CVP-related transfers. The LT WT ROD does not include all potential sellers and buyers in California. For example, potential buyers that are SWP Contractors are not included. The Feather River Service Area and the Lower Yuba River Accord assumed water transfer supplies were added to the LT WT ROD amounts because not all sellers were included in the LT WT ROD. These areas represent additional potential sources for SWP-related water transfers.

Maximum seller amounts listed in the LT WT ROD are provided in Table 3H-2.

Table 3H-2. Bureau of Reclamation Long-Term Water Transfers Record of Decision Maximum Seller Amounts

Water Agency	Maximum Potential Transfer (acre-feet per year) ^a
Sacramento River Area of Analysis	
Anderson-Cottonwood Irrigation District	5,225
Burroughs Farms	2,000
Conaway Preservation Group	35,000
Cranmore Farms	8,000
Eastside Mutual Water Company	2,230
Glenn-Colusa Irrigation District	91,000
Giusti Farms	1,000
Henle Family Limited Partnership	700

Water Agency	Maximum Potential Transfer (acre-feet per year) ^a
Lewis Ranch	2,310
Natomas Central Mutual Water Company	30,000
Pelger Mutual Water Company	3,750
Pleasant Grove-Verona Mutual Water Company	18,000
Princeton-Codora-Glenn Irrigation District	13,200
Provident Irrigation District	19,800
Reclamation District 108	55,000
Reclamation District 1004	27,175
River Garden Farms	16,000
Sutter Mutual Water Company	36,000
Sycamore Mutual Water Company	20,000
Te Velde Revocable Family Trust	7,094
American River Area of Analysis	
City of Sacramento	5,000
Placer County Water Agency	47,000
Sacramento County Water Agency	15,000
Sacramento Suburban Water District	30,000
Yuba River Area of Analysis	
Browns Valley Irrigation District	8,100
Cordua Irrigation District	12,000
Feather River Area of Analysis	
Butte Water District	17,000
Garden Highway Mutual Water Company	14,000
Gilsizer Slough Ranch	3,900
Goose Club Farms and Teichert Aggregates	10,000
Nevada Irrigation District	15,000
South Sutter Water District	15,000
Tule Basin Farms	7,320
Merced River Area of Analysis	
Merced Irrigation District	30,000
Delta Region Area of Analysis	
Reclamation District 2060	6,000
Reclamation District 2068	7,500
Pope Ranch	2,800
Yolo Ranch	8,000
Total	647,104

Source: Bureau of Reclamation 2021:7.

LT WT ROD = Bureau of Reclamation Long-Term Water Transfers Record of Decision.

^a Note from LT WT ROD: This does not represent the amount of water that would be transferred, and the total transfers would be limited to less than 250,000 acre-feet in any 1 year, based on the buyers' demands for transfers.

The maximum seller amounts listed in Table 3H-2 include the Feather River Service Area water transfer supplies. The maximum transfer amount for the Feather River Service Area was determined by selecting the maximum historical transfer amount from 2008 through 2020, which are shown in Table 3H-3. Note that Butte Water District is included in Reclamation's LT WT ROD; however, the value to represent Butte Water District is the historical transfer amount and not the LT WT ROD amount (i.e., 19,932 acre-feet instead of 17,000 acre-feet).

Table 3H-3. Historical Maximum Feather River Service Area Transfer Amounts (acre-feet)

Year	BWD	WCWD	BWGWD	RID	PMWC	SEWD	Total
2008	10,006	14,906	0	7,550	0	13,071	45,533
2009	3,608	6,085	0	7,021	0	2,599	19,313
2010	13,666	24,564	12,390	20,766	0	8,683	80,069
2011	0	0	0	0	0	0	0
2012	10,919	25,466	14,353	16,974	0	0	67,712
2013	3,378	0	0	0	0	2,514	5,892
2014	0	35,442	18,904	21,033	3,200	14,955	93,534
2015	15,488	0	0	0	1,740	1,500	18,728
2016	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0
2018	19,932	34,122	20,291	21,420	5,218	3,142	104,125
2019	0	0	0	0	0	0	0
2020	2,310	0	0	0	4,467	2,308	9,085
Maximum	19,932	35,442	20,291	21,420	5,218	14,955	117,258

BWD = Butte Water District; BWGWD = Biggs-West Gridley Water District; PMWC = Plumas Mutual Water District; RID = Richvale Irrigation District; SEWD = Sutter Extension Water District; WCWD = Western Canal Water District.

The maximum Lower Yuba River Accord transfer amount was determined by selecting the maximum historical transfer amount from 2008 through 2020, which are shown in Table 3H-4.

Table 3H-4. Historical Maximum Lower Yuba River Accord Transfer Amounts

Water Year	Sacramento Valley Water Year Hydrologic Classification ^a	Quantity (acre-feet)
2008	Critical	166,086
2009	Dry	180,000
2010	Below normal	141,856
2011	Wet	0
2012	Below normal	81,681
2013	Dry	177,274
2014	Critical	161,647
2015	Critical	89,131
2016	Below normal	60,000
2017	Wet	0
2018	Below normal	92,987
2019	Wet	0
2020	Dry	120,538
Maximum		180,000

^a Water year hydrologic classification as implemented in State Water Resources Control Board Water Right Decision 1641.

The grand total of the maximum water transfer supplies available from agencies in the Reclamation LT WT ROD, Feather River Service Area, and Lower Yuba River Accord is 927,363 (647,104 + 117,258+180,000) acre-feet. If, for example, 20% carriage water is required, then the total maximum transfer amount is 741,890 acre-feet (or 742 thousand acre-feet). While this analysis assumes maximum transfer supplies would be available in all water year types, the actual availability of transfer supplies depends on many factors, including willing sellers and buyers, market conditions, hydrologic conditions, and regulatory conditions. Thus, the analysis is conservative.

3H.3.3 Historical Cross Delta Water Transfers

A summary of the historical 1995–2020 cross Delta water transfers, based on the best available data, is shown in Table 3H-5, and the maximum values for each water year type are shown in Table 3H-6. While this analysis assumes maximum transfer volumes based on historical water transfers, historical data shows that historical transfers typically are much less than maximum transfer volumes due to willing buyers and sellers, market conditions, hydrologic conditions, regulatory conditions, etc. Therefore, future water transfers would be less than the maximum transfer volumes.

Table 3H-5. Historical 1995–2020 Cross Delta Water Transfers

Water Year	Sacramento Valley Water Year Hydrologic Classification ^a	Cross Delta Transfers Entering Delta ^b (thousand acre-feet)	Exported Cross Delta Transfers (thousand acre-feet)
1995	Wet	0	0
1996	Wet	0	0
1997	Wet	0	0
1998	Wet	0	0

Water Year	Sacramento Valley Water Year Hydrologic Classification ^a	Cross Delta Transfers Entering Delta ^b (thousand acre-feet)	Exported Cross Delta Transfers (thousand acre-feet)
1999	Wet	0	0
2000	Above normal	0	0
2001	Dry	404	323
2002	Dry	164	131
2003	Above normal	70	56
2004	Below normal	119	95
2005	Above normal	6	5
2006	Wet	0	0
2007	Dry	125	100
2008	Critical	169	135
2009	Dry	275	220
2010	Below normal	264	211
2011	Wet	0	0
2012	Below normal	85	59
2013	Dry	352	246
2014	Critical	415	332
2015	Critical	262	210
2016	Below normal	60	42
2017	Wet	0	0
2018	Below normal	254	165
2019	Wet	0	0
2020	Dry	271	190

^a Water year hydrologic classification as implemented in State Water Resources Control Board Water Right Decision 1641.

^b Values prior to carriage water.

Table 3H-6. Maximum Historical 1995–2020 Water Transfers by Water Year Type

Sacramento Valley Water Year Hydrologic Classification ^a	Water Year	Cross Delta Transfers Entering Delta (thousand acre-feet)	Exported Cross Delta Transfers (thousand acre-feet)
Wet	2019	0	0
Above normal	2003	70	56
Below normal	2010	264	211
Dry	2001	404	323
Dry following below normal, above normal, or wet	2001	404	323
Dry following dry or critical	2009	275	220
Critical	2014	415	332

^a Water year hydrologic classification as implemented in State Water Resources Control Board Water Right Decision 1641.

3H.4 Existing Water Transfer Capacity Analysis

CalSim 3 results were analyzed to estimate the available capacity for water transfers under existing conditions. The Banks and Jones Pumping Plants monthly export results were retrieved from the model. Any non-project water was removed from the Banks and Jones Pumping Plants (i.e., Lower Yuba River Accord flows). The Banks Available Pumping Capacity was calculated as follows:

$$(1) \text{ Banks Available Pumping Capacity} = 6,680 \text{ cfs} - \text{CalSim 3CS3 Banks Pumping}$$

Where:

6,680 cubic feet per second (cfs) is the allowable Clifton Court Pumping under the USACE Permit ("Clifton Court" and "Banks Pumping Plant" are used interchangeably).

The Jones Available Pumping Capacity was calculated as follows:

$$(2) \text{ Jones Available Pumping Capacity} = 4,600 \text{ cfs} - \text{CalSim 3CS3 Jones Pumping}$$

Where:

4,600 cfs is the assumed physical capacity of the Jones Pumping Plant in the CalSim 3 model.

The Total Available Pumping Capacity is as follows:

$$(3) \text{ Total Available Pumping Capacity} =$$

$$\text{Banks Available Pumping Capacity} + \text{Jones Available Pumping Capacity}$$

This calculation was tabulated only during Delta Balanced Conditions¹ and for the months of July through September (water transfer window permitted under the 2019 BiOps that allows for a commensurable comparison with the historical water transfers) and July through October (current water transfer window excluding November). The values were then averaged by each water year type, assuming the CalSim 3 May water year type represents the entire calendar year. For example, if the CalSim 3 water year type in May of 1959 is below normal, then October of 1959 would be classified as below normal as well.

The assumptions above do not consider (1) outages at the Banks and Jones Pumping Plants (this may potentially lower the available pumping capacity slightly) and (2) the additional 500 cfs in exports allowed by the USACE Permit during the summer months for the Banks Pumping Plant (this would potentially increase the available pumping capacity and more than offset any outages at the Banks and Jones Pumping Plants).

The regulatory limitations, maximum seller amounts, CalSim 3 results for available export capacity, and historical water transfers are summarized in Table 3H-7 for each water year type. Table 3H-7 (column 8) shows there is sufficient available export capacity for water transfers in all water year types with the current facilities (existing conditions). Maximum historical water transfers in each water year type were less than the permitted annual volumes. However, the CalSim 3 results indicate sufficient available export capacity during the July through October period to accommodate the maximum annual water transfer volumes permitted under the 2019 BiOps and 2020 ITP.

¹ The term *balanced conditions* are periods when it is agreed, between the United States and California, that the volume of water comprised of releases from upstream reservoirs plus unregulated flow is approximately equal to the volume of water needed to meet the water supply of Sacramento Valley in-basin uses, plus exports.

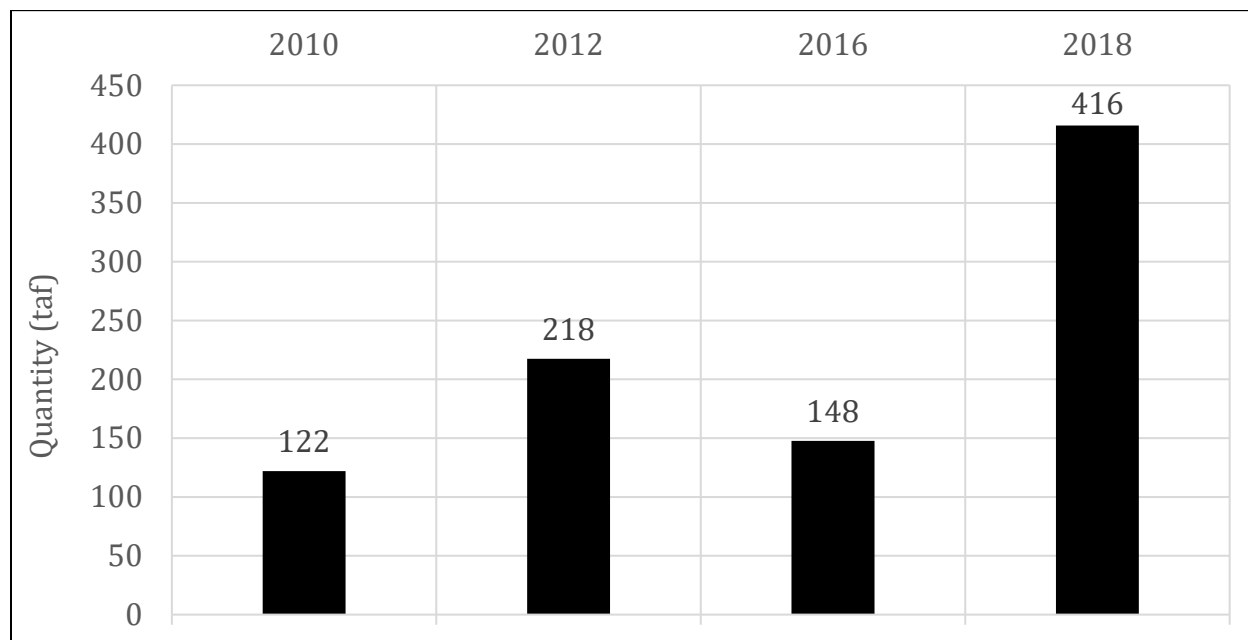
1 While the CalSim 3 model shows available capacity in wet and above normal years, historically there
2 have been minimal to no water transfers during these water year types because of higher SWP and
3 CVP water allocations that led to little to no demand for water transfers. Below normal is the only
4 water year type where historical transfers approach CalSim 3 available export capacity during the
5 months of July through September. Therefore, additional analysis was done on the below normal
6 years.

Table 3H-7. Summary of Water Transfer Information and CalSim 3 Results (thousand acre-feet)

Sacramento Valley Water Year Hydrologic Classification ^a	Maximum Permitted Exports for Water Transfer (2019 BiOps and 2020 ITP) [1]	Maximum Transfer Water Exports (Reclamation LT WT ROD) [2]	Maximum Reclamation LT WT ROD Plus Feather River Service Area Plus Lower Yuba River Accord (After 20% Carriage Water) [3]	CalSim 3 Available Banks and Jones Pumping Capacity during July–September [4]	Maximum Historical Water Transfers Exported (1995–2020, mainly July–September) [5]	CalSim 3 Available Capacity (July–September) Minus Maximum Historical [6] = [4] – [5]	CalSim 3 Available Banks and Jones Pumping Capacity during July–October [7]	CalSim 3 Available Capacity (July–October) Minus Maximum Historical [8] = [7] – [5]
Wet	360	250	742	179	0	179	308	308
Above normal	360	250	742	357	56	301	609	553
Below normal	360	250	742	238	211	27	419	208
Dry following below normal, above normal, or wet	360	250	742	965	323	642	1,357	1,034
Dry following dry or critical	600	250	742	1,104	220	884	1,452	1,232
Critical	600	250	742	1,599	332	1,267	2,029	1,697

2019 BiOps = 2019 National Marine Fisheries Service and U.S. Fish and Wildlife Service Biological Opinions for the long-term operation of the Central Valley Project and State Water Project; 2020 ITP = 2020 Incidental Take Permit from California Department of Fish and Wildlife for long-term operation of the State Water Project; Lower Yuba River Accord = Long-Term Lower Yuba River Accord Water Transfer Program; LT WT ROD = Bureau of Reclamation Long-Term Water Transfers Record of Decision.

^a Water year hydrologic classification as implemented in State Water Resources Control Board Water Right Decision 1641.



Note: A text description of this figure is provided in Chapter 39, *Description of Figures*.

Figure 3H-2. Available Clifton Court Capacity during Historical Below Normal Water Years (2010–2020)

The historical (actual) exports were retrieved for each of the below normal years in the 2010–2020 record (these values include both project and non-project water). The available export capacity was determined for Clifton Court in a similar manner as done in the CalSim 3 analysis for the Banks Pumping Plant. The Jones Pumping Plant was assumed to be zero because it would typically be at physical capacity during summer months of below normal years. The available export capacity for Clifton Court is shown in Figure 3H-2. The figure shows that export capacity is not the limiting factor during the historical below normal water years even after water transfers were exported. When the month of October is added, the CalSim 3 current facilities available export capacity provides an additional buffer (see column 8 for below normal in Table 3H-7) to convey the water transfers.

Therefore, for the current facilities, available export capacity should be sufficient to move future water transfers, and adding the project facilities for all the alternatives is not expected to affect the amount of water transfers that may occur during any water year type.

3H.5 Water Transfer Analysis at North Delta Intakes

With the project, conveyance of transfer water to the south Delta export pumps could occur via the new project facilities (i.e., new north Delta intakes and tunnel) rather than through the Delta. As described previously, carriage water is a necessary component of water transfers through the Delta. As stated previously, carriage water is the amount of Sacramento River outflow required to maintain water quality conditions in the Delta in the absence of the water transfer, and it is typically an additional amount of water beyond that of the transfer amount. The carriage water requirement varies depending on conditions of a particular water year. Purchasers of the water do not know how much carriage water will be required when the purchase is made. Since 2008, carriage water amounts have typically ranged from 20% to 35% (California Department of Water Resources 2019).

1 If some transfer water is conveyed with the new project facilities, then the amount of transfer water
2 and associated carriage water flowing into the Delta could be reduced relative to the amount that
3 occurs under existing conditions, depending on the hydrologic year and the amount of water
4 purchased. The use of the project facilities for water transfers would result in minimal effects on
5 Delta water quality relative to current operations. Under current operations, the carriage water
6 portion of the water transfer action maintains water salinity conditions in the Delta to be the same
7 as without the water transfer. In other words, the “with” and “without” water transfer conditions
8 under current operations would have similar Delta salinity conditions.

9 As such, transferring water through the north Delta intakes would result in similar Delta salinity
10 conditions as “with” or “without” water transfer conditions under current operations, as the amount
11 of Sacramento River inflow for transfer would be over and above the inflow required to meet the
12 Delta salinity regulatory requirements, and diverting that water at the north Delta intakes does not
13 result in any additional salinity changes in the Delta.

14 If water transfers were exported through the proposed north Delta intakes, buyers may assume
15 that they would receive a larger percentage of the purchased water because less carriage water
16 would be needed to maintain water quality. This assumption may lead to buyers purchasing
17 less transfer water, but the difference would likely be small.

18 3H.6 References Cited

- 19 Bureau of Reclamation. 2021. *Amended Record of Decision Long-Term Water Transfers*. Available:
20 https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361. Accessed: August
21 9, 2021.
- 22 California Department of Fish and Wildlife. 2020. *California Endangered Species Act Incidental Take*
23 *Permit No. 2081-2019-066-00. Long-Term Operation of the State Water Project in the Sacramento-*
24 *San Joaquin Delta*. Sacramento, CA: Ecosystem Conservation Division.
- 25 California Department of Water Resources. 2019. *Draft Carriage Water Overview for Non-Project*
26 *Water Transfers*. Sacramento, CA.
- 27 National Marine Fisheries Services. 2019. *Biological Opinion of Long-Term Operation of the Central*
28 *Valley Project and the State Water Project*. October 21. National Marine Fisheries Service, West
29 Coast Region.
- 30 U.S. Fish and Wildlife Service. 2019. *Biological Opinion for the Reinitiation of Consultation on the Long*
31 *Term Coordinated Operations of the Central Valley Project and State Water Project*. Service File
32 No. 08FBTD00-2019-F-0164. October 21. Sacramento, CA.