due to stream-aquifer interaction. Reductions in flow of approximately 50 TAF or more are a result of changes in stream and flood bypass flows during surplus conditions after one or more years of groundwater substation transfers. These changes are also illustrated above in Figure B-6.

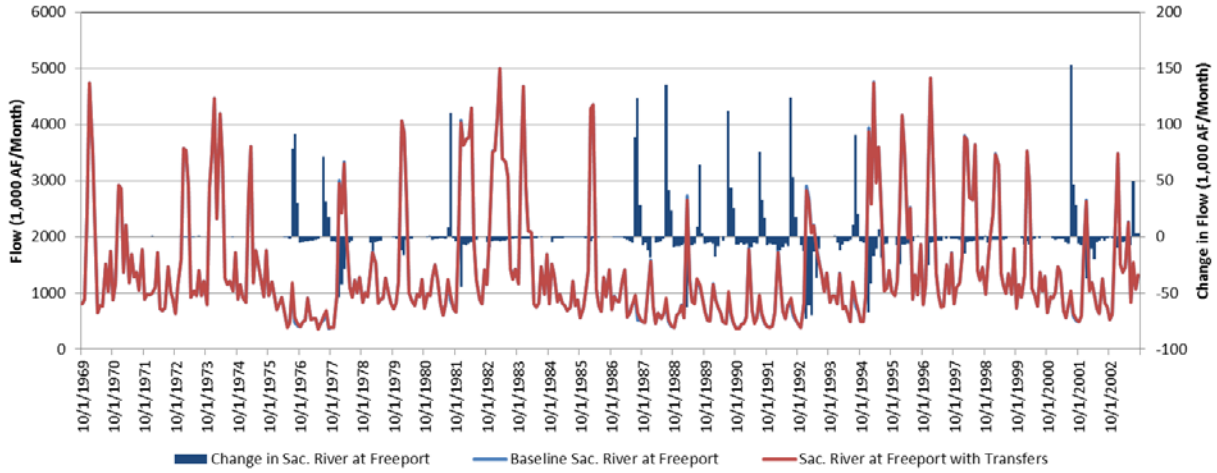

Figure B-54. Sacramento River at Freeport with and without Alternative 3 Transfers

Figure B-55 illustrates changes on the Merced River at the confluence with the San Joaquin River. Change in flow corresponds to storage change at Lake McClure; increases represent transfer water made available by reservoir releases at Lake McClure while decreases result from reservoir refill.

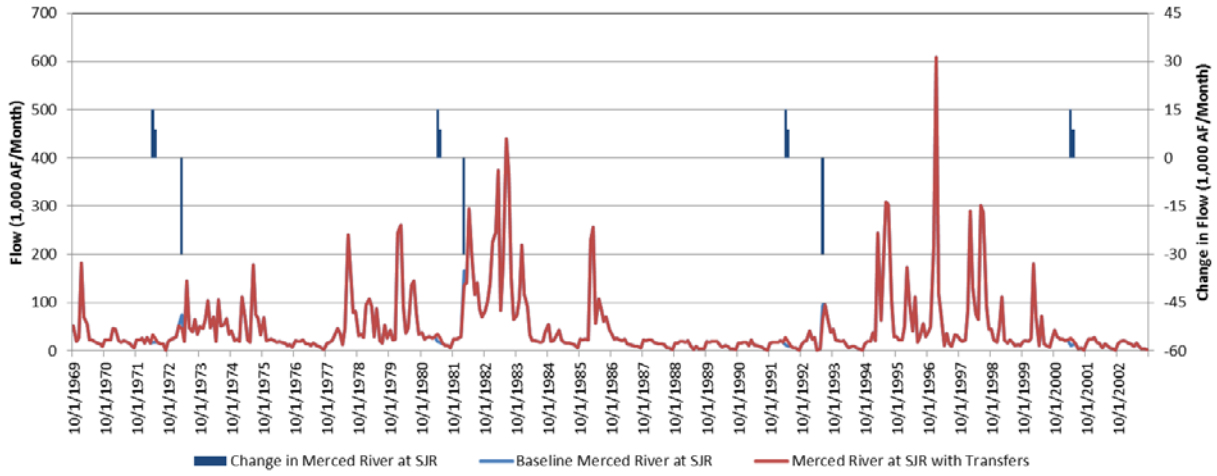

Figure B-55. Merced River at the San Joaquin River with and without Alternative 3 Transfers

Figure B-56 illustrates San Joaquin River flows at Vernalis. Increases in flow are Merced ID transfer water to be diverted at Banta Carbona ID and conveyed to the DMC prior to reaching the head of Old River. Decreases in flow occur

when Lake McClure refills space vacated by reservoir release transfers and also reduce Delta outflow.

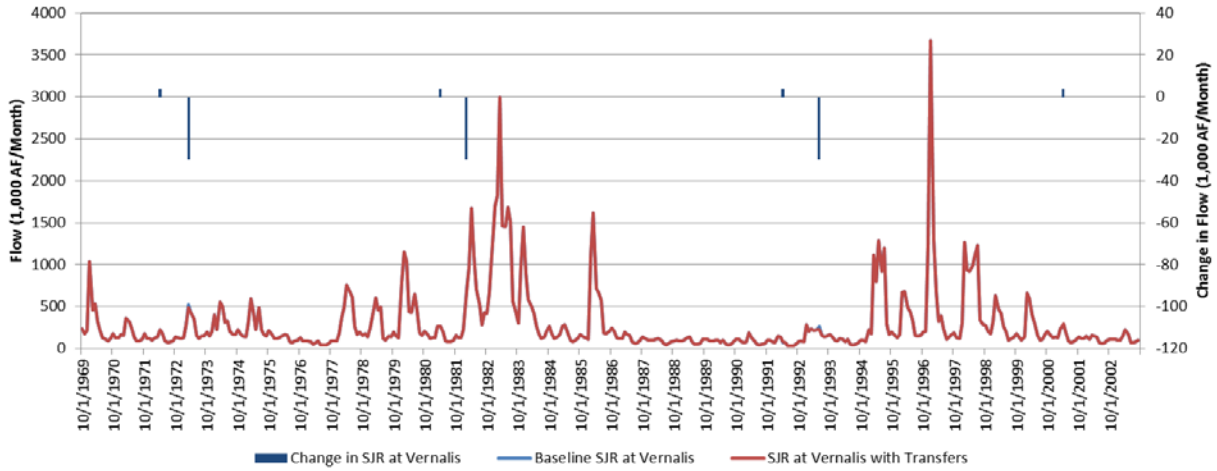

Figure B-56. San Joaquin River at Vernalis with and without Alternative 3 Transfers

Changes to Delta outflow are illustrated below in Figure B-57. Increases in Delta outflow are primarily due to carriage water to facilitate transfers. Decreases in Delta outflow are attributed to reservoir refill upstream and changes in stream-aquifer interaction during surplus conditions.

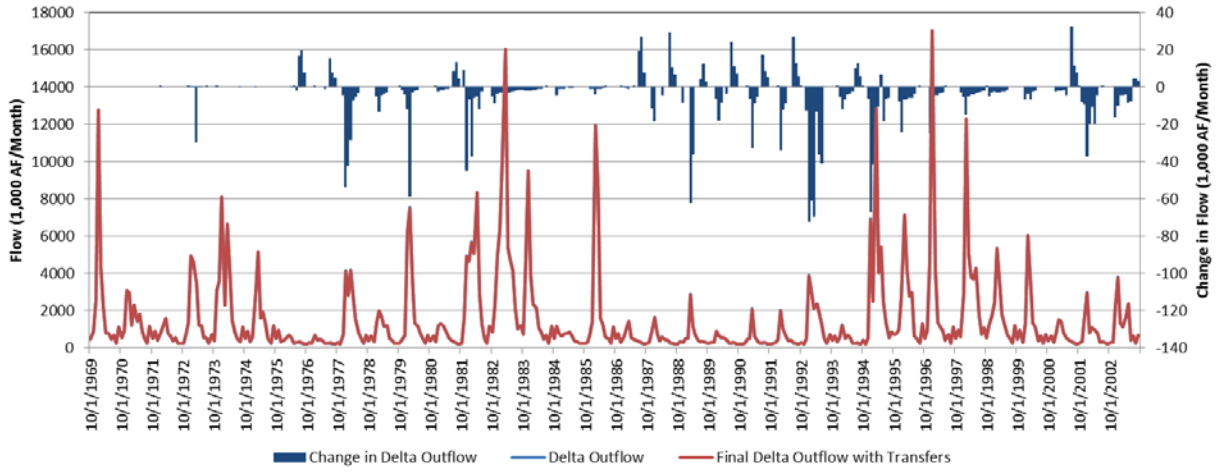

Figure B-57. Delta Outflow with and without Alternative 3 Transfers

Table B-5 summarizes changes in Delta outflow on a monthly average basis. Average annual Delta outflow is reduced by approximately 31 TAF. Delta outflow increases from July through September due to carriage water for transfers through the Delta. Delta outflow is reduced from November through June when reservoirs refill and from changes in stream-groundwater interaction during surplus conditions.

Table B-5. Average Monthly Delta Outflow in (TAF) for Alternative 3

Delta Outflow	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	393	867	1,490	3,260	3,312	3,278	1,753	1,381	816	546	297	638	18,031
With Transfers	393	867	1,485	3,250	3,300	3,268	1,748	1,378	813	552	301	640	17,995
Change	0	-1	-5	-10	-12	-10	-5	-3	-3	6	4	2	-37

B.6.3.3 Exports and Diversions

Figure B-58 illustrates the change in exports at Jones Pumping Plant. Increases are primarily transfer water exported to SLDMWA. Decreases in exports at Jones occur as a result of changes in stream-groundwater interaction that reduce Delta inflow during balanced conditions.

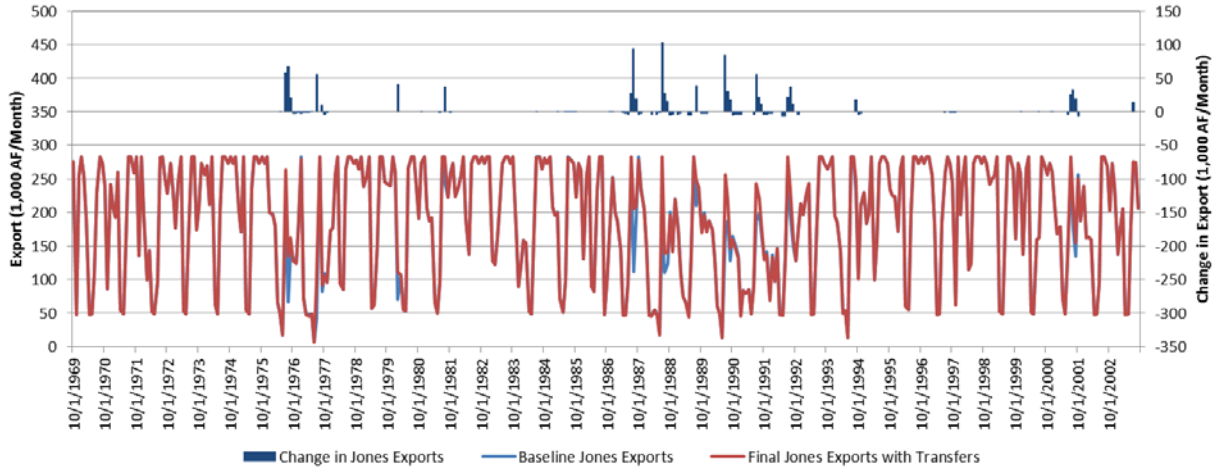

Figure B-58. Exports at Jones Pumping Plant with and without Alternative 3 Transfers

Table B-6 summarizes the average monthly exports at Jones Pumping Plant. Increases occur during the transfer months of July, August, and September, with an average annual increase of 25 TAF. There are small decreases in most other months.

Table B-6. Average Monthly Exports at Jones Pumping Plant (TAF) for Alternative 3

Jones Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	222	212	235	197	186	198	69	65	153	256	252	223	2,268
With Transfers	221	211	235	197	187	198	69	65	152	269	263	227	2,292
Change	-1	-1	0	0	1	0	0	-1	-1	13	11	4	25

Increases in exports at Banks Pumping Plant occur when Banks is used to export transfer water. This is illustrated below in Figure B-59.

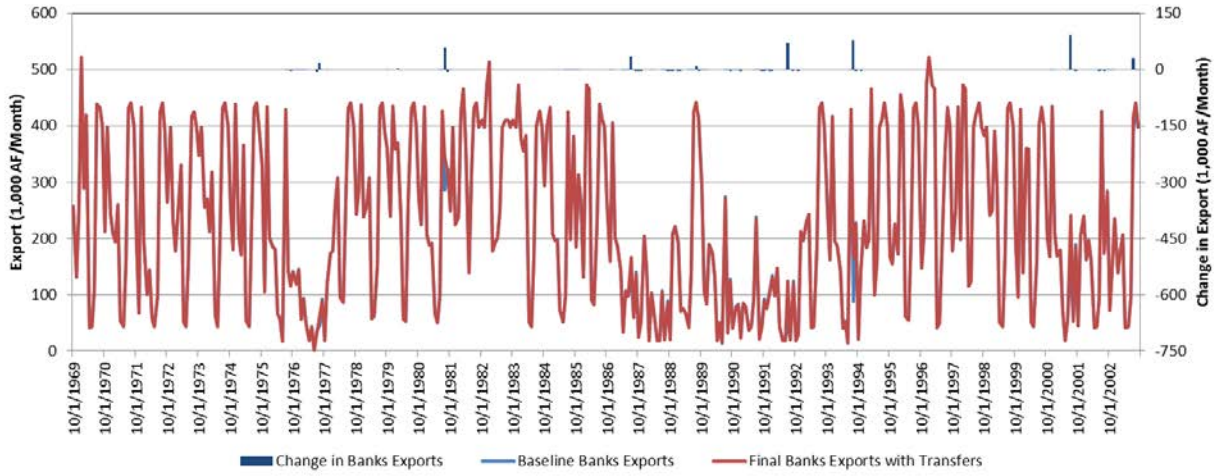

Figure B-59. Exports at Banks Pumping Plant with and without Alternative 3 Transfers

Table B-7 summarizes the average monthly exports at Banks Pumping Plant. Pumping increases in the months of July, August, and September with an average annual increase of 8.3 TAF.

Table B-7. Average Monthly Exports at Banks Pumping Plant (TAF) for Alternative 3

Banks Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	202	212	307	222	239	261	70	62	156	363	316	320	2,731
With Transfers	201	211	307	221	239	261	70	62	156	370	320	319	2,737
Change	-1	-1	0	0	0	0	0	0	0	6	4	-1	6

Total CVP/SWP exports, the sum of exports at Jones and Banks Pumping Plants, are illustrated in Figure B-60.

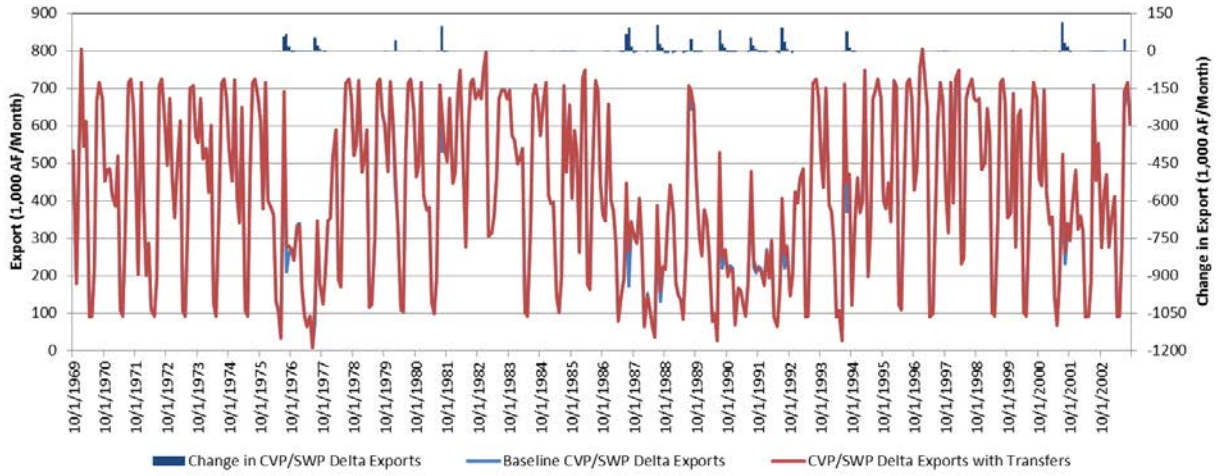

Figure B-60. Total CVP/SWP Exports from the Delta with and without Alternative 3 Transfers

Table B-8 summarizes the average monthly combined CVP/SWP exports. The average annual change under Alternative 3 is approximately 31 TAF. Exports increase in the July through September period and decrease in most other months.

Table B-8. Average Monthly Combined CVP/SWP Exports (TAF) for Alternative 3

CVP/SWP Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	424	424	543	419	425	459	138	128	309	619	568	543	4,998
With Transfers	422	422	542	418	426	459	138	127	308	638	583	546	5,030
Change	-2	-2	-1	-1	1	0	0	-1	-1	19	16	3	31

Figure B-61 illustrates baseline, Alternative 3, and the change in East Bay MUD diversions at Freeport. The changes are an increase in diversions during months when East Bay MUD would be taking CVP Project water.

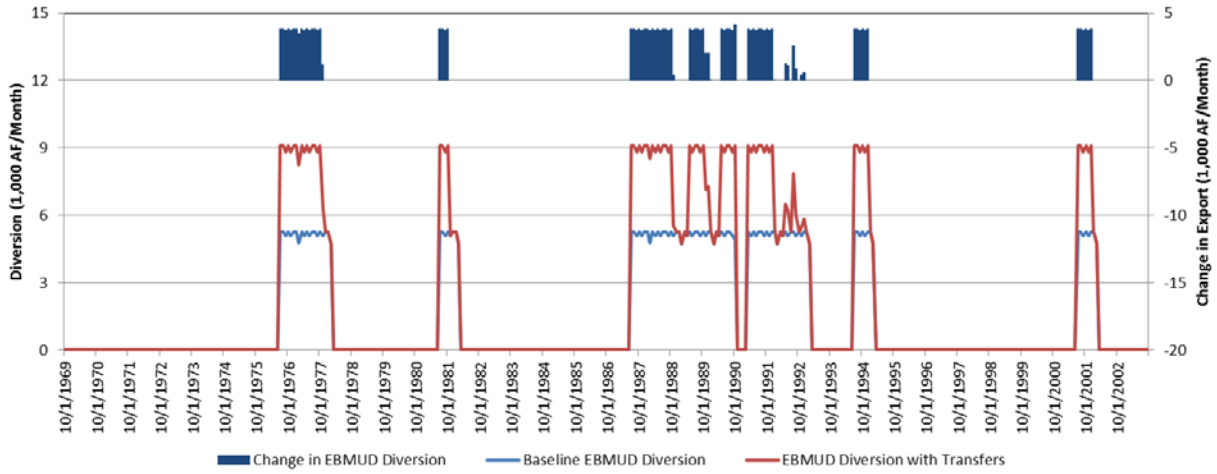

Figure B-61. East Bay MUD Diversions with and without Alternative 3 Transfers

Contra Costa WD diversions increase to take delivery of transfer water as illustrated below in Figure B-62. Contra Costa WD identified an annual transfer demand of up to 15 TAF and this volume of water diverted at a rate of five TAF per month during the July through September period. Contra Costa WD diversions of transfer water are assumed to occur at the point of diversion with the best water quality and available capacity.

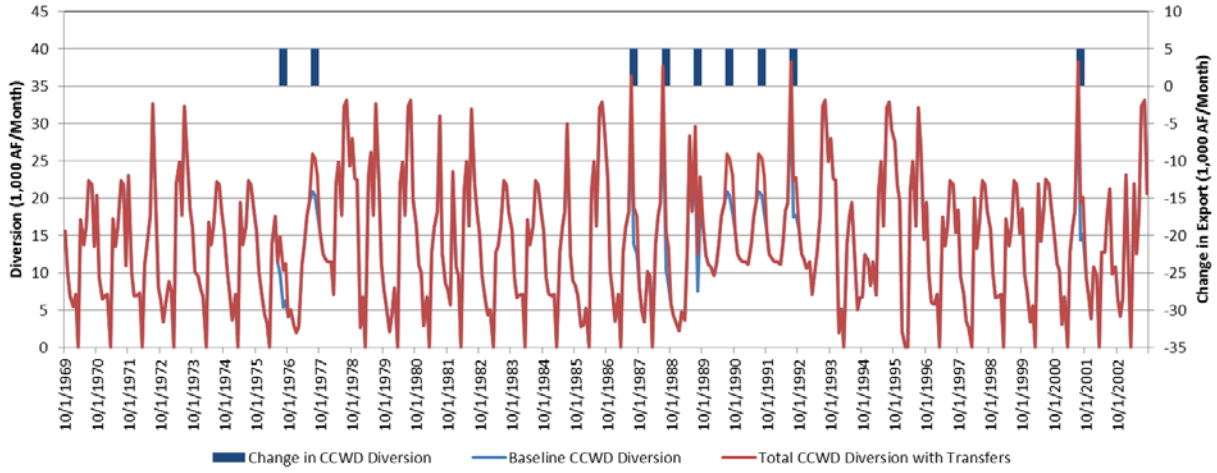

Figure B-62. Contra Costa WD Diversions with and without Alternative 3 Transfers

B.6.4 Alternative 4: No Groundwater Substitution

Alternative 4 would include transfers through cropland idling, crop shifting, stored reservoir release, and conservation. It would not include any groundwater substitution transfers.

Figure B-63 summarizes the quantity of transfer water made available under Alternative 4 on an annual basis and illustrates where the water is diverted or used. As in the other alternatives, a percentage of water to be transferred through the Delta goes to carriage water to maintain Delta water quality with increased exports under the transfer alternative. The volume of crop idling water available under Alternative 4 is greater than under Alternative 2 because some sellers may choose to expand crop idling transfers if groundwater substitution transfers are not used.

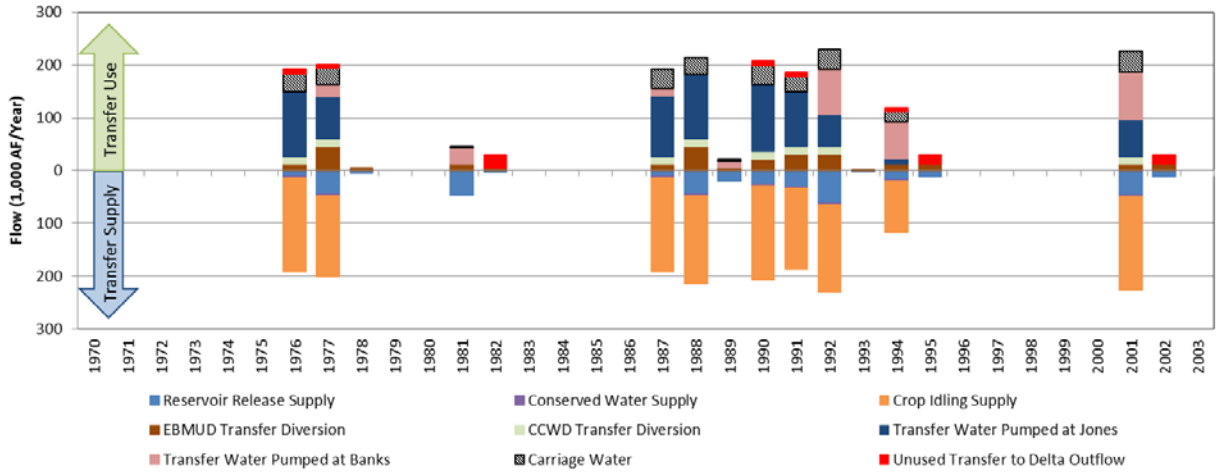

Figure B-63. Annual Transfers Summary for Alternative 4

B.6.4.1 Storage

Figure B-64 illustrates the change in operations at Shasta with the Project. Under Alternative 4 Shasta storage increases in some month when transfer water made available in May and June from crop idling can be stored for transfer in July, August, and September. There are no reductions in Shasta storage under this alternative because there are no releases in excess of baseline releases to account for changes in stream-aquifer interaction.

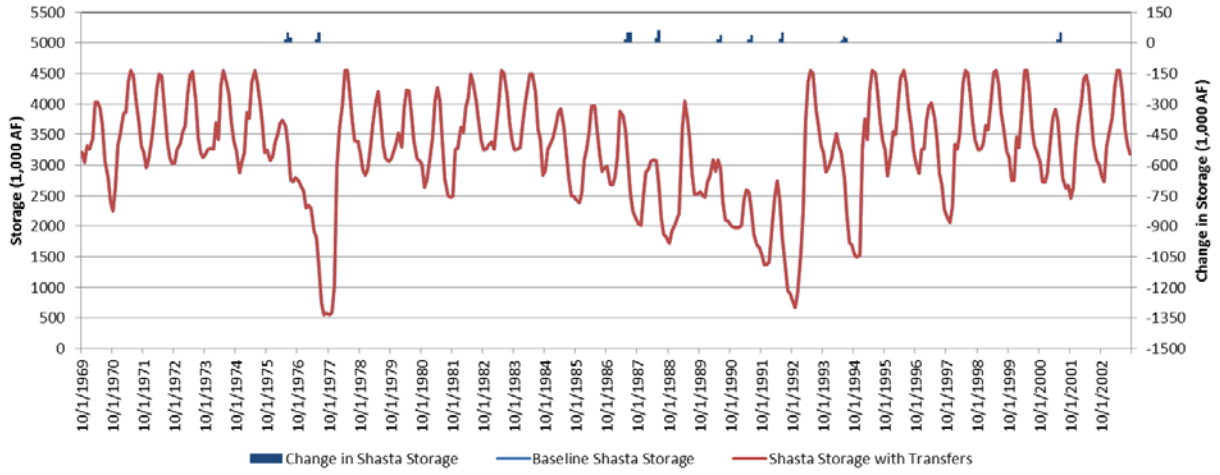

Figure B-64. Shasta Operations with and without Alternative 4 Transfers

Operations at Folsom under Alternative 4 are illustrated below in Figure B-65. Transfer water can be temporarily stored in Folsom for release and delivery in subsequent months. This includes transfers from crop idling in the Sacramento Valley, and reservoir release from upstream Placer County Water Agency reservoirs.

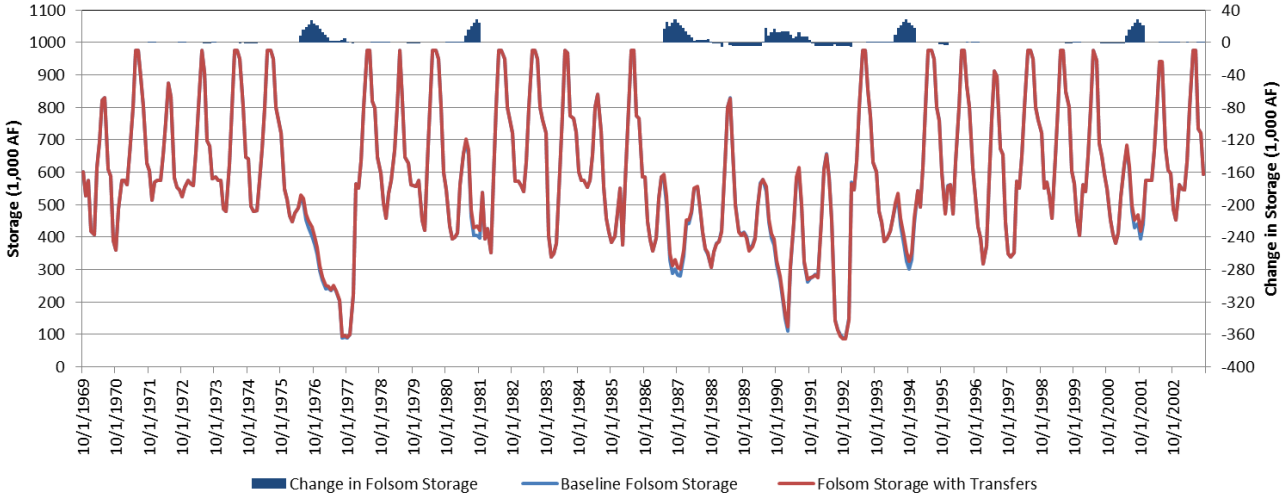

Figure B-65. Folsom Operations with and without Alternative 4 Transfers

Figure B-66 illustrates the change in SWP operations at Oroville. Changes in Oroville storage occur from shifts in the timing of delivery of SWP water to accommodate transfers and temporary storage of crop idling water.

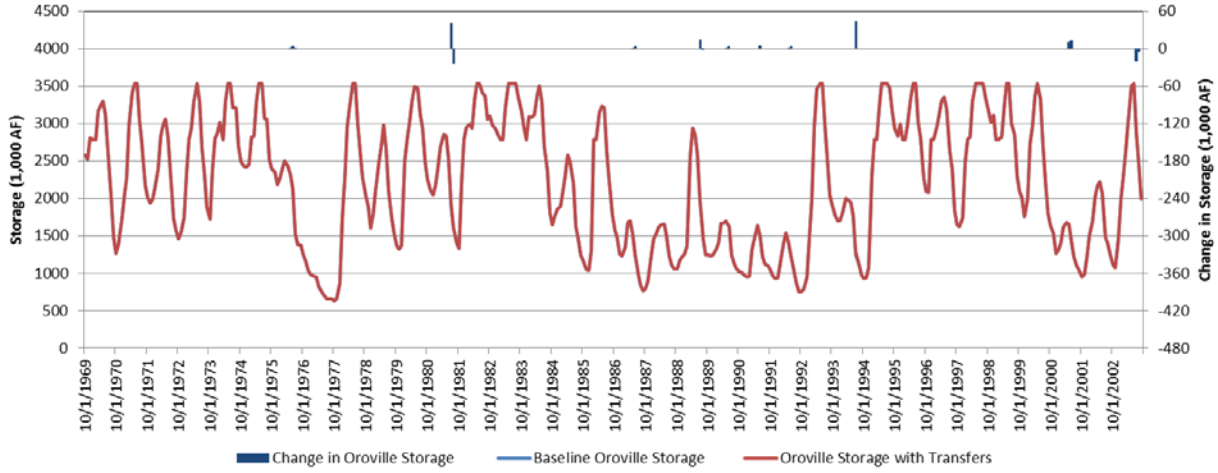

Figure B-66. Oroville Operations with and without Alternative 4 Transfers

South Sutter WD releases water from Camp Far West Reservoir to participate in reservoir release transfers. Figure B-67 illustrates the only change in reservoir storage from baseline conditions as the quantity released for transfer. Camp Far West Reservoir storage returns to baseline levels when the reservoir refills.

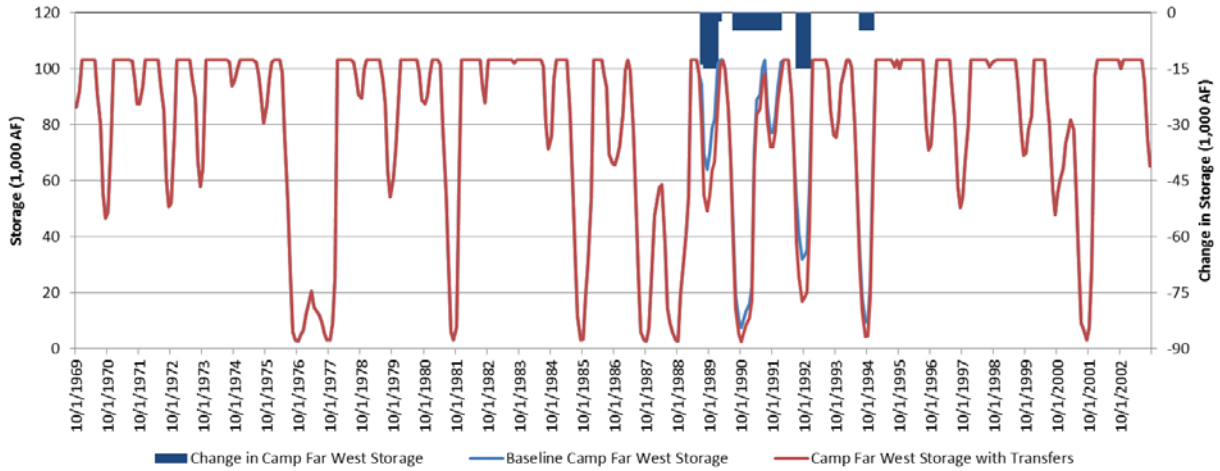

Figure B-67. Camp Far West Operations with and without Alternative 4 Transfers

Browns Valley ID releases up to five TAF of water from Merle Collins Reservoir for transfer. Changes in Merle Collins storage are the same for Alternatives 2, 3, and 4 because all alternatives include reservoir release transfer measures. Figure B-68 illustrates Browns Valley ID operations of Merle Collins when making reservoir release transfers of up to five TAF.

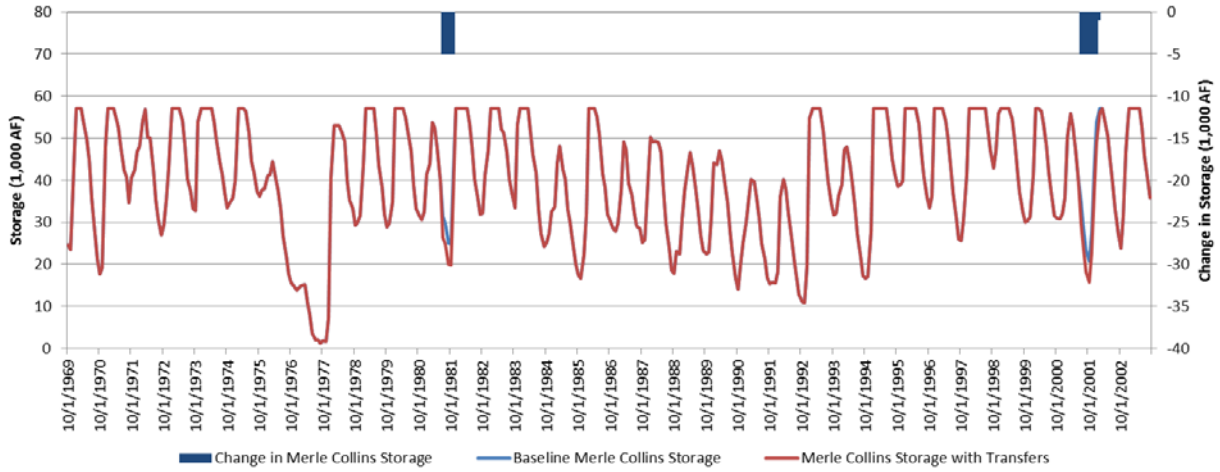

Figure B-68. Merle Collins Operations with and without Alternative 4 Transfers

Placer County Water Agency releases water from MFP reservoirs for transfer to East Bay MUD. Changes in MFP storage are the same for Alternatives 2, 3,

and 4 because all alternatives include reservoir release transfer measures (see Figure B-69).

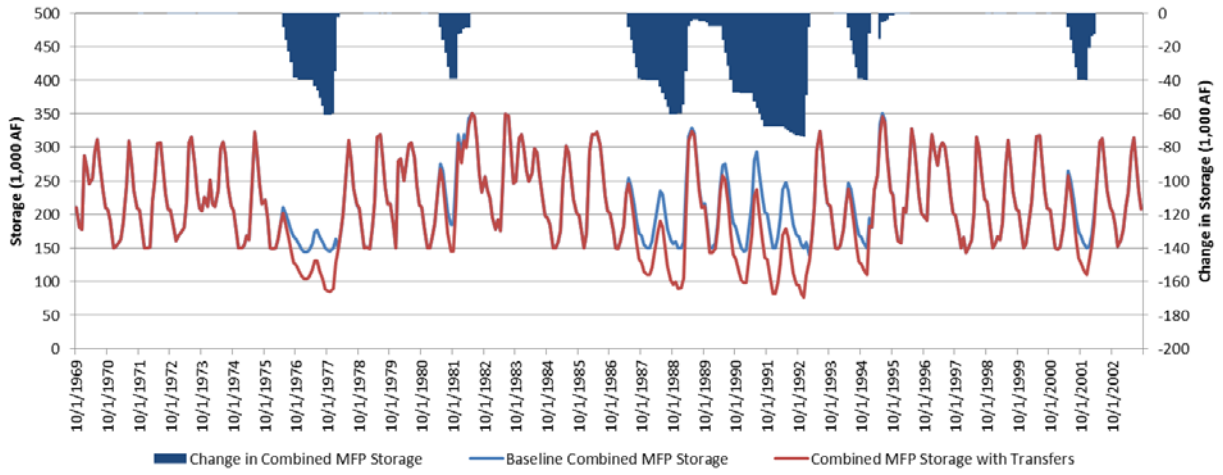

Figure B-69. MFP Operations with and without Alternative 4 Transfers

Figure B-70 illustrates Merced ID operations of Lake McClure when making reservoir release transfers of up to 30 TAF.

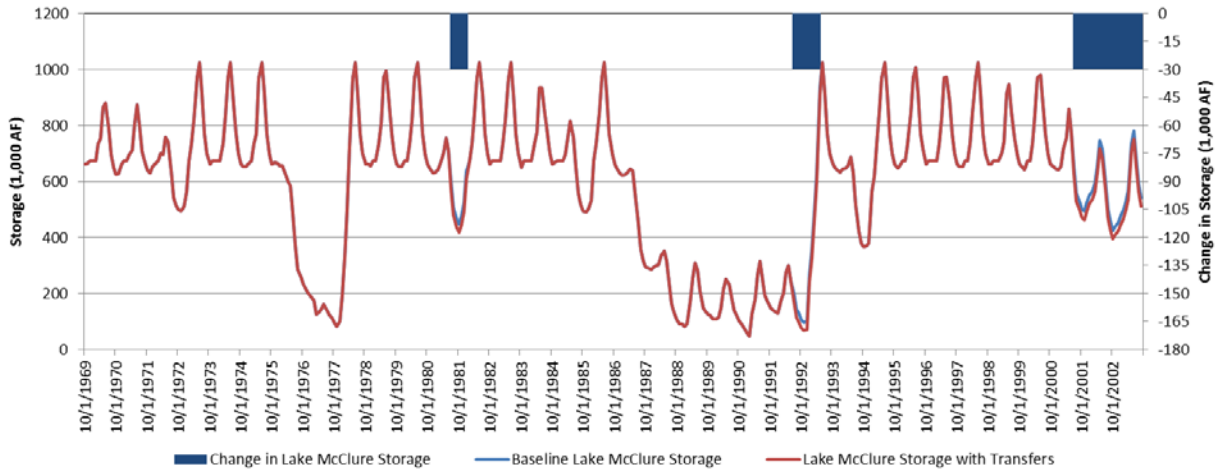

Figure B-70. Lake McClure Operations with and without Alternative 4 Transfers

Browns Valley ID's conserved water is stored in Yuba County Water Agency's New Bullards Bar Reservoir and released for transfer in years with demand and available export capacity. These releases of conserved water are the only effect to New Bullards Bar Reservoir as illustrated below in Figure B-71. New Bullards Bar Reservoir storage returns to baseline levels when the reservoir refills.

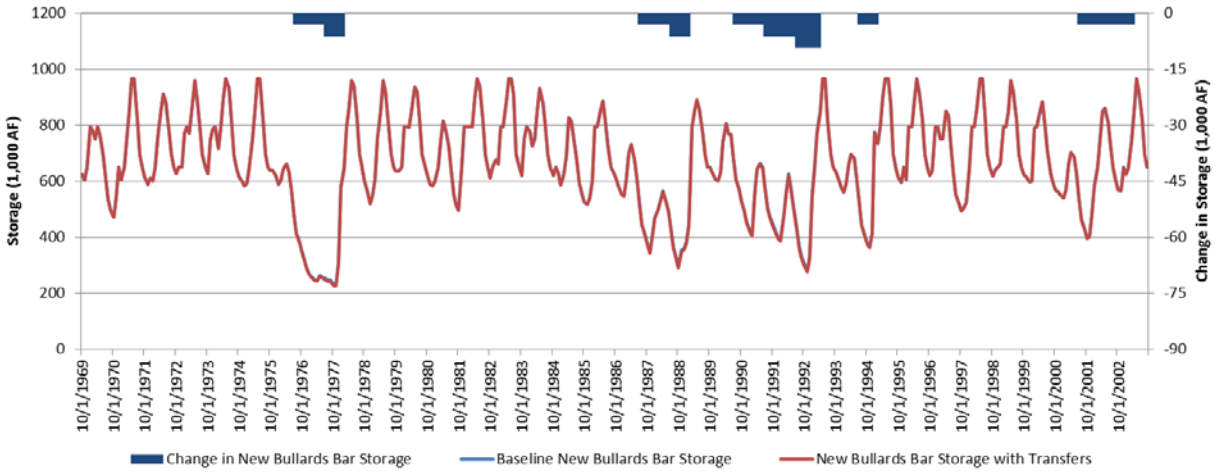

Figure B-71. New Bullards Bar Operations with and without Alternative 4 Transfers

B.6.4.2 Stream Flow

Releases from Keswick Dam correspond with Shasta operations as illustrated below in Figure B-72. Decreases in release occur when crop idling transfers are stored in Shasta and precede increases as stored transfer water is released for transfer through the Delta. There are no releases in response to changes in stream-groundwater interaction because there are no groundwater substitution transfers in Alternative 4.

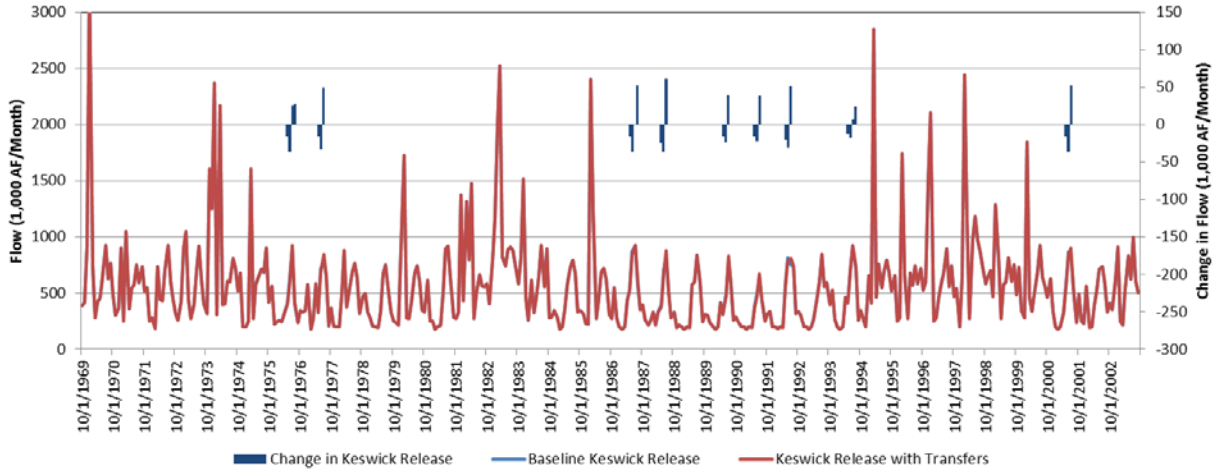

Figure B-72. Keswick Dam Release with and without Alternative 4 Transfers

Figure B-73 illustrates the effect of Alternative 4 transfers to the Sacramento River at Wilkins Slough. Increased flows result from changes in Keswick release, plus water made available by crop idling transfers upstream of Wilkins Slough. Decreases occur when transfer water is stored upstream in Shasta.

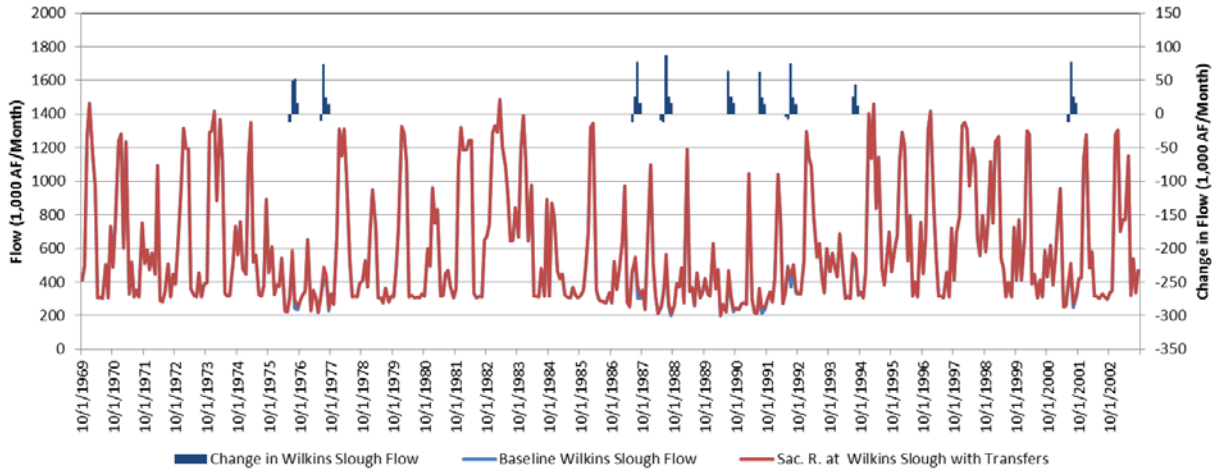

Figure B-73. Sacramento River at Wilkins Slough with and without Alternative 4 Transfers

Figure B-74 illustrates Nimbus Dam releases. Nimbus releases reflect CVP operations of Folsom Reservoir. Increases in release occur when Placer County Water Agency transfer water is released from Folsom for diversion at Freeport by East Bay MUD. Decreases can occur if transfer water made available downstream from Folsom is stored in Folsom and when Placer County Water Agency's upstream reservoirs refill.

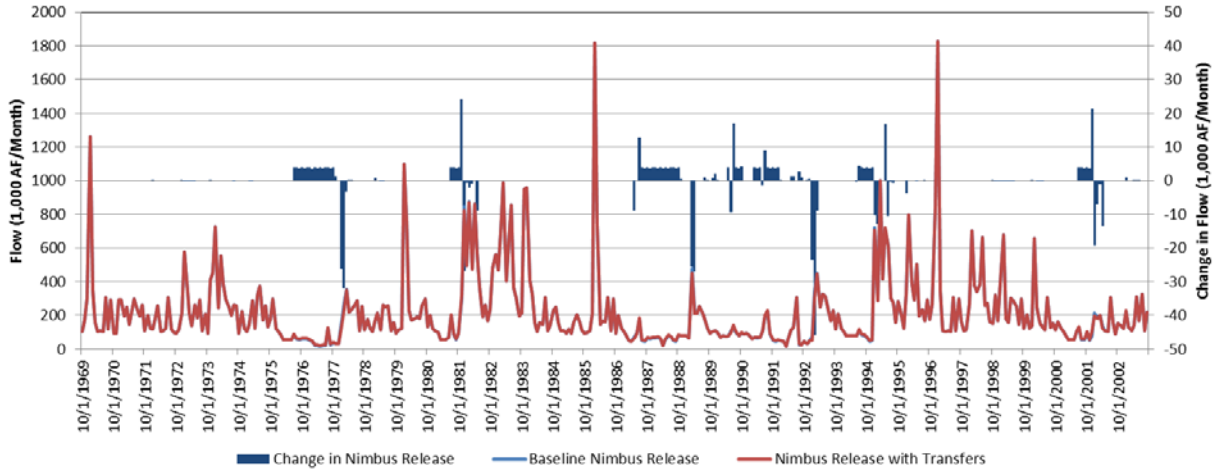

Figure B-74. Nimbus Dam Release with and without Alternative 4 Transfers

Flows on the American River at H Street, illustrated below in Figure B-75, reflect the same changes in flow under Alternative 4 as illustrated above at Nimbus.

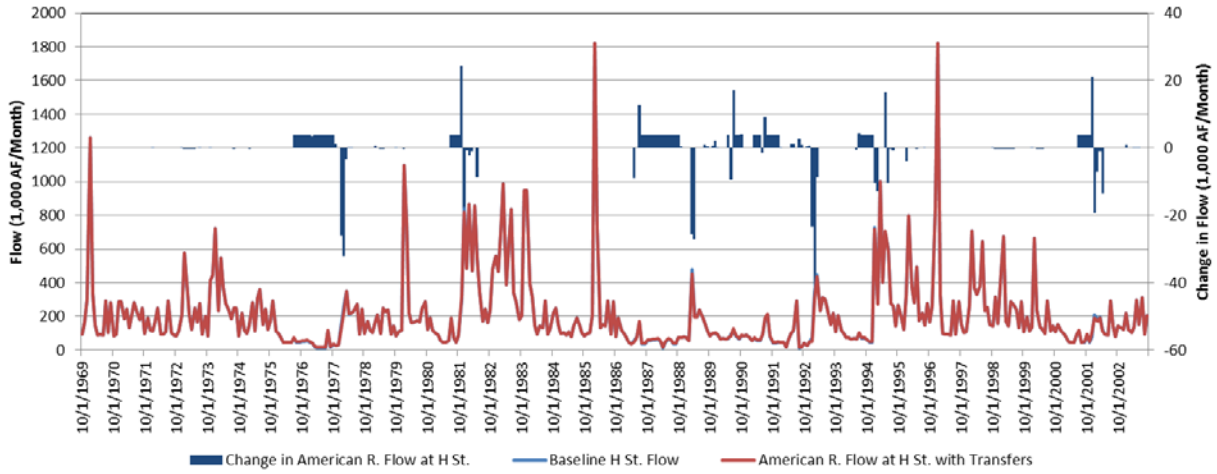

Figure B-75. American River at H Street with and without Alternative 4 Transfers

Figure B-76 illustrates change in Feather River flow below Thermalito. Feather River flows change due to changes in operations at Oroville. Increases and decreases in flow on the Feather River below Thermalito are primarily a result of shifting the timing of delivery of SWP water to accommodate transfers. Changes also occur when crop idling water, stored in previous months, is released down the Feather River for delivery through the Delta.

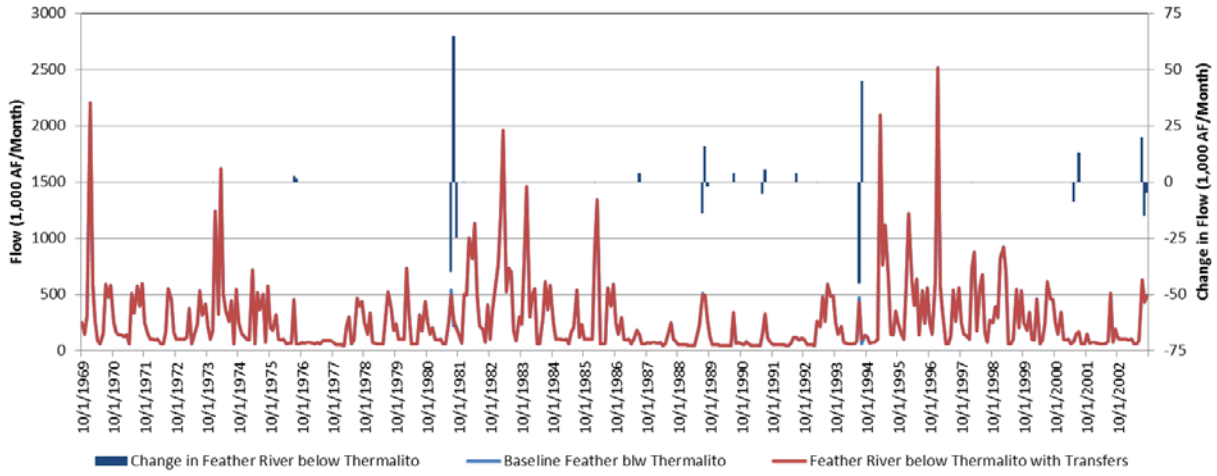

Figure B-76. Feather River below Thermalito with and without Alternative 4 Transfers

Figure B-77 illustrates changes in flow on the Yuba River as a result of Browns Valley ID's reservoir release transfers from Merle Collins Reservoir and release of Browns Valley ID's conserved water from New Bullards Bar Reservoir. Decreases occur when these reservoirs refill.

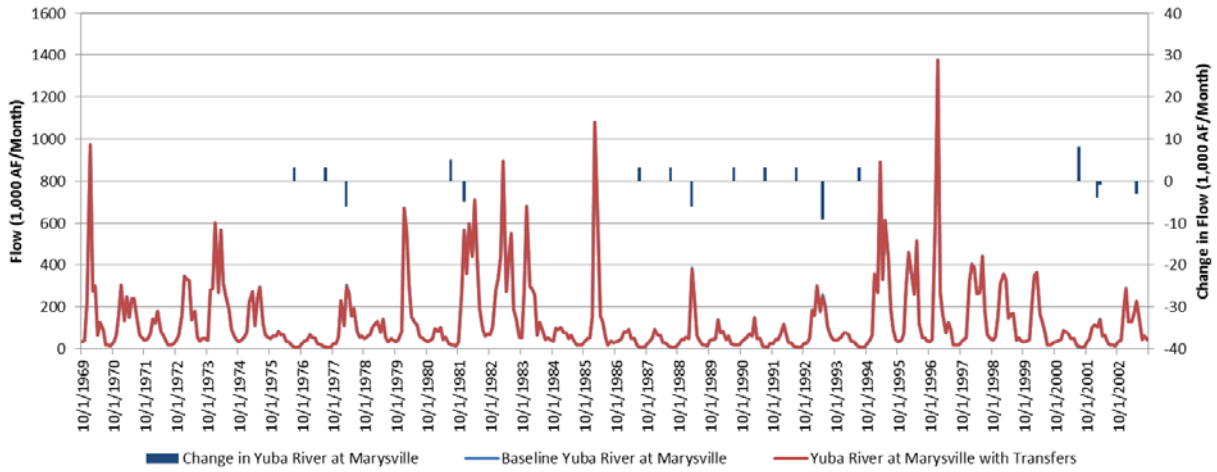

Figure B-77. Yuba River at Marysville with and without Alternative 4 Transfers

Figure B-78 illustrates the response of Bear River flows into the Feather River as a result of South Sutter WD reservoir release transfers from Camp Far West Reservoir. Flows increase when water is released for transfer and decrease when Camp Far West refills.

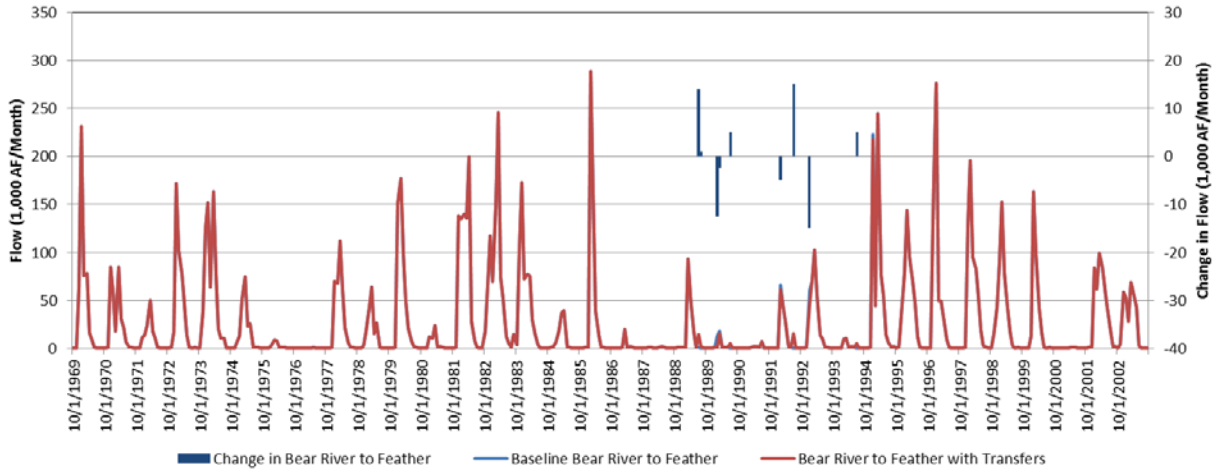

Figure B-78. Bear River to the Feather River with and without Alternative 4 Transfers

The flow on the Lower Feather River represents an aggregation of flows on the Yuba River, Bear River, and upper portions of the Feather River. There are also increases due to water made available by crop idling transfers. Figure B-79 represents the effect to the Feather River system.

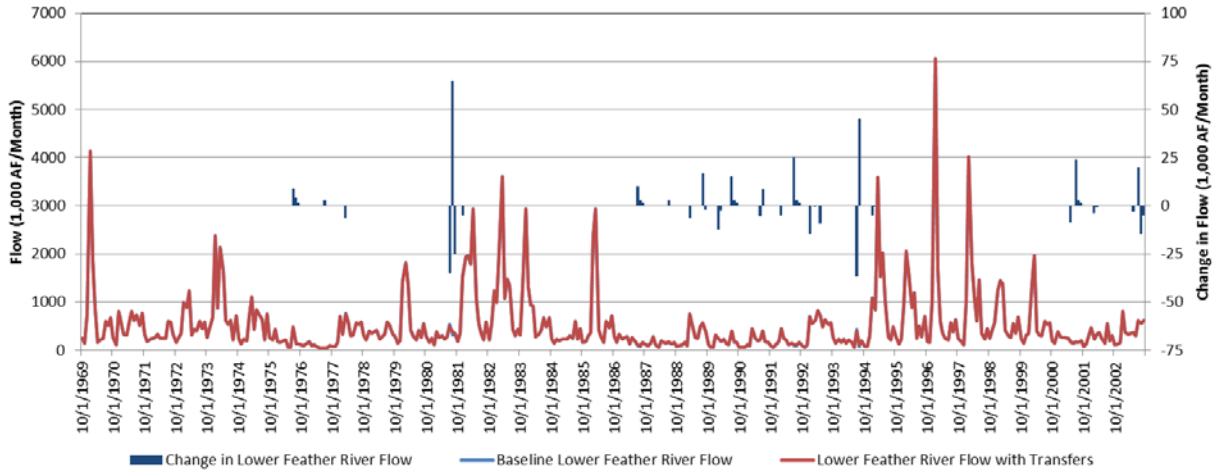

Figure B-79. Lower Feather River with and without Alternative 4 Transfers

Figure B-80 illustrates the flow of the Sacramento River at Freeport. This location is an aggregation of all changes on the Sacramento River at Wilkins Slough, the Lower Feather River, and the American River at H Street, and changes between those locations and Freeport. Changes between those locations and Freeport include increases in flow due to water made available through crop idling transfers.

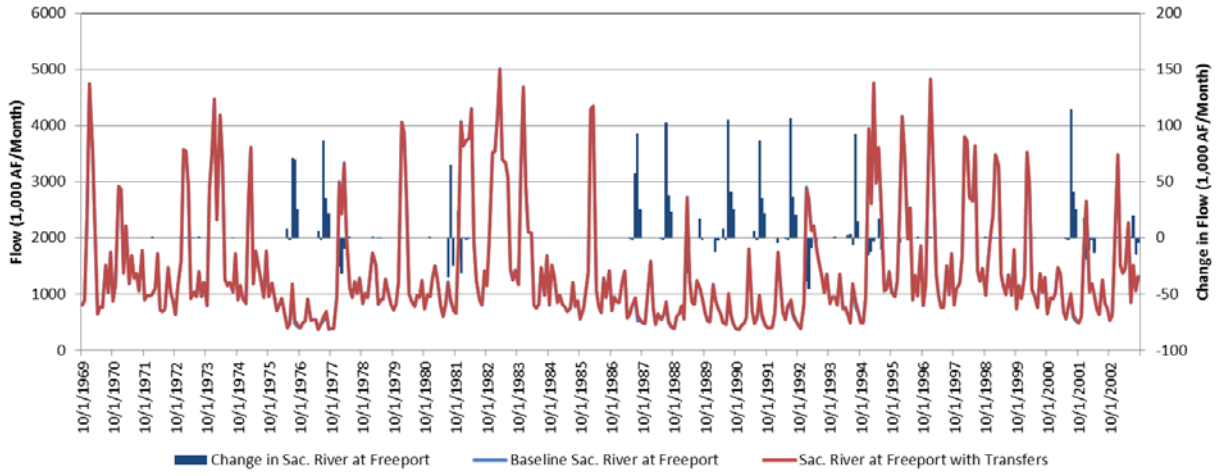

Figure B-80. Sacramento River at Freeport with and without Alternative 4 Transfers

Figure B-81 illustrates changes on the Merced River at the confluence with the San Joaquin River. Increases in Merced River flow are transfer water made available by reservoir releases at Lake McClure; decreases are a result of reservoir refill.

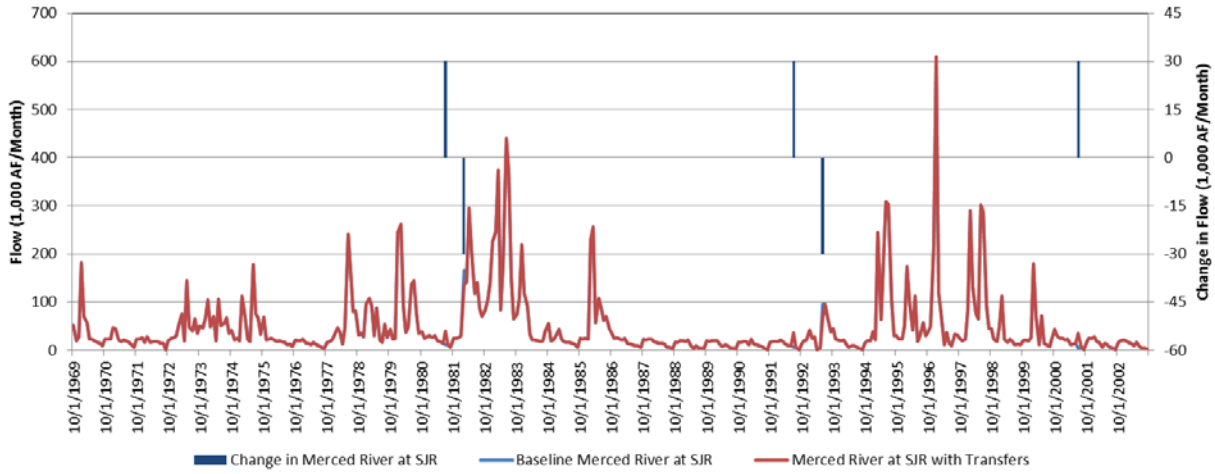

Figure B-81. Merced River at the San Joaquin River with and without Alternative 4 Transfers

Figure B-82 illustrates San Joaquin River flows at Vernalis. Increases in flow result from Merced ID transfers. Under Alternative 4, transfer water made available by Merced ID is diverted at CVP/SWP export facilities in the south Delta. Therefore, changes at Vernalis equal changes in Merced River flows at the confluence with the San Joaquin River.

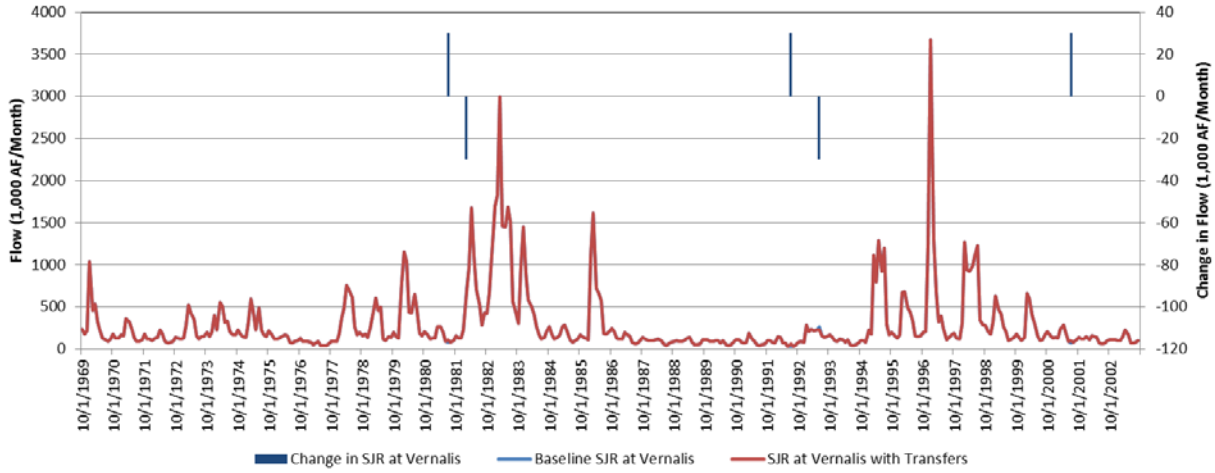

Figure B-82. San Joaquin River at Vernalis with and without Alternative 4 Transfers

Changes to Delta outflow are illustrated below in Figure B-83. Increases in Delta outflow are primarily due to carriage water to facilitate transfers through the Delta. Decreases in Delta outflow are attributed to reservoir refill upstream.

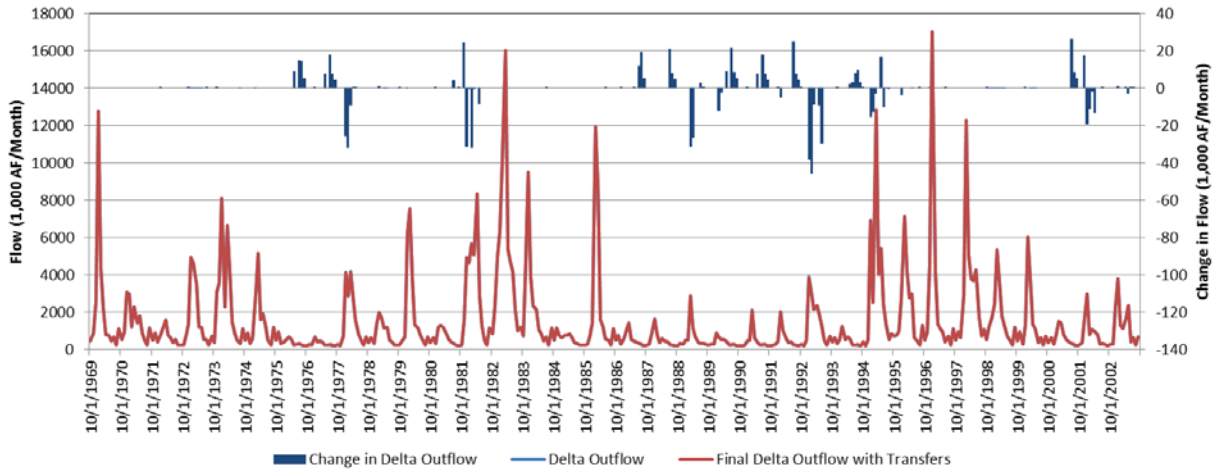

Figure B-83. Delta Outflow with and without Alternative 4 Transfers

Table B-9 summarizes these changes on an average monthly and annual basis. Average annual Delta outflow is reduced by one TAF with increases primarily from July through September for carriage water and decreases primarily from January through March as reservoirs that made transfer releases refill.

Table B-9. Average Monthly Delta Outflow (TAF) for Alternative 4

Delta Outflow	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	393	867	1,490	3,260	3,312	3,278	1,753	1,381	816	546	297	638	18,031
With Transfers	393	868	1,489	3,257	3,307	3,277	1,751	1,382	815	551	300	640	18,030
Change	0	1	0	-3	-4	-2	-1	1	-1	5	3	1	-1

B.6.4.3 Exports and Diversions

Figure B-84 illustrates the change in exports at Jones Pumping Plant. Under Alternative 4 there are only increases in exports.

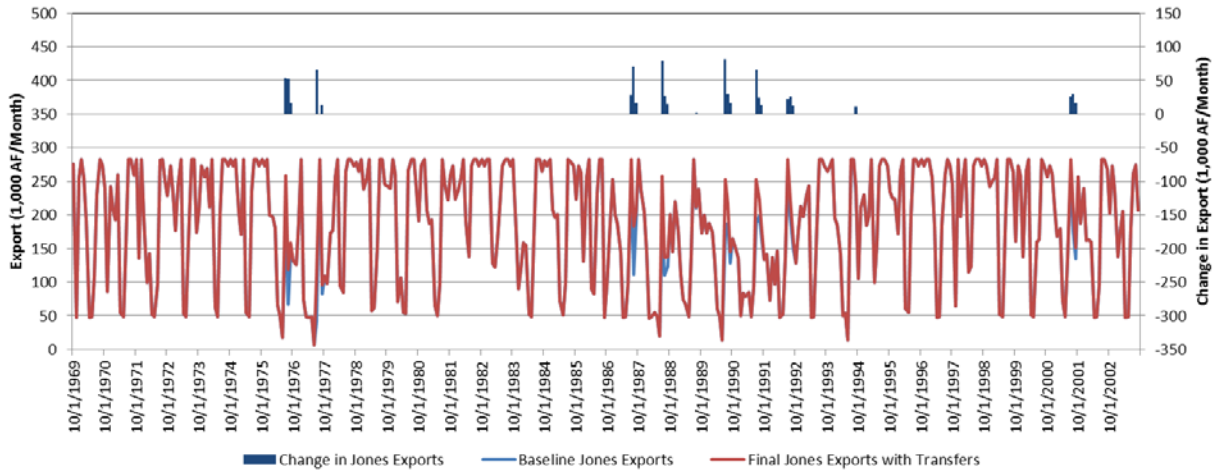

Figure B-84. Exports at Jones Pumping Plant with and without Alternative 4 Transfers

Table B-10 summarizes the average monthly exports at Jones Pumping Plant. Increases occur during the transfer months of July, August, and September, with an average annual increase of 24 TAF.

Table B-10. Average Monthly Exports at Jones Pumping Plant (TAF) for Alternative 4

Jones Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	222	212	235	197	186	198	69	65	153	256	252	223	2,268
With Transfers	222	212	235	197	186	198	69	65	153	268	259	227	2,291
Change	0	0	0	0	0	0	0	0	0	12	8	4	24

Increases in Banks Pumping Plant exports occur when Banks is used to export transfer water. Decreases occur when the timing of SWP water as simulated in the CalSim II baseline is shifted to help facilitate transfers. These changes are illustrated below in Figure B-85.

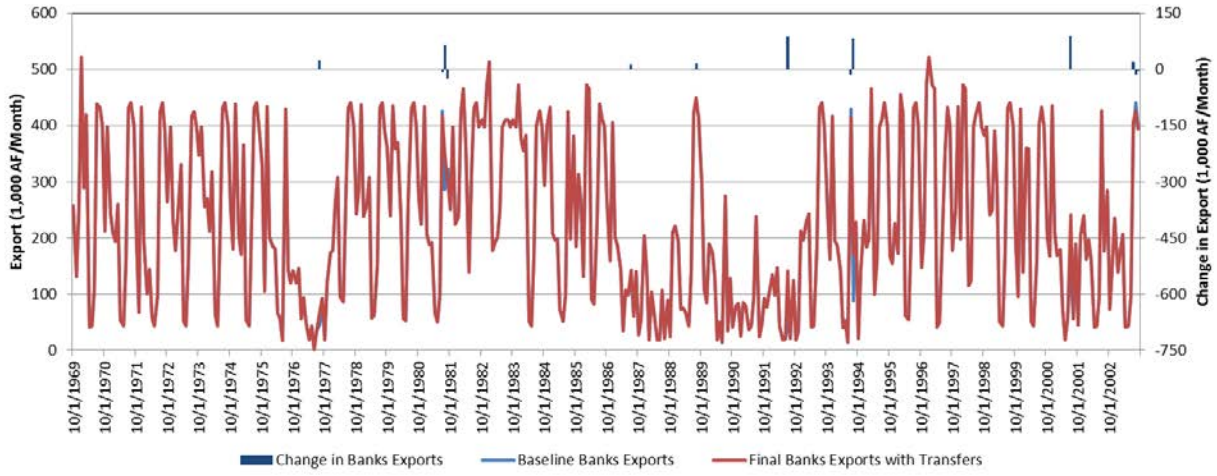

Figure B-85. Exports at Banks Pumping Plant with and without Alternative 4 Transfers

Table B-11 summarizes average monthly exports at Banks Pumping Plant. Average annual Banks exports increase by ten TAF.

Table B-11. Average Monthly Exports at Banks Pumping Plant (TAF) for Alternative 4

Banks Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	202	212	307	222	239	261	70	62	156	363	316	320	2,731
With Transfers	202	212	307	222	239	261	70	62	156	369	321	319	2,740
Change	0	0	0	0	0	0	0	0	0	5	5	-1	10

Total CVP/SWP exports, the sum of exports at Jones and Banks Pumping Plants, are illustrated in Figure B-86.

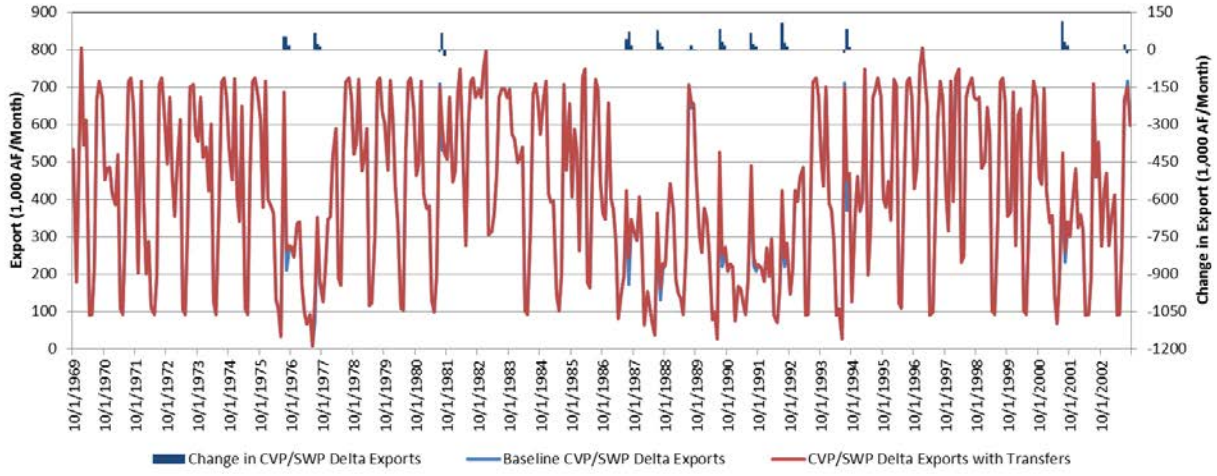

Figure B-86. Total CVP/SWP Exports from the Delta with and without Alternative 4 Transfers

Table B-12 summarizes average monthly combined CVP/SWP exports. Average annual combined exports increase by 33 TAF with changes in the July through September period only.

Table B-12. Average Monthly Combined CVP/SWP Exports (TAF) for Alternative 4

CVP/SWP Exports	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Baseline	424	424	543	419	425	459	138	128	309	619	568	543	4,998
With Transfers	424	424	543	419	425	459	138	128	309	637	580	546	5,032
Change	0	0	0	0	0	0	0	0	0	18	13	3	33

Figure B-87 illustrates diversions made by East Bay MUD at Freeport under both the baseline and with Project scenarios. Baseline diversions represent East Bay MUD taking delivery of CVP Project water under their existing water service contract.

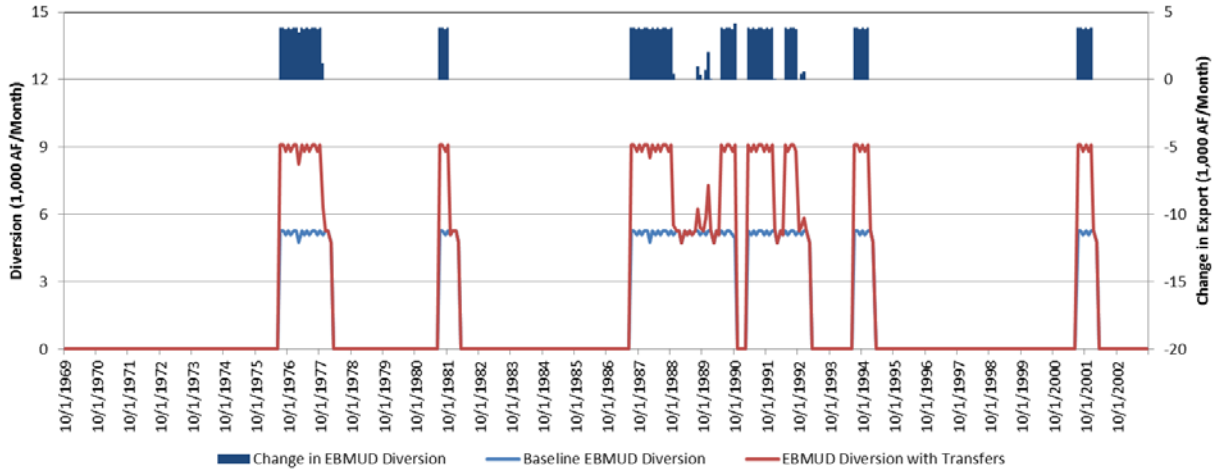

Figure B-87. East Bay MUD Diversions with and without Alternative 4 Transfers

Contra Costa WD diversions increase to take delivery of transfer water as is illustrated below in Figure B-88.

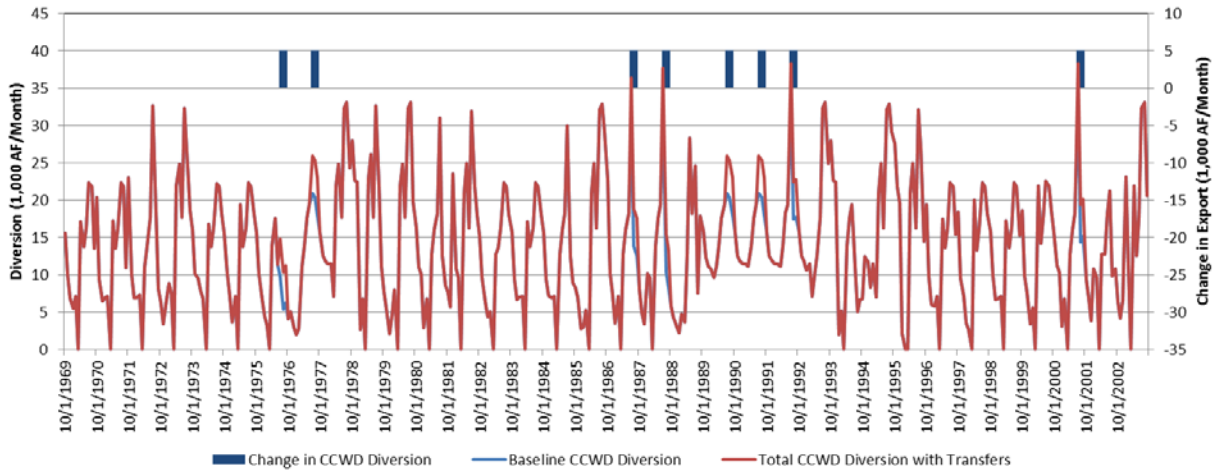

Figure B-88. Contra Costa WD Diversions with and without Alternative 4 Transfers

B.7 References

National Oceanic and Atmospheric Administration Fisheries Service. 2009. Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan. National Marine Fisheries Service, Southwest Region, Long Beach, CA. June 4, 2009. 844 pp.

U.S. Fish and Wildlife Service. 2008. Biological Opinion on the Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). Final. December 15, 2008.

Attachment 1: CalSim II Assumptions for Baseline Operations

	Existing Condition[1]
Planning Horizon	2014
Period of Simulation	82 years (1922-2003)
HYDROLOGY	
Level of Development (land use)	2005 Level[3]
DEMANDS	
North of Delta (excluding the American River)	
CVP	Land-use based, limited by contract amounts[4]
SWP (FRSA)	Land-use based, limited by contract amounts[5]
Non-project	Land-use based, limited by water rights and SWRCB Decisions for Existing Facilities
Antioch Water Works	Pre-1914 water right
Federal refuges	Recent historical Level 2 water needs[6]
American River Basin	
Water rights	Year 2005, full water rights[7]
CVP	Year 2005 plus Freeport Regional Water Project[7]
San Joaquin River Basin[9]	
Friant Unit	Limited by contract amounts, based on current allocation policy
Lower basin	Land-use based, based on district level operations and constraints
Stanislaus River basin[10 19]	Land-use based, based on New Melones Interim Operations Plan, up to full CVP Contractor deliveries (155 TAF per year) depending on New Melones Index
South of Delta	
CVP	Demand based on contract amounts[4]
Federal refuges	Firm Level 2 water needs[6]
Contra Costa WD	195 TAF per year CVP contract supply and water rights[11]
SWP[5 12]	Demand based on full Table A amounts (4.13 MAF per year)
Article 56	Based on 2001-2008 contractor requests
Article 21	MWD demand up to 200 TAF per month (December-March) subject to conveyance capacity, KCWA demand up to 180 TAF per month, and other contractor demands up to 34 TAF per month, subject to conveyance capacity
North Bay Aqueduct	77 TAF per year demand under SWP contracts, up to 43.7 cfs of excess flow under Fairfield, Vacaville and Benicia Settlement Agreement
FACILITIES	
System-wide	Existing facilities
Sacramento Valley	
Shasta Reservoir	Existing, 4,552 TAF capacity
Red Bluff Diversion Dam	Diversion dam operated with gates out all year, NOAA Fisheries BO (Jun 2009) Action I.3.1[19]; assume permanent facilities in place

	Existing Condition[1]
Colusa Basin	Existing conveyance and storage facilities
Upper American River	Placer County Water Agency American River pump station
Lower Sacramento River	Freeport Regional Water Project
Fremont Weir	Existing (un-notched) Weir
Delta Export Conveyance	
SWP Banks Pumping Plant (South Delta)	Physical capacity is 10,300 cfs, permitted capacity is 6,680 cfs in all months and up to 8,500 cfs during Dec 15th - Mar 15th depending on Vernalis flow conditions[20] ;additional capacity of 500 cfs (up to 7,180 cfs) allowed Jul–Sep for reducing impact of NOAA Fisheries BO (Jun 2009) Action IV.2.1[19] on SWP[21]
CVP C.W. "Bill" Jones Pumping Plant (formerly Tracy PP)	Permit capacity is 4,600 cfs in all months (allowed for by the DMC-California Aqueduct Intertie)
Upper DMC Capacity	Exports limited to 4,200 cfs plus diversion upstream from DMC constriction plus 400 cfs DMC-California Aqueduct Intertie
Los Vaqueros Reservoir	Enlarged storage capacity (160 TAF), existing pump location, Alternate Intake project included[14]
San Joaquin River	
Millerton Lake (Friant Dam)	Existing, 520 TAF capacity
South of Delta (CVP/SWP project facilities)	
South Bay Aqueduct	SBA rehabilitation, 430 cfs capacity from junction with California Aqueduct to Alameda County FC&WSD Zone 7 point
California Aqueduct East Branch	Existing capacity
REGULATORY STANDARDS	
Trinity River	
Minimum Flow below Lewiston Dam	Trinity EIS Preferred Alternative (369-815 TAF per year)
Trinity Reservoir end-of-September minimum storage	Trinity EIS Preferred Alternative (600 TAF as able)
Clear Creek	
Minimum flow below Whiskeytown Dam	Downstream water rights, 1963 Reclamation proposal to USFWS and NPS, predetermined Central Valley Protection Improvement Act 3406(b)(2) flows[22] , and NOAA Fisheries BO (Jun 2009) Action I.1.1[19]
Upper Sacramento River	
Shasta Reservoir end-of-September minimum storage	NOAA Fisheries 2004 Winter-run Biological Opinion (1,900 TAF in non-critical dry years), and NOAA Fisheries BO (Jun 2009) Action I.2.1[19]
Minimum flow below Keswick Dam	Flows for the SWRCB Water Rights Order 90-5, predetermined Central Valley Protection Improvement Act 3406(b)(2) flows, and NOAA Fisheries BO (Jun 2009) Action I.2.2[19]
Feather River	
Minimum flow below Thermalito Diversion Dam	2006 Settlement Agreement (700 / 800 cfs).
Minimum flow below Thermalito Afterbay outlet	1983 DWR, CDFW agreement (750 – 1,700 cfs)
Yuba River	
Minimum flow below Daguerre Point Dam	D-1644 Operations (Lower Yuba River Accord)[15]
American River	

	Existing Condition[1]
Minimum flow below Nimbus Dam	American River Flow Management as required by NOAA Fisheries BO (Jun 2009) Action II.1[19]
Minimum flow at H Street Bridge	SWRCB D-893
Lower Sacramento River	
Minimum flow near Rio Vista	SWRCB D-1641
Mokelumne River	
Minimum flow below Camanche Dam	Federal Energy Regulatory Commission 2916-029[13], 1996 (Joint Settlement Agreement)
Minimum flow below Woodbridge Diversion Dam	Federal Energy Regulatory Commission 2916-029[13], 1996 (Joint Settlement Agreement)
Stanislaus River	
Minimum flow below Goodwin Dam	1987 Reclamation, CDFW agreement, and flows required for NOAA Fisheries BO (Jun 2009) Action III.1.2 and III.1.3[19]
Minimum dissolved oxygen	SWRCB D-1422
Merced River	
Minimum flow below Crocker-Huffman Diversion Dam	Davis-Grunsky (180 – 220 cfs, Nov – Mar) and Cowell Agreement
Minimum flow at Shaffer Bridge	Federal Energy Regulatory Commission 2179 (25 – 100 cfs)
Tuolumne River	
Minimum flow at Lagrange Bridge	Federal Energy Regulatory Commission 2299-024, 1995 (Settlement Agreement) (94 – 301 TAF per year)
San Joaquin River	
San Joaquin River below Friant Dam/Mendota Pool	Interim San Joaquin River Restoration flows limited by existing channel capacities
Maximum salinity near Vernalis	SWRCB D-1641
Minimum flow near Vernalis	SWRCB D-1641 and NOAA Fisheries BO (Jun 2009) Action IV.2.1 Phase II flows not provided due to lack of agreement for purchasing water.
Sacramento-San Joaquin Delta	
Delta Outflow Index (flow and salinity)	SWRCB D-1641 and USFWS BO (Dec 2008) Action 4[19]
Delta Cross Channel gate operation	SWRCB D-1641 with additional days closed from Oct 1-Jan 31 based on NOAA Fisheries BO (Jun 2009) Action IV.1.2[19] (closed during flushing flows from Oct 1-Dec 14 unless adverse water quality conditions)
South Delta exports (Jones PP and Banks PP)	SWRCB D-1641 export limits and Vernalis flow-based export limits in Apr -May as required by NOAA Fisheries BO (June 2009) Action IV.2.1 Phase II[19] (additional 500 cfs allowed for Jul-Sep for reducing impact on SWP)[21]
Combined Flow in Old and Middle River	USFWS BO (Dec 2008) Actions 1-3 and NOAA Fisheries BO (Jun 2009) Action IV.2.3[19]
OPERATIONS CRITERIA: RIVER-SPECIFIC	
Upper Sacramento River	
Flow objective for navigation at Wilkins Slough	NOAA Fisheries BO (Jun 2009) Action I.4[19]; 3,250 – 5,000 cfs based on CVP water supply condition
American River	

	Existing Condition[1]
Folsom Dam flood control	Variable 400/670 flood control diagram (without outlet modifications)
Feather River	
Flow at mouth of Feather River (above Verona)	Maintain the CDFW/DWR flow target of 2,800 cfs for Apr - Sep dependent on Oroville inflow and FRSA allocation
Stanislaus River	
Flow below Goodwin Dam	Revised Operations Plan and NOAA Fisheries BO (Jun 2009) Action III.1.2 and III.1.3[19]
San Joaquin River	
Salinity at Vernalis	Grasslands Bypass Project (partial implementation)
OPERATIONS CRITERIA: SYSTEMWIDE	
CVP Water Allocation	
CVP settlement and exchange	100% (75% in Shasta critical years)
CVP refuges	100% (75% in Shasta critical years)
CVP agriculture	100% - 0% based on supply. South-of-Delta allocations are additionally limited due to D-1641, USFWS BO (Dec 2008), and NOAA Fisheries BO (Jun 2009) export restrictions[19]
CVP municipal & industrial	100% - 50% based on supply. South-of-Delta allocations are additionally limited due to D-1641, USFWS BO (Dec 2008), and NOAA Fisheries BO (Jun 2009) export restrictions[19]
SWP Water Allocation	
North of Delta (FRSA)	Contract-specific
South of Delta (including North Bay Aqueduct)	Based on supply; equal prioritization between Ag and M&I based on Monterey Agreement; allocations are limited due to D-1641, USFWS BO (Dec 2008), and NOAA Fisheries BO (Jun 2009) export restrictions[19]
CVP/SWP Coordinated Operations	
Sharing of responsibility for in-basin use	1986 Coordinated Operations Agreement (East Bay MUD FRWP and 2/3 of the North Bay Aqueduct diversions are considered as Delta export, 1/3 of the North Bay Aqueduct diversion is considered as in-basin use)
Sharing of surplus flows	1986 Coordinated Operations Agreement
Sharing of restricted export capacity for project-specific priority pumping	Equal sharing of export capacity under SWRCB D-1641, USFWS BO (Dec 2008), and NOAA Fisheries BO (Jun 2009) export restrictions[19]
Water transfers	Acquisitions by SWP contractors are wheeled at priority in Banks Pumping Plant over non- SWP users; LYRA included for SWP contractors[21]
Sharing of export capacity for lesser priority and wheeling-related pumping	Cross Valley Canal wheeling (max of 128 TAF per year), CALFED ROD defined Joint Point of Diversion
San Luis Reservoir	San Luis Reservoir is allowed to operate to a minimum storage of 100 TAF
CVPIA 3406(b)(2)	
Policy decision	Per May 2003 Department of Interior decision
Allocation	800 TAF per year, 700 TAF per year in 40-30-30 dry years, and 600 TAF per year in 40-30-30 critical years
Actions	Pre-determined non-discretionary USFWS BO (Dec 2008) upstream fish flow objectives (Oct- Jan) for Clear Creek and Keswick Dam, non-discretionary NOAA Fisheries BO (Jun 2009) actions for the American and Stanislaus Rivers, and NOAA Fisheries BO (Jun 2009) actions leading to export restrictions[19]

	Existing Condition[1]
Accounting adjustments	No discretion assumed under USFWS BO (Dec 2008) and NOAA Fisheries BO (Jun 2009)[19], no accounting
WATER MANAGEMENT ACTIONS	
Water Transfer Supplies	
Lower Yuba River Accord[21]	Yuba River acquisitions for reducing impact of NOAA Fisheries BO export restrictions[19] on SWP

Notes:

1 These assumptions were developed under the direction of the DWR and Reclamation management team for the Bay Delta Conservation Plan (BDCP) Habitat Conservation Plan and EIR/EIS. Additional modifications were made by Reclamation and the Long-Term Water Transfer Project team and coordinated with Reclamation.

2 Footnote removed.

3 The Sacramento Valley hydrology used in the Existing Condition CalSim II model reflects nominal 2005 land use assumptions. The nominal 2005 land use was determined by interpolation between the 1995 and projected 2020 land use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects 2005 land use assumptions developed by Reclamation to support Reclamation studies.

4 CVP contract amounts have been reviewed and updated according to existing and amended contracts, as appropriate. Assumptions regarding CVP agricultural and municipal and industrial (M&I) service contracts and Settlement Contract amounts are documented in the Delivery Specifications attachments to the BDCP CalSim II assumptions document.

5 SWP contract amounts have been updated as appropriate based on recent Table A transfers/agreements. Assumptions regarding SWP agricultural and M&I contract amounts are documented in the Delivery Specifications attachments to the BDCP CalSim II assumptions document.

6 Water needs for Federal refuges have been reviewed and updated and are documented in the Delivery Specifications attachments to the BDCP CalSim II assumptions document.

7 Assumptions regarding American River water rights and CVP contracts are documented in the Delivery Specifications attachments to the BDCP CalSim II assumptions document. The Sacramento Area Water Forum agreement, its dry year diversion reductions, MFP operations and "mitigation" water is not included.

8 Footnote removed.

9 The new CalSim II representation of the San Joaquin River has been included in this model package (CalSim II San Joaquin River Model, Reclamation, 2005). Updates to the San Joaquin River have been included since the preliminary model release in August 2005.

10 The CalSim II model representation for the Stanislaus River does not necessarily represent Reclamation's current or future operational policies. A suitable plan for supporting flows has not been developed for NOAA Fisheries BO (Jun 2009) Action III.1.3.

11 The actual amount diverted is reduced because of supplies from the Los Vaqueros project. The existing Los Vaqueros storage capacity is 160 TAF. Associated water rights for Delta excess flows are included.

12 Under Existing Conditions it is assumed that SWP Contractors can take delivery of all Table A allocations and Article 21 supplies. Article 56 provisions are assumed and allow for SWP Contractors to manage storage and delivery conditions such that full Table A allocations can be delivered. Article 21 deliveries are limited in wet years under the assumption that demand is decreased in these conditions. Article 21 deliveries for the NBA are dependent on excess conditions only, all other Article 21 deliveries also require that San Luis Reservoir be at capacity and that Banks PP and the California Aqueduct have available capacity to divert from the Delta for direct delivery.

13 Mokelumne River flows reflect East Bay MUD operations in consideration of supplies associated with the Freeport Regional Water Project.

14 The Contra Costa WD Alternate Intake Project, an intake at Victoria Canal, that operates as an alternate Delta diversion for Los Vaqueros Reservoir.

15 D-1644 and the Lower Yuba River Accord are assumed to be implemented for the Existing Conditions baselines. The Yuba River is not dynamically modeled in CalSim II. Yuba River hydrology and availability of water acquisitions under the Lower Yuba River Accord are based on modeling performed and provided by the Lower Yuba River Accord EIS/EIR study team.

16 Footnote removed.

17 Footnote removed.

18 Footnote removed.

19 In cooperation with Reclamation, NOAA Fisheries, USFWS, and California Department of Fish and Wildlife, DWR has developed assumptions for implementation of the USFWS BO (Dec 15th 2008) and NOAA Fisheries BO (June 4th 2009) in CalSim II.

20 Current U.S. Army Corps of Engineering permit for Banks PP allows for an average diversion rate of 6,680 cfs in all months. Diversion rate can increase up to 1/3 of the rate of San Joaquin River flow at Vernalis during Dec 15th – Mar 15th up to a maximum diversion of 8,500 cfs, if Vernalis flow exceeds 1,000 cfs.

21 Acquisitions of Component 1 water under the Lower Yuba River Accord, and use of 500 cfs dedicated capacity at Banks PP during Jul– Sep, are assumed to be used to reduce as much of the impact of the Apr-May Delta export actions on SWP contractors as possible.

[22] Delta actions, under USFWS discretionary use of CVPIA 3406(b)(2) allocations, are no longer dynamically operated and accounted for in the CalSim II model. The Combined Old and Middle River Flow and Delta Export restrictions under the USFWS BO (Dec 15th 2008) and the NOAA Fisheries BO (June 4th 2009) severely limit any discretion that would have been otherwise assumed in selecting Delta actionsunder the CVPIA 3406(b)(2) accounting criteria. Therefore, it is anticipated that CVPIA 3406(b)(2) account availability for upstream river flows below Whiskeytown, Keswick and Nimbus Dams would be very limited. It appears the integration of BO Reasonable and Prudent Alternative actions will likely exceed the 3406(b)(2) allocation in all water year types. Upstream flows on Clear Creek and the Sacramento River are pre-determined based on CVPIA 3406(b)(2) based operations from the Aug 2008 BA Study 7.0 and Study 8.0 for Existing Conditions baselines. The procedures for dynamic operation and accounting of CVPIA 3406(b)(2) are not included in CalSim II.

[23] Only acquisitions of Lower Yuba River Accord Component 1 water are included.

Key:

CVP = Central Valley Project
FRSA = Feather River Service Area
TAF = thousand acre-feet
MAF = million acre-feet
KCWA = Kern County Water Agency
BO = biological opinion
DMC = Delta-Mendota Canal
NBA = North Bay Aqueduct
EIS = Environmental Impact Statement
NPS = National Park Service
CDFW = California Department of Fish and Wildlife
LYRA = Lower Yuba River Accord
SWP = State Water Project
SWRCB = State Water Resources Control Board
WD = Water District
MWD = Metropolitan Water District of Southern California
cfs = cubic feet per second
PP = Pumping Plant
SBA = South Bay Aqueduct
FC&WSD = Flood Control and Water Service District
USFWS = U.S. Fish and Wildlife Service
DWR = Department of Water Resources
FRWP = Freeport Regional Water Project
ROD = Record of Decision
CALFED = State (CAL) and Federal (FED) agencies participating in the Bay-Delta Accord
CVPIA = Central Valley Project Improvement Act
NOAA Fisheries = National Oceanic and Atmospheric Administration Fisheries Service

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