4.2. SURFACE WATER RESOURCES

This section evaluates the surface water/water supply impacts of the two flow alternatives for providing fishery beneficial use protection required in the 1995 WQCP (SWRCB 1995). The two alternatives, the San Joaquin River Agreement (SJRA) and the State Water Resources Control Board (SWRCB) Water Right Priority System, are described in detail in Chapter 2.

4.2.1 Key Impact Issues and Evaluation Criteria

To evaluate the effects of implementation of either alternative on water supply, two key parameters are analyzed: delivery changes and carryover storage changes. These represent the major water supply parameters affected by implementation of the project alternatives.

Key issues identified in the scoping process and considered in this analysis are:

1. Flow changes at Vernalis

2. How sales and transfers of water and changes in flow schedules affect both upstream and downstream water quality and quantity (including the Delta) in the different water year types.

3. Impacts on water supply availability from the New Melones Project.

    - The impact of SJRA on the long-term operations of New Melones Reservoir and the availability of Stanislaus River water for existing and reasonably foreseeable future in-basin needs.

    - Whether the reallocation of Stanislaus River/New Melones water adversely impacts the ability of local agencies to develop future water supplies or impairs their ability to exercise their watershed, basin, or area of origin priorities.

    - Impact on the New Melones Project's ability to meet water quality objectives at Vernalis including the impacts associated with a different release pattern/timing of releases caused by the acquisition of water on the tributaries.

An issue raised in the public scoping but not addressed in this EIS/EIR is the effects on south Delta water quality, quantity, and flow due to changes in export pumping rates and operation of the South Delta Barrier Program. These issues (i.e., those directly related to exports and the operation of fish and flow control sturctures) are the subject of other independent NEPA/CEQA analyses for the Interim South Delta Program (ISDP) including the Temporary Barriers Program. The ISDP is to improve water levels and circulation in the South Delta channels and to allow full pumping capacity

at Banks Pumping Plant (DWR and USBR 1996). The issues are not within the scope of this proposed action. See Section 4.12, Cumulative Effects, especially Section 4.12.1.3 for more information on the ISDP.

4.2.2 Environmental Consequences

The water supply impact assessment of the proposed project is based upon the hydrologic analysis specifically conducted for this EIR/EIS (Section 4.1.4 and Appendix A). This analysis utilized several operation simulation models developed by Reclamation (PROSIM, SANJASM and STANMOD). A long-term, 71-year (1922 through 1992) hydrological sequence was simulated to characterize impacts over various combinations of hydrologic events, ranging from periods of extended drought to floods.

The water supply impacts of implementing the alternative action (Water Right Priority System) were determined by analyzing the SWRCB Draft EIR (1998) on the 1995 WQCP which used DWRSIM (see Section 4.1.4) to simulate project operations. Unlike the SWRCB Draft EIR analysis, however, the impact assessment conducted here utilized the SWRCB Flow Alternative 2 (rather than Flow Alternative 1) as the base case. Flow Alternative 2 simulated the conditions occurring if the SWP and the CVP were solely responsible for meeting the 1995 WQCP flow and water quality objectives at Vernalis. This represents the closest approximation to the "existing flow and operational conditions" that could be obtained from the SWRCB Draft EIR (1998) analysis.

4.2.2.1 Water Deliveries

No Action

Water deliveries under the No Action alternative would be similar to existing conditions. The San Joaquin River Group willing sellers would continue to operate under present contractual arrangements. The SWP and CVP would be responsible for meeting the Vernalis flow standards stated in the 1995 WQCP. The 1997 New Melones Interim Plan of Operation would continue for the 12-year life of the project.

Proposed Action

The proposed action (SJRA) specifies a protocol by which the SJRGA would provide up to 110,000 acre-feet of water for a pulse flow in April-May, attraction flows in October, and some additional water, provided by Oakdale Irrigation District (OID), to be used at the discretion of Reclamation and the USFWS (see Section 2.1.1 or Appendix A). The need for this water, and hence the potential impact on other surface water beneficial uses, varies with water year type. Consequently, the hydrologic modeling of the SJRA implementation over the historic 71-year hydrologic record

(Appendix A) was used to characterize the magnitude of water affected by the proposed action. Tables 4.2.1 and 4.2.2 summarize the resulting water allocation for April and May, respectively. Averages for each water year type were developed for the purpose of evaluating potential impacts.

Table 4.2-1: AVERAGE ALLOCATION OF SJRA WATER (TAF) OVER THE 71-YEAR HYDROLOGIC PERIOD (1922-1992) AND ALLOCATION AS A PERCENT OF MAXIMUM SURFACE WATER AVAILABLE (APRIL RELEASE)

	Exchange Contractors		OID/SSJID		MID/TID[1]		Merced ID		Total	
Water Year Type	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**
Wet	0.00	0	0.06	0.01	0.00	0	1.32	0.2	1.37	0.4
Above Normal	1.81	0.2	3.83	0.6	3.62	0.4	14.99	2.2	24.26	0.8
Below Normal	4.86	0.6	10.45	1.7	9.27	1.1	29.37	4.2	53.96	1.8
Dry	6.33	0.8	13.99	2.3	11.19	1.3	37.78	5.4	69.29	2.3
Critically Dry	2.59	0.3	5.33	0.9	3.56	0.4	18.13	2.6	29.61	1.0
71-yr. Average	2.88	0.3	6.19	1.03	5.10	0.6	19.35	2.8	33.52	1.1

[1] Maximum surface water available was unknown (see Table 3.1-1), thus average annual diversion amounts used to characterize available water.

Table 4.2-2: AVERAGE ALLOCATION OF SJRA WATER (TAF) OVER THE 71-YEAR HYDROLOGIC PERIOD (1922-1992) AND ALLOCATION AS A PERCENT OF MAXIMUM SURFACE WATER AVAILABLE (MAY RELEASE)

	Exchange Contractors		OID/SSJID		MID/TID[1]		Merced ID		Total	
Water Year Type	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**	**(TAF)**	**%**
Wet	0.38	0.04	0.99	0.2	0.57	0.01	5.54	0.8	7.49	0.2
Above Normal	5.56	0.7	12.30	2.1	10.17	1.2	32.18	4.6	60.21	2.0
Below Normal	6.57	0.8	13.71	2.3	12.52	1.5	38.77	5.6	71.56	2.4
Dry	5.84	0.7	12.92	2.2	11.46	1.3	37.66	5.4	67.87	2.2
Critically Dry	2.86	0.3	6.93	1.2	5.34	0.6	20.92	3.0	36.04	1.2
71-yr. Average	3.84	0.5	8.64	1.4	7.20	0.8	25.18	3.6	44.86	1.5

[1]Maximum surface water available was unknown (Table 3.1-1), thus average annual diversion amounts used to characterize available water.

Tables 4.2-1 and 4.2-2 document that the average water allocation across all year types and willing sellers ranges from 33,530 acre-feet to 44,860 acre-feet or between 1.1 to 1.5 percent of the total water available from these sellers (based on surface water use provided in Table 3.1-1). The greatest potential adverse impact occurs during below normal and dry years with Merced Irrigation District exhibiting the largest potential change in water supply. Depending upon the water year type and the month in which the fish water release occurs (April or May), Merced ID provides an average of 4.2 percent to 5.6 percent of their total water supplies to the proposed action. This constitutes a potentially significant negative impact on water deliveries which is above the 71-year average.

Table 4.1-1 (see Section 4.1.3) presents the water uses (deliveries) potentially affected by implementation of the preferred alternative. Merced ID potentially provides up to 67,500 acre-feet of water to meet the proposed action needs (October attraction flows and April/May pulse flow). Table 4.2-3 shows the number of times, in a 71-year hydrologic sequence, that the full allocation from each willing seller would be required. There are from 6 to 8 occurrences of this allocation event in the simulated record (8 - 11 percent of the years). In most instances, these full allocations occur during below normal or dry hydrologic conditions when irrigation demand would also be high. Based on the afore stated assumptions, in years of full allocations and in certain sequential hydrologic conditions, Merced ID would potentially experience significant reductions in irrigation deliveries when and if these conditions occurred within the 12-year life of the proposed project.

Table 4.2.3: NUMBER OF OCCURRENCES OF FULL ALLOCATIONS (110 TAF) NEEDED TO MEET SJRA FLOW OBLIGATIONS OVER THE 71-YEAR HYDROLOGIC PERIOD (1922-1992)

Water Year Type	April Pulse Flow Release (number of times 110 TAF cap reached)	May Pulse Flow Release (number of times 110 TAF cap reached)
Wet	0	0
Above Normal	0	3
Below Normal	2	2
Dry	4	3
Critically Dry	0	0
Total	6	8

The other willing sellers (Exchange Contractors, OID/SSJID, MID/TID) are not as greatly affected. Based on the long term average allocations of 2,880 acre-feet (for the Exchange Contractors) to 6,190 acre-feet for OID/SSJID (Tables 4.2-1 and 4.2-2), these represent only 1 percent or less of their available water supplies and, on average, are less-than-significant impacts to the deliveries of

surface water within their service areas. When periods of full allocation are considered (Table 4.2-3), it is possible for the Exchange Contractors, OID/SSJID, and MID/TID to provide 1.3 percent, 6.2 percent, and 2.6 percent respectively of their total supplies (see Tables 2.1-3 and 3.1-1) to meet their obligations under the Agreement. This is considered a less-than-significant impact when there are full allocations. OID, however, has committed to provide up to 26,000 acre-feet of water independent of water year type. As a result, there is a potentially significant adverse impact to OID's water deliveries during critically dry years (when allocations are reduced under the 1988 stipulation and agreement with Reclamation). Because some of the 26,000 acre-feet may come from groundwater (conjunctive use), tailwater recovery, or conservation (Table 2.1-3) during critically dry years, the impact to water deliveries in critically dry years can be mitigated to less-than-significant levels.

Alternative Action

To evaluate impacts resulting from implementation of the alternative action (SWRCB Water Right Priority System), data from the *Draft Environmental Impact Report for the Implementation of the 1995 Bay/Delta Water Quality Control Plan* (SWRCB 1998) were used. In particular, the State showed 73-year period (1922-1994) and critical period (May 1928-October 1934) annual average water delivery changes for each alternative analyzed (Table V-1 and Table V-2). The SWRCB Alternative 2, where the SWP and CVP were entirely responsible for meeting the 1995 WQCP Vernalis flow objectives, is similar to the base case used in the analysis of the above described preferred alternative (SJRA). It is therefore reasonable to compare the delivery changes of the SWRCB Alternative 2 with the SWRCB Water Right Priority System alternative (SWRCB Alternative 3) to determine the impacts of implementing the alternative action.

The total average annual change in deliveries resulting from implementing the Water Right Priority System is a minus 31,000 acre-feet (the difference between -367,000 thousand acre-feet for Alternative 3 and -336,000 thousand acre-feet for Alternative 2 in Table V-1, SWRCB 1995). For the San Joaquin River Basin, the surface water delivery change is -62,000 acre-feet (Table VI-75, SWRCB 1995). This average annual reduction is distributed across a completely different array of water users (up to 38) than is the proposed action (which uses six specific willing sellers). This reduction is a potentially significant negative impact, since many junior water appropriators would have to completely curtail their diversions in order to achieve the 1995 WQCP Vernalis flow objectives. Similarly, in critically dry years, implementation of the SWRCB Water Right Priority System would result in 12,000 acre-feet of delivery reduction from junior appropriators. This is also considered a potentially significant adverse impact since the delivery change is imposed without regard to the consequences or willing ability of the appropriator(s) to provide the water. The SWRCB analysis does not provide any information on the total water supplies available to the junior appropriators affected by this alternative. Therefore, an objective determination of the magnitude of impact is not possible, and the effect is considered a potentially significant adverse impact.

4.2.2.2 Carryover Storage in San Joaquin Basin Reservoirs

Carryover storage is the amount of water retained in a reservoir at the end of September of each water year. Carryover storage helps meet future demand in the event that the next year is dry. The amount of water dedicated to carryover storage is balanced against the amount needed to meet immediate delivery needs, hydropower generation needs, and instream flow requirements of a project, according to operation rules that differ for each reservoir (SWRCB 1998).

To determine the impacts of implementing the project alternatives on carryover storage, average September end-of-month storage volumes for each flow alternative are compared to those of the base case. Reservoirs in this analysis include New Melones Reservoir, New Don Pedro Reservoir and Lake McClure.

No Action

Average carryover storage in the reservoirs of the San Joaquin River Basin under the No Action alternative are shown in Tables 4.2-4 and 4.2-5. The SWP and CVP would be responsible for meeting the Vernalis flow standards stated in the 1995 WQCP. The New Melones Interim Operation Plan would continue for the 12-year life of the project. These No Action storage levels reflect any existing operational constraints (e.g., flood control, FERC license agreements, etc.) which affect the volume of water in the reservoir or determine a minimum carryover storage.

Table 4.2-4: AVERAGE END-OF-YEAR STORAGE (TAF) IN PROJECT RESERVOIRS FOR NO ACTION - APRIL*

Water Year Type	New Melones Reservoir (TAF)	New Don Pedro Reservoir (TAF)	Lake McClure (TAF)
Wet	1831	1703	749
Above Normal	1330	1445	659
Below Normal	1251	1260	501
Dry	1144	1218	400
Critically Dry	746	864	317
71-yr. Average	1299	1325	544

* "April Pulse" releases are included in the No Action alternative from the Stanislaus and Tuolumne rivers.

Table 4.2-5: AVERAGE END-OF-YEAR STORAGE (TAF) IN PROJECT RESERVOIRS FOR THE NO ACTION - MAY

Water Year Type	New Melones Reservoir (TAF)	New Don Pedro Reservoir (TAF)	Lake McClure (TAF)
Wet	1831	1697	749
Above Normal	1331	1426	659
Below Normal	1251	1241	501
Dry	1145	1204	400
Critically Dry	754	856	317
71-yr. Average	1300	1312	544

Proposed Action

Implementation of the preferred alternative, the flows in the San Joaquin River Agreement, affects carryover storage in the reservoirs within the project area. These changes have been summarized, by water year type for the New Melones, New Don Pedro, and Lake McClure reservoirs (Tables 4.2-6 through 4.2-8).

The changes in carryover storage in New Melones Reservoir resulting from implementation of the proposed action are shown in Table 4.2-6. This Stanislaus River reservoir experiences an average increase in storage over the 71 years of the hydrologic sequence of 53,000 to 59,000 acre-feet (8 to 9 percent increase over the base case). Change in end-of-year storage varies by water year type, with the greatest change (77,000 to 72,000 acre-feet) occurring in critically dry water years (a 24 to 21 percent increase over No Action alternative depending upon which month the pulse flow is released). Under the proposed action, this significant beneficial impact to carryover storage during critically dry years is the direct result of using project water obtained from willing sellers, rather than having Reclamation provide requisite flows via releases from their facility. In addition, the May 1997 New Melones Interim Plan of Operation, and its stakeholder refinement during 1998, will result in an operation plan to be determined by U.S. Department of Interior.

Table 4.2-6: NEW MELONES RESERVOIR-STANISLAUS RIVER AVERAGE CHANGE IN END-OF-YEAR STORAGE (TAF) UPON IMPLEMENTATION OF THE PROPOSED ACTION (SJRA)

Water Year Type	Average Change in Storage (TAF) (April Release)	Percent Change (April Release)	Average Change in Storage (TAF) (May Release)	Percent Change (May Release)
Wet	47	3	42	2
Above Normal	66	6	55	5
Below Normal	57	5	52	5
Dry	49	6	47	5
Critically Dry	77	24	72	21
71-yr. Average	59	9	53	8

The project can affect New Melones Reservoir operations. Up to 26,000 acre-feet per year would be made available to Reclamation by OID. As modeled, this water would be made available to Reclamation in New Melones Reservoir as a reduction in the amount of water that is diverted by OID. The current Interim Operations Plan would initially treat this water as additional carryover storage after the year has passed, and then enter that effect on storage into the next year's allocation of water. The current rules for allocating additional storage (or inflow) at new Melones Reservoir under the Interim Operations Plan will not allocate "out" every additional acre-foot of additional storage or inflow. Thus, as modeled, a substantial portion of the OID water remains in storage, carried forward into the next year, and at times accumulating several years in a row. There is no attempt in this analysis to presume how the additional water would be allocated among Reclamation purposes, one of which is a desire for additional carryover storage.

Additionally, although not experienced in the modeling, at times there may be occasions when releases from the SJRG members under the SJRA may contribute to flows at Vernalis that would otherwise be required of Reclamation. To the extent that Reclamation can reduce its releases from New Melones Reservoir in recognition of this occurrence, water will be conserved in New Melones Reservoir for additional allocation or reserved as carryover storage.

As a result of project implementation, the New Don Pedro Reservoir would experience less-than-significant changes in carryover storage (Table 4.2-7). The average change (over the 71-year hydrology) is only a 1 percent decrease from the base line; an 11,000 acre-feet decrease in storage for a reservoir which has over 2.3 million acre-feet in capacity. Even the largest average decrease observed, 24,000 acre-feet during below normal years with a May pulse flow release, would represent only a 2 percent decrease from the base line in carryover storage. At a lake elevation of 763.7 feet

(the elevation corresponding to the average storage over the 71-year period) the largest change in storage (a 24,000 acre-feet decrease) would result in only a 2.6 foot drop from the normal water level elevation.

Table 4.2-7: NEW DON PEDRO RESERVOIR-TUOLUMNE RIVER AVERAGE CHANGE IN END-OF-YEAR STORAGE (TAF) UPON IMPLEMENTATION OF THE PROPOSED ACTION (SJRA)

Water Year Type	Average Change in Storage (TAF) (April Release)	Percent Change (April Release)	Average Change in Storage (TAF) (May Release)	Percent Change (May Release)
Wet	0	0	-1	0
Above Normal	-12	-1	-22	-2
Below Normal	-20	-2	-24	-2
Dry	-22	-2	-23	-2
Critically Dry	-10	-1	-17	-2
71-yr. Average	-11	-1	-16	-1

With implementation of the proposed action (SJRA), Lake McClure, on the Merced River, would sustain the largest drop in carryover storage (Table 4.2-8). The average decrease over the 71-year hydrologic sequence was 47,000 to 58,000 acre-feet of storage; this represents a 10 to 13 percent reduction in carryover storage. The largest decrease occurred during below normal and dry years where from 79,000 to 91,000 acre-feet were removed depending upon the release month and year type. This constitutes a potentially significant negative impact; between 17 and 23 percent reduction in carryover storage occurs compared to the No Action alternative. Lake McClure is the smallest of the reservoirs within the project area with slightly over 1.0 million acre-feet of capacity. At a lake elevation of 782.2 feet (the elevation corresponding to the average 71-year storage), the lake pool elevation would drop approximately 22.2 feet during a dry year with a May pulse flow release due to implementation of the proposed project. To look at this comparison another way, the average lake elevation in a below normal water year is 772.1 feet and in a dry year is 745.5 feet. The lake would drop approximately 23.7 feet during a below normal year and 28.5 feet during a dry year with the May pulse flow release due to the implementation of the proposed project.

Table 4.2-8: LAKE MCCLURE (NEW EXCHEQUER)-MERCED RIVER AVERAGE CHANGE IN END-OF-YEAR STORAGE (TAF) UPON IMPLEMENTATION OF THE PROPOSED ACTION (SJRA)

Water Year Type	Average Change in Storage (TAF) (April Release)	Percent Change (April Release)	Average Change in Storage (TAF) (May Release)	Percent Change (May Release)
Wet	0	0	-1	0
Above Normal	-49	-7	-73	-11
Below Normal	-79	-16	-91	-18
Dry	-84	-21	-91	-23
Critically Dry	-53	-17	-67	-21
71-yr. Average	-47	-10	-58	-13

Alternative Action

Implementation of the alternative action, the SWRCB Water Right Priority System, would have beneficial impacts to New Melones Reservoir, and potentially significant negative impacts to New Don Pedro Reservoir and Lake McClure, respectively. Table 4.2-9 shows the changes in reservoir carryover storage for the three San Joaquin Basin reservoirs within the project area. The changes are determined using the SWRCB Alternative 2 as the base case. In the San Joaquin system, New Melones would carry all the responsibility for meeting the Vernalis standards, which in effect, would be equivalent to the New Melones Interim Plan of Operation which governs current operational conditions.

Table 4.2-9: CHANGE IN RESERVOIR CARRYOVER STORAGE (TAF) RESULTING FROM IMPLEMENTATION OF THE SWRCB WATER RIGHT PRIORITY SYSTEM (FROM SWRCB 1998).

Period	New Melones Reservoir (TAF)	New Don Pedro Reservoir (TAF)	Lake McClure Reservoir (TAF)
73-year Period Average	219	-90	-55
Critical Period Average	486	-325	-47

With the alternative action, New Melones Reservoir would experience a significant increase in carryover storage related to the use of other water supplies within the San Joaquin Basin. The 73-

year average increase in storage of 219,000 acre-feet is a beneficial impact of implementing this alternative. Similarly, the average increase of 486,000 acre-feet of carryover storage during the critical period (1928- 1934) is also a significant beneficial impact to New Melones carryover storage.

Conversely, with the alternative action, New Don Pedro Reservoir would experience a significant negative impact to carryover storage. The average decrease of 90,000 acre-feet over the 73-year period, and 325,000 acre-feet during the critical period constitute a significant reduction in storage within this reservoir resulting directly from implementation of the Water Right Priority System allocation of flow.

With implementation of the alternative action, Lake McClure would also be subjected to a decrease in carryover storage. The 73-year period average was 55,000 acre-feet lower than the base case. The critical period average was 47,000 acre-feet lower than the base case. These reductions in carryover storage constitute a potentially significant adverse impact to this 1.1 million acre-feet reservoir as a result of implementing the alternative action (SWRCB Water Right Priority System).

4.2.2.3 Water Quality

Changes in water quality at Vernalis due to implementation of the alternatives were evaluated using the hydrologic analysis. Reclamation models predicted Total Dissolved Solids (TDS) at Vernalis for every month within the hydrologic sequence simulated (1922-1992). Comparison of the predicted TDS for each month against the 1995 WQCP objective for that month (converted from Electrical Conductivity to TDS) facilitate an assessment of whether the standard was exceeded or met. Instances when the action causes an incremental exceedence of the standard are interpreted as a negative affect; conversely, actions causing an incremental attainment of water quality values below the standard are considered to be a benefit.

No Action

The No Action alternative assumes that New Melones Reservoir is operated consistent with the Interim Operation Plan (USBR 1997c) and is solely responsible for meeting the SWRCB 1995 WQCP objectives. When there is insufficient water in New Melones Reservoir to meet all of the demands, salinity objectives cannot be met. Table 4.2-10 shows the number of times the Vernalis salinity objectives were exceeded over the 71-year hydrologic period simulated in the hydrologic analysis. This table only shows the months of exceedence; other months of the year never exhibited water quality in excess of the standards. The No Action alternative for both the April and May pulse flow release is shown, since differences in average monthly values occur depending upon the release month.

Table 4.2-10: NUMBER OF EXCEEDENCES OF 1995 BAY/DELTA WATER QUALITY OBJECTIVE AT VERNALIS OVER THE 71-YEAR HYDROLOGIC PERIOD

Alternative	Oct.	Nov.	Feb.	Jun.	Jul.	Aug.	Sep.	Total
No Action- April	8	4	4	8	22	28	11	85
SJRA Action- April	0	4	4	7	20	27	11	73
No Action- May	10	5	4	5	20	27	11	82
SJRA Action- May	0	4	4	4	19	27	11	59

Water quality exceedence based on monthly averages occurs in the fall (October and November), winter (February), and through the summer low flow period (June through July). The greatest number of months with exceedences, and the largest magnitude of exceedence, occur during the low flow summer period (Table 4.2-10). The standards during this period (June through August) are also at their lowest of the year, 455 TDS (SWRCB 1997).

Table 4.2-11 presents the average monthly values for total dissolved solids (TDS) for the No Action and SJRA alternatives for the 71-year hydrologic period by water year type. Of concern is the June through August period when the water quality standard for salinity is 455 TDS.

TABLE 4.2-11: AVERAGE WATER QUALITY (TDS) AT VERNALIS BY WATER YEAR TYPE

WATER YEAR AVERAGE - NO ACTION APRIL - WATER QUALITY (TDS) AT VERNALIS													
WY Type	October	Novembe	December	January	February	March	April	May	June	July	August	Septembe	WY Average
Wet	553	553	344	217	153	160	159	176	225	412	442	424	318
Above	526	490	350	262	199	270	218	317	393	452	453	516	370
Below	557	539	442	421	413	418	278	404	454	456	482	546	451
Dry	504	507	451	430	438	517	336	453	460	574	608	650	494
Critical	621	582	485	491	578	556	405	455	488	648	649	624	549
WATER YEAR AVERAGE - PROPOSED ACTION APRIL - WATER QUALITY (TDS) AT VERNALIS													
WY Type	October	Novembe	December	January	February	March	April	May	June	July	August	Septembe	WY Average
Wet	505	559	350	218	158	160	158	176	224	412	442	424	315
Above	481	489	352	261	202	279	205	314	395	453	453	515	367
Below	510	539	443	422	414	418	234	391	454	455	474	543	441
Dry	448	516	446	421	443	517	275	452	459	564	603	648	483
Critical	549	590	485	489	577	555	372	455	477	636	648	626	538
WATER YEAR AVERAGE - NO ACTION MAY - WATER QUALITY (TDS) AT VERNALIS													
WY Type	October	Novembe	December	January	February	March	April	May	June	July	August	Septembe	WY Average
Wet	552	553	349	218	154	160	164	163	231	412	442	425	319
Above	527	491	352	263	202	270	264	239	393	452	453	516	369
Below	556	542	442	422	412	419	363	294	454	455	480	546	449
Dry	504	507	451	431	437	517	431	348	459	566	602	649	492
Critical	621	583	485	491	578	556	446	420	482	647	651	625	549
WATER YEAR AVERAGE - PROPOSED ACTION MAY - WATER QUALITY (TDS) AT VERNALIS													
WY Type	October	Novembe	December	January	February	March	April	May	June	July	August	Septembe	WY Average
Wet	505	559	355	222	159	160	164	160	232	412	442	425	316
Above	482	491	355	263	207	280	265	204	401	453	453	515	364
Below	515	542	442	425	414	420	359	248	454	455	478	543	441
Dry	450	516	446	421	445	517	429	281	457	560	600	649	481
Critical	550	590	485	490	577	556	447	372	475	634	650	626	538

Proposed Action

Implementation of the proposed action results in an overall reduction in the number of salinity standard exceedences at Vernalis. The most significant beneficial impact occurs during the month of October where all exceedence events would be eliminated by the proposed action. There also would be some improvement in June and July, and potential improvement in November (if the pulse flow were released entirely in May) or August (if the pulse flow were released entirely in April).

The improvements in water quality at Vernalis take into consideration the increased flow of high quality water from the San Joaquin River tributaries, which occurs in October and during the spring (April/May). No improvements (as measured by numbers of exceedence) were seen from the Spring Pulse Flows, since water quality is inherently good in the basin at this time as pulse flows occur in the basin. Evaluation of the average change in TDS during the pulse flow periods revealed a measurable improvement in water quality. The average decrease in TDS was 27 mg/l and 36 mg/l for the April and May release, respectively.

While not modeled, the potential use of agricultural return flow water by OID/SSJID and by the Exchange Contractors to meet their SJRA commitments does not appear to impact overall quality of the San Joaquin River at Vernalis. This is largely due to the fact that small quantities of potentially lower quality return flow would be added to large flows from the Merced, Tuolumne, and Stanislaus rivers that are high in quality.

The improvement in water quality at Vernalis resulting from implementation of the proposed project should also maintain or improve water quality in the South Delta. The exact magnitude and distribution of this beneficial impact cannot be assessed by the monthly analysis performed herein which is based on Appendix A.

Alternative Action

The SWRCB evaluated the change in salinity as a result of implementing the suite of flow alternatives they considered in their DEIR (SWRCB 1998). Using the Board's Flow Alternative 2 (SWP/CVP responsible for meeting 1995 WQCP objectives), a comparison was made with the predicted salinity resulting from implementing the Water Right Priority System (Flow Alternative 3). The SWRCB's analysis simulated average end-of-month Electrical Conductivity for the 73-year hydrologic period. Their results indicated that monthly averages during the 73-year period only exceeded the salinity standard during June, July, and August.

Overall the SWRCB predicted a net improvement in water quality due to implementation of the alternative action in November, December, January, February, and March. These were times when the salinities were lower than the standard, even for the base case (Flow Alternative 2). During the remaining months of the year, the SWRCB's analysis indicated that salinities were greater with the alternative action than with no action; the quality exceeded standards during June, July, and August. Furthermore, during these exceedence periods the implementation of the alternative action actually

increased the salinity. Since implementation of the alternative action would create further degradation in an already degraded water quality environment in the San Joaquin River at Vernalis, this is a potentially significant adverse impact.

Inspection of the SWRCB's impact analysis (1998) leads to the qualitative conclusion that implementation of the Water Right Priority System alternative would lead to potentially significant impacts to water quality during the summer months (when quality is already exceeding standards and further degradation could potentially limit the beneficial uses of water). Some benefits to quality occur during the late fall and winter months when quality is naturally high. The significant negative impacts would need to be mitigated by releases of water from New Melones Reservoir sufficient to achieve the standards.

4.2.3 Impact Summary and Mitigation of Impacts

4.2.3.1 Water Deliveries

Proposed Action

- Implementation of the preferred alternative (SJRA) would result in potentially significant impacts to water deliveries for Merced ID during critically dry conditions and under below normal or dry hydrologic conditions only when full allocations and certain sequential hydrologic conditions occur. Under such circumstances, impacts can be mitigated by implementation of a conjunctive use program to store surface water in groundwater aquifers during times of surplus which can then be pumped to augment surface supplies during times of shortages.

- Implementation of the preferred alternative (SJRA) would result in potentially significant adverse impacts for OID water deliveries during critically dry years when the District does not receive its full allocation. OID does not have storage capacity to offset these shortages. Therefore, to reduce these potentially significant impacts to less-than-significant levels, OID through conjunctive use, reclamation, and improved efficiency, could make up for the water shortage in critically dry years.

- All other willing sellers/willing buyers water deliveries would either be unaffected by the preferred action or experience less-than-significant impacts.

Alternative Action

- Implementation of the SWRCB Water Right Priority System would have significant adverse impacts to water deliveries within the San Joaquin River Basin. Average annual deliveries would be reduced by 62,000 acre-feet and, at times, complete curtailment of diversions by junior water right appropriators. The number and composition of the affected appropriators are different than the preferred alternative and vary with water year type. It was not possible

with available information to determine if these potentially significant impacts to junior appropriators could be mitigated.

4.2.3.2 Water Storage

Proposed Action

- Implementation of the preferred alternative (SJRA) would result in beneficial impacts to carryover water storage for New Melones Reservoir. No mitigation is required.

- A less-than-significant adverse impact to carryover storage in New Don Pedro Reservoir would result. No mitigation is required.

- A potentially significant negative impact to carryover storage for Lake McClure (Merced Irrigation District) would occur during below normal or dry hydrologic conditions. These impacts are unmitagable and therefore unavoidable.

Alternative Action

- A beneficial impact (i.e., a large increase in storage) would occur to New Melones reservoir as other water supplies within the San Joaquin Basin would be used to meet the 1995 WQCP Vernalis flow objectives.

- A significant negative impact to New Don Pedro Reservoir storage would occur with implementation of the alternative action as reservoir storage would be used to meet 1995 WQCP Vernalis flow objectives. These impacts are unmitagable and therefore unavoidable.

- A potentially significant negative impact to Lake McClure storage would occur with implementation of the alternative action as reservoir storage would be used to meet 1995 WQCP Vernalis flow objectives. These impacts are unmitagable and therefore unavoidable.

4.2.3.3 Water Quality

Proposed Action

- Beneficial impacts to water quality would occur in the San Joaquin River at Vernalis during October as instances of the exceedence of standards are reduced. No mitigation is required.

- Beneficial impacts to water quality may also occur in June and July, and potentially in November or August (depending upon when the pulse flow would be released) as the number of times the salinities exceed the standards at Vernalis are reduced. No mitigation is required.

- April or May Spring Pulse flow would reduce salinities, on the average, by 27 to 36 mg/l and would be a beneficial impact. No mitigation would be required.

Alternative Action

- Implementation of the Water Right Priority System would improve water quality at Vernalis during November, December, January, February, and March and would be a beneficial impact. No mitigation would be required.

- Potentially significant adverse impacts to water quality at Vernalis would occur during the summer months (June, July, and August). Quality at Vernalis already exceeds standards during this period, and based on the SWRCB modeling assumptions, further degradation of water quality as a result of implementing the alternative action could limit beneficial uses. Mitigation of these impacts to a less-than-significant level would require additional water releases from New Melones by Reclamation.