Chapter 13
Service Providers

13.1 Introduction

This chapter describes the environmental setting for service providers and the regulatory background associated with service providers. This chapter also evaluates the environmental impacts on service providers that could result from the Lower San Joaquin River (LSJR) and southern Delta water quality (SDWQ) alternatives, and, if applicable, offers mitigation measures that would reduce or avoid any significant impacts.

This chapter describes the potential impacts of the LSJR and SDWQ alternatives associated with service providers within the area of potential effects, which includes: the plan area, as described in Chapter 1, *Introduction*; the Eastern San Joaquin, Modesto, Turlock, and Merced[1] Subbasins; and other areas outside the plan area with service providers that are affected by the alternatives. Service providers discussed in this chapter are public providers of water supply for municipal, industrial, and agricultural uses, and providers of wastewater treatment. Private wells that provide domestic water supply are also included in this chapter.

The extended plan area, also described in Chapter 1, *Introduction,* generally includes the area upstream of the rim dams.[2] The area of potential effects for this area would be service providers in this area relying on surface water diversions from the Stanislaus, Tuolumne, and Merced Rivers. Unless otherwise noted, all discussion in this chapter refers to the area of potential effects below the rim dams. Where appropriate, the extended plan area is specifically identified.

In Appendix B, *State Water Board's Environmental Checklist*, the State Water Resources Control Board (State Water Board) evaluated whether the plan amendments[3] would cause any adverse impact on resources in each of the listed environmental categories and provided a brief explanation for its determinations. It determined that impacts on public services (e.g., fire protection, police protection, schools, parks) and some impacts associated with utilities and service systems (e.g., stormwater drainage facilities, landfills) were either less than significant or had no impact. Impacts in the checklist that are identified as "Potentially Significant Impacts" under utilities and service systems or hydrology and water quality are discussed in detail in this chapter.

The State Water Board focuses the impact analysis in this chapter on specific issues associated with the LSJR and SDWQ alternatives that are related to potentially significant impacts identified in Appendix B (i.e., XVII b and IX a). The impacts listed below in Table 13-1 are specific to the LSJR and SDWQ alternatives; they are modified, as appropriate, from the impacts listed in Appendix B to be more relevant to effects that may occur in association with the alternatives. Particularly, they are

[1] As described in Chapter 9, *Groundwater Resources*, the Merced Subbasin was extended for the analysis to include a part of the Chowchilla Subbasin, creating the *Extended Merced Subbasin*.

[2] In this document, the term *rim dams* is used when referencing the three major dams and reservoirs on each of the eastside tributaries: New Melones Dam and Reservoir on the Stanislaus River; New Don Pedro Dam and Reservoir on the Tuolumne River; and New Exchequer Dam and Lake McClure on the Merced River.

[3] These plan amendments are the *project* as defined in State CEQA Guidelines, Section 15378.

modified to address effects associated with potential reductions in surface water supply to service providers. Accordingly this chapter evaluates whether the LSJR and SDWQ alternatives would: (1) require or result in the construction of new water supply facilities or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects, and (2) violate any water quality standards such that drinking water quality from (a) public water systems and (b) domestic wells would be affected.[4] Additionally, this chapter evaluates if the LSJR alternative would result in substantial changes to San Joaquin River (SJR) inflows to the Delta such that insufficient water supplies would be available to service providers relying on Central Valley Project (CVP)/State Water Project (SWP) exports. This is because changes to SJR inflow into the southern Delta resulting from the LSJR alternatives could change exports to service providers in the export service areas (i.e., CVP and SWP contractors) since some the inflow from the LSJR is exported at the CVP and SWP pumps to the export service areas. Section 13.4, *Impact Analysis*, describes the significance thresholds for determining whether a potential impact associated with service providers is significant.

A summary of the potential impacts of the LSJR and SDWQ alternatives on service providers is provided in Table 13-1. As described in Chapter 3, *Alternatives Description*, LSJR Alternatives 2, 3, and 4 each include four methods of adaptive implementation. This recirculated substitute environmental document (SED) provides an analysis with and without adaptive implementation because the frequency, duration, and extent to which each adaptive implementation method would be used, if at all, within a year or between years under each LSJR alternative is unknown. The analysis, therefore, discloses the full range of impacts that could occur under an LSJR alternative, from no adaptive implementation to full adaptive implementation. As such, Table 13-1 summarizes impact determinations with and without adaptive implementation.

Impacts related to the No Project Alternative (LSJR/SDWQ Alternative 1) are presented in Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* and the supporting technical analysis is presented in Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1).* More information and analysis regarding the environmental impacts associated with the construction and/or operation of water treatment facilities or water supply infrastructure or other actions that may be taken by service providers in response to implementation of the plan amendments are discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*.

[4] As stated in Appendix B, *State Water Board's Environmental Checklist*, the LSJR Alternatives would change the volume of water in existing reservoirs and rivers and would not result in a violation of waste discharge requirements (WDRs). The SDWQ Alternatives 2 and 3 would articulate the water quality objective (i.e., standard) for salinity, from which requirements in WDRs would be derived; therefore, they would not violate WDRs. Thus, this chapter does not further discuss violations of WDRs.

Table 13-1. Summary of Service Provider Impact Determinations

Alternative	Summary of Impact(s)	Impact Determination without Adaptive Implementation	Impact Determination with Adaptive Implementation[a]
Impact SP-1: Require or result in the construction of new water supply facilities or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects			
No Project Alternative (LSJR/SDWQ Alternative 1)	See note.[b]	Significant	NA
LSJR Alternative 2	Average surface water diversions on the Stanislaus, Tuolumne, and Merced Rivers would be reduced by 2 percent, 2 percent, and 6 percent, respectively, compared to baseline conditions. Further, there would not be a substantial depletion of groundwater supplies; therefore, it is not expected that service providers or public water suppliers would need to construct or operate new water supply or wastewater treatment facilities or expand existing facilities. However, if adaptive implementation method 1 were implemented on a long-term basis (an increase in the February–June percent of unimpaired flow from 20 percent up to 30 percent), it is expected that there would be a substantial reduction of surface water on the Merced and Tuolumne Rivers and a substantial depletion of groundwater supplies in the Extended Merced Subbasin. These reductions would potentially require service providers to construct new and expanded water supply or wastewater treatment facilities, the construction of which could result in significant environmental effects.	Less than significant	Significant and unavoidable[c]
LSJR Alternative 3	Surface water diversion reductions on the Stanislaus, Tuolumne, and Merced Rivers are expected to be approximately 12 percent, 14 percent and 16 percent, respectively. Further, as a result of the substantial reduction of surface water supply on the rivers, it is expected that there would be a substantial depletion of groundwater supplies in the Modesto, Turlock, and Extended Merced Subbasins. These reductions would potentially require service providers to construct new and expanded water supply or wastewater treatment facilities, the construction of which could result in significant environmental effects.	Significant and unavoidable	Significant and unavoidable
LSJR Alternative 4	Surface water diversion reductions on the Stanislaus, Tuolumne, and Merced Rivers are expected to be approximately 32 percent, 35 percent,	Significant and unavoidable	Significant and unavoidable

Alternative	Summary of Impact(s)	Impact Determination without Adaptive Implementation	Impact Determination with Adaptive Implementation[a]
	and 32 percent, respectively. Further, as a result of the substantial reduction of surface water supply on the rivers, it is expected that there would be a substantial depletion of groundwater supplies in the Eastern San Joaquin, Modesto, Turlock, and Extended Merced Subbasins. These reductions would potentially require service providers to construct new and expanded water supply or wastewater treatment facilities, the construction of which could result in significant environmental effects.		
SDWQ Alternative 2	The Cities of Stockton and Tracy, and Mountain House CSD, may need to construct new wastewater treatment facilities or expand existing facilities to comply with potential changes to NPDES effluent limitation implementing a 1.0 dS/m salinity objective, the construction of which could result in significant environmental effects.	Significant and unavoidable	NA
SDWQ Alternative 3	The construction of new wastewater treatment facilities is not expected in order to comply with changes to NPDES effluent limitations implementing a 1.4 dS/m objective for salinity. As such, construction would not occur and would not result in significant environmental effects.	Less than significant	NA
Impact SP-2a: Violate any water quality standards such that drinking water quality from public water systems would be affected			
No Project Alternative (LSJR/SDWQ Alternative 1)	See note.[b]	Less than significant	NA
LSJR Alternative 2	Because service providers and irrigation districts relying primarily on surface water would not need to supplement their supply with groundwater under LSJR Alternative 2, there would likely be no degradation of groundwater quality. If an increase in the February–June percent of unimpaired flow from 20 percent up to 30 percent were implemented on a long-term basis, increased groundwater pumping and reductions in groundwater levels in the Extended Merced Subbasin could affect groundwater quality. However, a substantial increase in groundwater pumping would not necessarily result in violation of water quality standards for drinking water because recent data do not indicate increased water quality standard violations in public water systems despite greatly increased groundwater pumping, and if a drinking water quality problem is	Less than significant	Less than significant

Alternative	Summary of Impact(s)	Impact Determination without Adaptive Implementation	Impact Determination with Adaptive Implementation[a]
	detected, action would be taken (as covered under Impact SP-1) to improve water quality. Therefore, impacts would be less than significant. During some months, salinity in the SJR at Vernalis and in the southern Delta channels may increase slightly, but on average, salinity is expected to be reduced; therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur, and impacts would be less than significant.		
LSJR Alternatives 3 and 4	As a result of increased groundwater pumping, reductions in groundwater levels in the Modesto, Turlock, and Extended Merced Subbasins under LSJR Alternative 3, and also in the Eastern San Joaquin Subbasin under LSJR Alternative 4 with adaptive implementation method 1 could affect groundwater quality. However, a substantial increase in groundwater pumping would not necessarily result in an increase in violation of water quality standards for drinking water because recent data do not indicate increased water quality standard violations in public water systems despite greatly increased groundwater pumping, and if a drinking water quality problem is detected, action would be taken (as covered under Impact SP-1) to improve water quality. Salinity in the SJR at Vernalis and in the southern Delta channels is expected to be reduced; therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur. Therefore, impacts would be less than significant.	Less than significant	Less than significant
SDWQ Alternatives 2 and 3	The USBR water rights permits will continue to include requirements to meet the current 0.7 EC April–August Vernalis salinity standard, as contained in the program of implementation. This would maintain the historical range of salinity in the southern Delta. Therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.	Less than significant	NA
Impact SP-2b: Violate any water quality standards such that drinking water quality from domestic wells would be affected[c]			
No Project Alternative (LSJR/SDWQ	See note. [b]	Less than significant	NA

Alternative	Summary of Impact(s)	Impact Determination without Adaptive Implementation	Impact Determination with Adaptive Implementation[a]
Alternative 1)			
LSJR Alternative 2	Because service providers and irrigation districts relying primarily on surface water would not need to supplement their supply with groundwater under LSJR Alternative 2, there would likely be no degradation of groundwater quality. If an increase in the February–June percent of unimpaired flow from 20 percent up to 30 percent were implemented on a long-term basis, increased groundwater pumping and reductions in groundwater levels in the Extended Merced Subbasin could affect groundwater quality. Domestic well users are largely unregulated and are under no state requirements to monitor, test, and treat their water to meet the state and federal Safe Drinking Water Act. There is no required mechanism to prevent private domestic wells from using groundwater that may exceed MCLs. Therefore, impacts would be significant under LSJR Alternative 2, with adaptive implementation.	Less than significant	Significant and unavoidable
LSJR Alternatives 3 and 4	As a result of increased groundwater pumping, reductions in groundwater levels in the Modesto, Turlock, and Extended Merced Subbasins under LSJR Alternative 3, and also in the Eastern San Joaquin Subbasin under LSJR Alternative 4 with adaptive implementation method 1 could affect groundwater quality. Domestic well users are largely unregulated and are under no state requirements to monitor, test, and treat their water to meet the state and federal Safe Drinking Water Act. There is no required mechanism to prevent private domestic wells from using groundwater that may exceed MCLs. Therefore, impacts would be significant.	Significant and unavoidable	Significant and unavoidable
Impact SP-3: Result in substantial changes to SJR inflows to the Delta such that insufficient water supplies would be available to service providers relying on Central Valley Project (CVP)/State Water Project (SWP) exports			
No Project Alternative (LSJR/SDWQ Alternative 1)	See note.[b]	Less than significant	NA
LSJR Alternative 2	Inflows would generally remain similar to baseline, which would result in an estimated average increase in exports of 18 TAF/y to the CVP and	Less than significant	Less than significant

Alternative	Summary of Impact(s)	Impact Determination without Adaptive Implementation	Impact Determination with Adaptive Implementation[a]
	SWP export service areas. Therefore, insufficient water supplies to service providers relying on exports would not occur and would not require or result in the construction of new water supply facilities or wastewater treatment facilities or the expansion of existing facilities.		
LSJR Alternative 3	Inflows would generally increase relative to baseline, which would result in an estimated average increase in exports of 76 TAF/y to the CVP and SWP export service areas. Therefore, insufficient water supplies to service providers relying on exports would not occur and would not require or result in the construction of new water supply facilities or wastewater treatment facilities or the expansion of existing facilities.	Less than significant	Less than significant
LSJR Alternative 4	Inflows would generally increase relative to baseline, which would result in an estimated average increase in exports of 194 TAF/y to the CVP and SWP export service areas. Therefore, insufficient water supplies to service providers relying on exports would not occur and would not require or result in the construction of new water supply facilities or wastewater treatment facilities or the expansion of existing facilities.	Less than significant	Less than significant

CVP = Central Valley Project
DDW = Division of Drinking Water
dS/m = deciSiemens per meter (1 dS/m = 1000 μS/cm)
MCLs = maximum contaminant levels
NA = not applicable
NPDES = National Pollution Discharge Elimination System
SWP = State Water Project
TAF/y = thousand acre-feet per year
USBR = U.S. Bureau of Reclamation

[a] Four adaptive implementation methods could occur under the LSJR alternatives, as described in Chapter 3, *Alternatives Description*, and summarized in Section 13.4.2, *Methods and Approach*, of this chapter.

[b] The No Project Alternative (LSJR/SDWQ Alternative 1) would result in implementation of flow objectives and salinity objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

[c] Salinity in the SJR at Vernalis and in the southern Delta is not relevant to groundwater and drinking water quality from domestic wells and, therefore, there would be no impact from the changes in salinity in these surface waters. This topic is not discussed further in Impact SP-2b.

13.2 Environmental Setting

This section characterizes the area of potential effects considered for the service providers impact analysis, which includes the plan area, the four groundwater subbasins as described in Chapter 9, *Groundwater Resources,* and those areas that receive water from the surface waters. This section provides information regarding the different service providers and the services provided by the water bodies in the area of potential effects. Numerous service providers rely on the water bodies in the area of potential effects for beneficial uses, such as irrigation and municipal and industrial supply. Services providers also use the water bodies as receiving waters in which to discharge treated wastewater effluent generated by residential, municipal, and industrial (i.e., domestic) uses in service districts in the area of potential effects.

13.2.1 Lower San Joaquin River and Tributaries

Service providers in the area of potential effects obtain their water supplies by either diverting surface water from the three eastside tributaries[5] or pumping groundwater from aquifers. These different sources of water and the service providers that rely on them are discussed below.

Surface Water and Service Providers

Five irrigation districts receive surface water from the Stanislaus, Tuolumne, and Merced Rivers and primarily supply agricultural uses with irrigation (Table 13-2). Descriptions and characteristics of the irrigation districts are provided in Chapter 2, *Water Resources* (Sections 2.3, 2.4, and 2.5). Some of the irrigation districts have contracts or agreements with other water users, such as water districts or conservation districts. The other water users provide water supply for both agricultural uses and municipal uses. These irrigation districts and the other water users are listed in Table 13-2.

Irrigation districts obtain the majority of their water supply from surface water diversions. The other water users primarily rely on groundwater or a combination of groundwater and surface water as their sources of water. Figure 13-1a identifies the location of the service providers that rely primarily or partially on surface water.

Groundwater and Service Providers

Groundwater is a vital resource in California. Typically, groundwater supplies approximately 30 percent of California's urban and agricultural uses. In dry years, groundwater use increases to approximately 40 percent statewide and 60 percent or more in some regions (DWR 2003). Drought conditions typically result in an increase of groundwater well activity and pumping to compensate for surface water supply shortages (DWR 2014). As a result of increased pumping in the recent drought, groundwater levels have decreased in many basins throughout the state since spring 2010. Basins with notable decreases in groundwater levels are in the Sacramento River, SJR, Tulare Lake, San Francisco Bay, Central Coast, and South Coast Hydrologic Regions (DWR 2014).

[5] In this document, the term *three eastside tributaries* refers to the Stanislaus, Tuolumne, and Merced Rivers.

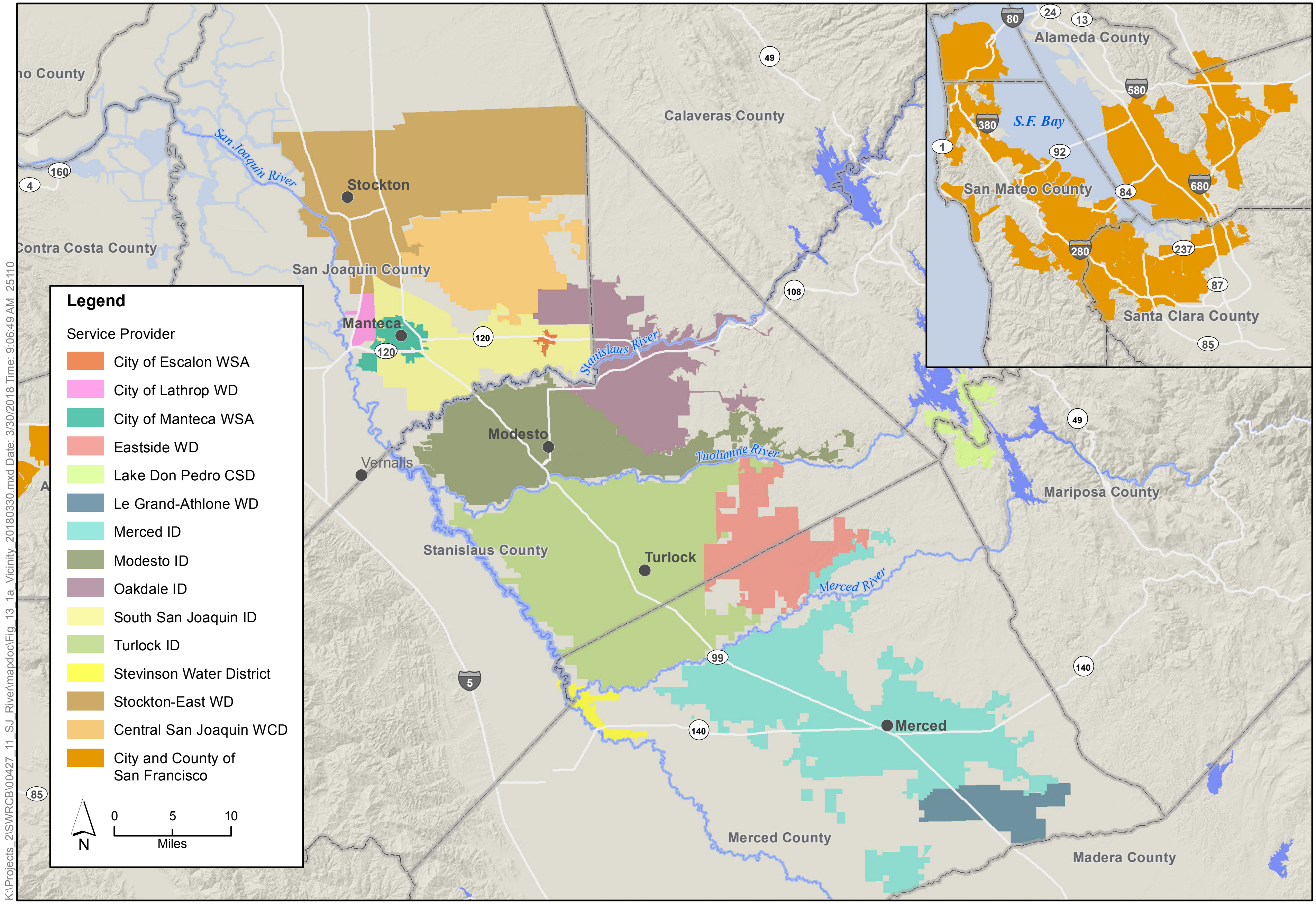


Figure 13-1a
Vicinity Map of Service Providers Relying on Surface Water

Table 13-2. Primary Surface Water Diverters and Other Water Users

Tributary River	Primary Surface Water Diverters	Other Water Users
Stanislaus[a]	OID, SSJID[b]	SEWD,[c] CSJWCD,[d] Tracy, Manteca, Lathrop, Ripon, Escalon
Tuolumne	MID, TID[e]	Modesto, CCSF[f]
Merced	Merced ID[g]	LeGrand Athlone Water District,[h] El Nido Irrigation District,[h] Stevinson Water District, Eastside Water District,[i] Lake Don Pedro CSD[j]

OID = Oakdale Irrigation District
SSJID = South San Joaquin Irrigation District
SEWD = Stockton East Water District
CSJWCD = Central San Joaquin Water Conservation District
MID = Modesto Irrigation District
TID = Turlock Irrigation District
CCSF = City and County of San Francisco
Merced ID = Merced Irrigation District
CSD = Community Services District

[a] U.S. Bureau of Reclamation (USBR) is contracted to provide surface water to SEWD and CSJWCD.

[b] SSJID and OID jointly hold contract rights with USBR to divert 600 thousand acre-feet (TAF). The primary use of the surface water diversions in the SSJID and OID service areas is agriculture; however, there are some water districts that are contracted with SSJID to provide water to municipal users.

[c] SEWD provides water to CalWater Services Company and Stockton Municipal Utilities District. The County of San Joaquin receives less than 2,000 acre-feet per year (AF/y) from SEWD.

[d] Although CSJWCD receives surface water from USBR, its primary water source is groundwater (San Joaquin County Department of Public Works 2004.)

[e] TID and MID customers primarily use water for agricultural irrigation, although some treated surface water is delivered to the City of Modesto.

[f] CCSF has agreements with MID and TID to provide carryover storage in New Don Pedro Reservoir. CCSF does not divert water directly from New Don Pedro Reservoir but owns the right to store up to 740 TAF of water in the reservoir. The 740-TAF water right is senior to TID and MID water rights. The current CCSF demand for water is approximately 290 TAF.

[g] Merced ID is the primary water diverter on the Merced River. Merced ID uses the surface water from the Merced River primarily for agricultural irrigation.

[h] LeGrand Athlone Water District and El Nido Irrigation District are within the sphere of influence of Merced ID, and El Nido Irrigation District was incorporated into Merced ID service area prior to 2008 (AMEC 2008).

[i] Eastside Water District receives limited amounts of surface water from Merced ID only during wet years (TGBA 2008).

[j] Lake Don Pedro Community Services District can withdraw up to approximately 5,000 AF/y from Lake McClure (Merced ID 2013).

As described in Chapter 9, *Groundwater Resources*, Section 9.2.2, *Subbasin Groundwater Use*, there are four main groundwater subbasins in the area of potential effects—the Eastern San Joaquin, Modesto, Turlock, and Extended Merced. Approximately 1,248,000 people live in areas overlying these four subbasins (U.S. Census Bureau 2010), and of this population, approximately 1,115,000 people, or 89 percent, receive some portion of their water supply from a public water supplier (California Environmental Health Tracking Program 2016). The remaining 11 percent, equivalent to approximately 133,000 people in the four main groundwater subbasins, rely solely on domestic[6] (i.e., private) wells for their water supply (Johnson and Belitz 2015). However, given the

[6] For the purposes of this chapter, *municipal wells* refer to wells owned by public water suppliers, and domestic wells are private wells owned by individuals/households.

incomplete records for private wells, it is difficult determine the actual number of people currently relying on private wells.

As shown in Table 13-3a (at the end of this chapter), 93 public water suppliers are identified within the four groundwater subbasins. Many of these water suppliers rely heavily or primarily on groundwater for municipal use. Table 13-3b identifies a subset of those public water suppliers listed in Table 13-3a. These are generally representative of the public water suppliers listed in Table 13-3a and well depth information could be obtained through the State Water Board's Division of Drinking Water (DDW) for this subset. Table 13-3b includes information regarding the size of the population served the water suppliers in 2014, the number of active wells owned by the suppliers in 2014, the percentage of groundwater supply reliance, the range of depths of the wells, and the range of depths to groundwater~~[7]~~ at the wells in Fall 2015. Figure 13-1b shows those service providers identified in Table 13-3b that rely solely on groundwater. Although information on private wells is limited, 66 domestic wells with well depth information were identified within the four groundwater subbasins based on information extract from the California Statewide Groundwater Elevation Monitoring (CASGEM) program (DWR 2015). The depth for these 66 wells ranges from 48 to 580 feet. Figure 13-2 shows the location of municipal and domestic wells relative to the groundwater subbasins and the irrigation districts in the area of potential effects.

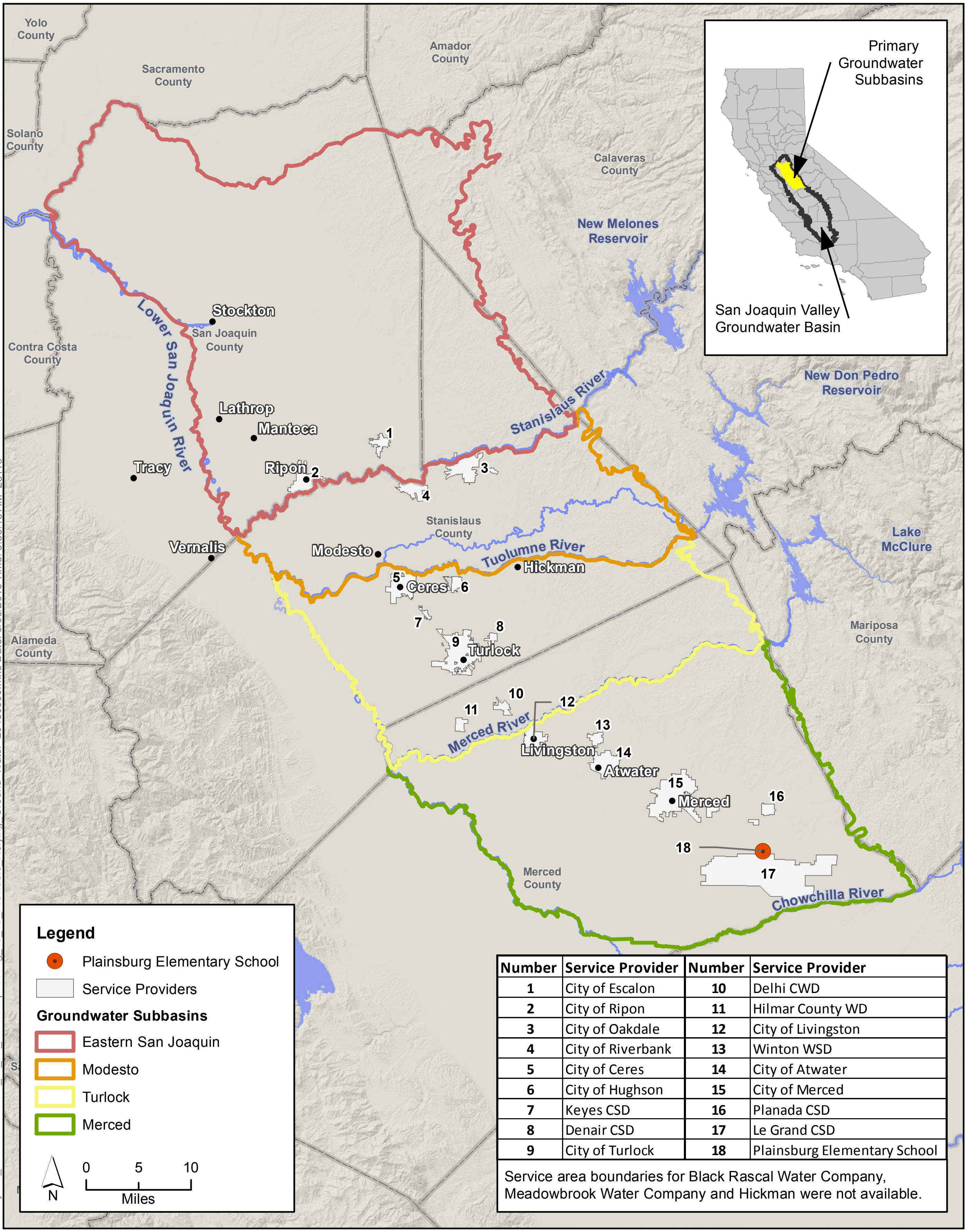
Surface Water Quality

As discussed in Chapter 5, *Surface Hydrology and Water Quality*, the water quality of the Stanislaus, Tuolumne, and Merced Rivers is primarily dictated by reservoir operations and agricultural return flow. Electrical conductivity[8] (EC) generally increases as water moves downstream in all three rivers because of the relatively high EC in agricultural drainage and groundwater discharge to the river. Chloride, bromide, sulfate, and boron are specific ions that contribute to overall salinity and are constituents of concern. However, of these constituents of concern in the area of potential effects, only boron is included on California's statewide list of impaired waterbodies (the 303[d] lists). Table 5-4 shows the constituents identified in the Section 303(d)[9] list for impaired waters in the plan area and other areas. The Tuolumne River, for example, is identified on the 303(d) list for constituents associated with agricultural uses, such as pesticides (chlorpyrifos, diazinon, DDT), and temperature (State Water Board 2011). Salinity can affect multiple beneficial uses, including the yield of crops that are sensitive to these constituents. Additionally, high EC values in source water may limit the ability to utilize recycled water. The presence of bromide in municipal water sources is also a concern because bromide is the precursor to the formation of harmful byproducts of the water disinfection process. However there are no 303(d) listings for bromide.

~~[7] The depth to groundwater refers to depth to the top of the aquifer.~~

[8] In this document, EC is *electrical conductivity*, which is generally expressed in deciSiemens per meter (dS/m). Measurement of EC is a widely accepted indirect method to determine the salinity of water, which is the concentration of dissolved salts (often expressed in parts per thousand or parts per million). EC and salinity are therefore used interchangeably in this document.

[9] Clean Water Act section 303(d) requires states, territories, and authorized tribes to develop a ranked list of water quality limited segments of rivers that do not meet water quality standards.



Number	Service Provider	Number	Service Provider
1	City of Escalon	10	Delhi CWD
2	City of Ripon	11	Hilmar County WD
3	City of Oakdale	12	City of Livingston
4	City of Riverbank	13	Winton WSD
5	City of Ceres	14	City of Atwater
6	City of Hughson	15	City of Merced
7	Keyes CSD	16	Planada CSD
8	Denair CSD	17	Le Grand CSD
9	City of Turlock	18	Plainsburg Elementary School

Service area boundaries for Black Rascal Water Company, Meadowbrook Water Company and Hickman were not available.

Figure 13-1b
Vicinity Map of Selected Service Providers Relying Solely on Groundwater

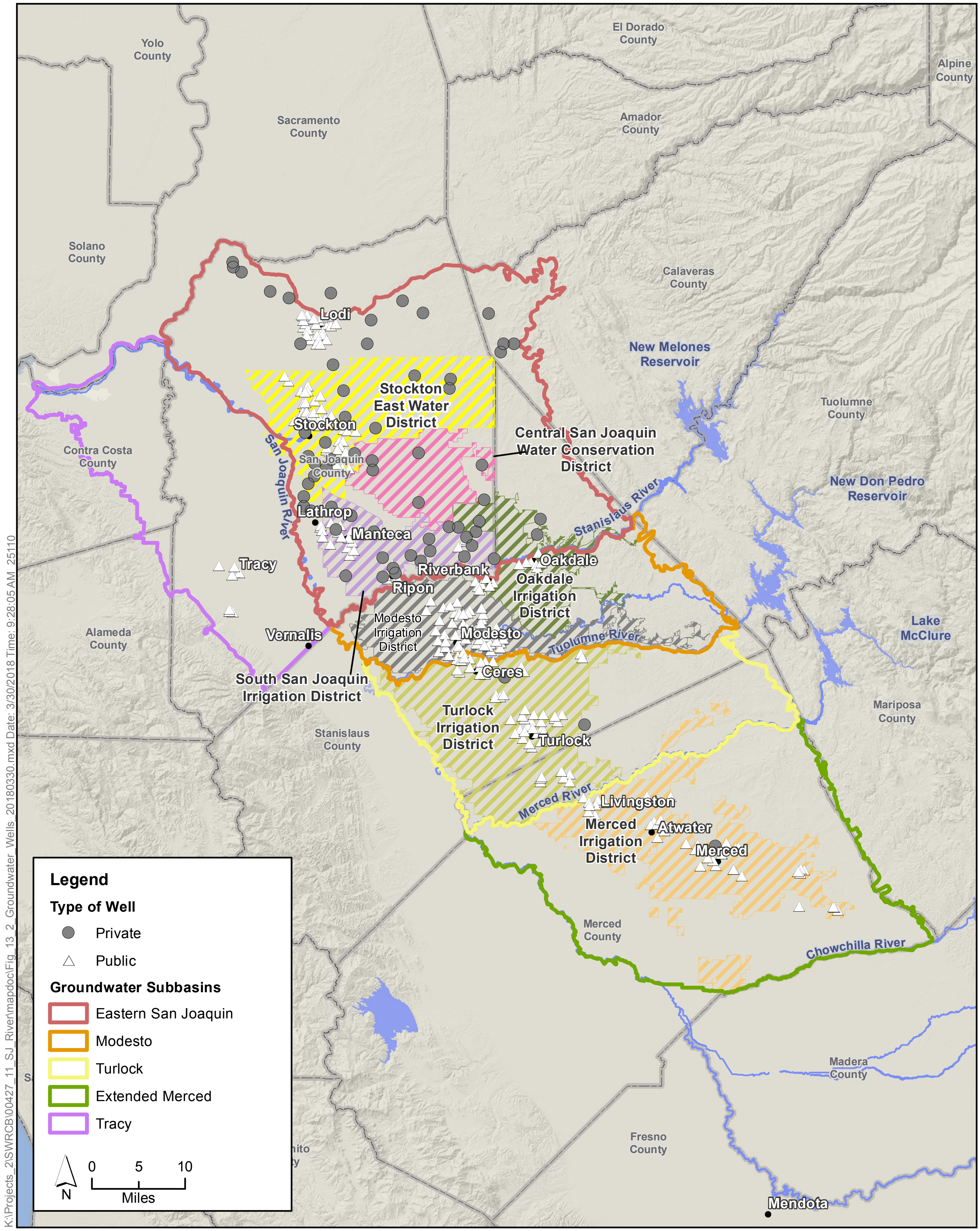


Figure 13-2
Municipal and Domestic Groundwater Wells in the Eastern San Joaquin, Modesto, Turlock, Extended Merced, and Tracy Groundwater Subbasins

Table 13-3b. Groundwater Reliance and Summary of Well Information for Selected Public Water Suppliers in the Eastern San Joaquin, Modesto, Turlock, and Extended Merced Subbasins

Public Water System	Population Served	# of Active Wells in 2014	Groundwater Reliance in 2014 (%)	Range of Well Depths (feet)	Range of Depths to Groundwater[a] (feet)	Range of Difference[b,c] (feet)
Eastern San Joaquin Subbasin						
Cal Water, Stockton	185,346	26	26	400–857	34–83	340–515
Escalon	7,137	4	100	535–600	71–81	464–519
Lathrop	12,427	5	88	280–430	17–17	263–288
Lodi	63,395	28	73	315–600	58–137	213–481
Manteca	66,451	15	42	240–425	20–41	244–398
Ripon	14,915	7	100	158–462	39–46	118–423
SEWD	50[d]		0[e]	396–700	87–100	456–463
Stockton	169,963	21	23	232–590	35–72	194–526
Modesto Subbasin						
Modesto	212,000	68	61	110–500	49–79	52–436
Oakdale	19,250	8	100	380–604	82–116	264–501
Riverbank	22,201	10	100	260–830	81–87	179–525
Turlock Subbasin						
Ceres	42,666	15	100	240–450	63–74	190–367
Delhi CWD	5,640	4	100	355–608	90–97	265–516
Denair CSD	3,225	4	100	460–620	91–98	366–528
Hickman	565	2	100	284–332	116–117	167–216
Hilmar CWD	4,850	2	100	300–400	73–75	227–325
Hughson	6,082	3	100	260–445	85–85	265–360
Keyes CSD	4,575	4	100	335–425	65–70	269–355
Turlock	64,215	24	100	265–610	67–86	184–535

Public Water System	Population Served	# of Active Wells in 2014	Groundwater Reliance in 2014 (%)	Range of Well Depths (feet)	Range of Depths to Groundwater[a] (feet)	Range of Difference[b,c] (feet)
Extended Merced Subbasin[f]						
Atwater	28,100	8	100	300–992	91–104	202–616
Black Rascal Water Company	393	2	100	NA	81–98	NA
Le Grand CSD	1,700	3	100	340–780	244–263	91–536
Livingston	13,940	8	100	284–518	73–90	204–430
Meadowbrook Water Company	6,309	3	100	371–528	88–95	276–440
Merced	80,095	22	100	152–800	87–107	55–713
Plainsburg Elementary School	150	1	100	600–600	142–142	458–458
Planada CSD	4,500	6	100	250–500	123–124	206–377
Winton WSD	8,500	3	100	395–965	121–121[g]	829–829[g]
Tracy Subbasin						
Tracy[h]	82,000	9	3	894–1216	186–202	788–826

Source: State Water Resources Control Board Division of Drinking Water 2016.

CSD = Community Services District
SEWD = Stockton East Water District
WD = Water District
WSD = Water and Sanitary District

[a] Range of depths to groundwater at the locations of the active wells owned by the public water supplier.

[b] Range of difference between well depths and depths to groundwater.

[c] Gray-shaded cells indicate that the difference between the depth of a well owned by the supplier and depth to groundwater at that well is less than 100 feet, which indicates that the well is potentially at a higher risk of running dry in the future.

[d] SEWD does not supply water to individual customers. SEWD sells water wholesale to different agencies. The 50 people that the water district serves are the employees working in its water treatment plant.

[e] SEWD had been relying solely on surface water between 2010 and 2014. In 2015, for the second consecutive year, SEWD did not receive their contracted water supply allocation from USBR due to lack of available CVP supplies resulting from severe drought conditions (Association of California Water Agencies 2015; SEWD 2016). Accordingly, SEWD reactivated the district's two inactive wells, built a new well and converted two old irrigation wells into drinking water wells (Sahota pers. comm.). The number of active wells in 2015 was five.

[f] As described in Chapter 9, *Groundwater Resources*, the Extended Merced Subbasin includes a portion of the Chowchilla Subbasin.

[g] Depth to groundwater data available only for one of three groundwater wells.

[h] Although the City of Tracy is not located in the four subbasins, it is within the area of potential effects because it receives water from SSJID and can be affected by the LSJR alternatives. Therefore, it is included in this table.

Groundwater Quality

As discussed in Chapter 9, *Groundwater Resources*, groundwater quality varies substantially throughout the San Joaquin Valley Groundwater Basin. In general, groundwater throughout the SJR region is suitable for most urban and agricultural uses. Groundwater in shallower aquifers generally contains higher concentrations of anthropogenic contaminants, such as nitrates and pesticides, than in deeper aquifers (DWR 2013). In addition to agricultural and industrial sources, trace elements (such as arsenic, manganese, vanadium and uranium) that are naturally occurring in rocks and soils can come in contact with the water and present water quality problems.

The Priority Basin Project of the Groundwater Ambient Monitoring and Assessment Program (GAMA) (Section 13.3.2, *State [Regulatory Background])* provides a comprehensive assessment of the state's groundwater quality. Two study units of the Priority Basin Project include the four groundwater subbasins that are subject to the LSJR alternatives: the Northern San Joaquin Valley (NSJ) study unit that includes the Eastern San Joaquin Subbasin and the Central Eastside study unit, which includes the Modesto, Turlock, and Extended Merced Subbasins[10].

In the NSJ study unit, one or more inorganic constituents (i.e., trace elements and nutrients, such as nitrate and nitrite) were detected at high concentrations in approximately 13 percent of the primary aquifers and at moderate concentrations in approximately 29 percent. The rest of the primary aquifers (58 percent) had low or no detections of inorganic constituents. Common sources of nutrients include fertilizers used in farming, seepage from septic systems, and human and animal waste. In the NSJ study unit, nutrients were present at high and moderate concentrations in approximately 2 and 9 percent of the primary aquifers, respectively (USGS and State Water Board 2010a). One or more organic constituents (i.e. volatile organic compounds [VOCs] and pesticides) were detected at high concentrations in approximately 3 percent of the primary aquifers and at moderate concentrations in approximately 7 percent. The remaining primary aquifers (90 percent) had low or no detections of organic constituents (USGS and State Water Board 2010a). VOCs are present in many household, commercial, industrial, and agricultural products, and are characterized by their tendency to volatilize into the air. Pesticides (herbicides, insecticides, and fumigants) are applied to crops, gardens, lawns, around buildings, and along roads to help control weeds, insects, fungi, and other pests. In the NSJ study unit, fumigants were detected at high concentrations in approximately 3 percent of the primary aquifers, and at moderate concentrations in approximately 3 percent. Herbicides and insecticides were detected at low concentrations in the primary aquifer (USGS and State Water Board 2010a).

In the Central Eastside study unit, one or more inorganic constituents were detected at high concentrations in 18 percent of the primary aquifer and at moderate concentrations in 44 percent. The rest of the primary aquifers (38 percent) had low or no detections of inorganic constituents (USGS and State Water Board 2010b). Nitrate was detected at high concentrations in approximately 2 percent of the primary aquifers and at moderate concentrations in approximately 15 percent of the primary aquifer. Concentrations of nitrate were low in the rest of the primary aquifers (83 percent) in the Central Eastside study unit. One or more organic constituents were detected at high concentrations in 1 percent of the primary aquifer and at moderate concentrations in

[10] As described in Chapter 9, *Groundwater Resources*, the Merced Subbasin was extended for the analysis to include a part of the Chowchilla Subbasin.

14 percent. The rest of the primary aquifers (85 percent) had low or no detections of organic constituents (USGS and State Water Board 2010b). In the Central Eastside, the fumigant dibromochloropropane (DBCP)[11] was detected at high concentrations in approximately 1 percent of the primary aquifers, at moderate concentrations in approximately 8 percent of the primary aquifer, and at low or not detected in approximately 91 percent (USGS and State Water Board 2010b).

Salinity, measured as total dissolved solids (TDS) or EC, in the four subbasins is relatively low, while elevated salinity levels are common in San Joaquin Valley groundwater (DWR 2003a). Salinity is generally lower on the eastern side of the San Joaquin Valley Groundwater Basin than on the western side, and is generally higher in the shallow aquifer than the deep aquifer. The relatively low groundwater salinity on the eastern side can be attributed to the low salinity of Sierra Nevada runoff and application of surface water as a major irrigation source in the subbasins. However, there are some localized issues. For example, increased levels in groundwater salinity have been detected in the Stockton area due to a lateral saline front to the west (NSJCGBA 2004). In the Merced Groundwater Basin, high TDS concentrations are principally the result of the migration of a deep saline water body that originates in regionally deposited marine sedimentary rocks that underlie the San Joaquin Valley. Under natural pressure, the saline groundwater body is migrating upward. But pumping by deep wells in the western and southern parts of the Extended Merced Subbasin may be causing these saline brines to upwell and mix with fresh water aquifers more rapidly than under natural conditions (MAGPI 2008).

Quality of Groundwater as a Source of Drinking Water

It is estimated that 85 percent of California's community public water systems,[12] supplying more than 30 million residents, rely on groundwater for at least part of their drinking water supply (State Water Board 2013a). In addition, approximately 2 million Californians rely on groundwater from either private domestic wells or other groundwater-reliant systems not regulated by the state. Due to California's reliance on groundwater, and because many community water systems are entirely reliant on groundwater for their drinking water supply, contamination of this resource can have far-reaching consequences. Pursuant to the requirements of AB 2222 (Caballero, Chapter 670, Statutes of 2008), in 2013 State Water Board submitted a report to the legislature that identified: (1) communities in California that rely on contaminated groundwater as a primary source of drinking water, (2) the principal contaminants and other constituents of concern, and (3) potential solutions and funding sources to clean up or treat groundwater in community public water systems or provide alternative water supplies.

The report identifies that approximately one-fifth of California's groundwater-reliant community water systems, prior to any treatment, used a contaminated groundwater source between 2002 and 2010. During this period, of the 510 active wells (serving 148 community water systems) within the four subbasins, 134 active wells (serving 54 community water systems) had two or more MCL exceedances (State Water Board 2013a). It is important to note that these findings reflect raw, untreated groundwater quality and not necessarily the quality of the water that is eventually served to the public. Community water systems that rely on contaminated groundwater typically treat their well water before it is delivered and consumed. However, in some cases, when a community cannot

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[11] Use of DBCP as a soil fumigant was discontinued in California in 1977.

[12] A *community public water system* (community water system) serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents. Community water systems are regulated by the state.

afford treatment or alternative sources of water are not available, contaminated water is served to the public until a solution is implemented. Over 98 percent of Californians on a public water supply are served safe drinking water (State Water Board 2013a).

The report also identifies 31 principal contaminants[13] in the community water systems that rely on a contaminated groundwater source. The 10 most frequently detected principal contaminants, summarized in Table 13-4, were found in over 90 percent of the contaminated groundwater wells prior to treatment. Twenty-one of the 31 principal contaminants detected in community water system wells are anthropogenic in origin. Some principal contaminants were more frequently detected within certain regions of the state, while other principal contaminants were found statewide. In general, naturally occurring contaminants are detected statewide, while anthropogenic contaminants tend to be detected in particular regions of the state. For example, arsenic (naturally occurring) is detected in a wide distribution of community water system wells across the state. In contrast, nitrate (anthropogenic) is predominantly detected above the MCL in areas of the state with current or historical agricultural activity, including the southern San Joaquin Valley, the Salinas Valley, and in the Southern California Inland Empire (State Water Board 2013a).

Table 13-4. Ten Most Frequently Detected Principal Contaminants Identified in State Water Board 2013a

Principal Contaminant	Number of Wells[a]	Type of Contaminant[b]
Arsenic	587	Naturally occurring
Nitrate	451	Anthropogenic nutrient
Gross alpha activity	333	Naturally occurring
Perchlorate	179	Industrial/Military use
Tetrachloroethylene (PCE)	168	Solvent
Trichloroethylene (TCE)	159	Solvent
Uranium	157	Naturally occurring
1,2-dibromo-3-chlropropane (DBCP)	118	Legacy pesticide
Fluoride	79	Naturally occurring
Carbon tetrachloride	52	Solvent

Source: State Water Board 2013a.
[a] This is the number of wells in which the contaminant was detected,
[b] Also can be naturally occurring, but typically at levels below the MCL

As shown in Table 13-4, nitrate is the second most frequently detected principal contaminant in groundwater, and at concentrations above its drinking water standard MCL of 45 milligrams per liter (mg/L), it is considered anthropogenic, making it the most frequently detected anthropogenic chemical above an MCL in drinking water sources. Agricultural fertilizers and animal wastes applied to cropland are major sources of nitrate in groundwater. Hence, nitrate is often used as an indicator of agricultural impact on groundwater quality. Nitrate is one of California's most prevalent groundwater contaminants, and can pose significant health risks at concentrations above the MCL (State Water Board 2013b). Harter et al. (2012) found that travel times of nitrate from source to wells range from a few years to decades in domestic wells, and from years to many decades and

[13] A *principal contaminant* is a chemical detected in a groundwater source sample above a primary MCL on two or more occasions during the most recent CDPH compliance cycle (2002–2010).

even centuries in deeper production wells. This means that elevated nitrate concentration in groundwater will remain high for a long time even if nitrate application is reduced today, and that reduction efforts are essential for any long-term improvement of drinking water sources.

Groundwater Quality and Over-Pumping

As discussed above, over pumping of groundwater has been depleting the groundwater resources in the San Joaquin Valley. One impact of over-drafting groundwater is degradation of groundwater quality. Prior to any development, natural recharge to, and discharge from, the groundwater system was in a dynamic steady state, and the groundwater table was stable. When a well is built and water is pumped from the aquifer, a cone of depression will be created at the well and the water table will be lowered. When pumping is stopped, subsequent recharge will allow the water level to rise, and the groundwater table is restored. If pumping continues, the groundwater level will decline and continue to do so until it stabilizes at a new, lower level. If pumping is persistently greater than recharge, the aquifer will eventually be dewatered. Lowering the groundwater table will alter the direction and rate of the groundwater flow and create a hydraulic gradient between the well and surrounding saturated zone. This can affect groundwater quality in the following ways.

1. Migration of surface contaminants to the well. Contaminants introduced at the land surface that infiltrate into the water table can flow towards the well. Contaminated shallow groundwater will also move downward within the aquifer and, eventually, into the zone of drinking water wells. Sources of chemicals introduced to ground water in this way include fertilizers, manure, and pesticides applied to agricultural lands; landfills; industrial-discharge lagoons; leaking gasoline storage tanks; cesspools and septic tanks; and domestically used chemicals. The slow movement of water from the surface through the unsaturated zone to deep aquifers means that it may be many years after a persistent chemical has entered the ground before it affects the quality of groundwater supplies (Morris et al. 2003; Harter et al. 2012). For example, while the San Joaquin Valley is not characterized by high concentrations of nitrates at the depth zone used for public supply, application of fertilizers and animal manure to agricultural land has caused downward movement of nitrates into the soil. As groundwater pumping continues and as irrigation water containing elevated concentrations of nitrate moves toward and through deeper parts of the aquifer, high concentrations of nitrates in the public water supply could be a concern in the future (Belitz et al. 2015).
2. Saline water intrusion. Under natural conditions the boundary between the freshwater and saltwater tends to be relatively stable, but pumping can cause saltwater to migrate inland and upward, resulting in saltwater contamination of the aquifer. Saltwater intrusion is an important consideration for aquifers adjacent to the coast or other saline bodies. The mobility of such saline waters depends upon the hydraulic gradients, permeability of the aquifer and the presence or absence of hydraulic barriers (Morris et al. 2003). Serious saline intrusion is confined to relatively few hydrogeological settings, but these are not necessarily coastal as paleo-saline waters may occur in inland aquifers at depth (Morris et al. 2003).
3. Mobilization of naturally-occurring trace elements such as uranium, arsenic, and radium. Pumping-induced mobilization of those elements has been studied around the world. Although the occurrence of trace elements (e.g., arsenic and uranium) is not anthropogenic, these elements can leach into groundwater and be mobilized by human activities (Smedley and Kinniburgh 2002; Barringer and Reilly 2013). For example, the downward infiltration of irrigation water with elevated bicarbonates caused movement of uranium in an area of the eastern San Joaquin Valley (Belitz et al. 2015).

The processes discussed above can be influenced by many factors, including location and depth of the well, the amount and frequency of groundwater pumping, number and proximity of nearby wells, aquifer characteristics (e.g., consolidated clays with low permeability or unconsolidated sands with high permeability), distance between the well(s) and the contaminant(s), contaminant characteristics (e.g., highly mobile in water or adhering primarily to soil), and land use near the well.

In general, water delivered to the end users from municipal drinking water wells does not exceed federal and state MCLs. This is because municipal wells are generally deep, and water quality tends to be better in deeper aquifers. Furthermore, water quality is managed such that if violation of drinking water standards is found at a public well, the well can be brought offline and corrective actions will be taken to ensure the water meet the MCL requirement again before it is delivered the consumers. For example, DBCP was detected over the MCL at two of the City of Atwater's wells. Granular Activated Carbon filtering systems were installed on these water sources to remove the contaminant prior to introduction of water into the city's water system (City of Atwater 2015). The City of Livingston, located in the Extended Merced Subbasin, recently improved filtration in order to reduce arsenic concentrations that were above the state MCL (Giwargis 2014).

In addition, water quality in community water systems is frequently monitored by the DDW and the service providers pursuant to various regulatory requirements stated in Section 13.3, *Regulatory Background*. As described in Section 13.3.1, *Federal [Regulatory Background]*, community water systems must provide annual drinking water quality reports, known as consumer confidence reports (CCRs), to their customers. Table 13-5 provides information from CCRs of selected municipalities in the groundwater subbasins during representative drought and non-drought years. These municipalities were selected because they are the major groundwater producers and together represent a wide range of total number of wells and locations in all four groundwater subbasins.

Private drinking water wells may have more significant water quality issues than municipal wells because they are often shallower than municipal wells and, therefore, are more susceptible to surface contaminants. However, the state does not regulate the water quality of private drinking water wells and does not require private drinking water well owners to test for water quality. As such, there is no comprehensive dataset on private drinking water quality, and there is a lack of water quality data for private drinking water wells within the area of potential effects.

Table 13-5. Primary Detected Contaminants in Exceedance of Maximum Contamination Level in Drinking Water for Selected Water Suppliers during Representative Non-Drought and Drought Years

		Non-Drought Year (2011)			Drought Year (2014)		
Public Water Supplier	Source of Water	Violation? (Y/N)	Primary Detected Contaminant	Corrective Action	Violation? (Y/N)	Primary Detected Contaminant	Corrective Action
Atwater	groundwater	N	NA	NA	N	NA	NA
Manteca	groundwater and surface water	Y	Arsenic in exceedance of the MCL (10 ppb) was detected in groundwater.[a]	Filters were installed to remove arsenic from wells where MCL was exceeded. Maximized water production from sources with low arsenic levels.	N	NA	NA
Merced	groundwater	N	NA		N	NA	NA
Modesto	groundwater and surface water	N	NA	NA	N	NA	NA
Riverbank	groundwater	Y	Total coliform bacteria	Drinking water system was disinfected, flushed, and contamination was resolved.	N	NA	NA
Stockton	groundwater and surface water	N	NA		N	NA	NA
Turlock	groundwater	Y	Arsenic[a]	Two wells with arsenic in exceedance of the MCL (10 ppb) were immediately removed from service.	N	NA	NA
SEWD	surface water	N	NA	NA	N	NA	NA

Source: City of Manteca 2012a and 2014; City of Merced 2011 and 2015; City of Modesto 2011 and 2014; City of Stockton 2011a and 2014; City of Turlock 2011 and 2014; City of Atwater 2011 and 2015; City of Riverbank 2011 and 2014; SEWD 2014.

SEWD = Stockton East Water District
MCL = maximum contaminant level
ppb = parts per billion
ppm = parts per million
NA = not applicable

[a] The U.S. Environmental Protection Agency reduced the MCL for arsenic from 50 ppb down to 10 ppb in 2001. This new MCL (10 ppb) became enforceable in January 2006. Water systems that are in violation of this MCL must include a health effects statement in their consumer confidence reports covering calendar year 2006 and beyond.

13.2.2 Extended Plan Area

There are 55 public water suppliers identified in the extended plan area (State Water Board 2016a; State Water Board 2016b; CEHTP 2016). Of these 55, 44 suppliers rely completely on groundwater and three have pre-1914 or riparian rights (State Water Board 2016a) and, as such, are not expected to be affected by water supply bypasses in the extended plan area. Twelve (identified in Table 13-6) of these 55 service providers have post-1914 water rights and rely on surface water diversions (State Water Board 2016a). The total annual water production by the 55 service providers in 2014 was 9.85 TAF, of which 7.61 TAF was produced by the 12 service providers listed in Table 13-6.

Table 13-6. Annual Water Use of Service Providers in the Extended Plan Area with Post-1914 Water Rights

Service Providers	Water Production in 2014 (TAF)
Calaveras County Water District (Copper Cove)	1.25
Calaveras County Water District (Ebbetts Pass)	1.50
City of Angels Camp	0.99
Del Oro Water Company (Strawberry District)	0.04
Groveland CSD	0.38
Lake Alpine Water Company	0.04
Tuolumne Utilities District (Columbia Water System)	0.48
Tuolumne Utilities District (Sonora/Jamestown Water System)	1.84
Tuolumne Utilities District (Cedar Ridge Water System)	0.12
Twain Harte CSD	0.22
Union Public Utility District	0.70
Yosemite National Park (Wawona)	0.05
Total	**7.61**

Source: State Water Resources Control Board, Division of Drinking Water 2016.
TAF = thousand acre-feet
CSD = Community Services District

13.2.3 Southern Delta

Many factors influence southern Delta water quality, such as the amount and salinity concentration of SJR flow entering the southern Delta at Vernalis; daily tidal action; CVP and SWP pumping operations; agricultural return flows; municipal wastewater discharges; and other influences. Chapter 2, *Water Resources* (Section 2.7, *Southern Delta*) and Chapter 5, *Surface Hydrology and Water Quality* (Section 5.2.8, *Southern Delta*) also provide additional information regarding southern Delta hydrodynamics. The sections below summarize the information found in these two chapters and provide additional information that describes the southern Delta's water quality (salinity) objectives, the factors that affect its existing salinity, the wastewater treatment plants (WWTPs) that discharge into the southern Delta and their effluent limitations, and the water suppliers that use the southern Delta as a source for drinking water.

Water Quality Objectives

The 2006 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan) identifies specific water quality objectives for EC, a primary indicator of salinity, for the southern Delta, for the protection of agricultural beneficial uses. The 2006 Bay-Delta Plan and the objectives are fully described in Section 13.3.2, *State [Regulatory Background]*, of this chapter. The numeric objectives for the southern Delta are as follows and are monitored at four compliance stations (SJR at Vernalis [C-10], SJR at Brandt Bridge [C-6], Old River near Middle River [C-8], and Old River at Tracy Boulevard Bridge [P-12]).

- 0.7 dS/m during the summer irrigation season (April–August).
- 1.0 dS/m during the winter season (September–March).

Water quality standards for drinking water are discussed below.

Existing Salinity

Salinity levels in the southern Delta are affected by complex hydrodynamics, including: inflow from the SJR at Vernalis; land use activities (e.g., agriculture) and discharges in the southern Delta; the seasons, tidal action, the placement of temporary barriers to reduce the effects of tidal action; the position of the Delta cross channel gates; and CVP and SWP exports.

The LSJR delivers water of relatively poor quality to the Delta, with agricultural drainage to the river being a major source of salts. Flow at Vernalis is typical of the inflow that the SJR contributes to the southern Delta. There is a strong relationship between the salinity concentrations at Vernalis and the salinity concentrations at Brandt Bridge and Old River at Middle River under most conditions (Appendix F.2, *Evaluation of Historical Flow and Salinity Measurements of the Lower San Joaquin River and Southern Delta)*. The salinity concentrations in the southern Delta typically increase slightly from agricultural drainage and treated effluent discharges to the southern Delta downstream of Vernalis.

Salinity also varies greatly in the southern Delta with the seasons and the tides. Winter salinity is mostly influenced by runoff from agricultural fields, while fall salinities tend to be influenced by seawater intrusion. The tides also influence the salinity by enhancing mixing. Generally, when temporary barriers are installed, tidal exchange is reduced. The temporary rock barriers (Old River Barrier near Delta-Mendota Canal, Middle River Barrier, and Grant Line Canal Barrier) are generally installed during the spring and removed in the fall (late September–November). Salinity in the southern Delta during lower flow periods can increase as a result of other sources (e.g., discharge of agricultural drainage, discharge of WWTPs).

An additional barrier, the Head of Old River Barrier (HORB), is occasionally installed during the spring to block passage of migrating fish into Old River. When installed, it reduces the normal diversion of SJR flow into Old River and the majority of the LSJR flows north to the Stockton Deep Water Ship Channel. However, some of the LSJR flow is drawn through Turner Cut and Middle River and Victoria Canal toward the CVP and SWP pumping facilities. The volume of water exported at the CVP and SWP can modify salinity concentrations in the southern Delta by affecting the partitioning of net flow through the various Delta channels.

Despite the variable hydrodynamics described above, the measured EC values throughout the southern Delta indicate the monthly patterns of EC are generally below the existing salinity objectives (i.e., 0.7 dS/m during the summer irrigation season [April–August] and 1.0 dS/m during the winter irrigation season [September–March]). The monthly increases in downstream salinity are greatest when the LSJR flow is low because dilution of agricultural drainage and municipal discharge will be less when the LSJR flow is low. Appendix F.2 describes the historical EC values at Vernalis and the interior compliance stations. There have been periodic exceedances in recent dry years at one or more of these southern Delta monitoring stations, but high salinity is not the general pattern. Based on the historical data, the salinity in the southern Delta is generally increased by a maximum of 0.2 dS/m above the Vernalis salinity, although the increment is sometimes higher in Old River at Tracy Boulevard. The existing salinity in the southern Delta generally ranges between 0.2 dS/m and 1.2 dS/m across all months of the year. Compliance with salinity objectives at Vernalis has been consistently achieved over the past 15 years. On average, salinity increases by 0.050 dS/m between Vernalis and Brandt Bridge (Chapter 5, *Surface Hydrology and Water Quality*, and Appendix F.2). The historical salinity increase between Vernalis and Old River at Tracy Boulevard is greater, averaging approximately 0.150 dS/m, with several monthly increases of more than 0.200 dS/m. Thus, when salinity at Vernalis is at the Vernalis EC objective, the salinity in the southern Delta is generally maintained between 0.7 dS/m and 1.2 dS/m (based on the historical monthly EC record).

Wastewater Dischargers

Existing WWTPs discharge treated wastewater effluent into the southern Delta and are considered point sources under the Clean Water Act (CWA). (33 U.S.C., § 1362, subd. (14).) Because treated wastewater effluent is a source of salt, these dischargers influence southern Delta salinity. There are six WWTPs that discharge into or are in the vicinity of the southern Delta, all of which are required to comply with effluent limitations established by National Pollution Discharge Elimination System (NPDES) permits (see Section 13.3.1, *Federal [Regulatory Background]*). These WWTPs, their receiving water bodies, and their total permitted discharge rates are listed in Table 13-7. Figure 2-12 shows the locations of WWTPs, compliance station locations, and nearby drinking water supply intakes.

Table 13-7. Wastewater Treatment Plants with Discharges in the Southern Delta

WWTP Facility	Current NPDES Permit Order Number	Receiving Water	Permitted Discharge (mgd)
Tracy [a]	R5-2012-0115	Old River (upstream of Doughty Cut)	16
Deuel	R5-2014-0014-01	Paradise Cut and Old River	0.62
Manteca [b]	R5-2015-0026	San Joaquin River	17.5
Stockton	R5-2014-0070	San Joaquin River	55
Mountain House CSD [c]	R5-2013-0004	Old River	5.4
Discovery Bay CSD	R5-2014-0073	Old River	2.1

WWTP = wastewater treatment plant
mgd = million gallons per day
NPDES = National Pollutant Discharge Elimination System
CSD = Community Services District

[a] In accordance with *City of Tracy v. State Water Board,* the existing southern Delta salinity objectives are not applied to Tracy and other municipal dischargers pending reconsideration of the southern Delta salinity objectives under Water Code §13241 and adoption of a proper program of implementation under Water Code §13242. Current capacity of Tracy's WWTP is 10.8 mgd, but there are plans to expand to 16.0 mgd within the permit term.

[b] Amended by Order R5-2015-0044. The Manteca Wastewater Quality Control Facility is currently designed for a discharge of 9.87 mgd but plans to expand to 17.5 mgd.

[c] The Mountain House CSD is currently designed for a discharge rate of 3 mgd but plans to expand to 5.4 mgd within the permit term.

Overall, the WWTPs have only a small effect on southern Delta salinity (Appendix C, *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*, and Appendix F.2, *Evaluation of Historical Flow and Salinity Measurements of the Lower San Joaquin River and Southern Delta*). For example, Tracy's discharge has limited effects on the overall salinity in the southern Delta compared to other sources of salinity in the area (e.g., water from agricultural activities and groundwater accretions). The permitted maximum salinity loads from the Tracy, Deuel, and Mountain House Community Services District (CSD) entering at the Head of Old River indicates that the salt load from point sources in this part of the southern Delta is a small percentage of the salt load entering from upstream. The salinity from wastewater discharges is generally exported at the CVP Jones Pumping Plant and SWP Banks Pumping Plant.

These WWTPs have effluent limitations that are established through the NPDES permits and waste discharge requirements (WDRs) issued by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) (see Section 13.3.1, *Federal [Regulatory Background]*). These effluent limitations are set by discharge permits for a wide variety of constituents including salt, and regulate the quality of the treated effluent discharged from the WWTPs. Except for Deuel,[14] the EC effluent limits for the WWTPs are currently based on facility performance to ensure salinity levels do not increase. Except for Deuel, at all of these WWTPs the existing NPDES requirements allow salinity of the discharge to be greater than the existing salinity objectives for the southern Delta as a result of litigation in *City of Tracy v. State Water Board*, under which the State Water Board was enjoined from applying the Delta salinity water quality objectives to the City of Tracy and other municipal discharger pending reconsideration and implementation of the objectives in accordance with Water Code Sections 13241 and 13242. Generally, the WWTPs of the southern Delta are in compliance with the current EC effluent limitations. The discharge permits also require the preparation of a salinity management plan (Harder pers. comm.; Martin pers. comm.). Table 13-8 identifies annual average EC of each WWTP for 2011–2014. Table 13-9 identifies the average April–August EC and the remainder of the year. Table 13-10 is a summary of southern Delta WWTPs' compliance with NPDES salinity requirements and salinity management plans.

Some service providers (i.e., WWTPs) are currently planning to modify existing facilities to reduce salinity loads. Of the six WWTPs discussed herein, two have made efforts or are working toward reducing salinity concentrations in their source water supplies, four are implementing pretreatment programs to reduce water softener use among water users, and three are either proposing to construct or are already operating a reverse osmosis (RO) treatment system. Table 13-11 summarizes the salinity reduction efforts of the various WWTPs.

[14] The EC effluent limits for Deuel are based on the 2006 Bay-Delta Plan water quality objectives for salinity, not on facility performance.

Table 13-8. Southern Delta Wastewater Treatment Plant Salinity (EC) Effluent Data (dS/m [µmhos/cm])[a]

Facility	2011 Annual Average EC Effluent	2012 Annual Average EC Effluent	2013 Annual Average EC Effluent	2014 Annual Average EC Effluent	2015 Annual Average EC Effluent
Tracy[b]	1.2 [1,1171]	1.2 [1,229]	1.2 [1,250]	1.3 [1,342]	1.2 [1,246]
Deuel	2.4 [2,415][c]	1.4 [1,410][d]	1.3 [1,280]	1.3 [1,275]	2.2 [2,254]
Manteca	0.8 [781]	0.8 [778]	0.7 [750]	0.7 [745][b]	0.8 [800]
Stockton[b]	1.0 [1,032]	1.0 [958]	1.0 [973]	1.0 [982]	1.1 [1,127]
Mountain House CSD	0.7 [693]	0.9 [908]	1.0 [990]	1.0 [991]	1.0 [1,029]
Discovery Bay CSD[e]	2.2 [2,167]	2.2 [2,173]	2.0 [2,006][f]	2.0 [2,054]	2.0 [2,058]

Sources: CIWQS 2011, 2012, 2013, 2014, 2015.

EC = electrical conductivity (salinity)

µmhos/cm = micromhos per centimeter

dS/m = deciSiemens per meter (1 dS/m = 1000 µS/cm). Numbers presented in dS/m were rounded.

CIWQS = California Integrated Water Quality System Project

CSD = Community Services District

[a] Based on monthly samples (January–December) unless otherwise noted.

[b] Based on weekly samples (January–December).

[c] No data on CIWQS, so the comparison to potential effluent limitations is based on recent ACLC R5-2011-0575, which reported an average monthly EC value of 2,260 µmhos/cm on January 31, 2011 and 2,570 µmhos/cm on February 28, 2011.

[d] Based on monthly samples (February–December).

[e] Based on biweekly samples (January–December)

[f] Based on biweekly samples (January–June and August – December)

Table 13-9. Southern Delta Wastewater Treatment Plant Salinity (EC) Effluent Data April–August and Remainder of the Year (dS/m [µmhos/cm])[a]

	2011 April–August	2011 Jan–Mar, Sept–Dec	2012 April–August	2012 Jan– Mar, Sept–Dec	2013 April–August	2013 Jan– Mar, Sept–Dec	2014 April–August	2014 Jan– Mar, Sept–Dec	2015 April–August	2015 Jan– Mar, Sept–Dec
Facility	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent	Average EC Effluent
Tracy [b]	1.2 [1,201]	1.2 [1,171]	1.2 [1,228]	1.2 [1,229]	1.3 [1,269]	1.2 [1,236]	1.3 [1,295]	1.4 [1,374]	1.3 [1,307]	1.2 [1,206]
Deuel	— [c]	2.6 [2,570][c]	2.2 [2,193]	0.8 [759][d]	0.8 [823]	1.6 [1,606]	0.7 [712]	1.7 [1,676]	1.7 [1,674]	2.7 [2,668]
Manteca	0.8 [793]	0.8 [774]	0.8 [786]	0.8 [774]	0.7 [739]	0.8 [759]	0.8 [770][e]	0.7 [728][b]	0.8 [842]	0.7 [768]
Stockton [b]	1.0 [1,054]	1.0 [1,015]	1.0 [996]	0.9 [930]	1.0 [965]	1.0 [978]	1.0 [1,005]	1.0 [965]	1.2 [1,173]	1.1 [1,093]
Mountain House CSD	0.7 [660]	0.7 [722]	0.9 [908]	0.8 [817]	1.0 [966]	1.0 [1011]	1.0 [1,009]	1.0 [979]	1.0 [1,038]	1.0 [1,022]
Discovery Bay CSD [e]	2.2 [2,180]	2.2 [2,125]	2.2 [2,153]	2.2 [2,187]	2.2 [2,186] [f]	1.9 [1,894]	2.1 [2,104]	2.0 [2,009]	2 [2,052]	2.1 [2,061]

Sources: CIWQS 2011, 2012, 2013, 2014, 2015.

CIWQS = California Integrated Water Quality System Project

CSD = Community Services District

dS/m = deciSiemens per meter (1 dS/m = 1000 µS/cm). Conversion is 1 dS/m = 1000 µmhos/cm. Numbers presented in dS/m were rounded.

EC = electrical conductivity (salinity)

µmhos/cm = micromhos per centimeter

[a] Based on monthly samples unless otherwise noted.

[b] Based on weekly samples.

[c] No data in CIWQS, so the comparison to potential effluent limitations is based on recent ACLC R5-2011-0575, which reported an average monthly EC value of 2.600 dS/m (2,570 µmhos/cm) on February 28, 2011.

[d] No data in CIWQS for January.

[e] Based on biweekly samples.

[f] No data in CIWQS for July 2013. Therefore, this value represents the EC effluent average for April–June, and August.

Table 13-10. Current Southern Delta Wastewater Treatment Plant Compliance Status with National Pollutant Discharge Elimination System Permit Special Provisions for Salinity Requirements

Facility	Requirements	Deadline	Compliance Status
Tracy	Salinity Reduction Plan, which includes a PPP	March 1, annually	Submitted Salinity PPP Report on March 1, 2015
Deuel	PPP for Salinity	December 1, annually	Submitted PPP for salinity on January 13, 2015
Manteca	PPP for Electrical Conductivity	December 1, annually	Submitted PPP on October 20, 2014
Stockton	PPP for Salinity, progress reports	June 1, annually, beginning 2015	Submitted PPP for salinity on May 26, 2015
Mountain House CSD	Salinity Reduction Plan, which includes a PPP	June 1, annually	Submitted Salinity Reduction Progress Report on May 19, 2015
Discovery Bay CSD	PPP for Salinity	January 30, annually	Submitted PPP for salinity on January 12, 2015

Note: Table updated in 2015.
PPP = Pollution Prevention Plan
CSD = Community Services District
WW = Wastewater

Table 13-11. Salinity Reduction Efforts of Southern Delta Wastewater Treatment Plant Dischargers

	Salinity Reduction Efforts		
WWTP Facility	Source Water	Pretreatment Program	WWTP Desalination
Tracy	Addition of freshwater from New Melones Reservoir to groundwater supplies Construction of an Aquifer Storage and Recovery (ASR) well pilot project; permanent ASR is anticipated based on pilot project	Reduction in water softeners	Currently proposing a desalination ~~plant (RO treatment)~~ project to reuse wastewater; released public initial study/mitigated negative declaration (IS/MND) for the Tracy Desalination and Green Energy Project in April 2012
Deuel	No plans for changes to groundwater supplies	No pretreatment program, and none required	Constructed an RO groundwater treatment system with brine concentrator in 2010
Manteca	No plans for changes to 50 percent surface water from SSJID and 50 percent groundwater	Reduction in water softeners	No plans for desalination at WWTP
Stockton	Implementing Delta Water Supply Project for conjunctive use planned for 2012	Reduction in water softeners and TDS from industries	No plans for desalination at WWTP, but proposes to replace alum with polymer, submit inflow and infiltration study to identify salinity sources and loads, and implement Capital

WWTP Facility	Salinity Reduction Efforts Source Water	Pretreatment Program	WWTP Desalination
			Improvement Energy Plan to meet salinity limitations
Mountain House CSD	No plans for changes to surface water from Clifton Court Forebay	Reduction in water softeners	No plans for desalination at WWTP
Discovery Bay CSD	—	—	Evaluated feasibility of constructing RO treatment system in 2010 Wastewater Master Plan

Note: The past and current violations at Deuel are potentially attributed to a malfunction of the RO and brine conversion systems used by the facility to reduce the salinity of the groundwater supply.

WWTP = wastewater treatment plant
RO = reverse osmosis
SSJID = South San Joaquin Irrigation District
TDS = total dissolved solids
CSD = community service district

Each of the current dischargers to the southern Delta is described below, including characteristics of the WWTP, salinity requirements, recorded violations in 2011, and currently implemented salinity control measures.

City of Tracy

Tracy discharges tertiary treated wastewater into Old River, which is a side branch of the SJR and contributes water to Clifton Court Forebay, a drinking water source for Southern California. The current NPDES discharge permit (Order No. R5-2012-0115) covers the main domestic wastewater treatment facility and an industrial pretreatment facility, including pretreated wastewater from the Leprino Foods Company (Leprino), a local cheese manufacturer (Central Valley Water Board 2012). All wastewater is discharged from Discharge Point 001 to Old River, located 3.5 miles north of the WWTP upstream of Paradise Cut (Figure 2-12). The nearest compliance monitoring station is station P-12 (Old River at Tracy Boulevard Bridge), approximately 4 miles west (downstream) of the discharge point (Central Valley Water Board 2007a). The nearest drinking water intakes are the CVP and SWP, which are approximately 10 miles downstream of the discharge (Central Valley Water Board 2007a).

Tracy's treated wastewater effluent is high in salt partly due to the municipal water supply and from significant salt loading from Leprino. Although Leprino provides preliminary treatment of its wastewater to reduce the high organic loading typical of food processing waste, no specific pretreatment is provided to reduce the high salt loading.

Tracy does not currently have EC effluent limitations; however, it still monitors for EC, as required by its NPDES permit, and has initiated salinity reduction efforts. The average EC of Tracy's wastewater effluent has not changed substantially over the past few years, although it did experience a slight increase in 2014 (Tables 13-7 and 13-8). Tracy submitted a salinity reduction plan in 2008 that describes the approach to identify, evaluate, and implement measures to reduce salinity in the effluent discharge and meet the interim salinity goal. Tracy also submitted a salinity best practicable treatment or control evaluation and salinity pollution prevention plan (PPP) in compliance with NPDES permit requirements.

Salinity Reduction Efforts

Source Water Supplies

Historically, the largest source of salinity in Tracy's wastewater effluent was the groundwater used as a potable water supply for the community. Tracy has obtained surface water potable supplies to replace the use of groundwater. Groundwater usage was reduced from 7,176 acre-feet (AF) in 2004 to 1,327 AF in 2009. As a result, there has been a reduction of approximately 5,000 tons of salt per year (Bayley pers. comm.). Additionally, Tracy is contracted with SSJID to receive water from New Melones Reservoir, and this additional water contributes to the reduction of salinity in the effluent (Tracy Press 2011). Additionally, Tracy completed construction of an Aquifer Storage and Recovery (ASR) well pilot project in 2012. The Central Valley Water Board must approve pilot tests on injection of drinking water into the groundwater basin. The permanent ASR project is planned for 2013 upon completion of environmental review. Tracy successfully commenced a pilot project to store surplus surface water supplies in the Semitropic Water Storage District in Kern County (Marshall pers. comm. 2012a).

Salinity Pretreatment Program

Replacing some groundwater with surface water for source water supplies has reduced the need for salt-based, self-regenerating water softeners, which contribute additional salinity to wastewater. These water softeners contribute to salinity because as they reduce hardness ions (e.g., calcium and magnesium), they produce a byproduct of a concentrated solution of the hardness ions and chloride that is discharged to the WWTP. This discharge increases the salinity of the wastewater entering the WWTP and the overall salinity of the treated effluent discharged from the WWTP. According to Tracy, there has been an observable significant decrease in the salinity of the wastewater effluent due to a reduction in the use of water softeners (City of Tracy 2008).

Desalination at the WWTP

Tracy is upgrading the WWTP to improve treatment and expand capacity. The treatment system capacity will be expanded from 10.8 million gallons per day (mgd) to 16 mgd through a four-phase expansion. In order to increase discharge capacity, Tracy is planning to construct a second outfall, Discharge Point 002, approximately 800 feet downstream of Discharge Point 001. Tracy is currently proposing to build a desalination plant (Verma pers. comm.). Tracy released a public draft of the initial study/mitigated negative declaration (IS/MND) for the Tracy Desalination and Green Energy Project in December 2011 and final document in April 2012 (State Clearinghouse Number 2011122004).

Deuel Vocational Institution

The California Department of Corrections and Rehabilitation's (CDCR) current NPDES permit (Order No. R5-2014-0014) authorizes treated effluent discharges from the Deuel Vocational Institution. Deuel has general population housing of more than 3,700 inmates. Treated effluent is discharged into the Deuel Drain, which is tributary to Paradise Cut and Old River (Central Valley Water Board 2014a). The western end of Paradise Cut discharges to Old River.

Table 13-12 summarizes the WWTP NPDES permit enforcement orders showing violations of EC effluent limitations occurring during the existing NPDES permit term. Deuel has had 16 violations of its daily and monthly average EC effluent limitations since the existing NPDES permit was issued.[15] These violations are potentially attributed to a malfunction of the RO and Brine Concentrator systems used by the facility to reduce the salinity of the groundwater supply. The RO system has only operated for 16 months of the 48 months since it has been permitted to operate (i.e., it has operated 33 percent of the time) (Central Valley Water Board 2015a). When the RO system operates, it reduces effluent EC concentrations to generally below 1.0 dS/m (Deuel Vocational Institute Wastewater Treatment Plant and Effluent Salinity, 2018).

Salinity Reduction Efforts

Source Water Supplies

Source water for Deuel comes from four on-site groundwater wells. The groundwater is treated prior to use via a RO system. Approximately 8,000 gallons per day of brine solution are removed and deposited to four evaporation ponds. Despite efforts to reduce salinity using this system, the facility continues to violate its effluent limitations; therefore, modifications to this facility are likely needed.

Salinity Pretreatment Program

Deuel does not have a pretreatment program because the only source of wastewater is the prison, and it does not treat industrial wastewater.

Table 13-12. Recent Wastewater Treatment Plant National Pollution Discharge Elimination System Permit Enforcement Orders for the Deuel Vocational Institution

Enforcement Order for EC Violation	Dates of Noncompliance	Description
Cease and Desist (R5-2008-0165-01) as amended by Administrative Civil Liability Complaint (ACLC) (R5-2010-0010)	NA	Established new interim daily EC limit of 3.000 dS/m (3,000 µmhos/cm) effective until Dec 31, 2010
ACLC (R5-2009-0571)	April 30, 2009	1 violation of daily EC limit of 3.000 dS/m (3,000 µmhos/cm)
ACLC (R5-2010-0526)	Aug 31, 2009–Feb 28, 2010	1 violation of monthly EC limit of 0.700 dS/m (700 µmhos/cm); 3 violations of monthly EC limit of 0.700 dS/m (700 µmhos/cm)
ACLC (R5-2010-0549)	April 30, 2010–Aug 31, 2010	5 violations of monthly EC limit of 0.700 dS/m (700 µmhos/cm)
ACLC (R5-2011-0575)	Sept 30, 2010–Feb 28, 2011	6 violations of monthly EC limit of 1.000 dS/m (1,000 µmhos/cm)

NA = not applicable
EC = electrical conductivity (salinity)
dS/m = deciSiemens per meter
µmhos/cm = micromhos per centimeter. Conversion is 1 dS/m = 1000 µmhos/cm.

[15] ACLC R5-2014-0518 and ACLC 2014-0550 were issued in 2014 and cover violations that occurred March 1, 2011 through December 31, 2013, and January 1, 2014 through March 31, 2014, respectively. However, EC was not one of the constituent standards that was in violation (Central Valley Water Board 2014a).

City of Manteca

Manteca's current NPDES permit (Order No. R5-2015-0026) regulates tertiary treated effluent discharges from Manteca and surrounding areas and a portion of Lathrop. Manteca discharges part of its treated effluent to irrigated fields. The remaining treated effluent is discharged to the SJR just upstream of the Mossdale EC monitoring station and SJR at Brandt Bridge (C-6) (Central Valley Water Board 2015b). The discharge is approximately 20 miles from the nearest drinking water intake (Central Valley Water Board 2009). Manteca receives municipal wastewater and wastewater from a produce washing and processing facility (Eckert Cold Storage). However, the food processing wastewater is only discharged to land and enters the facility through a separate collection system.

After the issuance of Manteca's former (2004) NPDES permit (Order No. R5-2004-0028), which included seasonal effluent limits for EC of 1.0 dS/m (September–March) and 0.7 dS/m (April–August), Manteca petitioned the State Water Board to amend the 0.7 dS/m effluent limit. On March 16, 2005, the State Water Board adopted Water Quality Order (WQO) 2005-005, which removed the 0.7 dS/m EC effluent limit. In October 2009, the Central Valley Water Board adopted Manteca's last NPDES permit (Order No. R5-2009-0095) that again included seasonal effluent limits for EC of 1.0 dS/m (September–March) and 0.7 dS/m (April–August)[16]. Since Manteca could not consistently comply with the 0.7 dS/m limitation, the Central Valley Water Board also adopted a time schedule order (No. R5-2009-0096), allowing Manteca until October 2014 to achieve compliance with the seasonal 0.7 dS/m effluent limitation. The time schedule order also required Manteca to update its salinity PPP, initially developed in 2005. Manteca submitted a revised PPP in April 2010. Under Order No. R5-2015-0026, effluent limitations based on the Delta salinity objectives were not imposed due to the *City of Tracy v. State Water Resources Control Board* litigation. Instead, a salinity effluent limitation based on current performance was imposed (calendar year annual average for EC is not to exceed 1.0 dS/m), as well as a continuing requirement to implement its PPP. The average EC of Manteca's wastewater effluent has not changed substantially over the past few years (Tables 13-7 and 13-8).

Salinity Reduction Efforts

Source Water Supplies

Manteca's groundwater supplies, and, consequently, their wastewater and treated effluent, have a high salt content. A portion of Manteca's water supply is pumped from groundwater wells with an EC level range of 0.3 dS/m to 0.6 dS/m. Starting in 2005, Manteca substituted a portion of its groundwater supply with surface water from the SSJID such that Manteca's water supplies are currently comprised of 50 percent surface water. Manteca is currently evaluating the possibility of installing salinity-removal technologies at some or all of its groundwater wells (City of Manteca 2010).

[16] Although the State Water Board removed the 0.7 dS/m EC limit in Manteca's 2004 NPDES permit, the Central Valley Water Board implemented the 0.7 dS/m EC limit again due to a subsequent State Water Board Order for the City of Tracy Wastewater Treatment Plant (WQO 2009-003).

Salinity Pretreatment Program

A source of wastewater salinity is self-regenerating water softeners (City of Manteca 2010). In recent years, Manteca's water supply has reduced its water hardness by obtaining different source water (e.g., surface water), but the use of water softeners has not decreased significantly because most water softener systems were installed in homes prior to the water hardness reduction. In the 2010 PPP, Manteca proposed to launch an education campaign to encourage residents to switch from standard self-regenerating water softeners to high-efficiency water softeners or an exchange tank system.

Several Manteca commercial and industrial wastewater generators participate in the current wastewater pretreatment processes and have undertaken efforts to reduce salinity. For example, the wastewater from Eckert Cold Storage has been separated into two streams, one for the food-processing and one for all other wastewater, thus reducing salinity discharged into the SJR.

Desalination at the WWTP

Manteca has not proposed to modify its facilities for salt removal.

City of Stockton

Stockton's current NPDES permit (Order No. R5-2014-0070) regulates tertiary treated effluent discharges from Stockton, the Port of Stockton, and surrounding urbanized San Joaquin County areas. The treated effluent is discharged to the SJR approximately 8 miles downstream from the SJR at Brandt Bridge compliance station (C-6) (Central Valley Water Board 2014b). There are no known drinking water intakes in the vicinity of the discharge (Central Valley Water Board 2014b). The average EC of Stockton's wastewater effluent has not changed substantially over the past few years (Tables 13-7 and 13-8). Stockton submitted a PPP to the Central Valley Water Board in 2005 and a draft salinity plan in June 2009. The average annual effluent is approximately 1.1 dS/m as stated in the 2011 salinity plan progress report based on effluent data collected from January to October 2010. These effluent data demonstrate compliance with the average annual salinity effluent limitation of 1.3 dS/m.

Salinity Reduction Efforts

Source Water Supplies

Stockton's existing water supply originates from groundwater wells, groundwater delivered by the California Water Service Company, and surface water delivered by SEWD from the Stanislaus and Calaveras Rivers. The average EC of the groundwater sources is approximately 0.5 dS/m (city wells) and approximately 0.4 dS/m (California Water Service wells), compared to 0.1 dS/m for surface water sources (City of Stockton 2009). The Delta Water Supply Project (DWSP) was completed in June 2012 and provides a new supplemental surface water supply from the SJR and includes a 30-mgd water treatment plant (City of Stockton 2011b).

Salinity Pretreatment Program

The extent of water softener use by Stockton residences is unknown (City of Stockton 2009). Stockton works with industrial dischargers within its service area to reduce TDS concentrations as part of its standard pretreatment program (City of Stockton 2009).

Desalination at the WWTP

Stockton is in the process of modifying the treatment plant to reduce salinity generated by alum (a chemical used to consolidate, and hence aid in the removal of, salt during the wastewater treatment process). It also will submit an inflow and infiltration study to the Central Valley Water Board as part of the capital improvement program to identify specific methods of reducing EC and TDS loads (City of Stockton 2011b).

Mountain House Community Services District

The Mountain House CSD's NPDES permit (Order No. R5-2013-0004) covers the discharge of tertiary treated effluent from the community of Mountain House in San Joaquin County into Old River (Central Valley Water Board 2013). The Jones Pumping Plant is located 4.5 miles west (downstream) of the discharge. The average EC of Mountain House CSD's wastewater effluent has not changed substantially over the past few years; however, it has slightly increased (Tables 13-7 and 13-8).

Salinity Reduction Efforts

Source Water Supplies

Mountain House CSD's source water is surface water from the Clifton Court Forebay, which has an EC of less than 0.3 dS/m (Central Valley Water Board 2007b).

Salinity Pretreatment Program

Mountain House CSD is required to implement a pretreatment program as specified in the current NDPES permit. Mountain House CSD continues to discourage the use of water softeners within its service area as part of its pretreatment program.

Desalination at the WWTP

Mountain House CSD currently neither operates a desalination system at the WWTP, nor does it plan to construct one.

Discovery Bay CSD

Discovery Bay CSD's NPDES permit (Order No. R5-2014-0073) regulates secondary treated discharges from the town of Discovery Bay to Old River (Central Valley Water Board 2014c). The Town of Discovery Bay owns the Discovery Bay WWTP, which serves approximately 16,000 people. Discovery Bay CSD's nearest compliance monitoring station is Clifton Court Forebay (2006 Bay-Delta Plan Station C-9). Bay-Delta Station C-9 is one of the four southern Delta salinity compliance stations and very little, if any, discharge from Discovery Bay CSD reaches the southern Delta (Marshall pers. comm. 2012b). However, because it is located within the southern Delta, it is included here as part of baseline conditions. The nearest drinking water intake is CCWD's Old River Intake for Los Vaqueros Reservoir. The average EC of Discovery Bay CSD's wastewater effluent has not changed substantially over the past few years; however, it has slightly decreased (Tables 13-7 and 13-8).

Salinity Reduction Efforts

Source Water Supplies

Discovery Bay CSD currently does not have any plans to change the source of its water supplies.

Salinity Pretreatment Program

Discovery Bay CSD currently does not have any plans to implement a salinity pretreatment program.

Desalination at the WWTP

According to the Discovery Bay Wastewater Treatment Master Plan (Discovery Bay CSD 2012), an RO treatment facility would be constructed to meet an effluent EC goal of 1.0 dS/m. However, because of the estimated high costs, high energy usage, and associated environmental impacts, the Discovery Bay CSD concluded in the master plan that RO treatment would only be constructed and used if mandated by the State (Discovery Bay CSD 2012).

Water Suppliers

Drinking water supply intakes are located in the southern Delta. These include the Jones and Banks pumping plants of the CVP and SWP, respectively, and the intakes for CCWD.

Central Valley Project and State Water Project

As described in Chapter 2, *Water Resources* (Section 2.6.2), and Chapter 5, *Surface Hydrology and Water Quality* (Sections 5.2.8 and 5.3.2), CVP and SWP export pumping is subject to 2006 Bay-Delta Plan objectives, which are implemented through the State Water Board's Water Right Decision 1641 (D-1641) (revised March 15, 2000). Both the CVP and the SWP have maximum permitted pumping rates but are limited by water availability depending on precipitation, snowpack, and senior water rights holders' needs. Delta outflow requirements may also limit export pumping if the combined Delta inflow is not enough to satisfy both the in-Delta agricultural diversions and CVP and SWP pumping. The 1986 Coordinated Operations Agreement (COA) between the federal and state governments sets the rules by which the CVP and SWP jointly operate their water storage and conveyance facilities in order meet regulatory obligations, maximize their contractual water deliveries, including Delta export pumping, and not adversely affect each other's water rights or the rights of others.

Contra Costa Water District

The CCWD diverts water from the southern and central Delta for drinking water supplies to eastern and central Contra Costa County. As described in Chapter 2, *Water Resources*, CCWD has four surface water intakes: Mallard Slough Intake, Rock Slough Pumping Plant #1, Old River Intake near State Route (SR) 4, and the Victoria Canal Intake. Old River and Victoria Canal Intakes are located immediately north–northwest of the SDWA boundary (Figure 2-12). The Mallard Slough Intake and Rock Slough Intake are located further west and closer to the ocean. The Old River Intake is the largest intake operated and accounts for the majority of surface water diverted to CCWD (CCWD and USBR 2008.)

CCWD's rights to divert water from the Delta integrate CCWD's operations with the coordinated operations of the CVP and SWP. CCWD has a contract with USBR for the delivery of 195,000 acre-feet per year (AF/y) of CVP water for municipal and industrial uses and agricultural users in the

CCWD service area. The water delivered under the contract may be diverted at the Rock Slough and Old River intakes at any time of the year. CCWD also has a water right for the Los Vaqueros Project that allows water to be diverted from Old River to Los Vaqueros Reservoir November–June during excess conditions in the Delta as defined in D-1629. CCWD also has a license and permit for diversions at Mallard Slough for up to 26,780 AF/y. Therefore, when CCWD operates within the terms of its CVP contract and water rights permits, it does so in conjunction with all other water supply interests (CCWD and USBR 2008).

CCWD's intakes are located in the western Delta where the effects of seawater intrusion are more pronounced. Generally, CCWD's intakes experience relatively fresh conditions in the late winter and early spring, and salinity increases in summer and fall as conditions become drier and regulatory standards governing Delta operations shift. This pattern can vary depending on hydrology (CCWD and USBR 2008). Use of the Mallard Slough Intake is generally restricted due to salinity concentrations because it experiences more tidal fluctuations as a result of its location. Water quality conditions have restricted diversions from Mallard Slough (an average of 3,100 AF/y) with no diversions available in dry years. When Mallard Slough supplies are used, CVP diversions at Rock Slough are reduced by an equivalent amount. The Victoria Canal Intake allows CCWD the flexibility to divert water with lower salinity and allows seasonal operations shifts between diversions. The seasonal variation in salinity between Old River/Rock Slough and Victoria Canal allows CCWD to divert predominantly in winter and spring from Old River. In the late summer, as salinity begins to rise, Victoria Canal salinity is generally lower than Old River salinity and remains lower until Delta outflow increases and Delta salinity improves (usually in December). Thus, CCWD typically diverts water in the summer and fall from Victoria Canal (CCWD and USBR 2008).

13.3 Regulatory Background

13.3.1 Federal

Relevant federal programs, policies, plans, or regulations related to service providers are described below.

Safe Drinking Water Act

The Safe Drinking Water Act (42 U.S.C., § 300f et seq.), originally passed by Congress in 1974 and amended in 1986 and 1996, was established to protect public health by regulating the nation's public drinking water supply. In addition to drinking water itself, the act requires the protection of its sources, such as rivers, lakes, reservoirs, springs, and groundwater wells. The act authorizes the U.S. Environmental Protection Agency (USEPA) to set national health-based standards for drinking water, such as MCLs, to protect against contaminants that may adversely affect public health. In California, as of July 1, 2014, the State Water Board's DDW implements the Safe Drinking Water Act. Included under the regulatory portion of the DDW program are: (1) issuance of permits for public water systems and their sources and treatment to ensure compliance with drinking water standards, (2) inspection of water systems, (3) tracking of monitoring requirements of water systems to determine compliance, and (4) enforcement actions.

The Safe Drinking Water Act mandates that all community water systems, regardless of water source (i.e., groundwater versus surface water) prepare and distribute an annual water quality report, or CCR. The CCR must summarize information on system source water, detected regulated contaminants in the drinking water, compliance to restore safe drinking water, and educational information, particularly regarding nitrate, arsenic, or lead in areas where these naturally occurring contaminants may be of concern. CCRs must be distributed to community water system customers by July 1 each year and the reports provide information on water quality for the preceding calendar year.

Clean Water Act

The federal CWA (33 U.S.C., § 1251 et seq.) places primary responsibility for developing water quality standards on the states. The CWA established the basic structure for regulating point and nonpoint discharges of pollutants into the waters of the United States and gave USEPA the authority to implement pollution control programs, such as setting wastewater standards for industry. The statute employs a variety of regulatory and non-regulatory tools to reduce pollutant discharges into waters of the United States, finance municipal wastewater treatment facilities, and manage polluted runoff.

Clean Water Act Section 402

Section 402 of the CWA regulates point-source discharges to surface waters through the NPDES program, which is administered by USEPA. In states with approved programs, like California, the State Water Board and the regional water boards have the primary responsibility to apply and enforce the requirements of the CWA as a substitute for direct regulation by USEPA (33 U.S.C. §§ 1342, subs. (b), (c); see related discussion of the Porter-Cologne Water Quality Control Act in Section 13.3.2, *State [Regulatory Background]*). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits. Typically, NPDES permits are reissued every 5 years (see Table 13-7 for recent permit information of WWTPs within the area of potential effects). WWTPs are required to obtain NPDES permits that contain specific requirements limiting discharge pollutants for the discharge of treated wastewater. NPDES permits also require dischargers to monitor their wastewater to ensure treated effluent meets all permitted requirements. The Central Valley Water Board generally issues WWTP NPDES permits for wastewater discharges within the area of potential effects.

13.3.2 State

Relevant state programs, policies, plans, or regulations related to service providers are described below.

California Code of Regulations, Title 23, and California Water Code, Section 106

Title 23 of the California Code of Regulations contains the State Water Board's regulations, Section 106 of the California Water Code (Wat. Code). Section 106 identifies the policy of the state that the use of water for domestic purposes is the highest use, with irrigation being the next highest use. Section 106.3 identifies that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes (also known as the "Human Right to Water"). Relevant state agencies, including the State Water Board, need to consider the human right to water when revising, adopting, or establishing policies and regulations relevant to domestic water use.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (Wat. Code, § 13000 et seq.) establishes a comprehensive program for the protection of water quality. It addresses both point and non-point discharges to surface and ground waters. It provides for a statewide program for water quality control administered regionally, within a framework of statewide coordination and policy. (Wat. Code, § 13000.) The nine regional water boards have primary responsibility for permitting through waste discharge requirements, inspection and enforcement actions. (See Wat. Code, §§ 13260 et seq. and 13300 et seq.) The Porter-Cologne Act provides for the adoption of water quality control plans. (Wat. Code, §§ 13170, 13240 et seq.) The State Water Board and the regional water boards administer the CWA's NPDES permit program, with oversight from USEPA. (See Wat. Code, §§ 13370 et seq.) The State Water Board is updating the 2006 Bay-Delta Plan in accordance with the CWA and the Porter-Cologne Act.

Given the authority under the Porter-Cologne Act to protect water quality, the State Water Board can take various actions to respond to areas with water quality concerns. For example, in enforcement actions, it can order parties responsible for nitrate contamination to provide replacement water to impacted communities, as appropriate. Since 2014, the State Water Board has assisted regional water boards with negotiating replacement water orders, including bottled water and RO treatment, for nitrate-impacted drinking water.

San Francisco Bay/Sacramento–San Joaquin Delta Estuary Water Quality Control Plan

The 2006 Bay-Delta Plan was adopted by the State Water Board in December of 2006 following a review of the 1995 Bay-Delta Plan. The 2006 Bay-Delta Plan identifies beneficial uses of the Bay-Delta, water quality objectives (i.e., flow and salinity) for the reasonable protection of those beneficial uses, and a program of implementation for achieving the water quality objectives.

The numeric objectives for EC in the 2006 Bay-Delta Plan for the southern Delta are based on the protection of agricultural beneficial uses, which is 100 percent protection of salt-sensitive bean and alfalfa crops (Appendix E, *Salt Tolerance of Crops in the Southern Sacramento–San Joaquin Delta*). The numeric objectives are 0.7 dS/m during the summer irrigation season (April–August) and 1.0 dS/m during the winter season (September–March). Compliance with these objectives is currently monitored at four compliance locations: SJR at Vernalis (C-10), SJR at Brandt Bridge (C-6), Old River near Middle River (C-8), and Old River at Tracy Boulevard Bridge (P-12). The numeric objectives are not just applicable at the compliance monitoring locations, but they also apply to the receiving waters of WWTP discharge: "unless otherwise indicated, water quality objectives cited for a general area, such as for the southern Delta, are applicable for all locations in that general area, and compliance locations will be used to determine compliance with the cited objectives" (State Water Board 2006).

D-1641 contains the current water right requirements, applicable to the California Department of Water Resources' (DWR's) and the U.S. Bureau of Reclamation's (USBR's) operations of the SWP and CVP facilities, to implement the Bay-Delta water quality objectives. It requires that USBR release flows from New Melones Reservoir to maintain EC at Vernalis. The salinity objectives are the maximum 30-day running average (monthly average) of mean daily EC (0.700 dS/m April–August and 1.0 dS/m September–March for all water year types) (State Water Board 2006).

The existing objective for chloride concentration (related to salinity) is a year-round maximum mean daily chloride concentration of 250 mg/L measured at five Delta intake facilities, of which CCWD's Pumping Plant No. 1 is one, for the reasonable protection of municipal beneficial uses. This is consistent with USEPA's secondary MCL for chloride. Additionally, a maximum daily chloride concentration of 150 mg/L (measured either at Pumping Plant No. 1 or the SJR at the Antioch Water Works Intake) is included in the 2006 Bay-Delta Plan for the reasonable protection of industrial uses. A water quality goal for bromides (related to salinity) is set at 0.15 mg/L.

Sacramento River and San Joaquin River Basins Water Quality Control Plan

The Central Valley Water Board's *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* identifies the beneficial uses to be reasonably protected in the Sacramento and SJR Basin water bodies, water quality objectives, implementation programs, and surveillance and monitoring programs. It includes wasteload allocations for salt and boron discharges into the LSJR. The waste load allocations are the concentration limits set equal to the EC water quality objectives for the SJR at the Airport Way Bridge near Vernalis. The Central Valley Water Board implements the plan by issuing WDR or NPDES permits for wastewater discharges. Southern Delta dischargers have been issued NPDES permits for treated discharges and are listed in Table 13-7.

The plan incorporates, by reference, the State Water Board's DDW's (formerly part of the California Department of Public Health (DPH) numerical drinking water maximum contaminant levels (MCLs). The incorporation of the MCLs, which apply to treated drinking water systems regulated by the DDW, makes the MCLs also applicable to ambient receiving water with respect to the regulatory programs administered by the regional water boards.

The Central Valley Water Board also adopted, and the State Water Board approved, plan amendments to add policies for variances from surface water quality standards for point source dischargers, a variance program for salinity, and exception from implementation of water quality objectives for salinity.[17] The amendments are pending approval by USEPA before they become effective. Under the variance policy, the Central Valley Water Board would be allowed the authority to grant variances from meeting water quality-based effluent limitations for non-priority pollutants to dischargers subject to NPDES permits. Under the salinity variance program, domestic and municipal wastewater permittees subject to NPDES permits may apply to the Central Valley Water Board for a variance from meeting water quality-based effluent limitations for salinity constituents (i.e., EC, total dissolved solids, chloride, sulfate and sodium). The Central Valley Water Board may approve the permittee's salinity variance request for a period not exceeding ten years after finding, among other things, that the attainment of water-quality based effluent limitations for salinity is not feasible, the permittee has implemented or will implement feasible salinity reduction/elimination measures and permittee continues to participate in the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) effort, a stakeholder effort working to develop comprehensive salt and nitrate management plans. Under the salinity exception program, dischargers that are subject to WDRs that are not also NPDES permits and conditional waivers may obtain a limited-term

[17] See *Central Valley Regional Water Quality Control Board Resolution No. R5-2014-0074* and *State Water Board Resolution No. 2015-010*.

exception to discharge requirements from the implementation of water quality objectives for salinity. SDWQ Alternatives 2 and 3 are subject to the variance policy, salinity variance program and salinity exception program adopted by the Central Valley Water Board under Resolution No. R5-2014-0074.

California Drinking Water Standards

The California drinking water standards are based on federal standards, which are listed in Title 22 of the California Code of Regulations and administered by the State Water Board's DDW. California MCLs, components of drinking water standards, are found in Title 22, Chapter 15, Division 4. Salinity can affect the taste, corrosivity, and other non-health-related characteristics of drinking water supplies. Drinking water has a recommended secondary MCL for specific conductance (i.e., salinity) of 0.900 dS/m. The upper secondary MCL is 1.600 dS/m and a short-term secondary MCL is 2.200 dS/m. No fixed consumer acceptance contaminant level has been established for conductance. Specific conductance concentrations lower than the recommended secondary MCL are desirable for a higher degree of consumer acceptance. The secondary MCL can be exceeded and is deemed acceptable to approach the upper MCL if it is neither reasonable nor feasible to provide more suitable waters. In addition, concentrations ranging up to the short-term MCL are acceptable only for existing community water systems on a temporary basis.

California Safe Drinking Water Act

The California Health and Safety Code (Part 12, Chapter 4) defines public water systems as a system for the provision of water for human consumption through pipes or other constructed conveyance that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. A public water system includes the following.

- Any collection, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system.
- Any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system.
- Any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

The Safe Drinking Water Act (at Health and Safety Code Section 116270 et seq.) includes the following summarized provisions regarding the controls to prevent contaminated water from getting to the end user of a public water system.

- Section 116287—DDW must place requirements on public water systems and water districts that are consistent with both the state and federal SDWA.
- Sections 116325 and 116350—DDW is responsible for ensuring that all public water systems are operated in compliance with the act and its regulations to protect public health.
- Section 116365—DDW must adopt primary drinking water standards for contaminants in drinking water that are not less stringent than the federal Safe Drinking Water Act.
- Section 116385—public water systems have to provide water analysis to DDW.
- Section 116395—DDW must assist local health officer in the evaluation of small public water systems for potential organic chemical contamination.

- Section 116400—if DDW determines a public water system is subject to potential contamination, it may require quarterly water analysis.
- Section 116425—DDW may exempt public water systems from any MCL or treatment requirements under certain compelling factors and other criteria, but only if it will not result in an unreasonable risk to health. Exemptions are granted for 12 months, but can be extended be up to 3 years if specific criteria are met.
- Section 116450—when primary drinking water standards are exceeded the public system operator has to notify DDW and users.
- Section 116470—public water systems are required to prepare and deliver consumer confidence reports; systems serving 10,000 service connections must disclose detections of contaminants and best available technologies to address the contamination.
- Section 116525 and 116540—operators of a public water system may not operate without a DDW permit. DDW may impose permit conditions, requirements for system improvements, and time schedule to ensure a reliable and adequate supply of water that is at all times pure, wholesome, potable, and does not endanger the health of consumers.
- Section 116550—public water systems may not change its source of supply or method of treatment without an amended permit.
- Section 116555—public water systems must comply with primary and secondary drinking water standards and provide pure, wholesome, healthful and potable water, among other requirements.
- Section 116655—DDW may issue compliance orders, which can include without limitation requiring treatment/purification, change in source water, or system repairs.

Detailed requirements for regular water quality monitoring are set forth in DDW's regulations at Cal. Code. Regs., tit. 22, Section 64400 et seq.

State Water Board Sources of Drinking Water Policy (Resolution No. 88-63)

The Sources of Drinking Water Policy (Resolution No. 88-63) established state policy that regional water boards must consider all surface water and groundwater, with certain exceptions, as suitable or potentially suitable for municipal or domestic supply. The policy defines the following three categories of waters potentially eligible for an exception from the designation and protection of a water source for municipal or domestic supply.

- Water bodies with high salinity (defined as TDS >3,000 mg/L), that either have naturally high contaminant levels that cannot reasonably be treated using either best management practices (BMPs) or best economically achievable treatment practices, or produce too low yield (<200 gallons per day).
- Waters designed or modified to treat wastewaters (domestic or industrial wastewater, process water, stormwater, mining discharges, or agricultural drainage), provided that such systems are monitored to ensure compliance with all relevant water quality objectives.
- Groundwater aquifers regulated as geothermal energy-producing sources or aquifers that have been exempted administratively by federal regulations for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy.

Groundwater Ambient Monitoring and Assessment Program

GAMA is a comprehensive groundwater quality monitoring program based on interagency collaboration between the State Water Board, regional water boards, DWR, Department of Pesticide Regulations, U.S. Geological Survey, and Lawrence Livermore National Laboratory (LLNL), and cooperation with local water agencies and well owners. Developed by the State Water Board in 2000, GAMA was expanded by the passage of the Groundwater Quality Monitoring Act of 2001, and includes the following four projects to meet the statutory requirements of the act.

- The Priority Basin Project—currently assesses the water quality of shallow aquifers typically used for domestic supplies prioritizing areas with the greatest household densities relying on domestic wells.
- GeoTracker GAMA—a groundwater information system that provides water quality data from multiple sources on an interactive Google-based map.
- Domestic Well Project—samples private wells on a county level for well owners who volunteer when the project is active in their county. Results are used by GAMA to evaluate water quality of domestic wells.
- Special Studies Project—focuses on groundwater studies conducted by LLNL, which cover nitrate, wastewater and groundwater recharge.

Groundwater Quality Monitoring Act of 2001

The Groundwater Quality Monitoring Act of 2001 was established to improve statewide comprehensive groundwater monitoring and to provide the public with readily available information about groundwater quality in California. The Groundwater Quality Monitoring Act requires that the State Water Board integrate existing monitoring programs and, as necessary, establish new program elements in order to create a comprehensive groundwater monitoring program for assessing the quality of all priority groundwater basin in the state that account for over 90 percent of groundwater used in California.

The Sustainable Groundwater Management Act

It is California state policy (Water Code § 113) that "groundwater resources be managed sustainably for long-term reliability and multiple economic, social, and environmental benefits for current and future beneficial uses" and that sustainable groundwater management "is best achieved locally through the development, implementation, and updating of plans and programs based on the best available science."

The Sustainable Groundwater Management Act (SGMA) (Wat. Code, § 10720 et seq.) provides the framework to implement this policy by requiring that local agencies in high- and medium-priority basins (DWR 2014) form groundwater sustainability agencies (GSAs) by June 30, 2017 that will develop, and commence implementation of, groundwater sustainability plans (GSPs) by either 2020 or 2022[18] that will achieve sustainable groundwater management within 20 years. SGMA defines

[18] SGMA requires critically overdrafted high and medium priority basins (as determined by DWR), to adopt GSPs by January 31, 2020. In the plan area this includes the Eastern San Joaquin, Merced and Chowchilla Subbasins. All other high and medium priority basins, such as the Modesto and Turlock Subbasins, must develop GSPs by January 31, 2022.

sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the [50 year] planning and implementation horizon without causing undesirable results." SGMA's definition of undesirable results includes such effects as chronic lowering of groundwater levels, significant and unreasonable reductions in groundwater storage, degradations of water quality, and land subsidence that interferes with surface land uses. (Wat. Code, § 10721, subd. (x).)

SGMA recognizes regional differences and provides flexibility to local agencies to tailor plans that meet their needs, improves coordination between land use and groundwater planning, prioritizes basins with the greatest problems and protects water rights. The legislation provides two key management principles: It ensures that local and regional agencies have the resources they need to sustainably manage groundwater, including the necessary authority, better technical information, and financial resources; and, when local agencies cannot or will not manage their groundwater sustainably, the legislation provides for State Water Board intervention until local agencies develop and implement sustainable groundwater management plans.[19] SGMA is described in greater detail in Chapter 9, *Groundwater Resources.*

13.3.3 Regional or Local

Relevant regional or local programs, policies, plans, or regulations related to service providers are described below. Although local policies, plans, or regulations are not binding on the state of California, below is a description of relevant ones.

Agricultural Water Management Plans

Several of the irrigation districts have prepared agricultural water management plans (AWMPs), in which they have identified methods for dealing with water supply shortages. Table 13-13 describes methods that are common throughout all of the irrigation district AWMPs for addressing surface water shortages.

Table 13-13. Irrigation District Methods for Addressing Surface Water Shortages

Irrigation District	Conjunctive Use	Reduction in Surface Water Allotments	Allowable Internal Transfers	Groundwater Used for Permanent Crops	Holds Carryover Surface Water for Crops	All Shortages Managed with Groundwater	Fair and Equitable Distribution	USBR Responsible for Shortages
SSJID	X	X	X	NA	NA	NA	X	X
OID	X	X	X	X	NA	NA	X	X
SEWD	X	X	NA	NA	NA	NA	NA	X
TID	X	X	X	X	X	NA	NA	NA
MID	X	X	NA	X	X	NA	NA	NA
Merced ID	X	X	NA	X	X	NA	X	NA

Sources: SSJID 2011, 2012; SEWD 2014; City of Stockton 2011c; OID 2012; TID 2012; MID 2012; Merced ID 2013; City of

[19] The State Water Board can only intervene in a local area and develop an interim plan in limited circumstances: when no agency is willing to serve as a GSA (by 2017); when a GSA does not compete a GSP (by 2020); and when both the GSP is inadequate or not implemented to achieve sustainability, and there is a condition of long-term overdraft or significant depletion of interconnected surface waters.

Merced 2001.
NA = not applicable

Urban Water Management Plans

The California Urban Water Management Planning Act requires urban water suppliers[20] to initiate planning strategies to ensure the appropriate level of reliability in their water service sufficient to meet the needs of the various categories of customers during normal, dry, and multiple dry water years. To do this, they must prepare an urban water management plan (UWMP) every 5 years. The intent of the UWMP is to present information about water supply, water usage, recycled water, and water use efficiency programs in a contracting water district's service area. The UWMP also serves as a resource for planners and policy makers over a 25-year planning time frame. Below is a brief summary of information contained in the UWMPs that are available for SSJID and MID and for entities that receive surface water from the irrigation districts.

South San Joaquin Irrigation District (SSJID)

SSJID is contracted to provide surface water to SEWD and the Cities of Tracy, Manteca, Lathrop, Ripon, and Escalon. In 2005, these cities, with the exception of Ripon, partnered with SSJID to construct a water treatment plant and pipeline to deliver treated water from the Woodward Reservoir to these participating cities as part of the South County Water Supply Project. The Cities of Manteca and Lathrop will receive 18,500 AF/y and 11,791 AF/y of treated potable water, respectively, once Phase II of the South County Water Supply Project is implemented (City of Lathrop 2009; City of Manteca 2012b).

SSJID's water comes from three sources: the Stanislaus River, groundwater pumping by SSJID and private land owners, and irrigation return flows from neighboring districts. The primary water supply is surface water diversions from the Stanislaus River. The majority of water users in the service area are agricultural, but the cities contracted with SSJID do serve municipal and urban users. SSJID projects it will have adequate supplies to meet water demands in normal years through 2030 (dependent upon the certainty of the available water supply, which is dependent upon each year's hydrology and regulatory uncertainty). SSJID would experience water shortages under single dry year conditions through 2030 that could not be compensated by conservation and only minimal shortages under multiple dry year conditions through 2030 that could likely be compensated by conservation (SSJID 2011).

Stockton East Water District (SEWD)

SEWD serves both urban and agricultural water users. SEWD's receives surface water from both the Stanislaus River (within the plan area) and Calaveras River (outside of the plan area). SEWD typically receives 75,000 AF/y from New Melones Reservoir on the Stanislaus River and under the OID/SSJID water transfer agreement, 8,000 to 30,000 AF/y[21]. SEWD typically receives

[20] *Urban water suppliers* are defined as suppliers that have 3,000 or more water connections or provide over 3,000 acre-feet of water annually.

[21] This agreement is based on New Melones Reservoir storage and inflow as of April 1 of each year. This contract ended in 2009, with a potential 10-year renewal, pending studies. A one-year temporary water transfer agreement for the water year 2009–2010 allowed for a sale of up to 15,000 AF/y from both OID and SSJID.

approximately 56.5 percent of its water supply from New Hogan Reservoir on the Calaveras River. As such, based on total surface water supplies received in 2010 (118,216 AF): 51,540 AF (approximately 44 percent of the total) came from New Melones Reservoir for agricultural use; 26,900 AF (approximately 23 percent of the total) came from the OID/SSJID water transfer agreement; and the New Hogan Reservoir provided 39, 776 AF of water (approximately 34 percent of the total) for urban use (SEWD 2014). SEWD maintains two groundwater wells that are only pumped to supplement demand during dry years. Saline intrusion and contamination from agricultural chemicals limit the use of groundwater. The *Stockton East Water District Water Management Plan* (SEWD 2014) includes the existing and projected water demands associated with these water users. SEWD's Water Management Plan identifies that deficiencies in water supply would occur under normal, single dry, and multiple dry years and would be offset by additional groundwater pumping from urban retailers and the DWSP (SEWD 2014).

City of Tracy

Tracy obtains water from both surface and groundwater sources. The amount of water that Tracy uses from each source varies year to year based on contractual agreements, annual precipitation, and city policy (City of Tracy 2011a). Currently, Tracy's existing water supplies include 17,500 AF/y through the USBR CVP Interim Renewal Contract; 2,500 AF/y via USBR WSID Option; and 11,120 AF/y from the South County Water Supply Project (City of Tracy 2014). Tracy Hills, once built out, will receive 2,430 AF/y from Byron Bethany Irrigation District (City of Tracy 2014). The City of Tracy is planning to decrease groundwater use to 2,500 AF/y by 2015; however, up to 9,000 AF/y of groundwater is available to the City of Tracy to make up for shortfalls in the event of a severe drought or other water shortage (City of Tracy 2014). Tracy anticipates that it has sufficient water supply to meet the water demand through 2035 during normal years, single dry and multiple dry years.

City of Ripon

Ripon last prepared an UWMP in 2003 and updated it in 2011 to meet new state standards. Ripon has an agreement with SSJID to receive 2,000 AF/y, with a gradual increase to 6,000 AF/y by 2030 (SSJID 2011).

City of Modesto and Modesto Irrigation District (MID)

Modesto relies on a conjunctive water use strategy with two primary sources: groundwater and surface water from the Tuolumne River purchased from MID. During normal water years, MID delivers approximately 33,600 AF/y of treated surface water to the City of Modesto. This amount is projected to increase to approximately 67,000 AF/y by 2035. Groundwater use is expected to be reduced in the future with the introduction of additional surface water supplies from the Modesto Regional Water Treatment Plant (MRWTP), and this supply source will become Modesto's primary water supply, with groundwater supplementing the available surface water supplies to meet demand (City of Modesto and MID 2011). The Phase Two expansion of MRWTP will double the capacity of MID's water treatment plant, and an additional 33,602 AF/y of demand will be met with surface water supplies upon the completion of this expansion.

The surface water supplied by the MRWTP is provided through agreements with MID, and if it becomes necessary to reduce deliveries to its landowners, there would be proportional reductions to the City of Modesto. The City of Modesto and MID project that water demand will be met 100 percent of the time with the water supply in normal, single dry, and multiple dry years, through

2035. In general, projected demand is expected to be met through additional groundwater pumping (City of Modesto and MID 2011).

City and County of San Francisco (CCSF)

The CCSF regional water system obtains approximately 85 percent of its water from the Upper Tuolumne River Watershed, which is collected in Hetch Hetchy Reservoir. The remaining 15 percent of CCSF's water supply is obtained from surface water sources in the Alameda and San Francisco Peninsula Watersheds (SFPUC 2013). In 2015, CCSF provided approximately 196 mgd of surface water to approximately 1,800,897 wholesale and 847,370 retail customers, and an additional 2 mgd of groundwater and recycled water was also delivered to retail customers (SFPUC 2016). The amount of water available to CCSF varies from year-to-year depending on meteorological conditions, water rights, and statutory and contractual obligations (City and County of San Francisco 2008). Currently, groundwater use is generally limited to irrigation in Golden Gate Park and at the San Francisco Zoo (City and County of San Francisco 2008). However, ongoing groundwater storage projects including the Regional Groundwater Storage and Recovery Project (as part of the WSIP, discussed below) and the San Francisco Groundwater Supply Project, would increase water supply reliability and diversify CCSF's water supply (SFPUC 2015).

In normal water years water demand is met 100 percent of the time. At current delivery levels, CCSF expects to experience up to a 25 percent water supply shortage 15–20 percent of the time during multiple-year droughts. To enhance the ability of CCSF to meet service goals for water supply, as well as water delivery reliability, water quality, and seismic reliability, SFPUC is implementing the Water System Improvement Program (WSIP). The WSIP is, in part, a water supply program that will be implemented in phases to meet projected water purchases through 2030 in drought and normal water years. The WSIP establishes a mid-term planning milestone for 2018 at which point SFPUC would reevaluate water demand projections through 2030 in the context of information, analysis and available water resources in 2018. The WSIP includes the following water supply elements.

- Water supply delivery to regional water system customers through 2018 of 265 mgd average annual target delivery, which includes 184 mgd for wholesale customers and 81 mgd for retail customers;
- Water supply sources would include 265 mgd average annual from Tuolumne River, San Francisco Peninsula, and Alameda Creek Watersheds, and 20 mgd (divided evenly between retail and wholesale customers) of water conservation, recycled water and local groundwater developed within the SFPUC's service area; and
- Water supply projects to meet dry-year demands with no greater than 20 percent system-wide rationing in any one year, which would include restoring the capacity of Calaveras and Crystal Springs reservoirs; groundwater conjunctive use; and water transfers with MID and TID during dry years (average 2 mgd) (CCSF 2008).

Delta Regional Monitoring Program

Since 2012, the Delta Regional Monitoring Program (Delta RMP), initiated by the Central Valley Water Board, has had the main goal of tracking and documenting the effectiveness of beneficial use protection on restoration efforts through comprehensive monitoring of water quality constituents in the Delta. The Delta RMP is stakeholder-directed with a steering committee consisting of publicly-owned WWTPs, municipal stormwater dischargers, the Central Valley Water Board, the USEPA, California Natural Resources Agency, State and Federal Contractors Water Agency, and Interagency Ecological Program. The Delta RMP is still under development.

Order R5-2014-0122 considers the amendment of NPDES permits of several Sacramento–San Joaquin Delta-area dischargers in accordance with 40 CFR 122.62(a)(2), including the City of Stockton Regional Wastewater Control Facility; the City of Tracy WWTP; Mountain House CSD; Discovery Bay CSD; and Deuel Vocational Institution to allow for the participation in the Delta RMP in lieu of conducting their current individual monitoring efforts, when feasible and appropriate.

General Plans

City and county general plans can contain policies governing service providers, specifically with respect to water supply and wastewater. The goals and policies governing service providers within the area of potential effects are addressed in the applicable county general plans. Although local general plans are not binding on the state of California, relevant provisions of these county general plans are outlined below.

Stanislaus County

Goals and policies addressing water services and groundwater resources are presented in the *Stanislaus County General Plan Conservation and Open Space Element* (Stanislaus County 1995). These include: monitoring groundwater quality, preventing reduction of groundwater levels, and incorporating water conservation strategies into new development.

Merced County

Goals and policies addressing water services are presented in the *Public Facilities Element* and the *Water Element* of the *2030 Merced County General Plan* (Merced County 2013). The policies support the adequate provision of utilities to the residents of Merced County and ensure a reliable water supply sufficient to meet the existing and future needs of the county by implementing groundwater recharge projects, demonstrating sufficient water supply for new development, and investing in additional surface water storage opportunities.

San Joaquin County

Objectives and policies addressing water services and groundwater resources are presented in the *Resources Element* of San Joaquin County's general plan (San Joaquin County 1992). The objectives include obtaining sufficient supplemental water supplies to meet all municipal and agricultural needs; protecting groundwater resources from overdraft; and preventing water supply contamination. The policies discuss maintaining water quality and managing water resources such that conjunctive use and other groundwater and surface water management practices are undertaken.

Contra Costa County

Goals and policies addressing water services are presented in the *Contra Costa County General Plan Public Facilities/Service Element* section on water services (Contra Costa County 2005). These policies include assurance of meeting regulatory standards for water delivery, water storage, and emergency water supplies to residents. The general plan identifies goals of ensuring potable water availability in quantities sufficient to serve existing and future residents and ensuring that new development pays the costs related to the need for future increased water system capacity.

City of Tracy

The *Tracy General Plan Public Facilities and Services Element* contains policies stating that the approval of a new development is conditioned on the availability of sufficient wastewater collection and treatment capacity to service the proposed development. In addition, new development shall fully fund the cost of wastewater treatment and disposal facilities. Tracy's general plan contains objectives and policies generally stating that the City shall meet the demands of future development with adequate water supply and infrastructure. Policies also state that the City shall establish water demand reduction standards for new development (City of Tracy 2011c).

City of Stockton

The *2035 Stockton General Plan* contains policies that discuss the need for proper facility sizing to meet long-term needs, wastewater reuse, and protection of critical infrastructure. It also contains policies that reflect the City's need for facilities able to meet long-term demands (City of Stockton 2007).

City of Manteca

Goals and policies addressing water services and wastewater services are presented in the *City of Manteca's General Plan Public Facilities and Service Element* (City of Manteca 2003). Goals include maintaining existing target level of services for water delivery to residents and meeting the needs of existing and projected development. Policies to support the goals include principally relying on groundwater resources in the near term, developing new water sources as necessary to serve new development, ensuring water quality and preventing contamination, and developing and implementing water conservation measures.

City of Lathrop

Section D of the *Comprehensive General Plan for the City of Lathrop* provides guidance for the elimination of deficiencies in existing utility services and obstacles to the expansion of utility services to adequately serve existing and future development (City of Lathrop 2004). This guidance includes: developing and maintaining existing groundwater resources within city limits, participating in the South County Surface Water Supply Project, converting agricultural water entitlements, and obtaining rights to other water sources in the region.

City of Escalon

Goals and policies identified in the City of Escalon's general plan are meant to address the community need for public service and facilities (City of Escalon 2005). These goals and policies are meant to develop services and facilities, such as those for water supply, as the city grows and to plan for the future increase in demand for such services.

City of Ripon

Goals and policies identified in the *City of Ripon's General Plan Land Use and Growth Accommodations Element* are meant to address groundwater resources and water conservation as they relate to water supply (City of Ripon 2006). These include monitoring the existing groundwater conditions and supply, identifying and securing available sources of supplemental surface water for replacement or recharge of groundwater, and promoting water conservation.

13.4 Impact Analysis

This section identifies the thresholds or significance criteria used to evaluate the potential impacts on service providers. It further describes the methods of analysis used to determine significance. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany the impact discussion, if any significant impacts are identified.

13.4.1 Thresholds of Significance

The thresholds for determining the significance of impacts for this analysis are based on the State Water Board's Environmental Checklist in Appendix A of the board's California Environmental Quality Act (CEQA) regulations. (Cal. Code Regs., tit. 23, §§ 3720–3781.) The thresholds derived from the checklist have been modified, as appropriate, to meet the circumstances of the alternatives. (Cal. Code Regs., tit. 23, § 3777, subd. (a)(2).) Impacts resulting from actions by service providers were identified as potentially significant in the State Water Board's Environmental Checklist (see Appendix B, *State Water Board's Environmental Checklist*) and, therefore, are discussed in this analysis as to whether the alternatives could result in the following.

- Require or result in the construction of new water supply facilities or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Violate any water quality standards such that drinking water quality in (a) public water systems and (b) domestic wells would be affected.
- Result in substantial changes to SJR inflows to the Delta such that insufficient water supplies would be available to service providers relying on CVP/SWP exports.

Where appropriate, specific quantitative or qualitative criteria are described in Section 13.4.2, *Methods and Approach*, for evaluating these thresholds.

As described Appendix B, *State Water Board's Environmental Checklist,* the LSJR and SDWQ alternatives would result in either no impact or less-than-significant impacts on the following related to service providers and, therefore, are not discussed further within this chapter.

- Exceed wastewater treatment requirements of the applicable regional water quality control board.
- Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed.
- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Result in a determination by the wastewater treatment provider, which serves or may serve the project, that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.
- Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs.
- Comply with federal, state, and local statutes and regulations related to solid waste.

13.4.2 Methods and Approach

LSJR Alternatives

This chapter evaluates the potential service provider impacts associated with the LSJR alternatives. Each LSJR alternative includes a specific unimpaired flow[22] requirement (i.e., 20, 40 or 60 percent) from February–June and different methods for adaptive implementation to reasonably protect fish and wildlife beneficial uses, as described in Chapter 3, *Alternatives Description*. Impacts could occur through a change in either surface water supply or groundwater supply or a change in surface or groundwater water quality under the LSJR alternatives. The methods for evaluating these changes and the potential impacts are detailed in the following sections.

Surface Water Supply

Results from the Water Supply Effects (WSE) model were used to estimate the potential surface water diversion reductions on each of the three eastside tributaries (Impact SP-1). Table 13-14 shows the changes in the cumulative distribution of the diversions that are expected to occur as a result of the LSJR alternatives as simulated by the WSE model.

While substantially reducing existing surface water supplies of service providers can be considered an impact, the extent to which service providers are affected is a function of their ability to use existing alternative supplies (e.g., groundwater) or develop alternative water supplies. Therefore, surface water diversion reductions are then compared to service providers' reliance on surface water as characterized in Tables 13-3a and 13-3b. The reductions are considered within the general context of water supply agreements and contracts to qualitatively determine whether service providers may need new and expanded water supply treatment facilities or water supply infrastructure.

This chapter provides a programmatic-level analysis of the impacts on service providers and refers to Chapter 16, *Evaluation of Other Indirect and Additional Actions* (Section 16.2), with respect to environmental impacts caused by service provider actions associated with various potential responses to the alternative. Potential impacts that result from service provider actions associated with the LSJR alternatives depend upon the specific actions selected by the service providers responsible for implementing site-specific projects, most of which are public agencies subject to their own CEQA obligations. Service providers may choose any approach described in Chapter 16, or a combination of approaches, or they may identify another as-yet unknown approach to meet its own unique needs. Potential new water supply facilities or infrastructure are described in Chapter 16 and include but are not limited to substitution of surface water with groundwater, aquifer storage and recovery, and recycled water sources (Sections 16.2.2, 16.2.3, and 16.2.4, respectively). With respect to CCSF, potential new water supply facilities or infrastructure may include in-Delta diversions and water supply desalination (Sections 16.2.5 and 16.2.6, respectively).

Changes to SJR inflow into the southern Delta at Vernalis resulting from the LSJR alternatives could change exports to service providers in the export service areas (i.e., CVP and SWP contractors). This

[22] *Unimpaired flow* represents the water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds. It differs from natural flow because unimpaired flow is the flow that occurs at a specific location under the current configuration of channels, levees, floodplain, wetlands, deforestation and urbanization.

is because some of the inflow is exported at the CVP and SWP pumps to the export service areas. The methodology used to estimate exports is fully described in Chapter 5, *Surface Hydrology and Water Quality* and Appendix F.1, *Hydrologic and Water Quality Modeling* (Section F.1.7) and results are presented in Tables F.1.7-2 through F.1.7-5 and summarized in Table 5-21. These changes are used in this chapter to qualitatively discuss whether there would be sufficient water supplies to service providers relying on CVP/SWP exports (Impact SP-3). To estimate the possible effects on exports, analysis related to exports and outflow assumes the State Water Board will not change the export constraints to protect any increased flows downstream of Vernalis because the LSJR alternatives as described in Chapter 3, *Alternatives Description*, would not affect export regulations**.**

Table 13-14. Distribution of Annual Baseline Water Supply and Differences from Baseline (Changes in Diversions) in the Eastside Tributaries for the LSJR Alternatives for 1922–2003

		LSJR Alternative 2				LSJR Alternative 3		LSJR Alternative 4	
		20% Unimpaired Flow		30% Unimpaired Flow					
Percentile	Baseline (TAF)	Change (TAF)	Percent Change	Change (TAF)	Percent Change	Change (TAF)	Percent Change	Change (TAF)	Percent Change
A. Annual Diversions from the Stanislaus River									
Minimum	252	-24	-9	-24	-9	-24	-9	-87	-35
10	538	-86	-16	-218	-41	-273	-51	-337	-63
20	583	-13	-2	-75	-13	-180	-31	-362	-62
30	605	20	3	11	2	-140	-23	-344	-57
40	630	27	4	10	2	-46	-7	-308	-49
50	661	12	2	3	0	-21	-3	-262	-40
60	676	10	2	5	1	-14	-2	-166	-25
70	694	7	1	3	0	-15	-2	-93	-13
80	708	1	0	1	0	-13	-2	-47	-7
90	723	1	0	1	0	-11	-1	-33	-4
Maximum	772	0	0	0	0	-13	-2	-13	-2
Average	637	-12	-2	-33	-5	-79	-12	-206	-32
B. Annual Diversions from the Tuolumne River									
Minimum	557	-186	-33	-186	-33	-216	-39	-343	-62
10	685	-33	-5	-142	-21	-277	-40	-456	-67
20	796	-15	-2	-81	-10	-234	-29	-510	-64
30	828	-6	-1	-51	-6	-188	-23	-450	-54
40	855	-3	0	-32	-4	-92	-11	-395	-46
50	878	-9	-1	-27	-3	-76	-9	-340	-39
60	891	-2	0	-20	-2	-63	-7	-218	-24
70	915	-5	-1	-25	-3	-56	-6	-153	-17
80	932	-2	0	-21	-2	-45	-5	-112	-12
90	960	-3	0	-22	-2	-52	-5	-107	-11

		LSJR Alternative 2				LSJR Alternative 3		LSJR Alternative 4	
		20% Unimpaired Flow		30% Unimpaired Flow					
Percentile	Baseline (TAF)	Change (TAF)	Percent Change	Change (TAF)	Percent Change	Change (TAF)	Percent Change	Change (TAF)	Percent Change
Maximum	1034	0	0	-30	-3	-30	-3	-127	-12
Average	851	-20	-2	-56	-7	-119	-14	-298	-35
C. Annual Diversions from the Merced River									
Minimum	136	67	49	67	49	67	49	66	48
10	441	-60	-14	-133	-30	-181	-41	-221	-50
20	558	-85	-15	-151	-27	-204	-37	-314	-56
30	578	-27	-5	-83	-14	-170	-29	-294	-51
40	602	-37	-6	-65	-11	-135	-22	-279	-46
50	617	-29	-5	-57	-9	-65	-11	-236	-38
60	630	-27	-4	-48	-8	-66	-10	-188	-30
70	643	-24	-4	-32	-5	-60	-9	-149	-23
80	653	-22	-3	-27	-4	-46	-7	-96	-15
90	669	-11	-2	-27	-4	-37	-6	-90	-13
Maximum	680	-7	-1	-7	-1	-7	-1	-32	-5
Average	580	-33	-6	-60	-10	-95	-16	-185	-32

TAF = thousand acre-feet

Groundwater Supply

Results from the WSE model, information from Tables 13-3a and 13-3b, and general information regarding municipal and potable wells were used to estimate the potential impact on groundwater supply for service providers (Impact SP-1). Specifically, the impact analysis draws from the following.

- Chapter 9, *Groundwater Resources*, assessment of Impact GW-1 (if reduction in surface water diversion would substantially deplete groundwater supplies or interfere with recharge).
- Public water suppliers' reliance on groundwater.
- Number of active groundwater wells operated by individual public water suppliers.
- Size of population served by the public water suppliers.
- Depths of selected wells shown in Table 13-3b and depths to groundwater at those wells.

In Chapter 9, it is determined that impacts on groundwater resources would be significant and unavoidable in the Extended Merced Subbasin under LSJR Alternative 2 with adaptive implementation; in the Modesto, Turlock, and Extended Merced Subbasins under LSJR Alternative 3; and in all four subbasins under LSJR Alternative 4. The public water suppliers located in the impacted subbasins (see Tables 13-3a and 13-3b) are more likely to be affected by a reduction in groundwater supply.

Municipal groundwater well depths in the four groundwater subbasins range from 110–1,216 feet (Table 13-3b), whereas domestic well depths range from 48–580 feet (State Water Board 2016b). In general, public wells are deeper than private wells because private entities generally do not have the resources to drill deep. Accordingly, private wells can run dry before public wells do during drought. The difference between well depth and depth to groundwater, as shown in Table 13-3b, is a rough indicator of the potential for a well to run dry in the future—the smaller the difference, the more likely that a particular well may go dry. This is a general indicator given that the depth to water in a well may be different from the depth to groundwater depending on the site-specific hydrogeologic characteristics of the aquifer and well depth. The depth to groundwater (Table 13-3b) refers to depth to the top of the aquifer; yet municipal drinking water wells can draw water from deeper confined aquifers, which can cause water level in a well to be different from the top of the aquifer. However, when the depth to groundwater approaches the well depth, there is more certainty that a well is close to running dry. A difference of 100 feet or less was selected to identify wells considered potentially at risk of running dry sooner relative to other wells (identified in the gray-shaded cells in Table 13-3b). If significant groundwater impacts are allowed to continue for multiple years, especially in combination with drought, these wells may be at greater risk of running dry.

As discussed for surface water supply, this chapter provides a programmatic-level analysis of the impacts on service providers and refers to Chapter 16, *Evaluation of Other Indirect and Additional Actions* (Sections 16.2 and 16.3), with respect to environmental impacts caused by service provider actions associated with various potential responses to the alternative. Potential new water supply facilities or infrastructure are described in Chapter 16 and include substitution of surface water with groundwater, aquifer storage and recovery, and recycled water sources (Sections 16.2.2, 16.2.3, and 16.2.4, respectively). ~~With respect to CCSF, potential new water supply facilities or infrastructure may include in-Delta diversions and water supply desalination (Sections 16.2.5 and 16.2.6, respectively).~~

Surface Water Quality

The potential impacts of the LSJR alternatives on existing drinking water sources in the southern Delta are evaluated quantitatively using the expected change in inflow from the LSJR predicted by the WSE model and the simulated effects on salinity values in the southern Delta (Impact SP-2a). EC in the southern Delta is largely controlled by EC at Vernalis. Table 13-15 presents baseline EC at Vernalis. The effect of LSJR Alternatives 2, 3, and 4 on these EC values is presented in Tables 13-16, 13-17, and 13-18. These tables show effects of the LSJR alternatives over a range of year types with the wetter, high flow years being represented by the salinity values at the lower ranges of the cumulative distribution and the drier, low flow years being represented by the salinity values at the higher ranges of the cumulative distribution. Further information about Delta salinity and changes in salinity within the southern Delta is presented in detail in Chapter 5, *Surface Hydrology and Water Quality,* in Appendix F.1, *Hydrologic and Water Quality Modeling* (which presents salinity changes under each of the LSJR alternatives) and Appendix F.2, *Evaluation of Historical Flow and Salinity Measurements of the Lower San Joaquin River and Southern Delta* (which presents historic salinity data).

Table 13-15. Cumulative Distribution of Baseline EC (µmhos/cm) at Vernalis

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Minimum	193	155	222	218	186	193	180	144	205	222	163	227	216
10	440	507	606	386	296	264	245	192	334	451	420	448	422
20	468	542	749	568	344	306	305	299	406	544	442	481	456
30	484	584	784	672	466	337	347	341	432	573	497	495	486
40	489	596	807	752	600	458	374	362	467	586	528	510	517
50	496	612	813	769	684	631	413	375	528	597	547	521	576
60	506	629	824	785	780	658	442	421	564	610	569	539	609
70	515	645	831	798	870	791	517	461	588	629	590	552	633
80	529	664	844	824	936	859	594	567	628	643	613	567	673
90	547	686	867	838	1,000	1,000	676	644	682	660	655	590	730
Maximum	589	759	926	882	1,000	1,000	700	700	700	700	700	669	747
Average	492	598	770	697	655	592	435	407	508	577	535	518	565

Note: 1 dS/m (deciSiemens per meter) = 1,000 µmhos/cm (micromhos per centimeter)

Table 13-16. Change in Cumulative Distribution of EC (µmhos/cm) at Vernalis Associated with LSJR Alternative 2

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Minimum	0	0	0	0	0	0	0	-2	0	0	0	0	0
10	-3	-6	17	-6	-15	-1	-2	-5	-57	0	-8	-21	0
20	-1	-6	6	-23	-9	-5	-5	-30	-89	7	-2	-3	7
30	-4	-4	10	24	24	-7	10	-34	-87	8	1	1	1
40	-2	0	2	2	-27	15	22	-36	-92	1	6	-3	3
50	-4	0	5	8	-32	0	17	-32	-109	4	0	-2	-1
60	-1	0	1	4	73	45	23	-48	-122	9	-1	-3	-14
70	-1	0	1	8	42	46	-20	-54	-124	2	-10	-3	-5
80	0	0	4	1	41	110	-58	-129	-104	6	-6	0	-11
90	-3	0	0	10	0	0	-80	-141	-98	4	0	-5	-45
Maximum	0	0	0	0	0	0	0	0	0	0	0	0	-9
Average	-2	-2	8	3	11	16	-9	-52	-85	4	-4	-6	-10

Note: 1 dS/m (deciSiemens per meter) = 1,000 µmhos/cm (micromhos per centimeter)

Table 13-17. Change in Cumulative Distribution of EC (µmhos/cm) at Vernalis Associated with LSJR Alternative 3

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Minimum	12	0	0	0	0	0	-5	-8	-64	25	0	0	3
10	-85	-99	144	29	-14	23	-29	-24	-150	-24	-3	-87	-9
20	-100	-118	43	106	35	7	-53	-112	-196	-38	-6	-98	-9
30	-80	-74	24	86	-17	37	-61	-139	-190	-2	14	-59	-10
40	-45	-6	6	24	-102	-20	-62	-145	-194	-1	-3	-9	-12
50	-29	0	11	16	30	-90	-74	-140	-229	-9	8	3	-44
60	-32	2	5	14	17	-48	-86	-174	-225	-3	5	2	-55
70	-36	1	10	19	-6	-119	-127	-189	-216	-2	3	-1	-58
80	-41	0	15	9	9	-97	-180	-275	-210	-1	4	0	-72
90	-32	2	27	17	-12	-75	-214	-327	-192	4	0	-5	-111
Maximum	-49	0	74	55	0	0	0	-143	-27	0	0	0	-36
Average	-49	-30	36	36	-6	-38	-94	-163	-185	-8	3	-25	-43

Note: 1 dS/m (deciSiemens per meter) = 1,000 µmhos/cm (micromhos per centimeter)

Table 13-18. Change in Cumulative Distribution of EC (µmhos/cm) at Vernalis Associated with LSJR Alternative 4

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Minimum	12	0	0	17	0	-32	-42	-31	-109	65	45	0	18
10	-93	-106	154	96	-31	2	-71	-62	-206	31	0	-87	-13
20	-103	-129	49	144	-10	-10	-104	-161	-260	23	55	-98	-22
30	-81	-74	24	95	-88	-7	-124	-192	-255	16	12	-59	-22
40	-45	-6	8	28	-185	-77	-138	-207	-262	19	5	-3	-37
50	-27	0	11	22	-109	-200	-156	-209	-305	16	17	5	-72
60	-32	2	7	24	-142	-186	-154	-245	-309	19	8	4	-89
70	-36	1	10	31	-78	-239	-216	-268	-305	9	4	0	-93
80	-41	0	15	24	-100	-250	-263	-364	-325	17	7	-2	-115
90	-27	2	27	34	-50	-243	-306	-411	-336	40	0	-1	-156
Maximum	-49	0	74	118	0	0	-150	-262	-53	0	0	0	-67
Average	-50	-32	41	51	-75	-121	-163	-229	-265	20	12	-22	-69

Note: 1 dS/m (deciSiemens per meter) = 1,000 µmhos/cm (micromhos per centimeter)

The magnitude of the effects of the alternatives at other locations within the southern Delta (e.g., Old River at Tracy Boulevard and SJR at Brandt Bridge) is expected to be slightly larger than the effects at Vernalis. This is because the Vernalis flow, which affects EC at Vernalis, also affects the change in EC between Vernalis and locations within the southern Delta. As a result, if an alternative is expected to cause a reduction in EC at Vernalis, it would be expected to cause a slightly greater reduction farther downstream. Similarly, if an alternative is expected to cause an increase in EC at Vernalis, it would be expected to cause a slightly greater increase farther downstream. This information is used to identify whether the salinity in the southern Delta would result in a substantial degradation to water quality such that municipal drinking water sources could be affected.

Groundwater Quality

The potential impact of the LSJR alternatives on groundwater quality in municipal drinking water wells in the Eastern San Joaquin, Modesto, Turlock, and Extended Merced Subbasins is evaluated qualitatively. The analysis is based, in part, on the discussion of potential indirect impacts on groundwater quality due to increased pumping and subsequent reduction of groundwater level as discussed in Section 13.2.1, *Lower San Joaquin River and Tributaries.* The analysis also considers MCL exceedance information for primary detected contaminants in groundwater wells of selected municipalities in the area of potential effects during a representative non-drought year and drought year (Table 13-5), when groundwater reliance increased. To determine whether drinking water sources could be significantly impacted, these variables are considered together within the context of the California Health and Safety Code provisions of the Safe Drinking Water Act to prevent contaminated water from getting to the end user of a public water system (Impacts SP-2a and SP-2b).

Adaptive Implementation

Each LSJR alternative includes a February–June unimpaired flow requirement (i.e., 20, 40, or 60 percent) and methods for adaptive implementation to reasonably protect fish and wildlife beneficial uses, as described in Chapter 3, *Alternatives Description*. In addition, a minimum base flow is required at Vernalis at all times during this period. The base flow may be adaptively implemented as described below and in Chapter 3. State Water Board approval is required before any method can be implemented, as described in Appendix K, *Revised Water Quality Control Plan*. All methods may be implemented individually or in combination with other methods, may be applied differently to each tributary, and could be in effect for varying lengths of time.

The Stanislaus, Tuolumne, and Merced Working Group (STM Working Group) will assist with implementation, monitoring, and assessment activities for the flow objectives and with developing biological goals to help evaluate the effectiveness of the flow requirements and adaptive implementation actions. The STM Working Group may recommend adjusting the flow requirements through adaptive implementation if scientific information supports such changes to reasonably protect fish and wildlife beneficial uses. Scientific research may also be conducted within the adaptive range to improve scientific understanding of measures needed to protect fish and wildlife and reduce scientific uncertainty through monitoring and evaluation. Further details describing the methods, the STM Working Group, and the approval process are included in Chapter 3 and Appendix K.

Without adaptive implementation, flow must be managed such that it tracks the daily unimpaired flow percentage based on a running average of 7 days. The four methods of adaptive implementation are described briefly below.

1. Based on best available scientific information indicating that more flow is needed or less flow is adequate to reasonably protect fish and wildlife beneficial uses, the specified annual February–June minimum unimpaired flow requirement may be increased or decreased to a percentage within the ranges listed below. For LSJR Alternative 2 (20 percent unimpaired flow), the percent of unimpaired flow may be increased to a maximum of 30 percent. For LSJR Alternative 3 (40 percent unimpaired flow), the percent of unimpaired flow may be decreased to a minimum of 30 percent or increased to a maximum of 50 percent. For LSJR Alternative 4 (60 percent unimpaired flow), the percent of unimpaired flow may be decreased to a minimum of 50 percent.
2. Based on best available scientific information indicating a flow pattern different from that which would occur by tracking the unimpaired flow percentage would better protect fish and wildlife beneficial uses, water may be released at varying rates during February–June. The total volume of water released under this adaptive method must be at least equal to the volume of water that would be released by tracking the unimpaired flow percentage from February–June.
3. Based on best available scientific information, release of a portion of the February–June unimpaired flow may be delayed until after June to prevent adverse effects to fisheries, including temperature, which would otherwise result from implementation of the February–June flow requirements. The ability to delay release of flow until after June is only allowed when the unimpaired flow requirement is greater than 30 percent. If the requirement is greater than 30 percent but less than 40 percent, the amount of flow that may be released after June is limited to the portion of the unimpaired flow requirement over 30 percent. For example, if the flow requirement is 35 percent, 5 percent may be released after June. If the requirement is 40 percent or greater, then 25 percent of the total volume of the flow requirement may be released after June. As an example, if the requirement is 50 percent, at least 37.5 percent unimpaired flow must be released in February–June and up to 12.5 percent unimpaired flow may be released after June. ~~If after June the STM Working Group determines that conditions have changed such that water held for release after June should not be released by the fall of that year, the water may be held until the following year.~~ See Chapter 3 and Appendix K for further details.

4. Based on best available scientific information indicating that more flow is needed or less flow is adequate to reasonably protect fish and wildlife beneficial uses, the February–June Vernalis base flow requirement of 1,000 cubic feet per second (cfs) may be modified to a rate between 800 and 1,200 cfs.

The operational changes made using the adaptive implementation methods above may be approved if the best available scientific information indicates that the changes will be sufficient to support and maintain the natural production of viable native SJR Watershed fish populations migrating through the Delta and meet any biological goals. The changes may take place on either a short-term (e.g., monthly or annually) or longer-term basis. Adaptive implementation is intended to foster coordinated and adaptive management of flows based on best available scientific information in order to protect fish and wildlife beneficial uses. Adaptive implementation could also optimize flows to achieve the objective, while allowing for consideration of other beneficial uses, provided that these other considerations do not reduce intended benefits to fish and wildlife. While the measures and processes used to decide upon adaptive implementation actions must achieve the narrative objective for the reasonable protection of fish and wildlife beneficial uses, adaptive implementation could result in flows that would benefit or reduce impacts on other beneficial uses that rely on water.

The quantitative results included in the figures, tables, and text of this chapter present WSE modeling of the specified unimpaired flow requirement for each LSJR alternative (i.e., 20, 40, or 60 percent). However, the modeling does allow some inflows to be retained in the reservoirs after June, as could occur under adaptive implementation method 3, to prevent adverse temperature effects and this is included in the results presented in this chapter. If the percent of unimpaired flow is not specified in this chapter, these are the percentages of unimpaired flow evaluated in the impact analysis. However, as part of adaptive implementation method 1, the required percent of unimpaired flow could change by up to 10 percent if the STM Working Group agrees to adjust it. The highest possible percent of unimpaired flow associated with an LSJR alternative is also evaluated in the impact analysis if long-term implementation of method 1 has the potential to affect a determination of significance. For example, if the determination for LSJR Alternative 2 at 20 percent unimpaired flow is less than significant, but the determination for LSJR Alternative 3 at 40 percent unimpaired flow is significant, then LSJR Alternative 2 is also evaluated at the 30 percent unimpaired flow. This use of modeling provides information to support the analysis and evaluation of the effects of the alternatives and adaptive implementation. For more information regarding the modeling methodology and quantitative flow and temperature modeling results, see Appendix F.1, *Hydrologic and Water Quality Modeling*.

Extended Plan Area

The analysis of the extended plan area generally identifies how the impacts may be similar to or different from the impacts in the plan area (i.e., downstream of the rim dams) depending on the similarity of the impact mechanism (e.g., changes in reservoir levels, reduced water diversions, and additional flow in the rivers) or location of potential impacts in the extended plan area. Where appropriate, the program of implementation is discussed to help contextualize the potential impacts in the extended plan area.

SDWQ Alternatives

The potential impacts of the SDWQ alternatives on existing drinking water sources in the southern Delta are evaluated qualitatively. The general range of historical salinity levels in the southern Delta are presented in Chapter 5, *Surface Hydrology and Water Quality* (Tables 5-15a-d), Appendix F.2, *Evaluation of Historical Flow and Salinity Measurements of the Lower San Joaquin River and Southern Delta*, and Section 13.2.3, *Southern Delta*.

The SDWQ alternatives would amend the southern Delta salinity objectives identified in the 2006 Bay-Delta Plan. The 2006 Bay-Delta Plan established salinity objectives to protect agricultural beneficial uses in the southern Delta. Under the CWA, the Central Valley Water Board is required to impose permit effluent limitations to achieve water quality objectives in the Bay-Delta Plan for point-source dischargers where there is a reasonable potential for the discharge to cause or contribute to an excursion above a water quality objective. (40 C.F.R., § 122.44, subd. (d).) The average annual effluent EC data, existing regulatory effluent limitations, and evaluation of enforcement orders are used to qualitatively discuss whether service providers could meet the objectives of the SDWQ alternatives. For this assessment, it is assumed that under baseline conditions, WWTP effluent limitations would be based on the current limitations. With the exception of Deuel, these are less stringent than the southern Delta salinity objectives specified in the 2006 Bay-Delta Plan. If the salinity objectives are changed according to SDWQ Alternatives 2 ~~and~~ or 3, WWTP effluent limitations for salinity would have be modified to require compliance with~~and set equal to~~ the new objectives. The potential impacts of the SDWQ alternatives on WWTPs are evaluated qualitatively (Impact SP-1).

WWTP discharges in the southern Delta have a de minimis influence on downstream ambient EC levels, both in low and high export scenarios. The extent to which WWTPs can meet salinity water quality objectives is in part controlled by factors beyond their control, namely flows and circulation patterns, which are largely controlled by tidal action and water diversions. As early as the 1991 Bay-Delta Plan the State Water Board recognized the need to meet salinity water quality objectives through the regulation of flow. WWTPs are subject to the Clean Water Act and must control their salt discharges. Appendix K states it is reasonable to view the extent to which WWTPs must control their discharges in light of the constraints they face, the de minimis effect of their discharge on salinity in the southern Delta, and the plan amendment's program of implementation's focus on water levels and flows to achieve the salinity water quality objectives. Desalination through RO treatment of effluent can reduce salinity in a wastewater discharge's effluent, but it is energy intensive, costly, and would not result in salinity improvements in the southern Delta. Given the above factors, Appendix K states that RO treatment for WWTP discharges into the southern Delta is currently not a feasible technology for the purpose of controlling salinity in the Delta. Appendix K states that where it is infeasible for WWTPs discharging to the southern Delta to comply with traditional numeric water quality-based effluent limitations for salts in an NPDES permit, the Central Valley Regional Water Board shall require enforceable effluent limitations in the form of best management practices, including pretreatment and source control measures. Performance-based effluent limitations are required to maintain WWTP performance. These WWTPs will have a continuing obligation to evaluate whether technological or economic changes have made previously deemed infeasible upgrades to control salinity in WWTP effluent feasible. Appendix K further provides that where it is or becomes feasible for WWTPs to comply with numeric water quality based effluent limitations for salts, the Central Valley Regional Water Board shall require them. In that case, new and expanded desalination through RO treatment may occur and this SED evaluates its environmental impacts, along with the more immediate actions that WWTPs may take to comply with the plan amendments, The Central Valley Water Board has determined the discharge from Discovery Bay CSD does not have reasonable potential to cause or contribute to an exceedance of the 2006 Bay-Delta Plan water quality objectives in Old River or the southern Delta (Marshall pers. comm. 2012a). This is because of the large dilution in Old River and the good quality of water in Old River coming down from the Sacramento River (Marshall pers. comm. 2012a). Thus, Discovery Bay CSD can comply with the water quality objectives and does not need effluent limits based on the 2006 Bay-Delta Plan water quality objectives (Marshall pers. comm. 2012a). Since SDWQ Alternatives 2 and 3 are higher than the existing salinity water quality objectives, Discovery Bay CSD would likely continue to not have a reasonable potential to cause or contribute to exceedance of the proposed salinity water quality objectives such that effluent limitations would not be required. Therefore, Discovery Bay CSD is not included in the analysis in Section 13.4.3, *Impacts and Mitigation Measures*.

This chapter provides a programmatic-level analysis of the impacts on service providers and refers to Chapter 16, *Evaluation of Other Indirect and Additional Actions* (Section 16.4), with respect to environmental impacts caused by service provider actions associated with various methods of compliance. Service providers may choose any method of compliance described in Chapter 16, or a combination of methods, or they may identify another as-yet unknown method of compliance to comply with requirements from the revised objectives. Potential new water supply facilities or infrastructure are described in Chapter 16 and include the following: new source water supplies including new and expanded infrastructure to support such supplies; salinity pretreatment programs; desalination, including new and expanded salinity removal facilities at existing WWTPs; and the real-time management of agricultural return flow, including the use of detention ponds (Sections 16.4.2, 16.4.3, 16.4.4, respectively).[23]

As noted in Chapter 9, *Groundwater Resources*, and discussed in Appendix B, *State Water Board's Environmental Checklist*, the SDWQ alternatives would not result in a change in the minimal groundwater pumping that currently takes place in the southern Delta; therefore, with regard to groundwater supply, and associated effects on drinking water supply, the SDWQ alternatives are not addressed in this chapter.

13.4.3 Impacts and Mitigation Measures

Impact SP-1: Require or result in the construction of new water supply facilities or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects

No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the*

[23] The City of Tracy finalized and adopted the *Initial Study/Mitigated Negative Declaration for the Tracy Desalinization and Green Energy Project* in April of 2012 (City of Tracy 2011b, 2012). Impact determinations from this document are incorporated herein. This document identified available and feasible mitigation necessary to reduce potentially significant environmental effects on aesthetics, agriculture, air quality, biological resources, cultural resources, geology and soils, hydrology and water quality, hazards and hazardous materials, and land use and planning. With the implementation of mitigation measures, impacts on these resources were determined by the City to be reduced to a less-than-significant level.

No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1), for the No Project Alternative technical analysis.

LSJR Alternatives

LSJR Alternative 2 (Less than significant/Significant and unavoidable with adaptive implementation)

Surface Water Supply

Results of the WSE model indicate that service providers diverting surface water from the Stanislaus, Tuolumne, and Merced Rivers would generally be able to divert similar surface water amounts at similar times under LSJR Alternative 2 when compared to baseline (Table 5-19). For LSJR Alternative 2, the average percent reduction in water supply on the Stanislaus, Tuolumne, and Merced Rivers was estimated to be 2 percent, 2 percent, and 6 percent, respectively (Table 13-14). Service providers relying on surface water diversions are expected to receive similar surface water supplies relative to baseline conditions. Because it is expected these service providers would have sufficient sources of surface water, it is not expected they would need to construct new or expanded water treatment facilities or water supply infrastructure.

Groundwater Supply

As described in Chapter 9, *Groundwater Resources*, the slight reduction in recharge compared to baseline, due to small changes to average surface water diversions under LSJR Alternative 2, would not likely result in a substantial reduction in groundwater levels. As such, those service providers (Tables 13-3a and 13-3b) and private users that rely primarily on groundwater would have sufficient sources for municipal and domestic uses under LSJR Alternative 2 and, therefore, it is not expected they would need to construct new or expand existing water treatment facilities or water supply infrastructure. Impacts would be less than significant.

Adaptive Implementation

Based on best available scientific information indicating that a change in the percent of unimpaired flow is needed to reasonably protect fish and wildlife, adaptive implementation method 1 would allow an increase of up to 10 percent over the 20-percent February–June unimpaired flow requirement (to a maximum of 30 percent of unimpaired flow). A change to the percent of unimpaired flow would take place based on required evaluation of current scientific information and would need to be approved as described in Appendix K, *Revised Water Quality Control Plan.* Accordingly, the frequency and duration of any use of this adaptive implementation method cannot be determined at this time. However, an increase of up to 30 percent of unimpaired flow would potentially result in different effects as compared to 20-percent unimpaired flow, depending upon flow conditions and frequency of the adjustment. While the total volume of water released February–June would be the same as LSJR Alternative 2 without adaptive implementation, the rate could vary from the actual (7-day running average) unimpaired flow rate.

Based on best available scientific information indicating that a change in the timing or rate of unimpaired flow is needed to reasonably protect fish and wildlife, adaptive implementation method 2 would allow changing the timing of the release of the volume of water within the February–June time frame. While the total volume of water released February–June would be the same as LSJR Alternative 2 without adaptive implementation, the rate could vary from the actual (7-day running average) unimpaired flow rate. Method 2 would not authorize a reduction in flows required by other agencies or through other processes, which are incorporated in the modeling of baseline conditions. Method 3 would not be authorized under LSJR Alternative 2 since the unimpaired flow percentage would not exceed 30 percent.

Adaptive implementation method 4 would allow an adjustment of the Vernalis February–June flow requirement. WSE model results show that under LSJR Alternative 2 the 1,200-cfs February–June base flow requirement at Vernalis would require a flow augmentation in the three eastside tributaries and LSJR only 2.7 percent of the time in the 82-year record analyzed. Similarly, flow augmentation would be required 0.7 percent of the time to meet a 1,000 cfs requirement and 0.5 percent of the time for an 800 cfs Vernalis base flow requirement. These results indicate that changes due to method 4 under this alternative would rarely alter the flows in the three eastside tributaries or the LSJR.

Surface Water Supply

At 30 percent unimpaired flow under LSJR Alternative 2 with adaptive implementation method 1, the average percent reduction in water supply on the Stanislaus, Tuolumne, and Merced Rivers was estimated to be 5 percent, 7 percent, and 10 percent, respectively. Thus, surface water supply reductions would be greater at the 30 percent unimpaired flow level compared to 20 percent unimpaired flow. Reductions would be greatest for service providers receiving Merced River diversions (i.e., Merced ID), but would also be substantial for Tuolumne River service providers (i.e., TID, MID, and CCSF).

The extent to which service providers' surface water supplies would actually be reduced is a function of the mechanisms by which they receive the water (e.g., water rights or contracts), existing policies, regulations, and the type of water use they supply. Some water supply contracts have provisions that dictate when and how much surface water other water users receive from irrigation districts. For example, contracts could require the irrigation district to supply the full contracted amount of surface water to the other water user at all times, including during drought or water restricted periods. Some irrigation districts have policies in place that may require curtailment of water supplies during periods of surface water reduction (Table 13-13). Although California recognizes water for domestic purposes as the most important use of water and irrigation as the next most important use (Cal. Code Regs., tit. 23, § 106), this does not necessarily mean that the water supply for domestic uses cannot be modified. Furthermore, if other water districts that supply domestic uses are receiving water through contracts with irrigation districts, then these uses would not necessarily be protected. For example, if MID experiences water shortages, its deliveries to service providers serving urban uses (e.g., City of Modesto) could be cut back proportionally, as described in MID's various plans and policy documents.

The extent to which service providers that primarily rely on surface water are affected by a reduction in surface water diversions is a function of their ability to develop alternative water supplies or rely on their current existing alternative supplies (e.g., groundwater). Service providers that rely heavily or primarily on surface water diversions to supply water to their service areas could experience significant reductions in water supply, depending on the various factors described above (i.e., mechanism by which they receive the water, existing policies, regulations, and the type of water use they supply). Thus, the extent of the effect under LSJR Alternative 2 with adaptive implementation method 1 would be great when compared to baseline. MID, TID, and Merced ID currently rely on surface water diversions from the Tuolumne and Merced Rivers as their primary water supply. The City of Modesto currently relies on surface water diversions to meet nearly 40 percent of its water demand (Table 13-3b). If surface water diversions were reduced on the Tuolumne and Merced Rivers, (depending on the mechanism by which they receive the water, existing policies, regulations, and the type of water use they supply) these service providers would likely be greatly affected. The ~~LSJR Alternative 2~~ program of implementation for the LSJR alternatives states that the State Water Board will take actions as necessary to ensure implementation of flow objectives does not impact supplies of water for minimum health and safety needs, particularly during drought periods. Actions may include assistance with funding and development of water conservation efforts and regional water supply reliability projects and regulating public drinking water systems and water rights. These actions would be aimed at those service providers supplying water to municipal users and may offset water supply reduction impacts on providers. However, it is expected service providers may need to construct or expand new water treatment facilities or water supply infrastructure to try to accommodate reductions in surface water supplies. Additionally, as a result of reduced water supply, LSJR Alternative 2 with adaptive implementation method 1 may necessitate WWTPs and related infrastructure to be modified to allow or augment water recycling or meet pretreatment or NPDES permit requirements.

As discussed in Appendix L, *City and County of San Francisco Analyses*, some portion of the increased release flows from New Don Pedro Reservoir on the Tuolumne River could be shared by CCSF (especially during a prolonged drought), thus potentially reducing water supply. This would depend on a number of factors, including the assignment of responsibility to CCSF or the irrigation districts to meet the flow requirements through a proceeding amending water rights or through FERC relicensing, the interpretation of the Fourth Agreement, whether CCSF pays the irrigation districts to release water to meet the flow requirement, and any future agreement between the irrigation districts and CCSF. If a prolonged drought occurred, and CCSF was required to share in the release of flows, thus potentially reducing water supply, it may need to construct new and expanded water treatment supply infrastructure for in-Delta diversion and desalination to accommodate reductions in surface water supplies, as identified in Chapter 16, *Evaluation of Other Indirect and Additional Actions,* Sections 16.2.5 and 16.2.6, respectively.

Identifying the exact nature of the new and expanded facilities potentially needed by those irrigation districts and other water suppliers to replace potentially reduced surface water supplies is speculative (as discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*). However, it is reasonably foreseeable that new and expanded facilities could include the following.

- New and expanded infrastructure, if needed, to convey water obtained through water transfers or sales from other entities or watershed.[24]

[24] One of the options that the service providers have to compensate for the reduction of surface water and groundwater availability due to the LSJR alternatives is water purchase or transfer from other entities. As discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*, Section 16.2.1, it is not expected that additional infrastructure would be needed. If new and expanded infrastructure is needed, the physical environmental impacts of the construction would be similar to those discussed in Chapter 16, Section 16.2.2 and Table 16-7; Section 16.2.3 and Table 16-9; and Section 16.2.4 and Table 16-10).

- New and expanded groundwater well(s) and distribution infrastructure (e.g., underground pipes) and infrastructure to treat groundwater, if needed.
- New and expanded conjunctive groundwater use program(s), which could use available capacity in unlined canals and agricultural fields that are not in production to recharge groundwater basins during high flow events.
- New and expanded facilities at existing WWTPs and distribution infrastructure (e.g., underground pipes) to increase the supply of recycled water as a possible source of water.
- New surface water reservoir and distribution infrastructure.

Depending on the location and particular construction and operational requirements, construction of the new and modified facilities described above could result in physical environmental impacts on resources such as those listed below (Chapter 16, Section 16.2.1, Section 16.2.2 and Table 16-7; Section 16.2.3 and Table 16-9; Section 16.2.4 and Table 16-10; and Section 16.2.7 and Table 16-11b).

- Air quality and greenhouse gases, as a result of emissions generated by construction equipment and construction trips.
- Biological resources, as a result of potential dust, noise, or possible removal of special-status species and habitat.
- Cultural resources, as a result of excavation, grading, and other soil-disturbing activities, if construction takes place in an area moderately or highly sensitive for cultural resources.
- Geology, as a result of potential erosion or construction on unstable soils.
- Water quality, as a result of runoff associated with dust control or other construction activities, or as a result of potential construction material spills, such as of lubricants or fuel.
- Hazards, as a result of handling, use, and disposal of hazardous materials during construction.
- Mineral resources, as a result of potentially inhibiting access to known mineral resources.
- Noise, as a result of the use of construction equipment within proximity to potential sensitive receptors (e.g., residences).
- Traffic, as a result of the use of construction equipment and commuting of construction workers.

Depending on the location and particular construction and operational requirements, operation of new and modified facilities could result in physical environmental impacts on resources such as those listed below (Chapter 16, Section 16.2.1, Section 16.2.2, and Table 16-7; Section 16.2.3 and Table 16-9; Section 16.2.4 and Table 16-10; and Section 16.2.7 and Table 16-11b).

- Aesthetics, as a result of operational lighting or blocking of views if views are designated and present and sensitive receptors are present.
- Air quality and greenhouse gases, as a result of increased energy demand.
- Biological resources, as a result of potential water quality impacts related to treating new water source(s).
- Water quality, as a result of the need to treat new water source(s).
- Hazards, as a result of handling materials (e.g., chlorine) potentially needed to treat new water source(s).
- Mineral resources, as a result of potentially inhibiting access to known mineral resources.

- Noise, as a result of new equipment operating within proximity to potential sensitive receptors (e.g., residences).

Should service providers need to construct new and expanded water treatment facilities or water supply infrastructure as a result of implementation of method 1 under LSJR Alternative 2, the activities involved therein are anticipated to either be discretionary actions and/or meet the definition of a project for CEQA. (State CEQA Guidelines, §§ 15377–15378.) If the activities are not discretionary actions and/or do not meet the definition of a project under CEQA (e.g., private well construction or modification), then it is presumed there would be very limited environmental impacts such that they would not rise to the level of causing potentially significant environmental impacts necessitating environmental documentation (e.g., mitigated negative declaration, environmental impact report). The decision-making body of the lead agency (e.g., public water supplier or local agency) would approve discretionary action(s) associated with any new or modified facilities or infrastructure. The approval of new or modified facilities would require the preparation and approval of a CEQA document identifying project-specific details and specific resource analyses of potentially significant impacts. The CEQA document would disclose any project-specific, potentially significant environmental impacts resulting from new or modified facilities. As part of this process, the decision-making body would be responsible (not the State Water Board) for imposing mitigation measures or BMPs if project-specific environmental impacts deemed potentially significant.

Although the exact scope and scale of environmental impacts cannot be determined because identifying the exact nature of the new and expanded facilities is speculative, Table 16-38 in Chapter 16 lists possible mitigation measures that would likely reduce potentially significant impacts on environmental resources as a result of construction and operation of new or modified facilities or infrastructure. For example, potentially significant environmental impacts due to construction may be mitigated through design, timing, and construction BMPs. Infrastructure could be designed to have minimal impact on the surrounding environment (e.g., pipelines could be buried under existing roads). Construction-timing mitigation measures may include scheduling such that work in surface waters, if needed, takes place after aquatic species have migrated out of the area. BMPs for construction activities could include the use of erosion prevention practices near surface waters, for example.

An SED must identify feasible mitigation measures for each significant environmental impact identified in the SED. (Cal. Code Regs., tit. 23, § 3777, subd. (b)(3).) CEQA does not grant agencies new, discretionary powers independent of the powers granted to the agencies by other laws. (Pub. Resources Code, § 21004; Cal. Code Regs., tit. 14, § 15040.) Accordingly, a mitigation measure may be legally infeasible if the lead agency does not have the authority to require or implement it. (Pub. Resources Code, § 21004; Cal. Code Regs., tit. 14, § 15040.) Since the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities or infrastructure, it is not feasible for the State Water Board to impose the possible mitigation measures listed in Table 16-38. Moreover, the State Water Boards lacks authority to impose mitigation measures related to impacts on certain resources (e.g., air, noise or traffic). Agencies responsible for approving the project-specific new or modified facilities can and should impose the applicable mitigation measures in Table 16-38. The storage capacities for the reservoirs are fixed. Accordingly, there is no possibility of increasing the total water supply to provide more water for surface water diversions as mitigation under LSJR Alternative 2. More water released to the rivers would leave less water for surface water diversions. Therefore, there is no feasible mitigation the State Water Board can implement to reduce environmental impacts resulting from the need for new or modified facilities or infrastructure. Impacts would be significant and unavoidable.

Groundwater Supply

MID, TID and Merced ID may need to supplement their surface water supplies with groundwater to meet their needs, under adaptive implementation method 1, as described above and in Chapter 9, *Groundwater Resources*. Impacts on groundwater would increase relative to the 20 percent unimpaired flow level in the Extended Merced Subbasin depending on the use by Merced ID. As described in Chapter 9, LSJR Alternative 2 adaptive implementation method 1 would result in a substantial depletion of groundwater supplies in the Extended Merced Subbasin if implemented on a long-term basis. Were that to occur, service providers and private users relying heavily or primarily on groundwater sources for municipal and domestic use could experience significant reductions in water supply over the long term. The magnitude or severity of the effect would depend on additional factors such as the size of the population being served and the number of active municipal wells in their service area, and the range of differences between well depths and depths to groundwater (Table 13-3b), and other factors (e.g., physical condition of wells). For example, Le Grand CSD serves a population of 1,700 with three active wells (Table 13-3b), and the range of difference between well depths and depths to groundwater for those three wells is 91–536 feet. In light of these three factors, the demand for municipal and domestic water supply in the service area of Le Grand CSD with implementation of LSJR Alternative 2 with adaptive implementation method 1 could likely be met in the short term. But the district's wells are aging, and two have experienced age-related failures recently (~~Chauhan pers. comm.~~ Giwargis 2014) If groundwater reductions were to continue for multiple years, especially in combination with drought conditions, these wells may be at risk of running dry.

Similar to the above discussion related to surface water supply, over the long term, service providers in the Extended Merced Subbasin may need to construct new and expanded water treatment facilities or water supply infrastructure (e.g., additional wells) to meet demands. Additionally, as a result of reduced water supply, implementation of LSJR Alternative 2 with adaptive implementation method 1 may necessitate WWTPs and related infrastructure to be modified to allow or augment water recycling or meet pretreatment or NPDES permit requirements. Therefore, impacts would be significant. Drinking water sourced from domestic wells would be affected similarly, and it is assumed that those affected would need to find an alternative drinking water supply such as bottled water or drill additional groundwater wells, and impacts would be significant.

Similar to the reductions in surface water supply, the reduction in groundwater supply to service providers in the Extended Merced Subbasin identified in Table 13-3a would likely require these entities to construct new and expanded water treatment facilities or water supply infrastructure (e.g., additional wells) to replace groundwater supplies. Identifying the exact nature of the new and expanded facilities needed to replace potentially reduced surface water diversions and groundwater supplies is speculative (as discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*). However, it is reasonably foreseeable that the facilities could include the following.

- New and expanded infrastructure, if needed, to convey water obtained through water transfers or sales from other entities.
- New and expanded groundwater well(s) and distribution infrastructure (e.g., underground pipes) and infrastructure to treat groundwater, if needed.

- New and expanded conjunctive groundwater use program(s), which could use available capacity in unlined canals and agricultural fields that are not in production to recharge groundwater basins during high flow events.
- New and expanded facilities at existing WWTPs and distribution infrastructure (e.g., underground pipes) to increase the supply of recycled water as a possible source of water.

Similar to the above discussion related to surface water supply, identifying the exact nature of the new and expanded facilities potentially needed to replace potentially reduced groundwater supplies is speculative (as discussed in Chapter 16). Depending on the location and particular construction and operational requirements, construction of the new or modified facilities, as described above, could result in significant physical environmental impacts on resources (Chapter 16 Section 16.2.1; Section 16.2.2 and Table 16-7; Section 16.2.3 and Table 16-9; and Section 16.2.4 and Table 16-10). Although the exact scope and scale of environmental impacts cannot be determined because identifying the exact nature of the new and expanded facilities is speculative, Table 16-38 in Chapter 16 lists possible mitigation measures that would likely reduce potentially significant impacts on environmental resources as a result of construction and operation of new or modified facilities or infrastructure. Because the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities or infrastructure, it is not feasible for the State Water Board to implement the possible mitigation measures listed in Table 16-38. Moreover, the State Water Board lacks authority to impose mitigation measures related to impacts such as air and noise. Agencies responsible for approving the project-specific new or modified facilities can and should impose the mitigation measures. The storage capacities for the reservoirs are fixed. Accordingly, there is no possibility of increasing the total water supply to provide more water for surface water diversions as mitigation under LSJR Alternative 2 with adaptive implementation method 1. More water released to the Merced River would leave less water for surface water diversions. Therefore, there is no feasible mitigation the State Water Board can implement to reduce environmental impacts on service providers and domestic groundwater users resulting from the need for new or modified facilities or infrastructure. Impacts would be significant and unavoidable.

LSJR Alternative 3 (Significant and unavoidable/Significant and unavoidable with adaptive implementation)

Surface Water Supply

As a result of LSJR Alternative 3, WSE model results predict surface water diversions would be generally reduced when compared to baseline conditions on the Stanislaus, Tuolumne, and Merced Rivers (Table 5-19). The average percent reduction in water supply on the Stanislaus, Tuolumne, and Merced Rivers was estimated to be 12 percent, 14 percent, and 16 percent, respectively, for LSJR Alternative 3 (Table 13-14). The impacts of LSJR Alternative 3 would be similar to those described above for LSJR Alternative 2 with adaptive implementation method 1; however, more irrigation districts and other water suppliers would likely be impacted as surface water supplies would be significantly reduced on the Stanislaus, Tuolumne, and Merced Rivers. Those irrigation districts and other water suppliers on the Tuolumne and Merced Rivers would be affected as described above for LSJR Alternative 2 with adaptive implementation method 1 (i.e., MID, TID, and Merced ID, City of Modesto and CCSF[25]). Additionally, it is expected that SSJID, OID, the City of Tracy, and SEWD may also be affected under LSJR Alternative 3, given the predicted reductions in surface water supplies and because they rely heavily or primarily on surface water to meet demand.

The reductions in surface water supply to service providers would likely require these entities to construct new and expanded water treatment facilities or water supply infrastructure to replace reduced surface water supplies. Identifying the exact nature of the new and expanded facilities needed to replace potentially reduced surface water diversions is speculative (as discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*). Because the surface water diversions on the Stanislaus, Tuolumne, and Merced Rivers would be reduced, potentially requiring the construction of new and expanded water treatment facilities or water supply infrastructure, impacts would be significant.

Similar to the discussion of surface water supply impacts under LSJR Alternative 2 with adaptive implementation method 1, identifying the exact nature of the new and expanded facilities potentially needed by service providers and domestic groundwater users to replace potentially reduced groundwater supplies is speculative (as discussed in Chapter 16). Depending on location and particular construction and operational requirements, construction of the new or modified facilities, as described above, could result in significant physical environmental impacts on environmental resources (Chapter 16, Section 16.2.2 and Table 16-7; Section 16.2.3 and Table 16-9; and Section 16.2.4 and Table 16-10). Although the exact scope and scale of environmental impacts cannot be determined because identifying the exact nature of the new and expanded facilities is speculative, Table 16-38 in Chapter 16 lists possible mitigation measures that would likely reduce potentially significant impacts on environmental resources as a result of construction and operation of new or modified facilities or infrastructure. Because the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities or infrastructure, it is not feasible for the State Water Board to impose the possible mitigation measures listed in Table 16-38. Moreover, the State Water Board lacks authority to impose mitigation measures related to impacts such as air and noise. Agencies responsible for approving the project-specific new or modified facilities can and should impose the applicable mitigation measures in Table 16-38. The storage capacities for the reservoirs are fixed. Accordingly, there is no possibility of increasing the total water supply to provide more water for surface water diversions as mitigation under LSJR Alternative 3. More water released to the river would leave less water for surface water diversions. Therefore, there is no feasible mitigation the State Water Board can implement to reduce environmental impacts resulting from the need for new or modified facilities or infrastructure. Impacts would be significant and unavoidable.

[25] With respect to CCSF and similar to the discussion under LSJR Alternative 2, with adaptive implementation method 1, and as discussed in Appendix L, *City and County of San Francisco Analyses*, a potential reduction in water supply during a prolonged drought would depend on a number of factors, including the assignment of responsibility to CCSF or the irrigation districts to meet the flow requirements through a proceeding amending water rights or through FERC relicensing, the interpretation of the Fourth Agreement, whether CCSF pays the irrigation districts to release water to meet the flow requirement, and any future agreement between the irrigation districts and CCSF. If a prolonged drought occurred, and CCSF was required to share in the release of flows, thus potentially reducing water supply, it may need to construct new and expanded water treatment supply infrastructure to accommodate reductions in surface water supplies.

Groundwater Supply

The average annual groundwater balance is expected to be substantially reduced in the Modesto, Turlock, and Extended Merced Subbasins under LSJR Alternative 3, which would eventually produce a measureable decrease in groundwater elevations (Chapter 9, *Groundwater Resources*). This effect would be more severe in dry years and in areas farther from the LSJR, the valley low point toward which groundwater moves. These substantial reductions in groundwater supplies would, in turn, impact service providers (Tables 13-3a and 13-3b) and private groundwater users in these subbasins who are relying heavily or primarily on groundwater sources for municipal and domestic uses. These entities would likely experience significant reductions in their groundwater supply, particularly over the long term and in dry years. As discussed under LSJR Alternative 2 with adaptive implementation method 1, the magnitude or severity of the effect would depend on additional factors, such as the size of the population being served, the number of active municipal wells in their service area, the range of differences between well depths and depths to groundwater (Table 13-3b), and other factors (e.g., physical condition of wells). Service providers at particular risk include those that have a higher potential for a well to run dry in the future. For example, Hickman, Hilmar CWD, Hughson, and Keyes CSD in the Turlock Subbasin; Le Grand CSD and the City of Merced in the Extended Merced Subbasin; and the City of Modesto in the Modesto Subbasin (Table 13-3b). This is because these service providers have relatively few active wells relative to the size of the population served and/or the range of difference between well depths and depths to groundwater is less than 100 feet (Table 13-3b). Private groundwater users are also at risk because domestic wells are typically more shallow and older than public municipal wells. Impacts would be significant and unavoidable.

Adaptive Implementation

As discussed under LSJR Alternative 2, adaptive implementation methods 2 and 4 are not expected to result in impacts on surface water diversions or groundwater supplies. Adaptive implementation method 3 would result in a shift in the volume of February–June water available to other parts of the year and would be unlikely to affect surface water diversions or groundwater supplies because the total amount of water available for diversion would be unaffected. Adaptive implementation method 1 would allow an increase or decrease of up to 10 percent in the February–June, 40 percent minimum unimpaired flow requirement (with a minimum of 30 percent and maximum of 50 percent) to optimize implementation measures to meet the narrative objective, while considering other beneficial uses, provided that these other considerations do not reduce intended benefits to fish and wildlife. Adaptive implementation must be approved using the process described in Appendix K, *Revised Water Quality Control Plan*. Accordingly, the frequency and duration of any use of this adaptive implementation method cannot be determined at this time. If the specified percent of unimpaired flow were changed from 40 percent to 30 percent or 40 percent to 50 percent on a long-term basis, the conditions and impacts could become more similar to LSJR Alternative 2 with adaptive implementation method 1 or LSJR Alternative 4 with adaptive implementation method 1, respectively. Reducing the unimpaired flow percentage from 40 percent to 30 percent would reduce impacts on several service providers, and effects may be limited to MID, TID, CCSF, and Merced ID, and those service providers (Tables 13-3a and 13-3b) and private groundwater users that rely solely on the Extended Merced Subbasin for water supply. However, increasing the unimpaired flow percentage from 40 percent to 50 percent would increase the magnitude and severity of the impacts on those service providers at 40 percent unimpaired flow because there would be less surface water available at 50 percent unimpaired flow. In addition, the Eastern San Joaquin Basin could be affected. As such, impacts would be significant. As discussed under LSJR Alternative 2 with adaptive implementation method 1, there is no feasible State Water Board mitigation to reduce these impacts, and impacts would be significant and unavoidable. Agencies responsible for approving the project-specific new or modified facilities can and should impose the applicable mitigation measures in Table 16-38.

LSJR Alternative 4 (Significant and unavoidable/Significant and unavoidable with adaptive implementation)

Surface Water Supply

As a result of LSJR Alternative 4, WSE model results predict surface water diversions would be greatly reduced when compared to baseline conditions on all three eastside tributaries. The average percent reduction in water supply on the Stanislaus, Tuolumne, and Merced Rivers was estimated to be 32 percent, 35 percent, and 32 percent, respectively, for LSJR Alternative 4 (Table 13-14). As discussed above under LSJR Alternative 3, the extent to which service providers' surface water supplies could be reduced is a function of the mechanism by which they receive the water (e.g., water rights, contracts), existing policies and regulations, and the type of water use they supply. The extent to which service providers are affected by a reduction in surface water diversions is a function of their abilities to use existing alternative supplies (e.g., groundwater) or develop alternative water supplies. Service providers that currently use surface water as a significant source of water supply could experience reductions in surface water supplies (e.g., irrigation districts, Tracy, SEWD, Modesto, CCSF[26]) similar to impacts described above for LSJR Alternative 3 with and without adaptive implementation. LSJR Alternative 4 program of implementation describes actions to assure that implementation does not impact supplies of water for minimum health and safety needs, and these actions may offset water supply reduction impacts on service providers for municipal uses. However, impacts would be significant.

The reductions in surface water supply to service providers would likely require these providers to construct new and expanded water treatment facilities or water supply infrastructure to replace reduced surface water supplies. Additionally, as a result of reduced water supply, LSJR Alternative 4 may necessitate WWTPs and related infrastructure to be modified to allow or augment water recycling or meet pretreatment or NPDES permit requirements. Identifying the exact nature of the new and expanded facilities needed to replace potentially reduced surface water diversions is speculative (as discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*). Because the surface water diversions on the Stanislaus, Tuolumne, and Merced Rivers would be reduced, potentially requiring the construction of new and expanded water treatment facilities or water supply infrastructure, impacts would be significant.

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[26] With respect to CCSF, and similar to the discussion under LSJR Alternative 2 with adaptive implementation method 1, and as discussed in Appendix L, *City and County of San Francisco Analyses*, a potential reduction in water supply during a prolonged drought would depend on a number of factors, including the assignment of responsibility to CCSF or the irrigation districts to meet the flow requirements through a proceeding amending water rights or through FERC relicensing, the interpretation of the Fourth Agreement, whether CCSF pays the irrigation districts to release water to meet the flow requirement, and any future agreement between the irrigation districts and CCSF. If a prolonged drought occurred, and CCSF was required to share in the release of flows, thus potentially reducing water supply, it may need to construct new and expanded water treatment supply infrastructure to accommodate reductions in surface water supplies.

Similar to the discussion of surface water supply impacts under LSJR Alternative 2, with adaptive implementation method 1, identifying the exact nature of the new and expanded facilities potentially needed by public and private water suppliers to replace potentially reduced municipal groundwater supplies is speculative (as discussed in Chapter 16). Depending on the location and the particular construction and operational requirements, construction of the new or modified facilities, as described above, could result in significant physical environmental impacts on environmental resources (Chapter 16, Section 16.2.2 and Table 16-7; Section 16.2.3 and Table 16-9; and Section 16.2.4 and Table 16-10). Although the exact scope and scale of environmental impacts cannot be determined because identifying the exact nature of the new and expanded facilities is speculative, Table 16-38 in Chapter 16 lists possible mitigation measures that would likely reduce potentially significant impacts on environmental resources as a result of construction and operation of new or modified facilities or infrastructure. Because the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities or infrastructure, it is not feasible for the State Water Board to impose the possible mitigation measures listed in Table 16-38. Moreover, the State Water Boards lacks authority to impose mitigation measures related to impacts such as air and noise. Agencies responsible for approving the project-specific new or modified facilities can and should impose the applicable mitigation measures in Table 16-38. The current storage capacities for the reservoirs are fixed. Accordingly, there is no possibility of increasing the total water supply to provide more water for surface water diversions as a means of mitigation under LSJR Alternative 4 with adaptive implementation. More water released to the river would leave less water for surface water diversions. Therefore, there is no feasible mitigation the State Water Board can implement to reduce environmental impacts resulting from the need for new or modified facilities or infrastructure. Therefore, impacts under LSJR Alternative 4, with adaptive implementation, would be significant and unavoidable.

Groundwater Supply

The average annual groundwater balance is expected to be substantially reduced under LSJR Alternative 4, with or without adaptive implementation, in the Eastern San Joaquin, Modesto, Turlock, and Extended Merced Subbasins (Chapter 9, *Groundwater Resources*). This would eventually produce a measureable decrease in groundwater elevations. This affect would be more severe in dry years and in areas farther from the SJR, the valley low point toward which groundwater moves. These substantial reductions in groundwater supplies would in turn impact service providers (Tables 13-3a and 13-3b) and private groundwater users in these subbasins that are relying heavily or primarily on groundwater sources for municipal and domestic needs. These entities would likely experience significant reductions in groundwater supply, particularly over the long term and in dry years. As discussed under LSJR Alternative 2, with adaptive implementation method 1, the magnitude or severity of the effect would depend on additional factors such as the size of the population being served, the number of active municipal wells in their service area, the range of differences between well depths and depths to groundwater (Table 13-3b), and other factors (e.g., physical condition of wells). Service providers and private groundwater users at particular risk include those that have a higher potential for a well to run dry in the future, including those identified under LSJR Alternative 3, with adaptive implementation. In addition, service providers in the Eastern San Joaquin Subbasin that may be more likely to be affected include Escalon and Lathrop (Table 13-3b). This is because these service providers have relatively few active wells relative to the size of the population served and/or the range of difference between well depths and depths to groundwater is less than 100 feet (Table 13-3b). Impacts would be significant and unavoidable.

SDWQ Alternative 2 (Significant and unavoidable)

The historical range of salinity in the southern Delta would be maintained under SDWQ Alternative 2 (Section 13.2.3, *Southern Delta*, and Impact SP-2a). Therefore, it is not anticipated that service providers supplying drinking water from the southern Delta would need to construct or modify water treatment facilities or water supply infrastructure because of increased salinity.

Under SDWQ Alternative 2, the Vernalis and southern Delta salinity objectives would be changed to a year-round value of 1.0 dS/m. However, EC at Vernalis would be maintained at or below 0.7 dS/m April–August and 1.0 dS/m September–March through requirements in USBR's water rights permits as provided for in the program of implementation. This would provide some assimilative capacity downstream of Vernalis and protect beneficial agricultural uses. Of the six WWTPs discussed herein, two have made efforts or are working toward reducing salinity concentrations in their source water supplies, four are implementing pretreatment programs to reduce water softener use among water users, and ~~three~~ two have or are ~~either~~ evaluating~~proposing to construct~~ desalination projects and one is ~~or are~~ already operating a RO treatment system. The City of Tracy is proposing the Desalinization and Green Energy Project, a proposed wastewater reuse project that has the potential benefit of allowing low salinity condensate to be returned to the city for blending with WWTP effluent. Discovery Bay studied the feasibility of constructing RO treatment for its WWTP effluent and concluded that it is cost-prohibitive and that it should pursue all reasonable efforts to reduce salinity through source control. Deuel treats source groundwater through RO treatment. Table 13-11 summarizes the salinity reduction efforts of the various WWTPs. These activities would be expected to reduce the salinity in the treated effluent discharged into the southern Delta by the service providers. Fixing existing RO systems or upgrading existing facilities would be expected to reduce salts more, when compared to other efforts such as educational programs or salt pretreatment programs. However, the total effect of these various projects to the southern Delta water quality depends on many variables, such as the type of activity, salt content of the source water, and operating efficiency of the activity.

The average annual EC values for WWTPs in the past few years were generally very close to or just over 1.0 dS/m. Table 13-19 identifies the average EC for each WWTP and their potential ability to comply with a potential 1.0 dS/m effluent limitation based on the violations documented to date and annual average EC data.

Manteca would be expected to comply with a 1.0 dS/m effluent limitation because their average annual EC values are currently near or below 1.0 dS/m, and they have not had any violations in the past. Because it is anticipated that this WWTP would not exceed wastewater treatment requirements, it is not likely to need additional facilities. Impacts would be less than significant.

Table 13-19. Southern Delta Wastewater Treatment Plant 2011-2014 Annual Average EC Effluent Data and Potential to Comply with an Effluent Limitation set to the SDWQ Alternative 2 EC Objective (dS/m [μmhos/cm])

WWTP Facility	2011 Annual Average EC Effluent	2012 Annual Average EC Effluent	2013Annual Average EC Effluent	2014 Annual Average EC Effluent	2015 Annual Average EC Effluent	Potential to Comply with an Effluent Limitation Set to the SDWQ Alternative 2 (1 dS/m) Objective? (Y/N)
Tracy	1.2 [1,171]	1.2 [1,229]	1.2 [1,250]	1.3 [1,342]	1.2 [1,246]	N
Deuel	2.4 [2,415][a]	1.4 [1,410]	1.3 [1,280]	1.3 [1,275]	2.2 [2,254]	N
Manteca	0.8 [781]	0.8 [778]	0.7 [750]	0.7 [745]	0.8 [800]	Y
Stockton	1.0 [1,032]	1.0 [958]	1.0 [973]	1.0 [982]	1.1 [1,127]	N
Mountain House CSD	0.7 [693]	0.9 [908]	1.0 [990]	1.0 [991]	1.0 [1,029]	N

Sources: See Table 13-8 for sources and additional information.

EC = electrical conductivity (salinity)

WWTP = Wastewater treatment plant

dS/m = deciSiemens per meter. Conversion is 1 dS/m = 1000 μmhos/cm. Numbers presented in dS/m were rounded.

μmhos/cm =micromhos per centimeter

CIWQS = California Integrated Water Quality System

CSD = Community Services District

[a] No data on CIWQS, so the comparison to potential effluent limitations is based on recent ACLC R5-2011-0575, which reported an average monthly EC value of 2,260 μmhos/cm on January 31, 2011 and 2,570 μmhos/cm on February 28, 2011.

Deuel currently has an NPDES permit with an EC standard based on the 2006 Bay-Delta plan EC objective. It has previously violated the permit standards. The past and current violations are potentially attributed to a malfunction of the RO and brine concentrator systems used by the facility to reduce the salinity of the groundwater supply. SDWQ Alternative 2 would not change the permit standards for Deuel and thus would not increase the number of existing violations, increase the salinity of the discharge at Deuel, or change the existing RO and brine concentrator facilities. Therefore, Deuel could potentially continue to have exceedances of the permit requirements and continue to violate their permit under SDWQ Alternative 2. Therefore, a change in baseline conditions is not expected with respect to Deuel. Impacts would be less than significant.

Mountain House CSD, Stockton, and Tracy currently have annual EC averages equal to or greater than 1.0 dS/m; therefore, they could have some exceedances of the wastewater treatment requirements if an effluent limitation is set at 1.0 dS/m. ~~However, these exceedances would only potentially result in an exceedance of the salinity objective (i.e., 1.0 dS/m) for the southern Delta for half of the year (between the months of September and March), when salinity at Vernalis may be as high as 1.0 dS/m, which would provide no assimilative capacity.~~ Mountain House CSD, Stockton, and Tracy may exceed an effluent limitation set at the water quality objective proposed under SDWQ Alternative 2 and this could require modifications to their wastewater treatment plants. For Tracy, these modifications could exceed those expected under their Desalinization and Green Energy Project. Setting an effluent limitation at the water quality objective for these entities would have little or no effect on overall compliance with the salinity objective in the southern Delta. Appendix K, therefore, provides that the State Water Board finds that RO treatment of WWTP effluent is not currently a feasible technology for the purpose of controlling salinity in the southern Delta. Appendix K provides that where it is infeasible for WWTPs discharging to the southern Delta to comply with traditional numeric water quality-based effluent limitations for salts in an NPDES permit, the Central Valley Regional Water Board shall require enforceable effluent limitations in the form of best management practices, including pretreatment and source control measures. Performance-based effluent limitations will also be required. These WWTPs will have a continuing obligation to evaluate whether technological or economic changes have made previously deemed infeasible upgrades to control salinity in WWTP effluent feasible. Appendix K further provides that where it is or becomes feasible for WWTPs to comply with numeric water quality based effluent limitations for salts, the Central Valley Regional Water Board shall require them. In that case, new and expanded upgrades like RO treatment of effluent may occur. Appendix K also states that the Central Valley Regional Water Board may grant variances in accordance with applicable state and federal law. As disclosed above in Impact SP-1 under LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 or 4, with or without adaptive implementation, there may be less surface water supply available. As such, the actions entities may take under SDWQ Alternative 2, with respect to surface water, may be somewhat limited. However, surface water replacement is considered because some entities may decide, based on their unique circumstances, this is a reasonable method of compliance.~~The Mountain House CSD and the Cities of Stockton and Tracy may apply for a variance under the Central Valley Water Board's Variance Policy discussed above once it is approved by USEPA. Under the policy, Mountain House CSD and Stockton and Tracy could be granted a variance from meeting the water quality-based effluent limitations for salinity constituents for a period of up to ten years. If the variance is not authorized, or if it is and after the expiration of the variance, Mountain House CSD and Stockton and Tracy still cannot meet the effluent limitations for salinity based on SDWQ 2, it is reasonably foreseeable that modifications to their facilities could occur. It is anticipated modifications could include~~ In light of the foregoing, environmental impacts of the following actions are evaluated (Chapter 16, *Evaluation of Other Indirect and Additional Actions*, Section 16.4.1, 16.4.2 and 16.4.3).

- New and expanded infrastructure to support new source water supplies, which could include canals, underground pipelines, and obtaining water transfers from one location to another to supply the new source water.
- New and expanded salinity pretreatment programs relying on industrial facility pretreatment or residential program(s), which could include modifications to existing industrial facilities such that waste is treated prior to discharge in the sewer system or a residential program educating people to remove water softeners.
- New and expanded salinity removal facilities at existing WWTPs (e.g., RO), which could include modifications to existing wastewater treatment plants such that salinity is removed from the treated effluent prior to discharge.

Depending on the type of facility, location, and particular operational requirements, construction of the facilities described above could result in physical environmental impacts on resources such as those listed below (Chapter 16, Section 16.4.1 and Table 16-25; Section 16.4.2 and Table 16-28; and Section 16.4.3 and Table 16-30).

- Air quality and greenhouse gases, as a result of construction equipment emissions and construction trips.
- Biological resources, as a result of dust, noise, or possible removal of sensitive biological species if present.
- Cultural resources, as a result of excavation, grading, and other soil disturbing activities, if construction takes place in a moderately or highly sensitive area for cultural resources.
- Geologic resources, as a result of erosion or constructing in unstable soils.
- Hazards, as a result of handling hazardous material during construction such as lubricants or diesel.
- Water quality, as a result of potentially generating runoff associated with dust control or other construction activities.
- Noise, as a result of the use of construction equipment if sensitive receptors (e.g., residences) are located within close proximity of the WWTP.
- Traffic, as a result of the use of construction equipment and commuting construction workers.

Depending on the type of facility, location, and particular operational requirements, operation of new or modified facilities could result in physical environmental impacts on resources such as those listed below (Chapter 16, Section 16.4.1 and Table 16-25; Section 16.4.2 and Table 16-28; and Section 16.4.3 and Table 16-30).

- Aesthetics, as a result of operational lighting.
- Air quality and greenhouse gases, as a result of operational emissions associated with salt removal techniques.
- Hazardous materials, as a result of an increase in hazardous materials on site associated with salt removal techniques.

- Noise, as a result of new equipment operating within proximity to sensitive receptors (e.g., residences).
- Traffic, as a result of an increase in employees to operate the new equipment or equipment modifications.

~~Therefore, since WWTPs may not be able to meet a new NPDES effluent limitation based on SDWQ Alternative 2, t~~The environmental impacts from the construction and operation of new or modified wastewater treatment facilities or infrastructure ~~is expected and impacts~~ would be significant.

New or modified wastewater treatment facilities or infrastructure would be under the jurisdiction of the service providers performing the action or the jurisdiction of the local agency in which the new or modified facility or infrastructure is proposed. The activities described above (e.g., new and expanded facilities at WWTPs) are anticipated to either be discretionary actions and/or meet the definition of a project for CEQA. (State CEQA Guidelines, §§ 15377–15378.) If they are not discretionary actions and/or do not meet the definition of a project under CEQA, then it is presumed there would be very limited environmental impacts such that they would not rise to the level of causing potentially significant environmental impacts necessitating environmental documentation (e.g., mitigated negative declaration, environmental impact report). As part of this process, the decision-making body (e.g., board of the service provider or municipality) would impose mitigation measures or BMPs if project-specific environmental impacts were deemed potentially significant. Although the exact scope and scale, and extent of potentially significant environmental impacts cannot be determined, Table 16-38 in Chapter 16 identifies mitigation measures that would likely reduce potentially significant impacts on environmental resources as a result of construction and operation of new or modified facilities or infrastructure. For example, potentially significant environmental impacts due to construction may be mitigated through design, timing, and construction BMPs. Facilities could be designed to have minimal impact on the surrounding environment (e.g., pipelines could be buried under existing roads). Construction-timing mitigation measures may include scheduling such that work in surface waters, if needed, would take place after aquatic species have migrated out of the area. BMPs for construction activities could include the use of straw bales to prevent erosion near surface waters.

The State Water Board does not have the authority to approve the construction of any of the new or modified facilities or infrastructure. Accordingly, it is not feasible for the State Water Board to impose mitigation measures related to the construction of new and modified facilities to reduce potentially significant environmental impacts. Moreover, the State Water Board lacks authority to impose mitigation measures related to impacts on certain resources (e.g., air, noise, or traffic). Lead agencies can and should impose the mitigation measures in Table 16-38 when approving construction of these facilities. Until and unless that occurs, impacts would remain significant and unavoidable.

With respect to the operation of any new or modified facility or infrastructure, the Central Valley Water Board issues NPDES permits for the WWTPs that impose discharge requirements to implement requirements of the Clean Water Act and applicable water quality control plans. None of the mitigation measures in Table 16-38 for the operation of any new or modified facility or infrastructure is a measure the Central Valley Water Board has authority to impose in NPDES permits. Lead agencies can and should impose the mitigation measures in Table 16-38 when approving the operation of these facilities. Until and unless that occurs, impacts would remain significant and unavoidable.

SDWQ Alternative 3 (Less than significant)

The historical range of salinity in the southern Delta would be maintained under SDWQ Alternative 3 (Section 13.2.3, *Southern Delta*, and Impact SP-2a). Therefore, it is not anticipated that service providers supplying drinking water from the southern Delta would need to construct or modify water treatment facilities or water supply infrastructure because of increases in salinity.

Table 13-20 identifies the average EC for each WWTP and each one's potential ability to comply with SDWQ Alternative 3 without new or modified facilities, based on past violation information and 2011–2014 EC data.

All of the service providers would be expected to be able to comply with SDWQ Alternative 3 without new or modified facilities based on annual average EC data and previous EC violations. Deuel currently has EC averages that are below the SDWQ Alternative 3 objectives, but has had past EC violations. As discussed above under SDWQ Alternative 2, the past violations are potentially attributed to a malfunction of the RO and brine concentrator systems used by the facility to reduce the salinity of the groundwater supply. Because no additional service providers are expected to require modifications or new facilities, impacts would be less than significant.

Table 13-20. Current Southern Delta Wastewater Treatment Plant 2011–2014 Annual Average EC Effluent Data and Potential to Comply with an Effluent Limitation set to the SDWQ Alternative 3 EC Objective (dS/m [µmhos/cm])

WWTP Facility	2011 Annual Average EC Effluent	2012 Annual Average EC Effluent	2013 Annual Average EC Effluent	2014 Annual Average EC Effluent	2015 Annual Average EC Effluent	Potential to Comply with an Effluent Limitation Set to the SDWQ Alternative 3 (1.4 dS/m) Objective? (Y/N)
Tracy	1.2 [1,1171]	1.2 [1,229]	1.2 [1,250]	1.3 [1,342]	1.2 [1,246]	Y
Deuel	2.4 [2,415][a]	1.4 [1,410]	1.3 [1,280]	1.3 [1,275]	2.2 [2,254]	N
Manteca	0.8 [781]	0.8 [778]	0.7 [750]	0.7 [745]	0.8 [800]	Y
Stockton	1.0 [1,032]	1.0 [958]	1.0 [973]	1.0 [982]	1.1 [1,127]	Y
Mountain House CSD	0.7 [693]	0.9 [908	1.0 [990]	1.0 [991]	1.0 [1,029]	Y

See Table 13-8 for sources and additional information.

EC = electrical conductivity (salinity)

WWTP = Wastewater treatment plant

dS/m = deciSiemens per meter. Conversion is 1 dS/m = 1000 µmhos/cm. Numbers presented in dS/m were rounded.

µmhos/cm = micromhos per centimeter

CIWQS = California Integrated Water Quality System

CSD = Community Services District

[a] No data on CIWQS, so the comparison to potential effluent limitations is based on recent ACLC R5-2011-0575, which reported an average monthly EC value of 2,260 µmhos/cm on January 31, 2011 and 2,570 µmhos/cm on February 28, 2011.

Impact SP-2a: Violate any water quality standards such that drinking water quality from public water systems would be affected

No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

LSJR Alternatives

LSJR Alternative 2 (Less than significant/Less than significant with adaptive implementation)

Groundwater Subbasins

There would likely be no degradation of groundwater quality under LSJR Alternative 2 because substantial additional pumping is not expected and, thus, the direction of groundwater flow would not change such that any localized groundwater contamination that exists in the subbasins would be affected (as described in Chapter 9, *Groundwater Resources*). Accordingly, LSJR Alternative 2 would have a less-than-significant impact on the quality of water for public water systems.

Southern Delta

Salinity is a concern for service providers (e.g., CCWD) diverting drinking water from the southern Delta. Because drinking water effects associated with salinity are considered to be related to taste and not harmful to human health, secondary drinking water MCLs are established for EC as summarized in Section 13.2.3, *Southern Delta*. As discussed in Chapter 5, *Surface Hydrology and Water Quality*, the WSE model predicts that average inflows from the LSJR would generally increase (Tables 5-16 and 5-17d), which is expected to lead to a slight decrease in average salinity in the southern Delta (Table 13-16). At Vernalis, any increases in EC would generally be very small and occur during July and December–March. Relatively large decreases in EC are predicted to occur during May and June. Overall, under LSJR Alternative 2, salinity in the southern Delta is not expected to differ much from baseline salinity and would decrease on average. In addition, generally a large portion of drinking water originates from the Sacramento River due to the locations of some drinking water intakes in the Delta (e.g., western Delta); as such, changes in SJR flow are unlikely to modify flows on the Sacramento River such that exceedances in drinking water standards would result. Therefore, LSJR Alternative 2 is not expected to substantially degrade water quality, specifically with respect to salinity, and service providers diverting water for domestic purposes would not be affected by the quality of water in the southern Delta under this alternative. Impacts would be less than significant.

Higher Delta inflow from the LSJR helps improve other water quality constituents besides salinity. For example, higher inflow (and outflow) helps to limit seawater intrusion, which brings salinity and bromide into the Delta, and it helps dilute water quality components that are generated within the Delta, such as organic carbon. Organic carbon also enters the Delta in the tributary water. Rainfall runoff events would continue to bring organic carbon from the tributaries into the Delta under the LSJR Alternative 2 in a manner similar to baseline conditions. However, releases from large reservoirs tend to have relatively low organic carbon, so higher releases from New Melones Reservoir, New Don Pedro Reservoir, and Lake McClure would not cause an increase in organic carbon. Releases from the eastside reservoirs and inflow to the southern Delta would generally be similar to baseline conditions (although slightly higher on average) under LSJR Alternative 2; therefore, the effect of the alternative on water quality constituents besides salinity would also be less than significant.

Adaptive Implementation

Groundwater

As discussed under Impact SP-1, LSJR Alternative 2 with adaptive implementation could result in substantial groundwater depletions from increased pumping within the Extended Merced Subbasin. This could affect the direction of groundwater flow, and localized groundwater contamination could move in undesirable directions as explained in Section 13.2.1, *Lower San Joaquin River and Tributaries*, potentially affecting groundwater as a source of drinking water. The change in groundwater flow is dependent on the location of pumping, the amount of groundwater pumped and the frequency at which pumping occurs, and hydrogeological characteristics of the aquifer (e.g., consolidated clays with low permeability or unconsolidated sands with high permeability). As discussed previously, the impact of groundwater pumping on groundwater quality also depends on a number of different variables, including location and depth of the well, the amount and frequency of groundwater pumping, number and proximity of nearby wells, hydrogeological characteristics of the aquifer, distance between the well(s) and the contaminant(s), contaminant characteristics (e.g., highly mobile in water or adhering primarily to soil), and land use near the well. In addition, it is not possible to predict how the affected parties would respond to the reduction of surface water due to the LSJR alternatives. They may deepen existing wells or build new wells. If they build new wells, it is impossible to determine the number of new wells and their location. Thus, while groundwater pumping can affect groundwater flow and quality, for all of the foregoing reasons, it is speculative to specifically determine what that change in groundwater flow, and its impact on groundwater quality, would be from increased groundwater pumping.

If LSJR Alternative 2, with adaptive implementation, is implemented frequently and long term, it is expected that service providers relying on surface water supplies may need to find alternative supplies (e.g., groundwater), especially those service providers relying on the Merced and Tuolumne Rivers for surface water supplies (i.e., MID, TID and Merced ID, City of Modesto [Table 13-2]). Furthermore, those service providers (Tables 13-3a and 13-3b) relying on the Extended Merced Subbasin for groundwater supply to meet their water needs potentially could be affected by changes in groundwater quality from the migration of contaminants. However, a substantial increase in groundwater pumping would not necessarily result in the use of drinking water that violates water quality standards for several reasons, as described below.

1. During the recent drought, the amount of groundwater pumped for drinking purposes and the service providers' reliance on groundwater greatly increased, and yet there was not a greater number of MCL violations as compared to a wet year based on the CCRs prepared by the service providers (Table 13-5).

2. While drinking water quality standard exceedances have been detected at the wellhead in different locations in the area of potential effects, these exceedances reflect raw, untreated groundwater quality. Service providers are required take actions to ensure that the water is in compliance with relevant drinking water standards before it is served to the public. Such actions

include monitoring groundwater quality regularly, and if any exceedances are detected, bringing the well offline until the problem is rectified (see Section 13.3.2, *State [Regulatory Background]*). Treatment options include blending, large-scale treatment systems, wellhead treatment systems, or Point-of-Use (POU)/Point-of-Entry (POE) systems used in homes or residences. These types of treatment options are currently used by service providers if and when a water quality concern is identified. Potential environmental impacts resulting from these types of new and expanded facilities are addressed under Impact SP-1.

3. While increased groundwater pumping may expedite the migration of contaminants introduced at the land surface, such as nitrate from fertilizer application on crop lands, into the water table and flow towards the well, the effect would be localized (i.e., at the well; see Section 13.2.1, *Lower San Joaquin River and Tributaries*). Hence, it would be unlikely that such contamination would spread to other parts of the aquifer.

Therefore, under LSJR Alternative 2, with adaptive implementation, it is not expected that the quality of groundwater used in public water systems would be affected such that violations of water quality standards would occur. Accordingly, impacts would be less than significant.

While mitigation is not required for less-than-significant impacts, local agencies can and should nevertheless exercise their authorities under SGMA to prevent and/or mitigate any degradation of groundwater quality from the migration of contaminants. As explained in Section 9.3.2 of Chapter 9, *Groundwater Resources*, under SGMA,[27] local agencies in high- and medium-priority basins are required to form groundwater sustainability agencies by June 30, 2017, that will develop and implement GSPs that achieve sustainable groundwater management within 20 years. Sustainable groundwater management includes not causing chronic lowering of groundwater levels and significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water supplies. GSPs must be adopted by January 31, 2020, for the Extended Merced Subbasin (as well as the Eastern San Joaquin and Chowchilla Subbasins). GSPs for the Modesto and Turlock Subbasins must be adopted by January 31, 2022). Upon GSP adoption, SGMA grants the local GSA specific authorities to manage and protect its groundwater basin including, but not limited to, the ability to require reporting of groundwater withdrawals and to control groundwater extractions by regulating, limiting, or suspending extractions from wells. If a local agency is unwilling or unable to manage its groundwater resources to prevent undesirable results as defined under the SGMA, which include chronic lowering of groundwater levels or migration of contamination, then SGMA empowers the state to provide interim management until local agencies are able to assume management. Thus, under SGMA, local agencies can and should manage groundwater subbasins both in terms of over-pumping and groundwater quality degradation from migrating contaminants.

Southern Delta

LSJR Alternative 2, with adaptive implementation method 1, would result in overall higher flows into the southern Delta. Higher Delta inflow from the LSJR helps improve water quality constituents, including salinity. For example, higher inflow (and outflow) helps to limit seawater intrusion, which brings salinity and bromide into the Delta, and it helps dilute water quality components that are generated within the Delta, such as organic carbon. Adaptive implementation method 2 would not

[27] The State Water Board is required to consider the policies of SGMA when revising or adopting policies, regulations, or criteria. (Wat. Code, § 10720.9.)

authorize a reduction in flows required by other agencies or through other processes, which are incorporated in the modeling of baseline conditions. Adaptive implementation method 3 would not be authorized under LSJR Alternative 2 since the unimpaired flow percentage would not exceed 30 percent. Adaptive implementation method 4 would allow an adjustment of the Vernalis February–June minimum flow requirement. WSE model results indicate that changes due to method 4 under this alternative would rarely alter the flows in the three eastside tributaries or the LSJR. As such, releases from the eastside reservoirs and inflow to the southern Delta would generally be higher on average under LSJR Alternative 2, with adaptive implementation methods 1, 2, and 4; therefore, the effect of the alternative on surface water quality constituents including salinity is expected to be less than significant.

LSJR Alternatives 3 and 4 (Less than significant/Less than significant with adaptive implementation)

Groundwater Subbasins

Reductions in groundwater levels in the Modesto, Turlock, and Extended Merced Subbasins and also the Eastern San Joaquin Subbasin under LSJR Alternatives 3 and 4 with or without adaptive implementation, could occur as a result of increased pumping. This could affect the direction of groundwater flow, and localized groundwater contamination could move in undesirable directions as explained in Section 13.2.1, *Lower San Joaquin River and Tributaries*, potentially affecting groundwater as a source of drinking water. As discussed previously, the impact of groundwater pumping on groundwater quality depends on a number of different variables, including location and depth of the well, the amount and frequency of groundwater pumping, number and proximity of nearby wells, hydrogeological characteristics of the aquifer (e.g., consolidated clays with low permeability or unconsolidated sands with high permeability), distance between the well(s) and the contaminant(s), contaminant characteristics (e.g., highly mobile in water or adhering primarily to soil), and land use near the well. In addition, it is not possible to predict how the affected parties would respond to the reduction of surface water due to the LSJR alternatives. The affected parties may deepen existing wells or build new wells. If they build new wells, it is impossible to determine the number of wells and their location. Thus while groundwater pumping can affect groundwater flow and quality, for all of the foregoing reasons, it is speculative to specifically determine what that change in groundwater flow and its impact on groundwater quality would be from to increased groundwater pumping.

If LSJR Alternatives 3 or 4, with or without adaptive implementation, is implemented, it is expected that service providers relying on surface water supplies may need to find alternative supplies (e.g., groundwater). Furthermore, those service providers relying on the Modesto, Turlock, and Extended Merced Subbasins for groundwater supply under LSJR Alternatives 3 and 4 (in addition the Eastern San Joaquin Subbasin under LSJR Alternative 4) to meet their water needs (Table 13-3a), potentially could be affected by changes in groundwater quality from the migration of contaminants. The potential reduction in groundwater quality under Alternatives 3 and 4, with or without adaptive implementation, could degrade drinking water quality for those service providers relying entirely, or in large part, on groundwater for municipal supply (see Tables 13-3a and 3-3b). However, as described for LSJR Alternative 2, a substantial increase in groundwater pumping would not necessarily result in the use of drinking water that violates water quality standards for several reasons as described below.

1. During the recent drought, the amount of groundwater pumped for drinking purpose and the service providers' reliance on groundwater greatly increased and yet there was not a greater number of MCL violations as compared to a wet year based on the CCRs prepared by the service providers (Table 13-5).
2. While drinking water quality standard exceedances have been detected at the wellhead in different locations in the area of potential effects, these exceedances reflect raw, untreated groundwater quality. Service providers are required take actions to ensure that the water is in compliance with relevant drinking water standards before it is served to the public. Such actions include monitoring groundwater quality regularly, and if any exceedances are detected, bringing the well offline until the problem is rectified (see Section 13.3.2*, State [Regulatory Background]*. Treatment options include blending, large-scale treatment systems, wellhead treatment systems, or POU/POE systems used in homes or residences. These types of treatment options are currently used by service providers if and when a water quality concern is identified. Potential environmental impacts resulting from these types of new and expanded facilities are addressed under Impact SP-1.
3. While increased groundwater pumping may expedite the migration of contaminants introduced at the land surface, such as nitrate from fertilizer application on crop lands, into the water table and flow towards the well, the effect would be localized, i.e., at the well (see Section 13.2.1, *Lower San Joaquin River and Tributaries*). Hence, it would be unlikely that such contamination would spread to other parts of the aquifer.

Therefore, under LSJR Alternatives 3 and 4, with or without adaptive implementation, it is not expected that the quality of groundwater used for public water systems would be affected such that violations of water quality standards would occur. Accordingly, impacts would be less than significant.

While mitigation measures are not required for less-than-significant impacts, local agencies can and should nevertheless exercise their authorities under SGMA to prevent and/or mitigate any degradation of groundwater quality from the migration of contaminants. As explained in Section 9.3.2 of Chapter 9, *Groundwater Resources*, under SGMA, local agencies in high- and medium-priority basins are required to form groundwater sustainability agencies by June 30, 2017, that will develop and implement GSPs that achieve sustainable groundwater management within 20 years. Sustainable groundwater management includes not causing chronic lowering of groundwater levels and significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water supplies. GSPs must be adopted by January 31, 2020, for Eastern San Joaquin, Merced and Chowchilla Subbasins. GSPs for Modesto and Turlock Subbasins must be adopted by January 31, 2022. Upon GSP adoption, SGMA grants the local GSA specific authorities to manage and protect its groundwater basin including, but not limited to, the ability to require reporting of groundwater withdrawals and to control groundwater extractions by regulating, limiting, or suspending extractions from wells. If a local agency is unwilling or unable to manage its groundwater resources to prevent undesirable results as defined under the SGMA, which include but are not limited to chronic lowering of groundwater levels or migration of contamination, then SGMA empowers the state to provide interim management until local agencies are able to assume management. Thus, under SGMA, local agencies can and should manage their groundwater subbasins both in terms of over-pumping and groundwater quality degradation from migrating contaminants.

Southern Delta

Inflows from the LSJR to the southern Delta are expected to generally increase February–June and have relatively small changes the rest of the year. Additional water into the southern Delta under LSJR Alternative 3 or LSJR Alternative 4, is not expected to substantially degrade the existing water quality of the southern Delta. Some months may experience small increases in salinity, but these increases would be the most noticeable during periods of high flow when Vernalis EC is relative low and would not cause drinking water problems (primarily within the minimum to 40th percentile of the cumulative distribution for December, January, July, and August [Tables 13-~~16~~ 17 and 13-~~17~~18]). In general, southern Delta salinity would be expected to decrease with LSJR Alternatives 3 and 4, particularly during March through June for both alternatives, as well as during February for LSJR Alternative 4 (Tables 13-~~16~~ 17 and 13-~~17~~18).

Similar to LSJR Alternative 2, LSJR Alternatives 3 and 4 with adaptive implementation methods 1 and 2 would result in overall higher flows into the southern Delta. Higher Delta inflow from the LSJR helps improve other water quality constituents, including salinity. For example, higher inflow (and outflow) helps to limit seawater intrusion, which brings salinity and bromide into the Delta, and it helps dilute water quality components that are generated within the Delta, such as organic carbon. In addition, adaptive implementation method 3 would not authorize a reduction in flows required by other agencies or through other processes, which are incorporated in the modeling of baseline conditions. Adaptive implementation method 4 would allow an adjustment of the Vernalis February–June minimum flow requirement. WSE model results indicate that changes due to adaptive implementation method 4 under LSJR Alternatives 3 and 4 would rarely alter the flows in the three eastside tributaries or the LSJR. As such, releases from the eastside reservoirs and inflow to the southern Delta would generally be higher on average under LSJR Alternatives 3 and 4, with adaptive implementation methods 1, 2, 3, and 4, when compared to baseline.

Additional inflow would provide additional assimilative capacity to receiving waters for constituents (e.g., salinity) and in general reduce the salinity and other water quality constituents in the southern Delta (Chapter 5, *Surface Hydrology and Water Quality*, Tables 5-29a–c). Therefore, LSJR Alternatives 3 and 4 with or without adaptive implementation are not expected to substantially degrade water quality, and service providers diverting water for municipal purposes from the southern Delta would not be impacted by the quality of water in the southern Delta. Impacts would be less than significant.

SDWQ Alternative 2 (Less than significant)

Salinity is a concern for service providers diverting drinking water from the southern Delta. Because drinking water effects associated with salinity are considered to be related to taste and not harmful to human health, secondary drinking water MCLs are established for EC as summarized in Section 13.3.2. As identified in Section 13.2.3, *Southern Delta*, baseline salinity in the southern Delta is between 0.2 dS/m and 1.2 dS/m during all months of the year, and the salinity at Vernalis has a strong relationship with the salinity of the southern Delta. Under SDWQ 2, the program of implementation would maintain EC at Vernalis at or below 0.7 dS/m April-August and 1.0 dS/m September-March, similar to current conditions, through actions undertaken by USBR in accordance with its water rights. Thus, it is expected the southern Delta would experience salinity levels similar to or better than (see Chapter 5, *Surface Hydrology and Water Quality*, which shows EC exceedances declining under the alternatives) baseline conditions (i.e., 0.2 dS/m–1.2 dS/m). Salinity in the southern Delta would remain below the upper limit for the secondary drinking water MCL (1.6

dS/m) and would still occasionally be above the recommended lower limit for the secondary drinking water MCL (0.9 dS/m). Therefore, SDWQ Alternative 2 is not expected to degrade water quality, and service providers diverting water for domestic purposes would not be impacted by the quality of water in the southern Delta under this alternative. Impacts would be less than significant.

SDWQ Alternative 3 (Less than significant)

Impacts would generally be the same as those discussed under SDWQ Alternative 2. Under SDWQ 3, the program of implementation would maintain EC at Vernalis at or below 0.7 dS/m April–August and 1.0 dS/m September–March, similar to current conditions, through actions undertaken by USBR in accordance with its water rights. This would maintain the historical range of salinity in the southern Delta (i.e., 0.2 dS/m–1.2 dS/m). Salinity in the southern Delta would remain below the upper limit for the secondary drinking water MCL (1.6 dS/m) and would still occasionally be above the recommended lower limit for the secondary drinking water MCL (0.9 dS/m). Salinity levels would not exceed the short term MCL (2.2 dS/m). Therefore, SDWQ Alternative 3 is not expected to degrade water quality and violate standards, and service providers diverting water for domestic purposes would not be impacted by the quality of water in the southern Delta under this alternative. Impacts would be less than significant.

Impact SP-2b: Violate any water quality standards such that drinking water quality from domestic wells would be affected

No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

LSJR Alternatives

LSJR Alternative 2 (Less than significant/ Significant and unavoidable with adaptive implementation)

Groundwater Subbasins

As discussed in SP-2a, there would likely be no degradation of groundwater quality under LSJR Alternative 2 because substantial additional pumping is not expected to occur in the subbasins (as described in Chapter 9, *Groundwater Resources*). Accordingly, LSJR Alternative 2 would have a less-than-significant impact on the quality of water in domestic wells.

Southern Delta

LSJR Alternative 2, would result in overall higher flows into the southern Delta. Higher Delta inflow from the LSJR helps improve water quality constituents, including salinity. Therefore, the effect of the alternative on surface water quality constituents, including salinity, is expected to be less than significant.

Adaptive Implementation

Groundwater

As discussed under Impact SP-1, LSJR Alternative 2 with adaptive implementation could result in substantial groundwater depletions from increased pumping within the Extended Merced Subbasin. This could affect the direction of groundwater flow, and localized groundwater contamination could move in undesirable directions as explained in Section 13.2.1, *Lower San Joaquin River and Tributaries*, potentially affecting groundwater as a source for drinking water. The change in groundwater flow is dependent on the location of pumping, the amount of groundwater pumped and the frequency at which pumping occurs, and hydrogeological characteristics of the aquifer (e.g., consolidated clays with low permeability or unconsolidated sands with high permeability). As discussed previously, the impact of groundwater pumping on groundwater quality also depends on a number of different variables including, but not limited to, location and depth of the well, the amount and frequency of groundwater pumping, number and proximity of nearby wells, hydrogeological characteristics of the aquifer, distance between the well(s) and the contaminant(s), contaminant characteristics (e.g., highly mobile in water or adhering primarily to soil), and land use near the well. In addition, it is not possible to predict how the affected parties would respond to the reduction of surface water due to the LSJR alternatives. They may deepen existing wells or build new wells. If they build new wells, it is impossible to determine the number of new wells and their location. Thus while groundwater pumping can affect groundwater flow and quality, for all of the foregoing reasons, it is speculative to specifically determine what that change in groundwater flow and its impact on groundwater quality would be from the increased groundwater pumping.

If LSJR Alternative 2, with adaptive implementation, is implemented frequently and long term, it is expected that service providers relying on surface water supplies may need to find alternative supplies (e.g., groundwater), especially those service providers relying on the Merced and Tuolumne Rivers for surface water supplies (i.e., MID, TID and Merced ID, City of Modesto [Table 13-2]). Furthermore, those service providers relying on the Extended Merced Subbasin for groundwater supply to meet their water needs (Tables 13-3a and 13 3b) potentially could be affected by changes in groundwater quality from the migration of contaminants.

In contrast to drinking water served by public water systems, a substantial increase in groundwater pumping may result in the use of drinking water by private domestic wells that does not meet water quality standards due to the potential for changes to groundwater quality from the migration of contaminants in the Extended Merced Subbasin. While it is true that pumping greatly increased during the drought and yet there was not a greater number of MCL violations as compared to a wet year as reported by service providers, there is a lack of information to support that this was also the case for private domestic wells. Importantly, private domestic well users are largely unregulated and are under no state requirements to monitor, test, and treat their water to meet the state and federal Safe Drinking Water Act. Therefore, there is no required mechanism to prevent private domestic wells from using groundwater that may exceed MCLs.

Therefore, under LSJR Alternative 2 with adaptive implementation there is a potential for the quality of groundwater used in private domestic wells to be affected such that violations of water quality standards would occur. Accordingly, impacts would be significant.

The State Water Board does not have authority to require implementation of mitigation that could reduce this impact to a less-than-significant level, because it does not regulate private domestic wells. It can and does assist in identifying water quality threats through the GAMA Program, which is the State Water Board's comprehensive groundwater quality monitoring program for California, and GeoTracker GAMA, which provides water quality data in California via the internet. Using the data collected in GAMA since year 2000, DDW also provides an online, map-based, tool called "Is My Property Near a Nitrate-Impacted Water Well?" for the domestic owners to evaluate the risk of their well to nitrate contamination. The map-based tool displays well locations of recent nitrate contamination above the MCL within a 2,000 feet radius of an address that the user provides. The tool can be accessed at http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/nitrate_tool/.

Possible mitigation measures owners and operators of private domestic wells should undertake to avoid or reduce potential drinking water impacts at private domestic wells include the following.

- Having a licensed contractor construct wells in accordance with well construction standards.
- Choosing a location for a well to make sure it is free of potential sources of contamination.
- Testing well water at certified drinking water laboratories to ensure its quality.
- If necessary, installing a water treatment system tailored to the overall water chemistry and constituents that need to be removed. Example systems include activated alumina filters, activated charcoal filters, air stripping, anion exchange, and ultraviolet radiation.
- If necessary, drilling a new well that taps into a cleaner aquifer or finding an alternative water source.
- Properly destroying unused and abandoned wells to prevent contamination.

In addition, local agencies can and should exercise their police powers and groundwater management authority under SGMA, described above, to address groundwater contamination so as to prevent and/or mitigate drinking water impacts on private domestic wells. Specifically, under SGMA, local agencies in high- and medium-priority basins are to form GSAs by June 30, 2017, which will develop and implement GSPs that achieve sustainable groundwater management within 20 years. Sustainable groundwater management is defined as "the management and use of groundwater in a manner that can be maintained during the [50 year] planning and implementation horizon without causing undesirable results." (Wat. Code, § 10721, subd. (v).) "Undesirable results" includes "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies." (Wat. Code, § 10721, subd. (x)(4).) GSPs must be developed for critically overdrafted high- and medium-priority basins by January 31, 2020 (DWR 2016). In the area of potential effects, this deadline applies to the Eastern San Joaquin, Merced, and Chowchilla Subbasins. All other high- or medium-priority basins must adopt GSPs by January 31, 2022. In the study area, this includes Modesto and Turlock Subbasins.

Each GSP must also include measureable objectives as well as milestones in increments of 5 years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan. (Wat. Code, § 10727.2.)

If local agencies are unwilling or unable to manage their groundwater resources, SGMA authorizes the State Water Board to step in to protect a groundwater basin in limited circumstances: (1) if no agency has opted by the June 30, 2017 to serve as a GSA for a basin, (2) when a GSA does not complete a GSP by the relevant deadline (2020 or 2022), or (3) when the GSP is inadequate or the GSP is not being implemented in a manner that is likely to achieve the plan's sustainability goal(s), and the basin is either in a condition of long-term overdraft or, after January 31, 2025, the State

Water Board determines that the basin is in a condition where groundwater extractions result in significant depletions of interconnected surface waters.

Thus, at this time, local agencies are vested with the mandatory duty to achieve sustainable groundwater management, which includes preventing significant and unreasonable degradation to water quality. These agencies, therefore, can and should exercise their full authorities to address degradation of groundwater quality, both under SGMA and their police powers. Doing so would prevent and/or mitigate private domestic well drinking water supply impacts. Due to inherent uncertainty in the degree to which this mitigation and those listed above may be implemented by local agencies and owners and operators of private domestic wells, drinking water impacts on private domestic wells would remain significant and unavoidable.

Southern Delta

As discussed in Impact SP-2a, LSJR Alternative 2, with adaptive implementation (including method 1), would result in overall higher flows into the southern Delta. Higher Delta inflow from the LSJR helps improve water quality constituents, including salinity. Therefore, the effect of the alternative on surface water quality constituents including salinity is expected to be less than significant.

LSJR Alternatives 3 and 4 (Significant and unavoidable/Significant and unavoidable with adaptive implementation)

Groundwater Subbasins

Reductions in groundwater levels in the Modesto, Turlock, and Extended Merced Subbasins and also the Eastern San Joaquin Subbasin under LSJR Alternatives 3 and 4 with or without adaptive implementation could occur as a result of increased pumping. This could affect the direction of groundwater flow, and localized groundwater contamination could move in undesirable directions as explained in Section 13.2.1, *Lower San Joaquin River and Tributaries*, potentially affecting groundwater as a source for drinking water. The change in groundwater flow is dependent on the location of pumping, the amount of groundwater pumped and the frequency at which pumping occurs, and hydrogeological characteristics of the aquifer (e.g., consolidated clays with low permeability or unconsolidated sands with high permeability). As discussed previously, the impact of groundwater pumping on groundwater quality also depends on a number of different variables, including location and depth of the well, the amount and frequency of groundwater pumping, number and proximity of nearby wells, hydrogeological characteristics of the aquifer, distance between the well(s) and the contaminant(s), contaminant characteristics (e.g., highly mobile in water or adhering primarily to soil), and land use near the well. In addition, it is not possible to predict how the affected parties would respond to the reduction of surface water due to the LSJR alternatives. They may deepen existing wells or build new wells. If they build new wells, it is impossible to determine the number of new wells and their location. Thus while groundwater pumping can affect groundwater flow and quality, for all of the foregoing reasons, it is speculative to specifically determine what that change in groundwater flow and its impact on groundwater quality would be from the increased groundwater pumping.

In contrast to drinking water served by public water systems, a substantial increase in groundwater pumping may result in the use of drinking water by private domestic wells that does not meet water quality standards due to the potential for changes in groundwater quality from the migration of contaminants in the Modesto, Turlock and Extended Merced Subbasins and also the Eastern San Joaquin Subbasin under LSJR Alternatives 3 and 4 with or without adaptive implementation. While it is true that pumping greatly increased during the drought and yet there was not a greater number of MCL violations as compared to a wet year as reported by service providers, there is a lack of information to support that this was also the case for private domestic wells. Importantly, private domestic well users are largely unregulated and are under no state requirements to monitor, test, and treat their water to meet the state and federal Safe Drinking Water Act. Therefore, there is no required mechanism to prevent private domestic wells from using groundwater that may exceed MCLs.

Therefore, under LSJR Alternatives 3 and 4, with or without adaptive implementation, there is a potential for the quality of groundwater used in private domestic wells to be affected such that violations of water quality standards would occur. Accordingly, impacts would be significant.

The State Water Board does not have authority to impose mitigation that could reduce this impact to a less-than-significant level, because it does not regulate private domestic wells. It can and does assist in identifying water quality threats through the GAMA Program and GeoTracker GAMA. Using the data collected in GAMA since year 2000, DDW also provides the online, map-based, tool called "Is My Property Near a Nitrate-Impacted Water Well?" for the domestic owners to evaluate the risk of their well to nitrate contamination, described previously under Impact SP-2b, LSJR Alternative 2.

Possible mitigation measures owners and operators of private domestic wells should undertake to avoid or reduce potential drinking water impacts at private domestic wells include the following.

- Having a licensed contractor construct wells in accordance with well construction standards.
- Choosing a location for a well to make sure it is free of potential sources of contamination.
- Testing well water at certified drinking water laboratories to ensure its quality.
- If necessary, installing a water treatment system tailored to the overall water chemistry and constituents that need to be removed. Example systems include activated alumina filters, activated charcoal filters, air stripping, anion exchange, and ultraviolet radiation.
- If necessary, drilling a new well that taps into a cleaner aquifer or finding an alternative water source.
- Properly destroying unused and abandoned wells to prevent contamination.

In addition, local agencies can and should exercise their police powers and groundwater management authority under SGMA, described above, to address groundwater contamination so as to prevent and/or mitigate drinking water impacts on private domestic wells. Specifically, under SGMA, local agencies in high- and medium-priority basins are to form GSAs by June 30, 2017, which will develop and implement GSPs that achieve sustainable groundwater management within 20 years. Sustainable groundwater management is defined as "the management and use of groundwater in a manner that can be maintained during the [50 year] planning and implementation horizon without causing undesirable results." (Wat. Code, § 10721, subd. (v).) "Undesirable results" includes "significant and unreasonable degraded water quality, including the migration of contaminant plums that impair water supplies." (Wat. Code, § 10721, subd. (x)(4).) GSPs must be developed for critically overdrafted high- and medium-priority basins by January 31, 2020 (DWR 2016). This deadline applies to the Eastern San Joaquin, Merced, and Chowchilla Subbasins. All other high- or medium-priority basins must adopt GSPs by January 31, 2022. This includes Modesto and Turlock Subbasins.

Each GSP must also include measureable objectives as well as milestones in increments of 5 years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan. (Wat. Code, § 10727.2.)

If local agencies are unwilling or unable to manage their groundwater resources, SGMA authorizes the State Water Board to step in to protect a groundwater basin in limited circumstances: (1) if no agency has opted by the June 30, 2017 to serve as a GSA for a basin, (2) when a GSA does not complete a GSP by the relevant deadline (2020 or 2022), or (3) when the GSP is inadequate or the GSP is not being implemented in a manner that is likely to achieve the plan's sustainability goal(s), and the basin is either in a condition of long-term overdraft or, after January 31, 2025, the State Water Board determines that the basin is in a condition where groundwater extractions result in significant depletions of interconnected surface waters.

Thus, at this time, local agencies are vested with the mandatory duty to achieve sustainable groundwater management, which includes preventing significant and unreasonable degradation to water quality. These agencies, therefore, can and should exercise their full authorities to address degradation of groundwater quality, both under SGMA and their police powers. Doing so would prevent and/or mitigate private domestic well drinking water supply impacts. Due to inherent uncertainty in the degree to which this mitigation and those listed above may be implemented by local agencies and owners and operators of private domestic wells, drinking water impacts on private domestic wells under LSJR Alternatives 3 and 4 would remain significant and unavoidable.

Impact SP-3: Result in substantial changes to SJR inflows to the Delta such that insufficient water supplies would be available to service providers relying on CVP/SWP exports

No Project Alternative (LSJR/SDWQ Alternative 1)

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative impact discussion and Appendix D, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1),* for the No Project Alternative technical analysis.

LSJR Alternatives

LSJR Alternative 2 (Less than significant/Less than significant with adaptive implementation)

There would be no reduction in annual average CVP/SWP exports under LSJR Alternative 2 (Section 13.4.2, *Methods and Approach*, and detailed in Chapter 5, *Surface Hydrology and Water Quality*). Modeling results of LSJR Alternative 2 indicate a slight increase in average inflow into the southern Delta from the LSJR. This slight increase in Delta inflow results in an estimated average increase in exports of 18 thousand acre-feet per year (TAF/y). This increase is minimal compared to the historic average annual export of 5,185 TAF/y. As such, under LSJR Alternative 2, the change in exports would be 0 percent of historic average annual exports. Because this change would not reduce the average volume of exported water, it is not expected that service providers relying on exports would experience insufficient water supplies. LSJR Alternative 2, with adaptive implementation method 1, would allow an increase of up to 10 percent over the 20 percent February–June unimpaired flow requirement and, thus, would not reduce the average inflow into the southern Delta from the LSJR. Accordingly, this would not result in a reduction in available water supplies to service providers relying on CVP/SWP exports. As part of LSJR Alternative 2, with adaptive implementation method 2, timing of the release of water within the February–June period would change. By shifting the release time, the shifted release would be affected by different Delta regulations, but the associated change in exports would be relatively small compared to total exports, and the average would not decrease relative to baseline, as a result of overall higher SJR inflow to the Delta. Adaptive implementation method 3 would not be authorized under LSJR Alternative 2 since the unimpaired flow percentage would not exceed 30 percent. LSJR Alternative 2, with adaptive implementation method 4, would allow an adjustment of the Vernalis February–June flow requirement. However, as described under Impact SP-1, changes due to adaptive implementation method 4 under this alternative would rarely alter the flow in the LSJR and, thus, average inflow to the southern Delta would not be changed such that export would be reduced. Impacts would be less than significant.

LSJR Alternative 3 (Less than significant/Less than significant with adaptive implementation)

There would be no reduction in annual average CVP/SWP exports under LSJR Alternative 3 (Section 13.4.2, *Methods and Approach*, and detailed in Chapter 5, *Surface Hydrology and Water Quality*). Modeling results of LSJR Alternative 3 indicate a slight increase in average inflow into the southern Delta from the LSJR. This slight increase in Delta inflow would result in an estimated average increase in exports of 76 TAF/y. This small increase is approximately 1 percent of the historic average annual export of 5,185 TAF/y. Because this change would not reduce the average volume of exported water, it is not expected that service providers relying on exports would experience insufficient water supplies. LSJR Alternative 3, with adaptive implementation method 1, would allow an increase or decrease of up to 10 percent in the February–June. Effects with a 10 percent decrease would be similar to those described for LSJR Alternative 2, with adaptive implementation method 1. As such, service providers would not be impacted. Adaptive implementation methods 2, 3 and 4 are not expected to result in substantial changes to CVP/SWP exports such that service providers relying on these exports are significantly impacted. LSJR Alternative 3, with adaptive implementation methods 2 or 3, could result in a change to the timing of the release of water within the February–June period. By shifting the release time, the shifted release would be affected by different Delta regulations, but the associated change in exports would be relatively small compared to total exports, and the average volume of exported water would not decrease relative to baseline. Changes in CVP/SWP exports and associated effects on service providers receiving those exports under LSJR Alternative 3 with adaptive implementation method 4 would be similar to LSJR Alternative 2 with adaptive implementation method 4 and as such, service providers would not be significantly impacted. Impacts would be less than significant.

LSJR Alternative 4 (Less than significant/Less than significant with adaptive implementation)

There would be no reduction in annual average CVP/SWP exports under LSJR Alternative 4 (Section 13.4.2, *Methods and Approach*, and detailed in Chapter 5, *Surface Hydrology and Water Quality*). Modeling results of LSJR Alternative 4 indicate an average increase in inflow into the southern Delta from the LSJR. This increase in Delta inflow results in an estimated average increase in exports of 194 TAF/y. This small increase is approximately 4 percent of the historic average annual export of 5,185 TAF/y. Because this change would not reduce the average volume of exported water, it is not expected that service providers relying on exports would experience insufficient water supplies. LSJR Alternative 4, with adaptive implementation method 1, would allow for a decrease of unimpaired flow to a minimum of 50 percent and would result in an increase in exports; therefore, service providers relying on these exports would not be affected. As part of LSJR Alternative 4 with adaptive implementation methods 2 or 3, timing of the release of water within the February–June period would change. By shifting the release time, the shifted release would be affected by different Delta regulations, but the associated change in exports would be relatively small compared to total exports, and the average volume of exported water would not decrease relative to baseline. Changes in CVP/SWP exports and associated effects on service providers receiving those exports with LSJR Alternative 4 with adaptive implementation method 4 would be similar to LSJR Alternative 2 with adaptive implementation method 4. Impacts would be less than significant.

13.4.4 Impacts and Mitigation Measures: Extended Plan Area

Bypass flows, as described in Chapter 5, *Surface Hydrology and Water Quality*, could be required much more frequently and be larger than under baseline conditions, resulting in potentially less surface water to the 12 service providers identified in the extended plan area in Table 13-6. As such, a small fraction of the water supply effect in the plan area to those service providers relying wholly or in part on surface water to meet water supply needs could be shifted to junior water rights holders in the extended plan area. To the extent that this water supply effect is shifted from agriculture uses downstream in the plan area to consumptive domestic and municipal uses upstream in the extended plan area, the effects on service providers would increase slightly in the extended plan area from that described for the plan area. The service providers identified in Table 13-6 have the potential to have their water supply affected to the extent that their water rights are junior to the senior downstream water right holders.

Under LSJR Alternative 2 without adaptive implementation water supply of downstream senior rights holders would generally be similar to baseline. Therefore, the impacts of LSJR Alternative 2 without adaptive implementation on service providers in the extended plan area would be less than significant.

Similar to the plan area, the extent to which service providers that primarily rely on surface water are affected by a reduction in surface water diversions is a function of their ability to develop alternative water supplies, including water purchases from senior water right holders, or rely on their current existing alternative supplies (e.g., groundwater) under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation. The program of implementation states that the State Water Board will take actions as necessary to ensure implementation of flow objectives does not impact supplies of drinking water for minimum health and safety needs, particularly during drought periods. Actions may include assistance with funding and development of water conservation efforts and regional water supply reliability projects and regulating public drinking water systems and water rights. These actions would be aimed at those service providers supplying water to municipal users and may offset water supply reduction impacts on providers. However, similar to those service providers in the plan area, it is expected that service providers in the extended plan area may need to construct or expand new water treatment facilities or water supply infrastructure to try to accommodate reductions in surface water supplies.

Some of these service providers would be able to implement groundwater pumping to replace some of the bypassed surface water. However, groundwater basins with sufficient quantity to replace the volume required are limited. Some individuals who rely on these service providers may put in their own groundwater wells to supplement that water. Similar to the plan area, significant environmental impacts could occur during construction or operation of new and expanded water facilities and lead agencies can and should implement mitigation measures (listed in Table 16-38). CEQA does not grant agencies new, discretionary powers independent of the powers granted to the agencies by other laws. (Pub. Resources Code, § 21004; Cal. Code Regs., tit. 14, § 15040.) Accordingly, a mitigation measure may be legally infeasible if the lead agency does not have the discretionary authority to impose or implement it. (Pub. Resources Code, § 21004; Cal. Code Regs., tit. 14, § 15040.) Since the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities or infrastructure, it is not feasible for the State Water Board to impose possible mitigation measures listed in Table 16-38. Moreover, the State Water Boards lacks authority to impose mitigation measures related to impacts such as traffic and noise. Agencies responsible for approving the project-specific new or modified facilities can and should impose the applicable mitigation measures in Table 16-38. Therefore, there is no feasible mitigation the State Water Board can impose to reduce environmental impacts resulting from the need for new or modified facilities or infrastructure. Impacts would be significant and unavoidable. Consequently, under LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 and 4, with or without adaptive implementation, the impacts would be significant and unavoidable for Impact SP-1 in the extended plan area.

The groundwater source area[28] underlying the extended plan area is primarily fractured bedrocks. There is only one DWR Bulletin 118-designated groundwater basin, the Yosemite Valley Basin in Yosemite National Park in Mariposa County, in the extended plan area; the rest of the area is primarily fractured bedrocks. These fracture systems produce relatively small, localized, and isolated groundwater areas. If surface water available to the service providers in the extended plan area is reduced due to implementation of the LSJR alternatives, there could be more groundwater pumping over time in the extended plan area. However, the impact of such an increase in pumping on groundwater quality would be minimal for the following reasons.

- The increase in pumping would be small based on the relatively small amount of total municipal use that occurs in the extended plan area (Section 13.2.2, *Extended Plan Area*).
- The groundwater in the fractured rocks are localized and isolated; hence, the influence of increased pumping on the migration of any contaminants would be minimal.

Thus, impacts on groundwater quality (Impacts SP-2a and SP-2b) would be less than significant in the extended plan area. As discussed in Chapter 5, *Surface Hydrology and Water Quality*, changes on flow upstream of the major rim dams in the Stanislaus, Tuolumne, and Merced Rivers would be small and would not change flows downstream of the rim dams. SJR inflows to the Delta would not be affected even if the extended plan area is taken into consideration. Therefore, impact of the LSJR alternatives with or without adaptive implementation to the service providers relying on CVP/SWP exports (Impact SP-3) would be less than significant.

[28] Although alluvial aquifers are most common in California, other groundwater development occurs in fractured crystalline rocks, fractured volcanics, and limestones. These nonalluvial areas that provide groundwater are referred to as *groundwater source areas*, while the alluvial aquifers are called *groundwater basins* in DWR Bulletin 118 (DWR 2003a). It is generally referring to areas of fractured bedrock in foothill and mountainous terrain.

13.5 Cumulative Impacts

For the cumulative impact analysis, refer to Chapter 17, *Cumulative Impacts, Growth-Inducing Effects, and Irreversible Commitment of Resources.*

Table 13-3a. Public Water Suppliers in the Eastern San Joaquin, Merced, Modesto, and Turlock Subbasins

Note: This table is first referenced in this chapter in Section 13.2.1, *Lower San Joaquin River and Tributaries*.

Public Water System	Population Served	County Served	Groundwater Subbasin	Groundwater Reliance (%) in 2014
4N Mobile Home Park	165	Stanislaus	Eastern San Joaquin	100
A V Thomas Produce, Inc.	200	Merced	Merced	100
Almond Park Water System	60	San Joaquin	Eastern San Joaquin	100
Atwater	28,100	Merced	Merced	100
Ballico CSD	309	Merced	Turlock	100
Bel Air Mobile Estate	150	San Joaquin	Eastern San Joaquin	100
Black Rascal Water Company	393	Merced	Merced	100
Burson Full Gospel Church	80	Calaveras	Eastern San Joaquin	100
Cal Water, Stockton	185,346	San Joaquin	Eastern San Joaquin	26
Calaveras CWD - Wallace	340	Calaveras	Eastern San Joaquin	100
Castle Airport	2091	Merced	Merced	100
Ceres	42,666	Stanislaus	Turlock	100
Ceres West Mobile Home Park	161	Stanislaus	Turlock	100
City of Modesto	212,000	Stanislaus	Turlock	61
City of Modesto, Central Turlock[b]	116	Stanislaus	Turlock	100
City of Modesto, De #6, So. Turlock	1,279	Stanislaus	Turlock	100
City of Modesto, De Grayson	1,219	Stanislaus	Turlock	100
City of Modesto, De Hayes	200	Stanislaus	Turlock	100
City of Modesto, De Hickman	565	Stanislaus	Turlock	100
City of Modesto, De Hillcrest	1,322	Stanislaus	Modesto	100
City of Modesto, De Walnut Manor	216	Stanislaus	Turlock	100
City of Modesto, De Waterford	7,897	Stanislaus	Modesto	100
City of Modesto, Salida	24,440	Stanislaus	Modesto	100
Clements Water Works #43	120	San Joaquin	Eastern San Joaquin	100
Country Club County WD	85	Merced	Turlock	100
Country Manor Mobile Home Park	75	San Joaquin	Eastern San Joaquin	100

Public Water System	Population Served	County Served	Groundwater Subbasin	Groundwater Reliance (%) in 2014
Country Villa Apartments	30	Stanislaus	Turlock	100
Country Western Mobile Home Park	120	Stanislaus	Turlock	100
Countryside Mobile Home Estates	60	Stanislaus	Turlock	100
Defense Distribution. Depot, Sharpe Site	1,650	San Joaquin	Eastern San Joaquin	100
Delhi CWD	5,640	Merced	Turlock	100
Denair CSD	3,225	Stanislaus	Turlock	100
El Nido Elementary School	210	Merced	Merced	100
El Nido Mobile Home Park	125	Merced	Extended Merced	100
El Torero Restaurant	225	Calaveras	Eastern San Joaquin	100
Elkhorn Estates Water System	200	San Joaquin	Eastern San Joaquin	100
Escalon	7,137	San Joaquin	Eastern San Joaquin	100
Faith Home Teen Ranch	50	Stanislaus	Turlock	100
Farmington Water Company	270	San Joaquin	Eastern San Joaquin	100
Finnlees Trailer Park	55	San Joaquin	Eastern San Joaquin	100
Foster Farms #5	26	Stanislaus	Turlock	100
Gayla Manor PWS	146	San Joaquin	Eastern San Joaquin	100
Glenwood Mobile Home Park	100	San Joaquin	Eastern San Joaquin	100
Green Run Mobile Estates	100	Stanislaus	Turlock	100
Hickman	565	Stanislaus	Turlock	100
Hilmar County WD	4,850	Merced	Turlock	100
Hughson	6,082	Stanislaus	Turlock	100
Islander Marina	150	San Joaquin	Eastern San Joaquin	100
Keyes CSD	4,575	Stanislaus	Turlock	100
Lathrop	12,427	San Joaquin	Eastern San Joaquin	88
Le Grand CSD	1,700	Merced	Merced	100
Linden CWD	1,450	San Joaquin	Eastern San Joaquin	100
Livingston	13,940	Merced	Merced	100
Lockeford CSD	2,500	San Joaquin	Eastern San Joaquin	100
Lodi	63,395	San Joaquin	Eastern San Joaquin	73

Public Water System	Population Served	County Served	Groundwater Subbasin	Groundwater Reliance (%) in 2014
Manteca	66,451	San Joaquin	Eastern San Joaquin	42
Meadowbrook Water Company	6,309	Merced	Merced	100
Merced	80,095	Merced	Merced	100
MID	16	Stanislaus	Turlock	0
Mobile Plaza Park	125	Stanislaus	Turlock	100
Morada Acres Water System	105	San Joaquin	Eastern San Joaquin	100
Morada Estates N PWS #46	180	San Joaquin	Eastern San Joaquin	100
Morada Estates PWS	158	San Joaquin	Eastern San Joaquin	100
Morada Manor Water System	109	San Joaquin	Eastern San Joaquin	85
Oakdale	19,250	Stanislaus	Modesto	100
Oakdale Golf & Country Club (EH)	25	Stanislaus	Modesto	100
Oakwood Lake Water District-Subdivision	43	San Joaquin	Eastern San Joaquin	100
Plainsburg Elementary School	150	Merced	Merced	100
Planada CSD	4,500	Merced	Merced	100
Rancho Marina	75	Sacramento	Eastern San Joaquin	100
Rancho San Joaquin Water Sys	141	San Joaquin	Eastern San Joaquin	100
Ripon	14,915	San Joaquin	Modesto	100
Riverbank	22,201	Stanislaus	Modesto	100
Roberts Ferry School Cafeteria	100	Stanislaus	Modesto	100
San Joaquin County–Colonial Heights	1,851	San Joaquin	Eastern San Joaquin	0
San Joaquin County–Lincoln Village	5,865	San Joaquin	Eastern San Joaquin	0
San Joaquin County-Mokelumne Acres	3,640	San Joaquin	Eastern San Joaquin	100
San Joaquin County-Raymus Village	1,086	San Joaquin	Eastern San Joaquin	100
San Joaquin County–Thornton	957	San Joaquin	Eastern San Joaquin	100
San Joaquin County–Wilkinson Manor	861	San Joaquin	Eastern San Joaquin	100
Sandy Mush Detention Center	800	Merced	Merced	100
SEWD	50	San Joaquin	Eastern San Joaquin	0
Shaded Terrace PWS	161	San Joaquin	Eastern San Joaquin	100
South San Joaquin ID	50	Stanislaus	Modesto	0

Public Water System	Population Served	County Served	Groundwater Subbasin	Groundwater Reliance (%) in 2014
Spring Creek Estates PWS	90	San Joaquin	Eastern San Joaquin	100
Stockton	169,963	San Joaquin	Eastern San Joaquin	23
TID/ La Grange Water System	195	Stanislaus	Turlock	0
Tracy[a]	82,000	San Joaquin	Tracy	3
Turlock	64,215	Stanislaus	Turlock	100
Valley Springs PUD	900	Calaveras	Eastern San Joaquin	100
Walnut Acres	100	San Joaquin	Eastern San Joaquin	100
West Lane Mobile Home Park	160	San Joaquin	Eastern San Joaquin	100
Willow Berm Marina	150	Sacramento	Eastern San Joaquin	100
Winton WSD	8,500	Merced	Merced	100
Total	1,197,140			

Sources: California Environmental Health Tracking Program (CEHTP) Drinking Water Systems Geographic Reporting Tool 2016; State Water Resources Control Board, Division of Drinking Water 2016.

Note: Gray-shaded rows indicate those public water suppliers shown in Table 13-3b.

CSD = Community Services District
CWD = County Water District
ID = Irrigation District
MID = Modesto Irrigation District
PWS = Public Water System
PUD = Public Utilities District
SEWD = Stockton East Water District
WD = Water District

[a] Although the City of Tracy is not located in the Eastern San Joaquin, Modesto, Turlock, or Extended Merced Subbasin, it is within the area of potential effects because it receives water from SSJID and can be affected by the LSJR alternatives. Therefore, it is included in this table.

[b] The City of Modesto, Central Turlock has no groundwater wells, but purchases groundwater from Turlock.

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13.6.2 Personal Communications

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