San Luis Low Point Improvement Project Environmental Impact Statement / Environmental Impact Report

Appendix N: Surface Water Supply Technical Report

This page left blank intentionally.

Appendix N
Surface Water Supply Technical Report

The Surface Water Supply Technical Appendix supplements Section 4.2, Surface Water Supply, in the San Luis Low Point Improvement Project (SLLPIP) Environmental Impact Statement/Environmental Impact Report (EIS/EIR). This technical report describes the changes to water supply associated with each action alternative. The changes are estimated using the CalSim II model.

N.1 Background

The Federal and State governments constructed the Central Valley Project (CVP) and State Water Project (SWP) in pursuit of the State Water Plan to maximize use of the state's water supplies and provide flood control. The Federal CVP currently has 253 water service contracts (including Sacramento River Settlement Contracts) (United States Fish and Wildlife Service [USFWS] 2008). The SWP currently has contracts to deliver supplies to 29 water suppliers across the state. These water contracts are subject to reductions, depending on the amount of water available each year. Water forecasting starts in the fall of the previous year when storage and hydrologic conditions are assessed. Annual water allocation for both the CVP and SWP are generally announced early in the calendar year for the following growing season and updated monthly.

This water supply technical report includes San Luis Reservoir, CVP facilities including the Delta-Mendota Canal and the San Felipe Division, SWP facilities including the California Aqueduct and the South Bay Aqueduct (SBA), and Santa Clara Valley Water District (SCVWD) infrastructure that conveys water to end users in Santa Clara County. Figure N-1 shows the study area.

N.1.1 San Luis Reservoir

San Luis Reservoir is an off-stream storage reservoir in Merced County. Department of Interior, Bureau of Reclamation (Reclamation) owns and jointly operates San Luis Reservoir with the California Department of Water Resources (DWR) to provide seasonal storage for the CVP and the SWP. San Luis Reservoir is capable of receiving water from both the Delta-Mendota Canal and the California Aqueduct, which enables the CVP and SWP to pump water into the reservoir during the wet season (October through March) and release water into the conveyance facilities during the dry season (April through September) when demands are higher. Deliveries from San Luis Reservoir also flow west through Pacheco Pumping Plant and Conduit to the San Felipe Division of the

CVP. The CVP contractors that receive water from San Luis Reservoir include the San Felipe Division and the Central Valley Region CVP Contractors. This section describes the annual reservoir operations, water storage and releases, and water supply facilities associated with San Luis Reservoir.

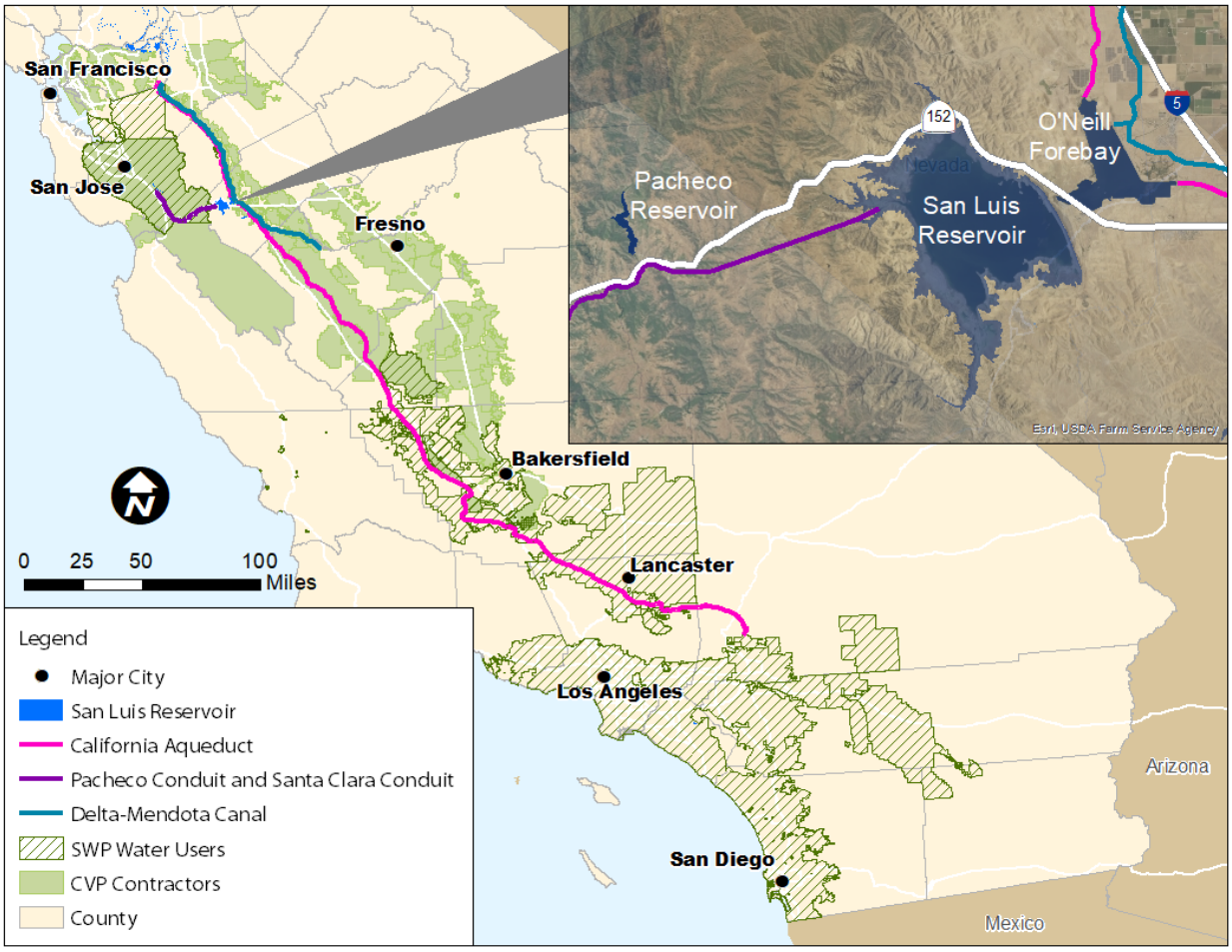
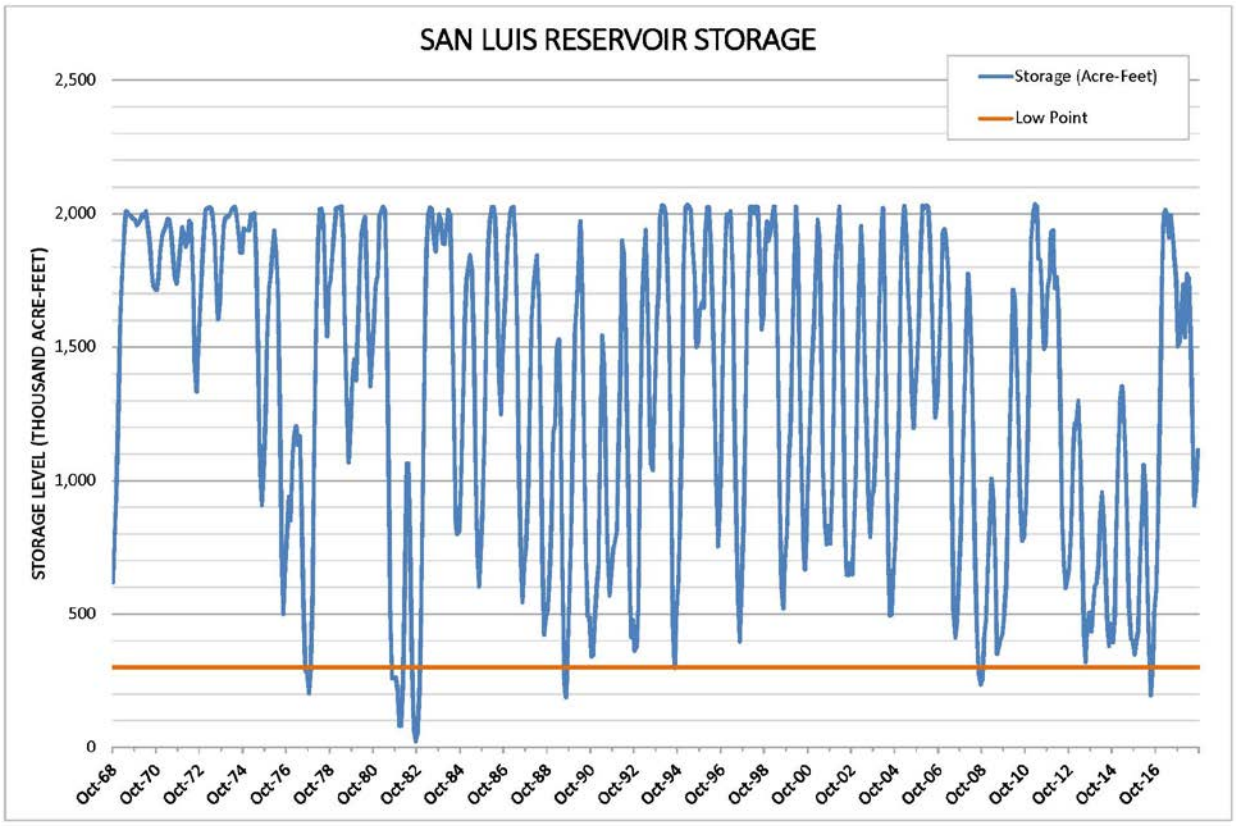


Figure N-1. Surface Water Supply Study Area

Figure N-2 shows monthly storage in San Luis Reservoir from 1968 through early 2018. Storage is highly variable throughout the year as the reservoir refills in the fall and winter months and releases water in spring and summer to meet CVP and SWP demands. In most years, the storage level in San Luis Reservoir has remained above 300 thousand acre-feet (TAF). As Figure N-2 shows, San Luis Reservoir was drawn down in 1981 and 1982 to a storage level of 79 TAF to facilitate repairs. During the drought periods of 1976–1977, 1988–1992 and 2007-2008, the reservoir was drawn down to below 300 TAF. San Luis Reservoir also fell below 300 TAF in the summer of 2016 (Reclamation 2016a).



Source: DWR California Data Exchange Center (CDEC) 2018

Figure N-2. Monthly Storage in San Luis Reservoir from 1921 to 2018

Table N-1 presents average monthly storage in San Luis Reservoir from 1970 through 2018. February, March, and April typically have the highest average storage as this is just after spring snowmelt from Northern California has been pumped through the Delta into the California Aqueduct and Delta-Mendota Canal and on to San Luis Reservoir. On average, storage in the reservoir is generally lowest in July, August, and September as water is being released to meet demands.

Table N-1. Average Monthly Storage in San Luis Reservoir (1921 through 2018)

Month	Storage (acre-feet)
January	1,475,953
February	1,628,474
March	1,762,224
April	1,693,288
May	1,451,058
June	1,137,430
July	894,445

Month	Storage (acre-feet)
August	775,277
September	846,592
October	909,379
November	1,048,939
December	1,248,938

Source: DWR CDEC 2018

During summer months, releases from San Luis Reservoir into O'Neill Forebay are made via the Gianelli Intake[1] and the Gianelli Pumping-Generating Plant turbines, which generate electricity. The water flows east into the San Luis Canal, and occasionally, water is also released from O'Neill Forebay back into the Delta-Mendota Canal, where electricity is also generated.

N.1.2 South-of-Delta CVP Facilities and Contractors

Reclamation operates the CVP, which diverts water from the Delta using the C.W. "Bill" Jones Pumping Plant (Jones Pumping Plant) into the Delta-Mendota Canal. The Delta-Mendota Canal is a 117-mile long canal that delivers water to users in the Central Valley and to and from San Luis Reservoir for storage. Water conveyed through the Delta-Mendota Canal to San Luis Reservoir is pumped from the canal to the O'Neill Forebay where it connects with the California Aqueduct and the San Luis Canal. The Delta-Mendota Canal continues east from the O'Neill Forebay to the Mendota Pool (Reclamation 2011a).

N.1.2.1 South-of-Delta CVP Contractors

The San Luis & Delta-Mendota Water Authority (SLDMWA) was formed in 1992 and covers approximately 3,300 square miles on the west side of the San Joaquin Valley and the Central Coast. It extends from the City of Tracy in San Joaquin County in the north to Kettleman City in Kings County in the south and contains 32 public agencies in the Central Valley Region that contract with Reclamation for CVP water (see Table N-2 below).

[1] The top of the Gianelli Intake is at an elevation of 296 feet and the bottom is at an elevation of 273 feet.

Table N-2. SLDMWA Agencies

Upper Delta-Mendota Canal	San Luis Canal	Exchange Contractors and Refuges	San Felipe Division	Lower Delta-Mendota Canal and Mendota Pool
Banta-Carbona Irrigation District	Panoche Water District	Central California Irrigation District	Pajaro Valley Water Management Agency	Broadview Water District
Byron-Bethany Irrigation District	Pleasant Valley Water District	Columbia Canal Company	San Benito County Water District	Eagle Field Water District
Centinella Water District	San Luis Water District	Firebaugh Canal Water District	Santa Clara Valley Water District	Fresno Slough Water District
City of Tracy	Westlands Water District	Grassland Water District		James Irrigation District
Del Puerto Water District		San Luis Canal Company		Laguna Water District
Patterson Water District				Mercy Springs Water District
Westside Irrigation District				Oro Loma Water District
West Stanislaus Irrigation District				Pacheco Water District
				Reclamation District 1606
				Tranquillity Irrigation District
				Turner Island Water District
				Widren Water District

Water supplies for the SLDMWA member agencies include CVP water, groundwater, and local surface water. The SLDMWA agencies hold contracts for approximately 3.0 million acre-feet (MAF) of CVP water annually. Approximately 2.5 MAF of the water is used to irrigate 1.2 million acres of agricultural lands in the Central Valley and Santa Clara and San Benito Counties, while 150,000 to 250,000 acre-feet (AF) is used for municipal and industrial (M&I) purposes, and 250,000 to 300,000 AF is used for environmental purposes including wildlife habitat management in the San Joaquin Valley (SLDMWA 2016).

The CVP has only delivered 100 percent of the contracted water to agricultural and M&I contractors in the SLDMWA service area three times since 1990 and SWP has only delivered 100 percent of the contracted amount twice since 1990. Because of groundwater overdraft conditions throughout the SLDMWA region, groundwater supplies are declining. This has further reduced water supplies for the SLDMWA agencies. In 2014 only 45 percent of the maximum contract volume were delivered to south-of-Delta CVP contractors (Reclamation 2015) and in 2015 south-of-Delta CVP M&I allocations were 25% of the contract total (Reclamation 2016b). In 2016, south-of-Delta CVP M&I allocations increased to 55% of the contract total (Reclamation 2016b). The San Felipe Division of the CVP and SCVWD are discussed below in more detail.

In recent years, Reclamation has made significant cutbacks to water deliveries for many CVP contractors due to the drought, among other factors, as shown in Table N-3. In 2015, south-of-Delta CVP M&I allocations were 25% of the contract total, which increased to 55% of the contract total in 2016 (Reclamation 2017b). Most CVP South-of-Delta agricultural water service contractors received an initial allocation of 65% of contracted supplies, and South-of Delta M&I contractors initially received a 90% allocation for 2017. However, these allocations were later revised to 100% in April 2017 (Reclamation 2017b). The San Felipe Division of the CVP and SCVWD are discussed below in more detail.

Table N-3. Water Allocations for South-of-Delta CVP Contractors, 2012-2017 (Percent of Maximum Contract Allocation)

	2012	2013	2014	2015	2016	2017
Agricultural	40%	20%	0%	0%	5%	100%
M&I	75%	70%	50%	25%	55%	100%
Exchange Contractors	100%	100%	65%	75%	100%	100%
Refuges	100%	100%	65%	75%	100%	100%
Eastside Division	100%	100%	55%	0%	0%	100%
Friant Class I	50%	62%	0%	0%	65%	100%
Friant Class II	0%	0%	0%	0%	0%	100%

Source: Reclamation 2017b

N.1.3 South-of-Delta SWP Facilities and Contractors

N.1.3.1 South-of-Delta SWP Facilities

DWR operates the SWP, which diverts water from the Delta through the Harvey O. Banks Pumping Plant (Banks Pumping Plant) into Bethany Reservoir. The California Aqueduct is 444 miles long and delivers water from Bethany Reservoir south to the Central Valley and Southern California. The California Aqueduct flows south 60 miles to O'Neill Forebay at San Luis Reservoir (DWR 2015). At O'Neill Forebay, the California Aqueduct becomes the San Luis Canal, which is managed jointly by Reclamation and DWR and serves both the CVP and SWP. The San Luis Canal is Federally-built and extends 103 miles from O'Neil Forebay southeast to just past Kettleman City (Reclamation 2011a). At this point it becomes the California Aqueduct again, an SWP facility that delivers water over the Tehachapi Mountains to southern California.

The SBA was constructed by the SWP in the 1960's to provide water to the south San Francisco Bay area in Alameda and Santa Clara Counties. The South Bay Pumping Plant lifts water from Bethany Reservoir into the SBA. Water then flows to a junction and a portion is pumped into Lake Del Valle. Water from the SBA can be stored in Lake Del Valle and released back into the SBA. After the Del Valle junction, water flows through pipelines to La Costa Tunnel, southwest past Sunol, through the Mission Tunnel, and south through the hills overlooking San Francisco Bay. The SBA ends in a 160-foot diameter Santa

Clara Terminal Tank in San Jose at the Penitencia water treatment plant (WTP) (DWR 2001).

The SBA conveys an annual maximum of 46,000 AF to the Alameda County Flood Control and Water Conservation District (Zone 7), 42,000 AF to Alameda County Water District, and 100,000 AF to SCVWD (DWR 2001). The SCVWD turnout on the SBA has a maximum capacity of 182 cubic feet per second (cfs).

N.1.3.2 South-of-Delta SWP Contractors

The SWP delivers water to 29 public water agencies in Northern, Central and Southern California that hold long-term contracts for surface water deliveries (see Table N-4 below for a list of south-of-Delta agencies with SWP contracts). The agencies deliver water for both urban and agricultural use, representing over 25 million municipal water users and 750,000 acres of irrigated farmland. Five of the agencies use the SWP water primarily for agricultural uses and the remaining 24 use the SWP water primarily for municipal use. As noted above, the Alameda County Flood Control and Water Conservation District (Zone 7), Alameda County Water District and SCVWD all receive their SWP supplies through the SBA.

Water supplies for the agencies include imported SWP water, groundwater, local surface water, and for some agencies other imported supplies. The agencies collectively have received deliveries ranging from approximately 1.4 MAF in dry water years to approximately 4.0 MAF in wet years.

Similar to CVP south-of-Delta deliveries, SWP exports from the Delta and the corresponding south-of-Delta deliveries have decreased over time. Implementation of the 2008 and 2009 United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Biological Opinions for the Long-Term Operations of the SWP and CVP resulted in substantial changes in south-of-Delta SWP deliveries. In the period between 2005 and 2013, average annual SWP exports have fallen by 12 percent (DWR 2015).

Table N-4. South-of-Delta SWP Contractors

Alameda County Flood Control & Water Conservation District - Zone 7	Metropolitan Water District of Southern California
Alameda County Water District	Mojave Water Agency
Antelope Valley-East Kern Water Agency	Oak Flat Water District
Castaic Lake Water Agency	Palmdale Water District
Coachella Valley Water District	San Bernardino Valley Municipal Water District
County of Kings	San Gabriel Valley Municipal Water District
Crestline-Lake Arrowhead Water Agency	San Gorgonio Pass Water Agency
Desert Water Agency	San Luis Obispo County Flood Control and Water Conservation District

Dudley Ridge Water District	Santa Barbara County Flood Control and Water Conservation District
Empire-West Side Irrigation District	Santa Clara Valley Water District
Kern County Water Agency	Tulare Lake Basin Water Storage District
Littlerock Creek Irrigation District	Ventura County Watershed Protection District

N.1.4 San Felipe Division and Santa Clara Valley Water District

N.1.4.1 San Felipe Division

The San Felipe Division of the CVP was authorized in 1960 and currently delivers water to agriculture and M&I users in Santa Clara County, the northern portion of San Benito County, the southern portion of Santa Cruz County, and the northern edge of Monterey County (Reclamation 2011a). The three agencies that make up the San Felipe Division are SCVWD, San Benito County Water District (SBCWD), and Pajaro Valley Water Management Agency (PVWMA). Table N-5 shows the CVP contract allocations for each of the San Felipe Division agencies. The PVWMA currently does not have a connection to the CVP system or San Luis Reservoir and is therefore not discussed further in this water supply section.

Table N-5. Contract Allocations for the San Felipe Division

San Felipe Division Members	Contract Type		Source of CVP Water
	Agriculture (AF)	M&I (AF)	
SCVWD[1]	33,100	119,400	San Luis Reservoir
SBCWD	38,244	5,556	San Luis Reservoir
PVWMA[2]	6,260	0	None (See Note 2)

Source: Reclamation 2016c

AF = Acre-Feet

[1] The SCVWD CVP water is used throughout Santa Clara County.

[2] Currently, the PVWMA does not have a connection to the CVP system. However, the PVWMA plans to construct a connection in the future. PVWMA has a contract reservation for an additional 19,900 AF per year which is not under contract until provisions of the CVPIA are fulfilled

SCVWD and SBCWD receive water directly from San Luis Reservoir through the San Felipe Division facilities (see Table N-6 and Figure N-1). Water for the San Felipe Division is withdrawn from San Luis Reservoir via two intakes on the west side of the reservoir. From the intakes, water flows west through the Pacheco Tunnel Reach 1 to the Pacheco Pumping Plant. At the plant, water is lifted to Reach 2 of the Pacheco Tunnel and conveyed through the Pacheco Conduit to the bifurcation of the Santa Clara and Hollister Conduits.

Water for SCVWD is delivered to the Coyote Pumping Plant via the Santa Clara Conduit, a tunnel that runs through the Diablo Mountains. From Coyote Pumping Plant, the water can either be delivered to Anderson Reservoir, Calero

Reservoir, groundwater recharge facilities, or the Rinconada and/or Santa Teresa WTPs.

Water from the Hollister Conduit serves San Benito County and extends from Pacheco Conduit to San Justo Reservoir. Located three miles southwest of the City of Hollister, San Justo Reservoir has a total storage capacity of 9,785 AF (Reclamation 2011b). The reservoir regulates San Benito County's imported water supplies, provides for pressure deliveries to some agricultural lands in the service area, and provides storage for peaking of agricultural water (USFWS 2008). SCVWD operates all San Felipe Division facilities with the exception of the Hollister Conduit and San Justo Reservoir, which are operated by SBCWD.

Table N-6. San Felipe Division Facilities

San Felipe Division Facility	Location and Description
Pacheco Tunnel	Reaches 1 and 2, along with the Pacheco Pumping Plant, bring water from San Luis Reservoir through the Diablo Mountain Range.
Pacheco Pumping Plant	At the end of Pacheco Tunnel Reach 1.
Pacheco Conduit	Extends from the Pacheco Tunnel Reach 2 outlet to the bifurcation of the Santa Clara and Hollister Conduits.
Santa Clara Tunnel and Conduit	Conveys water from the Pacheco Conduit to the Coyote Pumping Plant.
Hollister Conduit	Extends from Pacheco Conduit to San Justo Reservoir.
Coyote Pumping Plant	End of Santa Clara Conduit near Anderson Dam. Can pump CVP water to Anderson Dam or direct it to SCVWD raw water pipelines that serve the water treatment plants.
San Justo Dam and Reservoir	Stores CVP water from Hollister Conduit.

Source: Reclamation 2011a.

N.1.4.2 Low Point Issue

As described in Chapter 1, conditions at San Luis Reservoir can promote the growth of reservoir-wide algae during the summer months, when the reservoir reaches the lower water surface elevations. The thickness of the algal blooms vary, but algal cells are typically observed in the water delivered through the Lower San Felipe Intake when the reservoir surface is drawn within 35 feet of the intake. The algal blooms are very difficult to treat at SCVWD's two WTPs that receive San Luis Reservoir water and can cause taste and odor issues for M&I water users in Santa Clara County.

San Luis Reservoir is currently the only point of delivery for the San Felipe Division's CVP supplies authorized under their current CVP Water Service Contracts (SCVWD contract No. 7-07-20-W0023 dated June 7, 1977 amended March 28, 2007; SBCWD contract No. 8-07-20-W0130 dated April 15, 1978 amended March 28, 2007).

The water elevation in San Luis Reservoir during the late summer and early fall periods varies from year to year, depending on various conditions. These conditions include the amount of stored water carried over from the previous year (carryover water), the volume of water that can be delivered from the Delta (usually depending on hydrologic conditions and regulatory restrictions on Delta exports), demands of Federal and State contractors, and operational decisions made by Reclamation and DWR.

In most years, the storage level in San Luis Reservoir has remained above 300 TAF (which corresponds to the water surface elevation at which the low point issue is likely to arise). The reservoir has not been drawn down to its minimum operating pool of 79 TAF since before the San Felipe Division began deliveries in 1987, when drawdown events occurred in response to droughts and to allow maintenance. During the drought periods of 1976–1977, 1988–1992, and 2008, the reservoir was drawn down to below 300 TAF (Figure N-2). San Luis Reservoir also fell below 300 TAF in summer 2016 (Reclamation 2016a). San Luis Reservoir was drawn down to a storage level of 79 TAF to facilitate repairs in 1981 and 1982. In the past, Reclamation has projected that San Luis Reservoir storage levels would drop below 300 TAF, which could affect water deliveries to the San Felipe Division. The low point issues did not materialize in most of these years because SWP contractors left some water in storage as carryover for future years. However, changing water supply conditions and increasing demands make continued long-term storage above 300 TAF unlikely.

The uncertainty associated with San Luis Reservoir water supply deliveries in turn affects SCVWD's water delivery operations. The duration of low point occurrences is projected to increase in the future and the SCVWD's ability to adjust operations to fully mitigate impacts associated with the low point issue will diminish over time as local supplies, currently reserved for use during drought events, are relied on to replace interrupted imported supplies.

N.1.4.3 Santa Clara Valley Water District

The SCVWD service area has several water supply sources, including imported water (CVP and SWP), water from the San Francisco Public Utilities Commission, natural groundwater, local surface water, recycled water, and surface water rights held by San Jose Water Company and Stanford University (SCVWD 2015). Table N-7 shows a breakdown of the SCVWD water supply sources for 2015.

Table N-7. SCVWD 2015 Water Supply

Source	Percent
Natural Groundwater Recharge	15%
Local Surface Water	17%
Recycled Water	8%

Source	Percent
San Francisco Public Utilities Commission	16%
CVP and SWP Allocations	23%
Carryover, Transfer, and Semitropic Takes	21%

Source: SCVWD 2015

SCVWD receives imported water from the CVP through San Luis Reservoir and the Pacheco Conduit, and from the SWP through the SBA. SCVWD has a maximum contract for 100 TAF per year of water from the SWP, although deliveries vary depending on hydrological conditions. Almost all of this supply is used to meet M&I needs (SCVWD 2010). SCVWD's maximum CVP contract is for 152.5 TAF per year, with 119.4 TAF for M&I and 33.1 TAF for agricultural irrigation. The actual amount SCVWD receives from the CVP is generally less than the contractual amount because of climate conditions, environmental regulations, and conveyance limitations. As Table N-7 shows, in 2015, the largest component of SCVWD's overall water supply (23 percent) was imported via the CVP and SWP and was used to replenish groundwater or was treated for drinking water use.

Groundwater is an important water supply source for Santa Clara County and its preservation was the goal that spurred the formation of the SCVWD. In a normal year, 40 to 50 percent of all water used in SCVWD is groundwater (SCVWD 2010). SCVWD manages two groundwater subbasins: the Santa Clara Valley Subbasin (subdivided into Santa Clara Plain and Coyote Valley in the 2012 Groundwater Management Plan) and the Llagas Subbasin. Natural recharge of the subbasins is insufficient to off-set groundwater pumping; therefore, SCVWD implements managed recharge using local and imported surface water. Recharge facilities managed by SCVWD include over 320 acres of off-stream ponds and over 30 local creeks (SCVWD 2010). In an average year, natural recharge accounts for approximately 60 TAF, while managed recharge accounts for 116 TAF (SCVWD 2005b; SCVWD 2010). Managed recharge also helps to prevent overdraft and land subsidence and allows for carryover of surplus water from wet years to dry years (SCVWD 2005a).

SCVWD has a long-term agreement with Semitropic Water Storage District to bank or store SWP water for future use. The agreement does not provide additional water supply for SCVWD, but it does allow excess water to be stored in wet years for later use during dry years or other periods of shortage. SCVWD currently has 350 TAF of storage capacity at the Semitropic Groundwater Storage Bank. SCVWD uses storage in the Semitropic Groundwater Storage Bank as an in-lieu supply; SCVWD does not withdraw water from Semitropic's groundwater basin, but instead takes a portion of Semitropic's SWP water allocation from the Delta through the SBA. However, Semitropic Water Storage District's allocation, like that of other south-of-Delta contractors, is proportional to SWP percentage allocation for the year and can therefore limit the amount of water SCVWD can withdraw.

SCVWD also participates in transfers and exchanges. SCVWD has exchanged portions of its CVP allocations with SBCWD and partners in the San Joaquin Valley who are CVP contractors. A total of 7 TAF was exchanged in 2004 (SCVWD 2005b). In 1998, SCVWD and two other agencies (PVWMA and Westlands Water District) entered in to an agreement for the permanent assignment of 6.26 TAF per year from Mercy Springs Water District, an agricultural CVP contractor. The agreement provides SCVWD an option for dry-year supplies up to 20 TAF over 20 years (SCVWD 2005b).

SCVWD has an effective water conservation program and has saved approximately 64,000 AF in 2015. SCVWD aims to meet a conservation target of approximately 98,800 AF by 2030 (SCVWD 2015).

In Santa Clara County, additional water sources that are not under the jurisdiction of SCVWD are available, and their use helps to reduce reliance on SCVWD supplies. Several municipalities in Santa Clara County have agreements with the City and County of San Francisco for water from the Hetch-Hetchy system. The San Jose Water Company and Stanford University have surface water rights of approximately 11,000 AF per year that they exercise to meet their demands (SCVWD 2015). Approximately 20 TAF of recycled water is currently used from four publicly-owned wastewater treatment plants in Santa Clara County (SCVWD 2015).

SCVWD manages water resources and sells treated water wholesale to retailers in Santa Clara County. Water infrastructure operated by SCVWD includes raw water conveyance, storage, water treatment, and treated water distribution. Raw water is treated at three SCVWD WTPs (Santa Teresa, Penitencia, and Rinconada) and then distributed, or used for groundwater recharge. Ten reservoirs managed by SCVWD capture local runoff and store it for groundwater recharge, irrigation, or drinking water treatment (SCVWD 2015). The total storage capacity of all ten reservoirs is approximately 170 TAF; however, this capacity has been restricted to approximately 113 TAF due to Safety of Dams interim operating restrictions (SCVWD 2010). With the exception of Anderson Reservoir, the local reservoirs were constructed for annual operations, storing water in the winter and releasing that water in the summer and fall for groundwater recharge.

N.1.4.4 Anderson Reservoir

Built in the 1950's, Anderson Reservoir has maximum capacity of 90,373 AF and is the largest of SCVWD's ten reservoirs (SCVWD 2010). Water from Anderson Reservoir is released into Coyote Creek for groundwater recharge and aquatic habitat. Anderson Reservoir is one of only two reservoirs connected to SCVWD's water distribution system and treatment plants. Water from San Luis Reservoir can be conveyed through the San Felipe Division facilities and stored in Anderson Reservoir for later use (SCVWD 2010). Anderson Reservoir is an important component of SCVWD's water supply system because it has the ability to provide carryover storage from year to year (SCVWD 2010). This

allows the reservoir to serve as a backup supply source for SCVWD's WTPs when imported water deliveries are curtailed (SCVWD 2010).

In 2011, the SCVWD completed a seismic study for Anderson Reservoir. Based on the results of the study, operating restrictions have been approved for Anderson Reservoir until a series of seismic upgrades are complete. The operating restrictions reduce Anderson Reservoir's maximum capacity from 90,373 AF to 61,810 AF, or 68 percent of its maximum capacity. Seismic upgrades are anticipated to be completed by 2024 (SCVWD 2016).

N.1.4.5 Pacheco Reservoir

Pacheco Reservoir is located on North Fork Pacheco Creek, and it was established in 1939 through construction of the North Fork Dam. This existing earthen dam is owned and operated by PPWD, and operated for groundwater recharge via releases to Pacheco Creek in spring and early summer. The design capacity of Pacheco Reservoir is 6,000 AF, with an operational capacity of 5,500 AF. The earthen dam is 100-feet tall and collects rainfall from a 75-square-mile watershed. Since the 1940s, the facility has undergone multiple repairs to its spillway.

North Fork Dam is currently under restricted-operation criteria through an April 5, 2017, order of the California Department of Water Resources' Division of Safety of Dams (DSOD), due to existing spillway deficiencies. PPWD is coordinating with the Federal Emergency Management Agency and DSOD on short-term and long-term repairs. The DSOD has stated that if satisfactory progress is not made to address spillway deficiencies, additional remedies would be invoked, inclusive of revocation of the PPWD's Certificate of Approval to store water.

N.1.4.6 Water Treatment

SCVWD operates three WTPs that treat water for M&I use. The Rinconada WTP treats and delivers up to 80 million gallons of water each day. This water is sent to retailers who then supply residential and commercial users in Santa Clara, Campbell, Sunnyvale, Cupertino, Mountain View and Los Altos and the towns of Los Gatos and Los Altos Hills. Water for the Rinconada WTP comes from the SBA and San Luis Reservoir. SCVWD's Anderson and Calero Reservoirs can also supply water to the WTP (SCVWD 2012a).

The Santa Teresa WTP is the largest WTP operated by SCVWD. It treats and delivers up to 100 million gallons of water per day for most of South San Jose (Almaden Valley, Blossom Valley, Santa Teresa), which includes both residential and commercial users. This WTP can also serve most of Penitencia WTP's service area if needed. Almost all the water for this WTP is imported from San Luis Reservoir. Anderson and Calero Reservoirs can also supply water to this WTP (SCVWD 2012b).

The Penitencia WTP is the smallest of the three WTPs and obtains most of its water from the SBA. It treats and delivers up to 40 million gallons of water per day to about 270,000 residential and commercial users in the east side of Santa Clara Valley from Milpitas in the north to Aborn Road in the south (SCVWD 2012c).

N.1.4.7 Current Water Supply Issues - 2008 Low Point Event

In 2008, SCVWD implemented several actions in response to low San Luis Reservoir levels and algal blooms. Storage in San Luis Reservoir dropped to as low as 220,000 AF – well below the Upper San Felipe Intake. At this level, water in San Luis Reservoir was only 22 feet above the Lower San Felipe Intake. SCVWD had to implement measures to continue meeting the water demands within its service area. The following is a brief description of the measures implemented by SCVWD in 2008 to address the low point event and maintain adequate water supplies summarized from a SCVWD technical memorandum on District operations in 2008 (SCVWD 2009).

1. SCVWD blended Anderson Reservoir water with CVP water from San Luis Reservoir for the Santa Teresa and Rinconada WTPs. Blending the algae-laden water with better quality water improved SCVWD's ability to treat the water to the appropriate water quality standards. This was possible because Anderson Reservoir had supply available; however, this might not always be possible during drought conditions. Additionally, current Division of Safety of Dams requirements reduce the ability to utilize storage high in Anderson Reservoir as a blending supply until seismic upgrades are complete (currently scheduled for 2024).

2. SCVWD increased its use of SWP water from the SBA to blend with its CVP water from San Luis Reservoir. SWP allocations were high enough to allow the changed operations. This option would be less useful with lower allocations or increased Delta pumping constraints.

3. SCVWD decreased the amount of surface water directed to groundwater recharge by reducing releases from Anderson Reservoir. This action was implemented to increase availability of surface water supply in Anderson Reservoir during the low point event. Limiting groundwater recharge to protect for low storage in San Luis Reservoir reduces overall groundwater storage and protection against drought and other outages.

4. SCVWD had to increase chemical applications at Santa Teresa and Rinconada WTPs to treat higher algae and turbidity conditions. Chemical costs increased, and filters required more frequent cleaning operations, increasing energy use, and the potential for an overall decrease in plant capacity.

5. SCVWD suspended availability of lower-cost non-contract water to retailers, during the spring. This resulted in several retailers switching to

groundwater during the spring, reserving surface water supplies (especially those in Anderson Reservoir) for the late summer/fall. As a result, the end-of-season groundwater level in 2008 was at the lowest levels in over a decade. The low groundwater levels may have increased pumping costs.

Although these actions allowed SCVWD to continue to deliver a portion of its CVP contract supplies during the months when San Luis Reservoir storage was low, the measures to accommodate the decreased CVP supplies resulted in adverse water supply and economic impacts to SCVWD. These actions depleted water resources that would otherwise be available to manage for drought conditions and other emergency system outages during 2008, and affected the availability of SCVWD to manage future water shortage events.

In 2016, algae growth and water levels below 300 TAF in San Luis Reservoir generated taste and odor issues in SCVWD's treated water supply generating customer complaints which caused the district to suspend deliveries from the reservoir and shift to local supplies stored in Anderson and Coyote reservoirs (Mercury News 2016). This shift to local supplies reduced storage levels in the two local reservoirs that are normally reserved through the summer as emergency supply and drawn down later in the fall to make room for winter inflow (Mercury News 2016).

N.2 Alternative 1 - No Action/No Project Alternative

Under the No Action/No Project Alternative, the CVP and SWP would continue to operate and provide water supply, as under existing conditions. Future changes in hydrology, land use, and regulations could affect water deliveries; however, the types of changes that could occur are unclear and incorporating these changes into the No Action/No Project Alternative would be speculative.

Under the No Action/No Project Alternative, SCVWD operations would remain the same as existing conditions. Under this alternative, modeling results have predicted that there would be 17 years (out of the 82 calendar years analyzed) where the San Luis Reservoir would be drawn below a 300 TAF level, i.e. low point years, for at least one month.

N.3 Alternative 2 - Lower San Felipe Intake Alternative

The Lower San Felipe Intake Alternative would involve construction of a new, lower San Felipe Intake to allow reservoir drawdown to its minimum operating level without algae reaching the San Felipe Intake.

N.3.1 Deliveries to South-of-Delta CVP Contractors

Under the No Action/No Project Alternative, deliveries from San Luis Reservoir to SCVWD are interrupted during low point events. These supplies

remain in San Luis Reservoir and increase the amount of reservoir carryover storage. In the year following a low point event, the amount of water in San Luis would be greater than in years without prior low point events because of the undelivered SCVWD water. Under the Lower San Felipe Intake Alternative, average reservoir levels in San Luis Reservoir would be less than the No Action/No Project Alternative because SCVWD would be able to withdraw their full CVP water allocation each year from San Luis Reservoir, even during low point months. This would result in less carryover water stored in San Luis Reservoir and a lower minimum storage level on average.

Decreased carryover storage by SCVWD as a result of low point events could decrease deliveries to CVP south-of-Delta agricultural contractors in subsequent years when SCVWD was not able to access that carried over supply. As shown in Tables N-8 and N-9, the change in delivery of water to CVP south-of-Delta agricultural contractors under this alternative is minimal, resulting in a less than one percent change in all water years. Figures N-3 and N-4 show the modeled impacts of the Lower San Felipe Intake Alternative on CVP south-of-Delta agricultural deliveries.

Table N-8. Averaged Modeled Difference in Total CVP South-of-Delta Agricultural Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
AN	0.0	0.0	0.0	0.0	0.0	-0.2	-0.4	-0.6	-1.0	-1.2	-1.6	-0.3	-5.3
BN	-0.1	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.4	-0.5	-0.3	-0.1	-2.5
D	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.3	-0.1	-1.7
C	-0.1	-0.1	-0.1	-0.2	-0.2	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0
All	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3	-0.1	-1.6

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-9. Averaged Modeled Difference in Total CVP South-of-Delta Agricultural Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.1%	0.1%	0.1%	0.1%	0.1%	-0.5%	-0.6%	-0.5%	-0.5%	-0.5%	-1.0%	-0.5%	-0.5%
BN	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
D	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
C	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.3%	1.0%	1.1%	1.1%	1.1%	1.1%	1.1%	0.0%
All	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.2%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

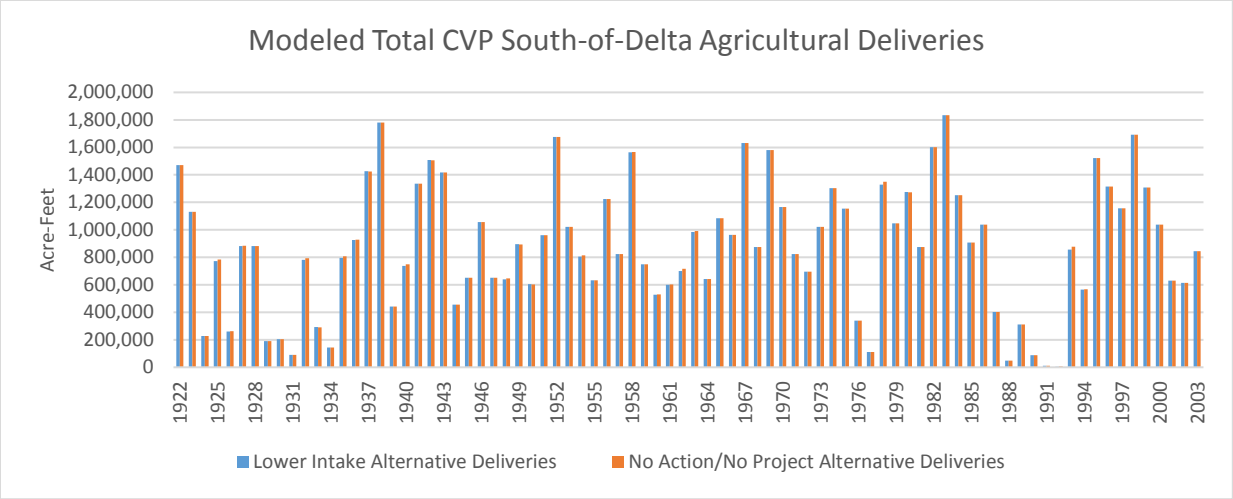


Figure N-3. Modeled Total CVP South-of-Delta Agricultural Deliveries under the No Action/No Project Conditions and Lower San Felipe Intake Alternative

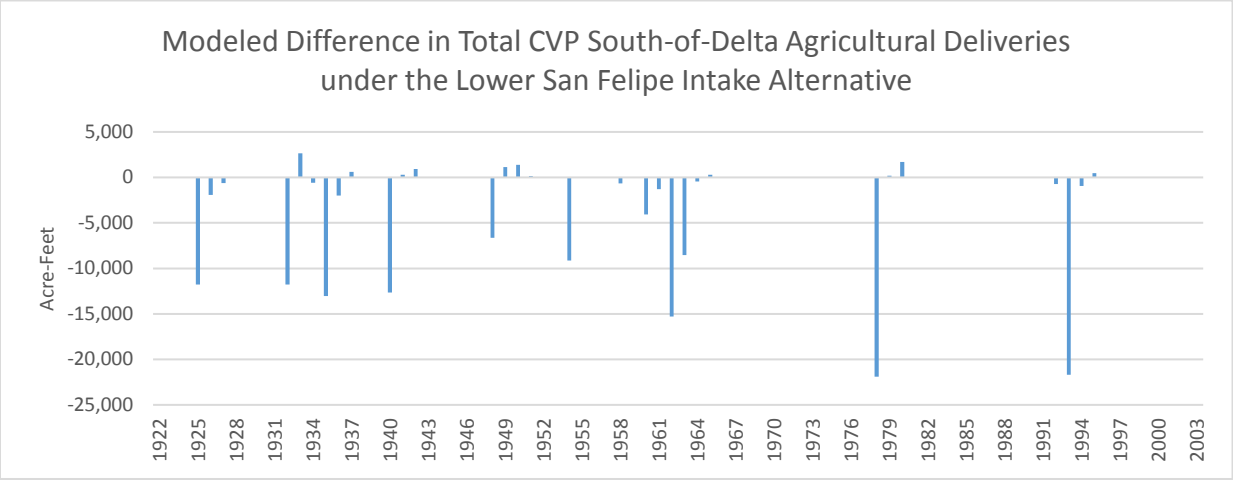


Figure N-4. Modeled Difference in Total CVP South-of-Delta Agricultural Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative

N.3.2 Deliveries to South-of-Delta SWP Contractors

The Lower San Felipe Intake Alternative would affect the operations of CVP supplies, but SWP supplies would remain unchanged. As shown in Tables N-10 and N-11, there is functionally no difference in the SWP deliveries (Table A deliveries) and surplus water supply (Article 21[2] deliveries). Figures N-5 through N-8 show the modeled impacts of the Lower San Felipe Intake Alternative on SWP deliveries and surplus water supply.

[2] Article 21 water is the water available to SWP contractors after fulfillment of SWP contractors Table A deliveries (DWR 2012)

Table N-10. Averaged Modeled Difference in State Water Project Deliveries (Table A and Article 21 deliveries) between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
SWP Table A Deliveries													
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
BN	0.0	-0.3	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
All	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
SWP Article 21 Deliveries													
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
BN	0.0	0.0	-0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-11. Averaged Modeled Difference in State Water Project Deliveries (Table A and Article 21 deliveries) between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
SWP Table A Deliveries													
W	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
BN	0.0%	-0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SWP Article 21 Deliveries													
W	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.0%	0.0%	0.0%	-0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
BN	0.0%	0.0%	-6.8%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
D	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All	0.0%	0.0%	-0.5%	-0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

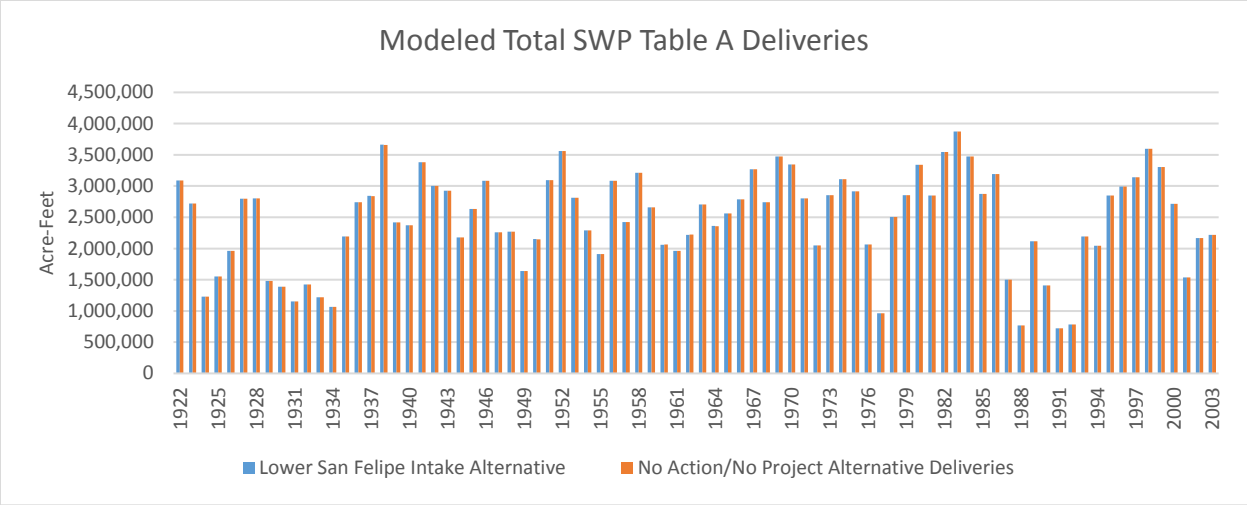


Figure N-5. Modeled Total SWP Table A Deliveries under the No Action/No Project Conditions and Lower San Felipe Intake Alternative

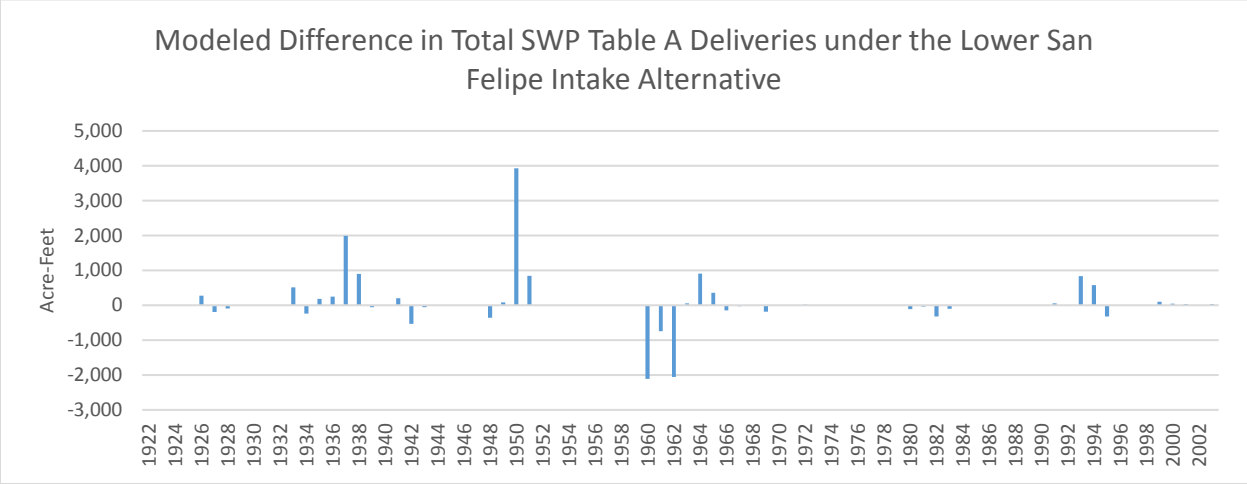


Figure N-6. Modeled Difference in Total SWP Table A Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative

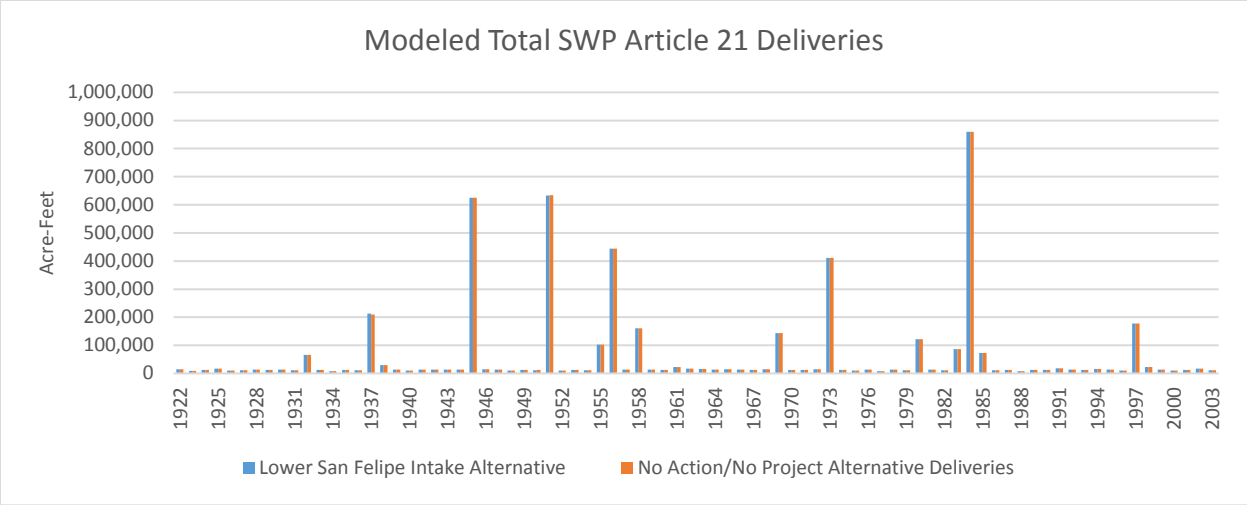


Figure N-7. Modeled Total SWP Article 21 Deliveries under the No Action/No Project Conditions and Lower San Felipe Intake Alternative

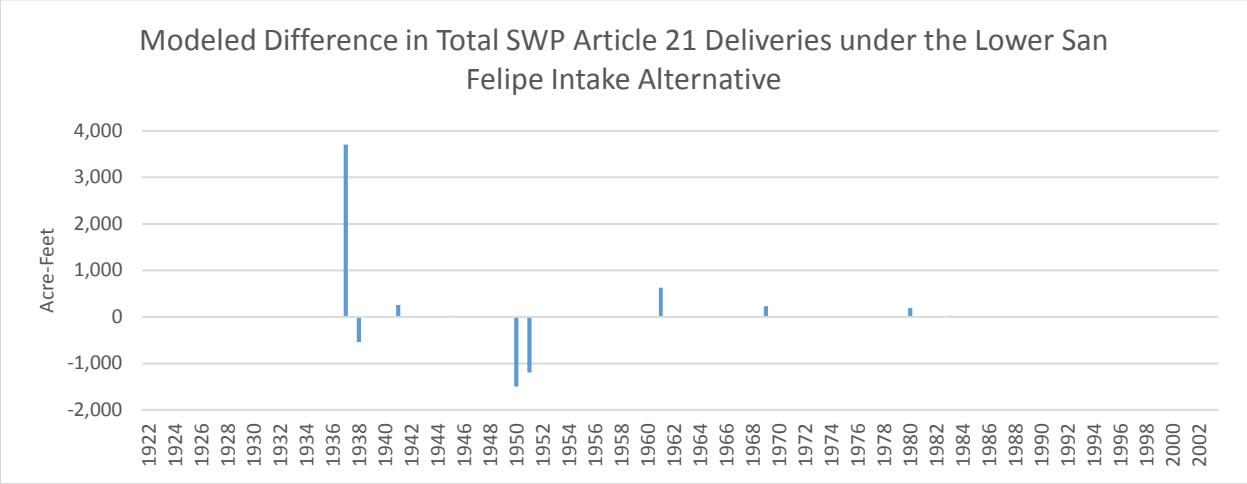


Figure N-8. Modeled Difference in Total SWP Article 21 Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative

N.3.3 Deliveries to Santa Clara Valley Water District

The Lower San Felipe Intake Alternative would result in the construction of a new lower intake for the San Felipe Division that would prevent algae-laden water from entering the intake. This alternative would reduce or avoid the need to blend San Luis Reservoir water with other higher quality water supplies or switch to alternate water supply sources such as groundwater when surface water supplies were reduced. Under this alternative, modeling results have predicted that there would be 17 years (out of the 82 calendar years analyzed) where San Luis Reservoir would be drawn below 300 TAF of storage i.e. low point years. As shown in Tables N-12 and N-13, San Felipe Division CVP M&I deliveries would increase on average by 3 TAF and there would be no difference in agricultural deliveries. Figure N-9 shows how the Lower San Felipe Intake Alternative addresses SCVWD low point water supply interruptions along with treated water demand shortages in the No Action Alternative. Results show that the Lower San Felipe Intake Alternative would allow uninterrupted delivery of SCVWD CVP M&I deliveries in all low point years and would be able to fully replace SCVWD's unmet treated water demand in 10 of the 17 low point years (on a calendar year basis).

Table N-12. Averaged Modeled Difference in San Felipe Division CVP Agricultural and CVP M&I Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division Agricultural Deliveries													
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
San Felipe Division CVP M&I Deliveries													
W	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
AN	1.2	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	5.1
BN	1.3	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.4	6.6
D	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.5
C	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.5
All	0.6	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.1	3.2

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-13. Averaged Modeled Difference in San Felipe Division CVP Agricultural and CVP M&I Deliveries between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division Agricultural Deliveries													
W	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.1%	0.1%	0.1%	0.1%	0.1%	-0.5%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.4%
BN	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
D	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
C	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.3%	1.0%	1.1%	1.1%	1.1%	1.1%	1.1%	-0.2%
All	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
San Felipe Division CVP M&I Deliveries													
W	0.0%	3.4%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
AN	21.3%	21.3%	0.0%	0.0%	0.0%	-0.2%	-0.1%	-0.2%	-0.2%	-0.2%	28.3%	-0.2%	5.2%
BN	22.1%	22.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	25.7%	15.7%	7.0%
D	7.9%	3.8%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	21.1%	2.8%
C	6.4%	-0.2%	-0.2%	-0.2%	-0.2%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	74.8%	4.8%
All	8.7%	8.2%	1.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	7.4%	11.2%	3.2%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

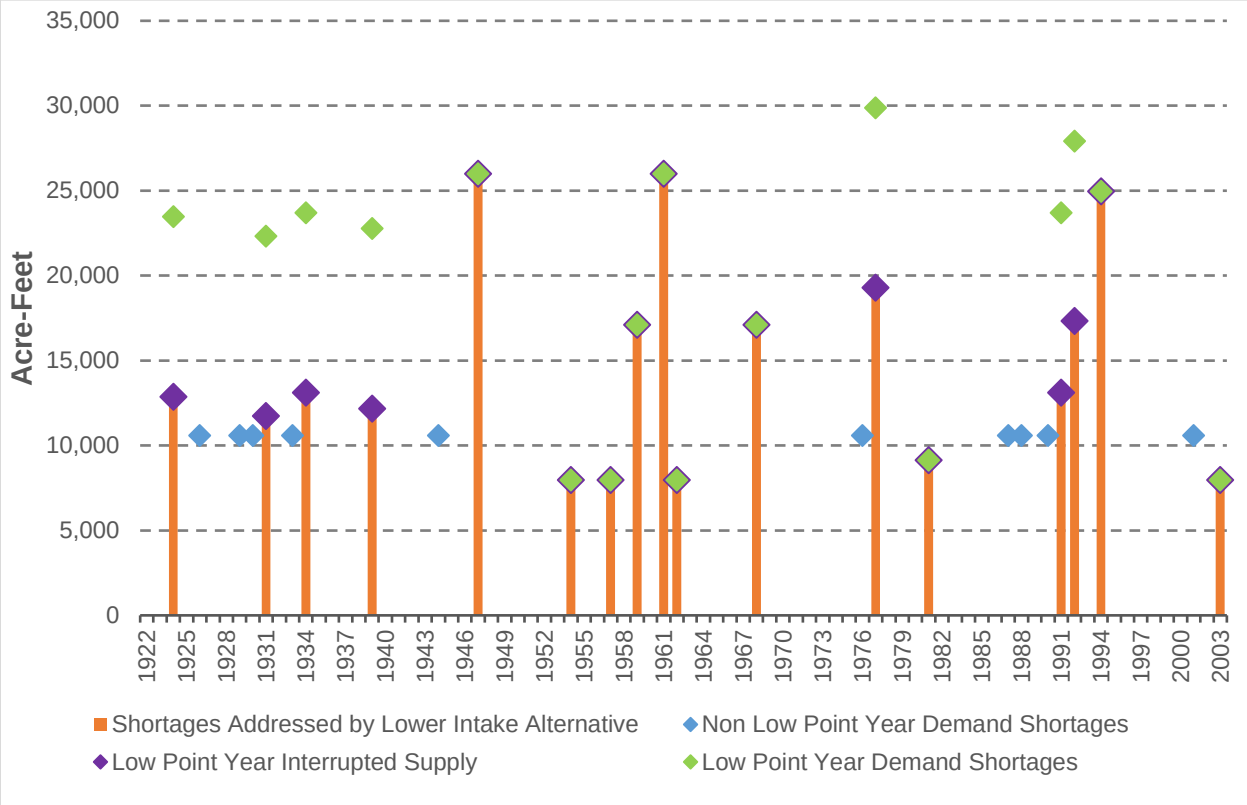


Figure N-9. Annual Shortages Addressed by the Lower San Felipe Intake Alternative

N.3.4 Changes to South-of-Delta Exports

Operation of the Lower San Felipe Intake Alternative would increase total south-of-Delta exports in some years when compared to the No Action/No Project Alternative. Simulated Delta exports would increase or decrease by less than 1 percent in all months of all water-year types (Tables N-14 and N-15). In August, October, and November, there would be a less than 1 percent decrease in Delta exports. During most years Delta exports, would be unchanged.

Table N-14. Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.9	0.5	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	0.0	0.1	0.6	0.4	0.0	0.0	0.0	0.0	-0.1	-0.3	0.7
BN	0.2	-0.6	0.4	0.0	0.7	0.0	0.0	0.0	0.0	-0.2	0.7	0.4
D	-0.2	-0.1	0.5	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.5	1.5
C	0.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	-1.0	1.5
All	0.2	0.0	0.2	0.1	0.3	0.1	0.0	0.0	0.0	0.0	-0.2	0.7

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

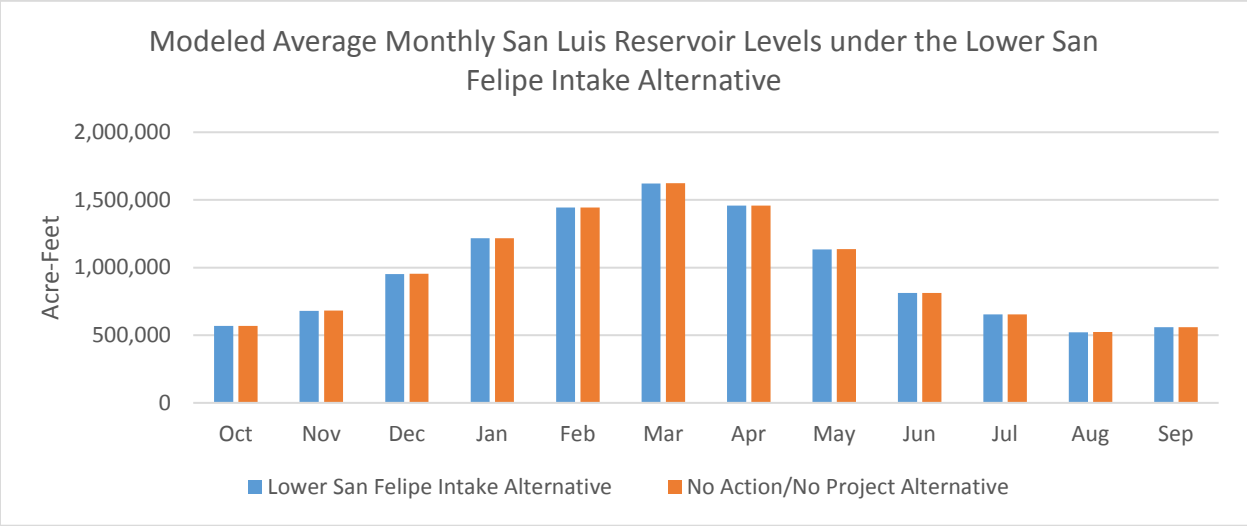
Table N-15 Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and Lower San Felipe Intake Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.2%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	-0.2%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
BN	0.0%	-0.2%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
D	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.4%
C	0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%	-0.7%	0.6%
All	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

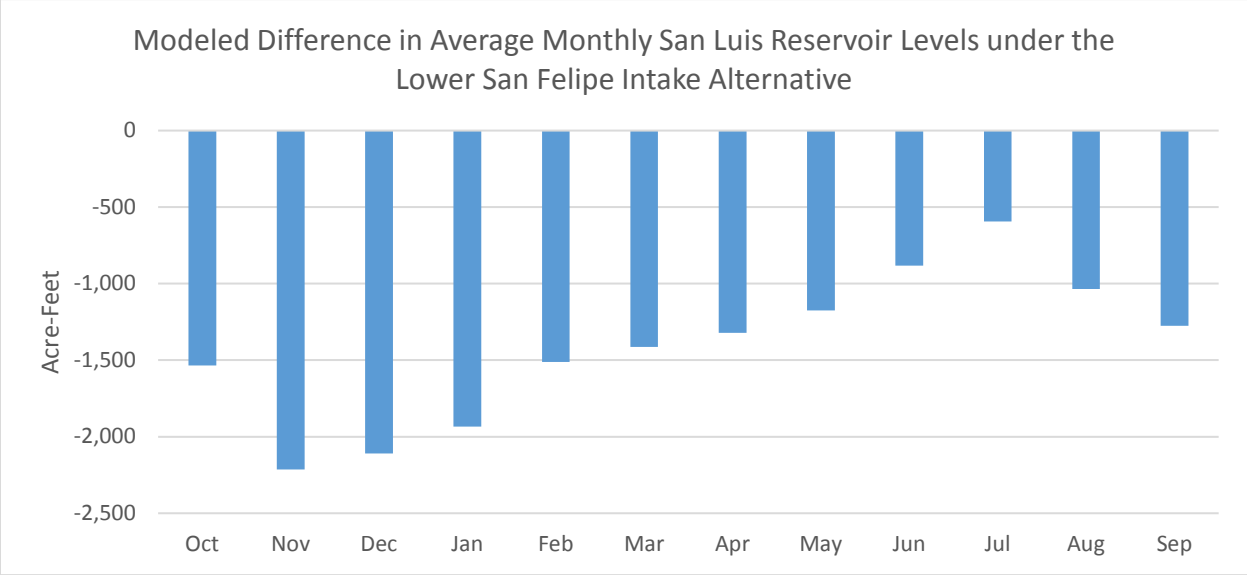
N.3.5 Changes in San Luis Reservoir Storage Levels

Under the Lower San Felipe Intake Alternative, SCVWD would be able to fully divert its CVP allocation and would not have to leave water in San Luis storage as it does in the No Action/No Project Alternative; therefore, reservoir levels would be lower. San Luis Reservoir would experience an average 2 TAF decrease in total annual storage across all years and less than a 1 foot decrease in reservoir elevation. Figure N-10 displays the average monthly San Luis Reservoir storage levels under the Lower San Felipe Intake Alternative. Figure N-11 displays the difference in average monthly San Luis Reservoir storage levels compared to the No Action/No Project Alternative.



Note: Data results from CalSim modeling presented in Appendix B.

Figure N-10. Modeled Average Monthly San Luis Reservoir Levels under the No Action/No Project Conditions and the Lower San Felipe Intake Alternative



Note: Data results from CalSim modeling presented in Appendix B.

Figure N-11. Modeled Difference in Average Monthly San Luis Reservoir Levels between the No Action/No Project Conditions and Lower San Felipe Intake Alternative

N.4 Alternative 3 - Treatment Alternative

The Treatment Alternative would develop new treatment technology retrofits at the SCVWD's Santa Teresa WTP to improve the WTP's ability to treat water from San Luis Reservoir during low point conditions.

N.4.1 Deliveries to South-of-Delta CVP Facilities and Contractors

Under the Treatment Alternative, average reservoir levels in San Luis Reservoir would likely be lower than existing conditions and the No Action/No Project Alternative because SCVWD would be able to withdraw their full contract amount of CVP water each year from San Luis Reservoir, even during low point years. This would result in less carryover water stored in the reservoir and lower overall levels during some years. Decreased carryover storage by SCVWD as a result of low point events could decrease deliveries to CVP south-of-Delta agricultural contractors in subsequent years when SCVWD was not able to access that carried over supply. The change in delivery of water to CVP south-of-Delta agricultural contractors would be the same as described for the Lower San Felipe Intake Alternative in Tables N-8 and N-9 and Figures N-3 and N-4; the change in water supply delivery would be minor.

N.4.2 Deliveries to South-of-Delta SWP Contractors

There would be no change in the SWP and CVP deliveries using the SBA and California Aqueduct, but the potential changes in surplus water would also apply to SWP contractors, as the San Luis Reservoir is a shared facility, holding both SWP and CVP water. Similar to the CVP under existing conditions, the availability of surplus water is infrequent, and contractors do not base long term water supply decisions based on the availability, or lack thereof, of this water.

N.4.3 Deliveries to Santa Clara Valley Water District

The Treatment Alternative would result in modifications to the existing Santa Teresa WTP to allow it to more effectively treat the algae-laden water from San Luis Reservoir. This alternative would avoid supply curtailments during low point events because it would allow water to be withdrawn from San Luis Reservoir using the existing San Felipe Intake that would have otherwise remained in San Luis Reservoir. Algae-laden water would be treated at the WTP and then conveyed to users.

Compared to the No Action/No Project Alternative, the Treatment Alternative would decrease the number of low point years that WTP production would not meet demands. This improvement would be similar to the improvements presented above for the Lower San Felipe Intake Alternative in Tables N-12 and N-13, by supporting SCVWD deliveries from San Luis Reservoir when levels fall below 300 TAF. The alternative would deliver additional M&I supply in all low point years when compared to the No Action/No Project Alternative, reducing SCVWD unmet demand during low point events. This alternative would increase the ability of San Felipe Division infrastructure to supply CVP water to SCVWD and would increase water reliability for the SCVWD in the long-term.

N.4.4 Changes in San Luis Reservoir Storage Levels

Under the Treatment Alternative, average reservoir levels in San Luis Reservoir would likely be lower than existing conditions and the No Action/No Project Alternative because SCVWD would be able to withdraw their full contract

amount of CVP water each year from San Luis Reservoir, even during low point years. This would result in less carryover water stored in the reservoir and lower overall levels during some years. The frequency and duration of this impact would be the same as described for the Lower San Felipe Intake Alternative in Figures N-10 and N-11; the changes in water supply would be minor. When compared to the No Action/No Project Alternative, the reduction in San Luis Reservoir storage would average a 2 TAF decrease and less than a 1 foot decrease in reservoir elevation.

N.5 Alternative 4 - San Luis Reservoir Expansion Alternative

The San Luis Reservoir Expansion Alternative would raise Sisk Dam by approximately ten feet and increase storage capacity at San Luis Reservoir by approximately 120,000 AF. The San Luis Reservoir Expansion Alternative would allocate the increased capacity to the CVP only.

N.5.1 Deliveries to South-of-Delta CVP Contractors

South-of-Delta CVP agricultural deliveries are expected to increase up to 25,000 AF under certain water year types. Tables N-16 and N-17 summarizes the change in delivery of CVP water under this option. Figures N-11 and N-12 show the modeled impacts of the San Luis Reservoir Expansion Alternative on CVP South-of-Delta agricultural deliveries.

Table N-16. Averaged Modeled Difference in Total CVP Agricultural Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	0.6	0.4	0.6	1.1	1.2	0.5	2.0	2.9	4.6	5.7	4.1	1.3	25.1
AN	0.7	0.5	0.8	1.4	1.6	0.8	1.1	1.7	2.7	3.4	2.4	0.8	17.8
BN	0.1	0.1	0.1	0.1	0.1	0.4	1.9	2.7	4.4	5.4	3.9	1.2	20.4
D	0.7	0.5	0.7	1.3	1.5	-0.1	-0.3	-0.4	-0.6	-0.8	-0.6	-0.2	1.8
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.5	0.3	0.5	0.8	1.0	0.3	1.1	1.5	2.5	3.1	2.2	0.7	14.4

Notes: Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-17. Averaged Modeled Difference in Total CVP Agricultural Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W	1.7%	1.7%	1.7%	1.7%	1.7%	0.8%	2.1%	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%
AN	3.1%	3.1%	3.1%	3.1%	3.1%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.8%
BN	0.2%	0.2%	0.2%	0.2%	0.2%	1.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	2.3%
D	2.9%	2.9%	2.9%	2.9%	2.9%	-0.3%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	0.3%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%
All	1.7%	1.7%	1.7%	1.7%	1.7%	0.8%	1.8%	1.7%	1.7%	1.7%	1.7%	1.7%	1.6%

Notes: Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

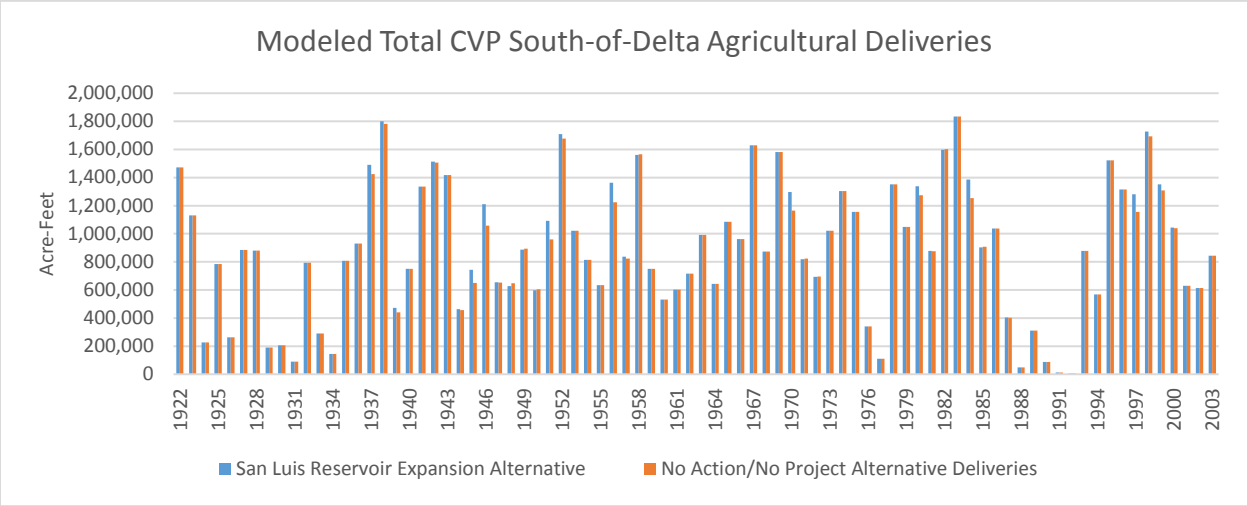


Figure N-12. Modeled Total CVP South-of-Delta Agricultural Deliveries under the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

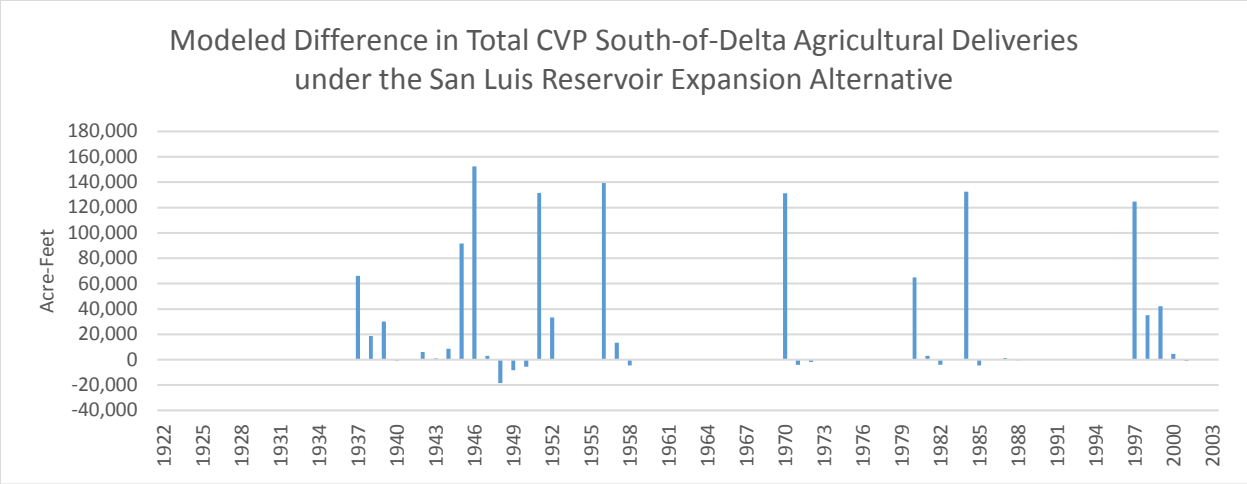


Figure N-13. Modeled Difference in Total CVP South-of-Delta Agricultural Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

N.5.2 Deliveries to South-of-Delta SWP Contractors

South-of-Delta SWP deliveries are expected to decrease an average of 3,000 AF under the San Luis Reservoir Expansion Alternative. Tables N-18 and N-19 summarizes the change in delivery of SWP water under this alternative. Figures N-13 through N-16 show the modeled impacts of the San Luis Reservoir Expansion Alternative on SWP deliveries and surplus water supply. Table A SWP deliveries would decrease slightly in all year types except critical and dry water years where they would increase by less than 1%. In addition, this alternative would reduce potential surplus water supply (Article 21) deliveries to SWP contractors as CVP deliveries increase. The availability of this surplus water in any particular year is uncertain, and contractors do not base long term water supply decisions based on the availability, or lack thereof, of this water.

Table N-18. Averaged Modeled Difference in Table A SWP Deliveries (Table A and Article 21) between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
SWP Table A Deliveries													
W	-0.3	-0.3	-0.3	-0.1	-0.1	-0.1	-0.5	-0.7	-0.8	-0.8	-0.8	-0.7	-5.6
AN	-1.0	-0.9	-0.9	0.0	-0.5	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-3.0
BN	0.8	0.5	0.6	0.1	-1.8	-0.3	-0.5	-1.8	-1.4	-1.1	-1.0	-1.0	-7.0
D	-0.8	-0.9	-0.8	0.0	0.0	0.0	0.1	0.5	0.8	1.1	1.0	0.8	1.8
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
All	-0.3	-0.3	-0.3	0.0	-0.4	-0.1	-0.2	-0.4	-0.3	-0.2	-0.2	-0.2	-3.0

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
SWP Article 21 Deliveries													
W	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2
AN	0.0	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
BN	0.0	0.0	-0.1	0.0	-9.2	-4.2	0.0	0.0	0.0	0.0	0.0	0.0	-13.6
D	0.0	0.1	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.0	0.0	0.0	0.0	-1.5	-0.7	0.0	0.0	0.0	0.0	0.0	0.0	-2.3

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-19. Averaged Modeled Difference in Table A SWP Deliveries (Table A and Article 21) between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
SWP Table A Deliveries													
W	-0.1%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.3%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
AN	-0.4%	-0.5%	-0.4%	0.2%	-1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
BN	0.3%	0.2%	0.3%	0.7%	-8.5%	-0.7%	-0.3%	-0.8%	-0.4%	-0.3%	-0.3%	-0.3%	-0.3%
D	-0.3%	-0.5%	-0.4%	0.0%	0.1%	-0.1%	0.1%	0.3%	0.3%	0.3%	0.3%	0.3%	0.1%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All	-0.1%	-0.1%	-0.1%	0.0%	-1.0%	-0.1%	-0.2%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
SWP Article 21 Deliveries													
W	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	-3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.2%
AN	0.0%	0.0%	0.0%	1.0%	1.2%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
BN	0.0%	0.0%	-9.1%	0.0%	-43.6%	-10.4%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	-19.2%
D	0.0%	9.4%	-7.1%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	6.3%	0.0%	0.5%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All	0.0%	0.7%	-1.4%	0.5%	-9.2%	-2.8%	-1.2%	0.0%	0.0%	0.0%	2.5%	0.0%	-3.7%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

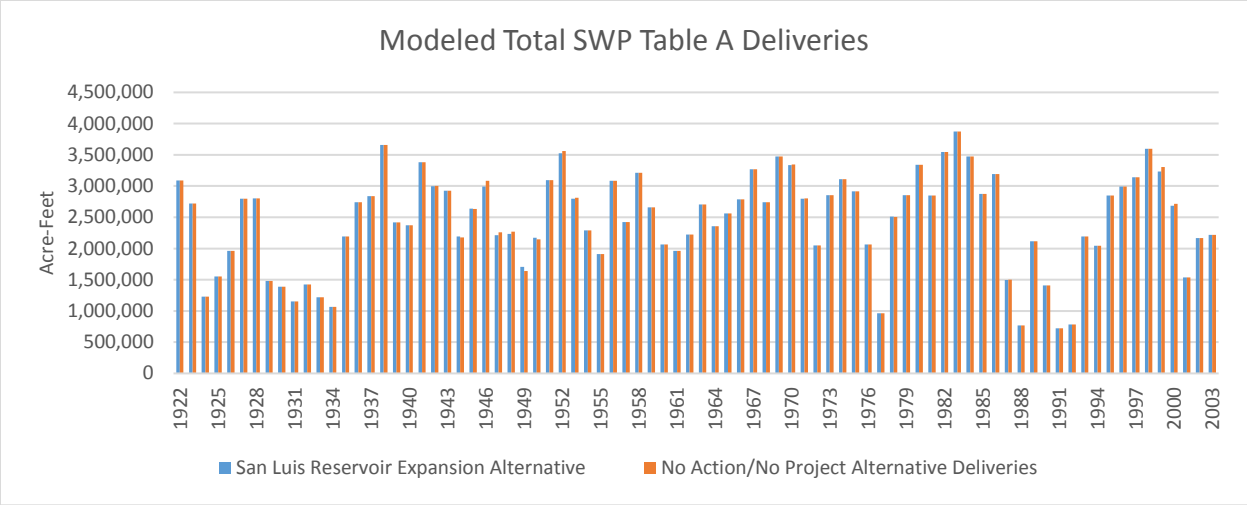


Figure N-14. Modeled Total SWP Table A Deliveries under the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

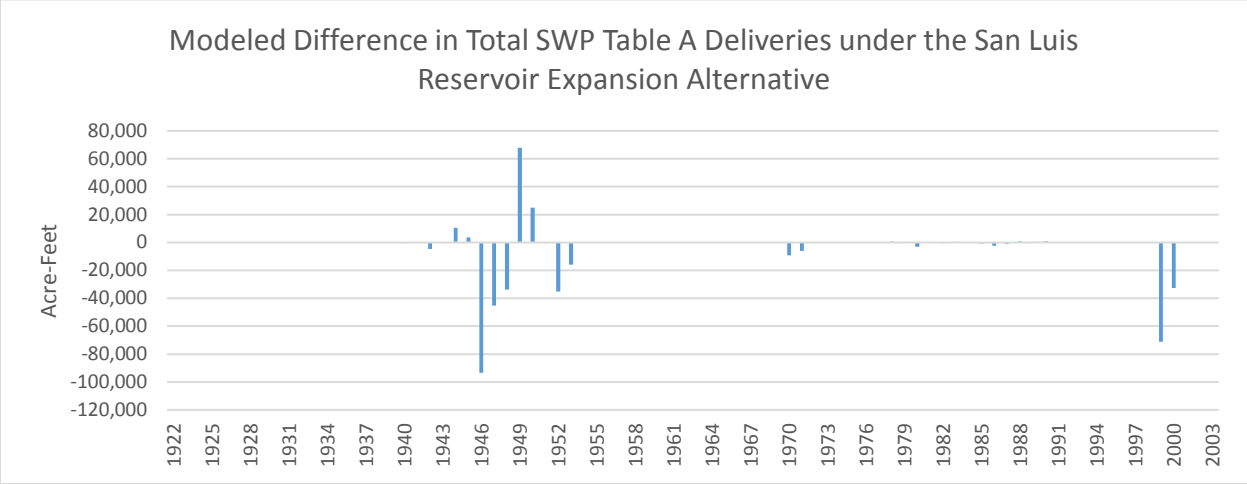


Figure N-15. Modeled Difference in Total SWP Table A Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

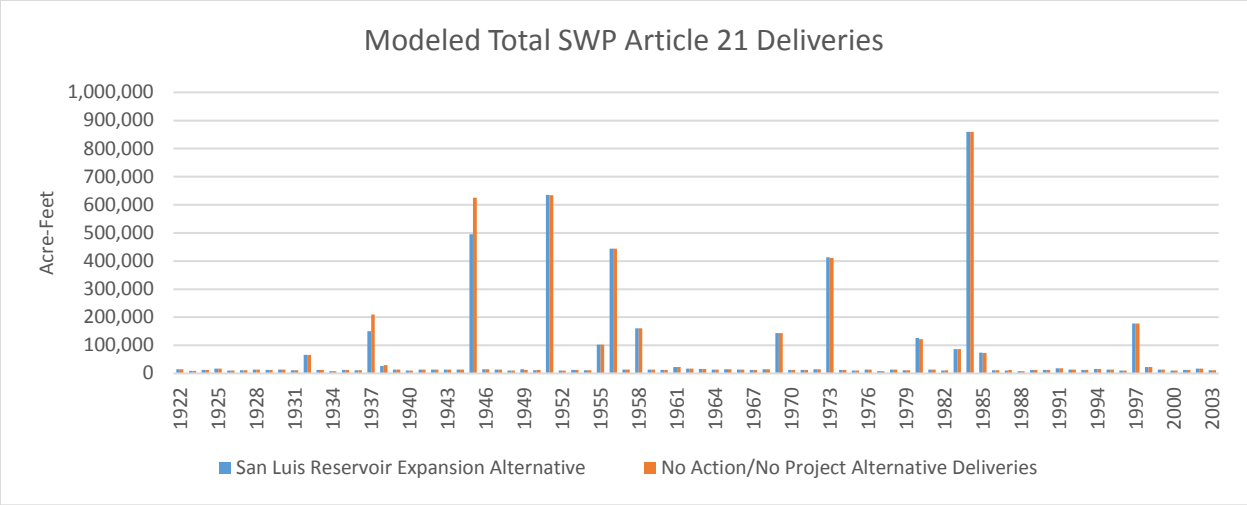


Figure N-16. Modeled Total SWP Article 21 Deliveries under the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

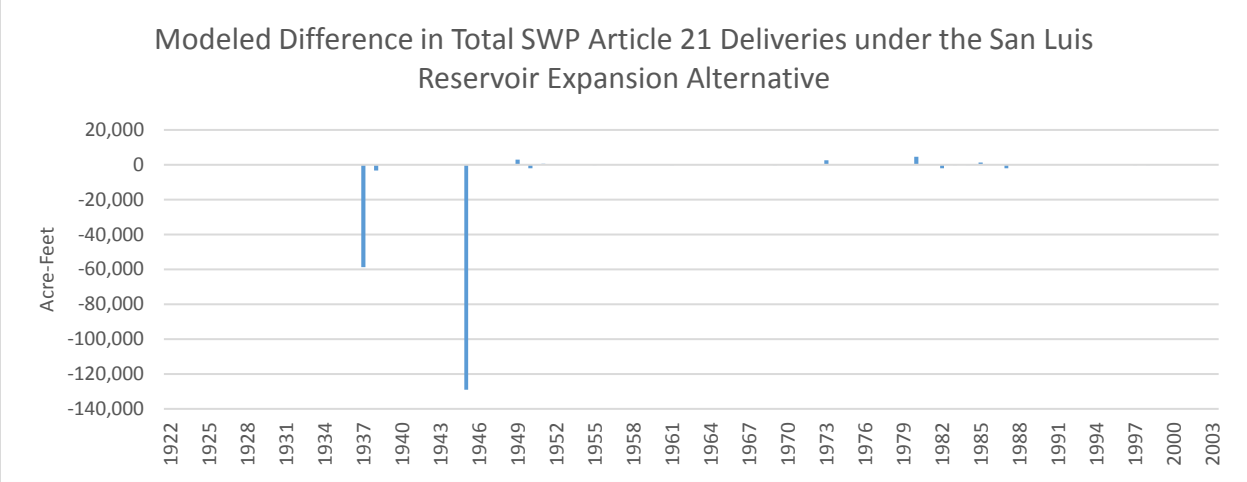


Figure N-17. Modeled Difference in Total SWP Article 21 Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

N.5.3 Deliveries to Santa Clara Valley Water District

Under this alternative, modeling results have predicted that there would be 17 years (out of the 82 calendar years analyzed) where San Luis Reservoir would be drawn below 300 TAF of storage i.e. low point years. Under the San Luis Reservoir Expansion Alternative, San Felipe Division CVP M&I and agricultural deliveries would increase on average by 600 AF, as shown in Tables N-20 and N-21. Figure N-17 shows how the San Luis Reservoir Expansion Alternative addresses SCVWD low point water supply interruptions along with treated water demand shortages in the No Action Alternative. The alternative would deliver additional water supplies in 8 of the 17 low point

years, but would not in any year fully address the low point generated water supply shortages.

Table N-20. Averaged Modeled Difference in San Felipe Division CVP Agricultural and CVP M&I Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division CVP Agricultural Deliveries													
W	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.1	1.0
AN	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.8
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.7
D	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.6
San Felipe Division CVP M&I Deliveries													
W	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.4
AN	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.7
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	-0.6	-0.3
D	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.6

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-21. Averaged Modeled Difference in San Felipe Division CVP Agricultural and CVP M&I Deliveries between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division CVP Agricultural Deliveries													
W	1.7%	1.7%	1.7%	1.7%	1.7%	0.8%	2.1%	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%
AN	3.1%	3.1%	3.1%	3.1%	3.1%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	2.0%
BN	0.2%	0.2%	0.2%	0.2%	0.2%	1.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	1.9%
D	2.9%	2.9%	2.9%	2.9%	2.9%	-0.3%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	0.9%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%
All	1.7%	1.7%	1.7%	1.7%	1.7%	0.8%	1.8%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
San Felipe Division CVP M&I Deliveries													
W	1.2%	1.2%	1.2%	1.2%	1.2%	0.6%	1.3%	1.3%	1.3%	1.3%	1.3%	1.3%	1.2%
AN	0.4%	0.4%	0.6%	0.6%	0.6%	0.8%	0.8%	0.8%	0.8%	0.8%	1.0%	0.8%	0.7%
BN	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.8%	0.8%	0.8%	1.1%	-6.9%	-0.3%
D	1.5%	1.4%	1.4%	1.4%	1.4%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.6%
C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All	0.8%	0.8%	0.8%	0.8%	0.8%	0.4%	0.8%	0.8%	0.8%	0.8%	0.8%	-0.4%	0.6%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

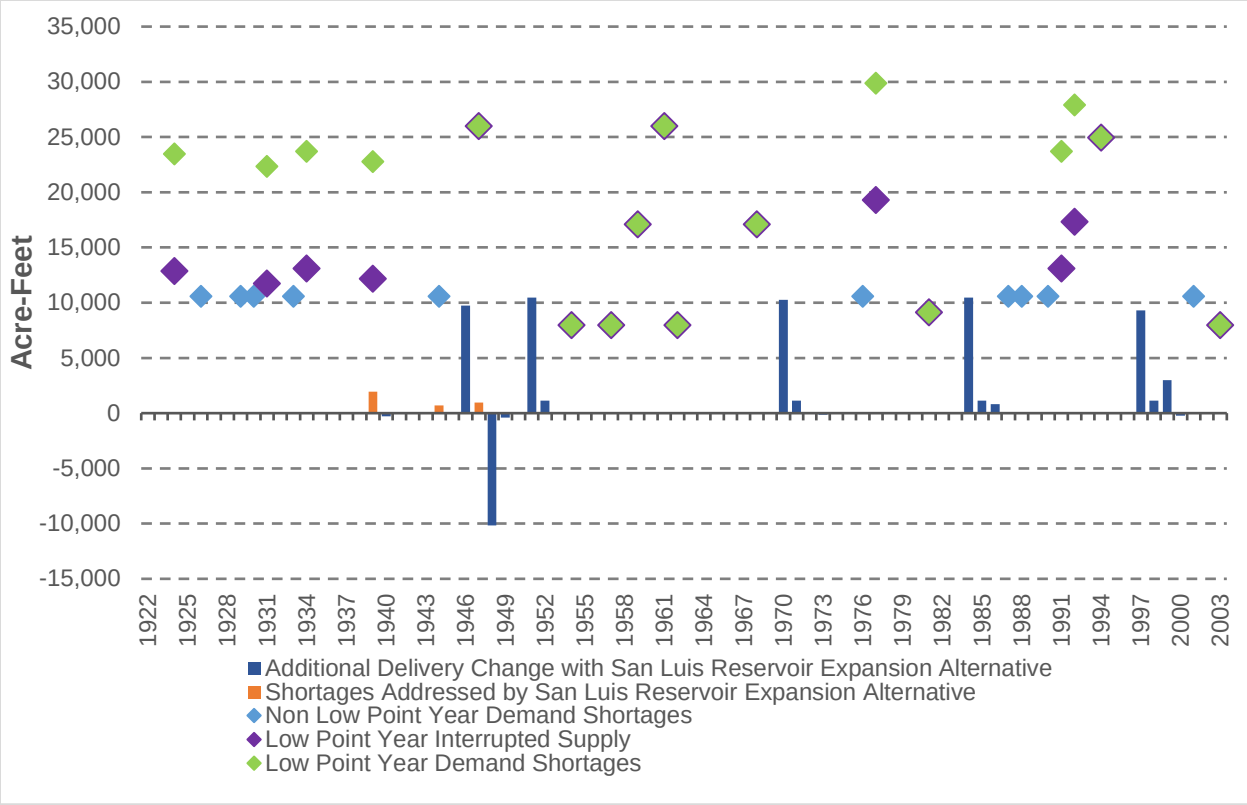


Figure N-18. Annual Shortages Addressed by the San Luis Reservoir Expansion Alternative

N.5.4 Changes in South-of-Delta Exports

Increasing storage capacity in San Luis Reservoir under the San Luis Reservoir Expansion Alternative would increase total south-of-Delta exports in some years when compared to the No Action/No Project Alternative. Except for one model period, simulated Delta exports would increase by less than two percent in all months of all water-year types (Tables N-22 and N-23). In February of Above Normal water years, there would be a 2.5 percent increase in Delta exports. During most years Delta exports, would be unchanged.

Table N-22. Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1.4	-1.0	0.0	1.8	5.8	14.6	1.5	0.0	0.0	1.2	0.7	0.4
AN	6.8	0.2	-2.7	6.5	9.9	1.1	0.0	0.0	0.0	-0.4	0.1	-0.8
BN	0.9	-4.0	1.3	0.0	-4.2	0.2	0.0	0.0	0.0	0.2	0.0	1.9
D	3.6	-4.5	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.8	-1.5	-0.9
C	0.1	0.0	-0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-23. Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (% change)

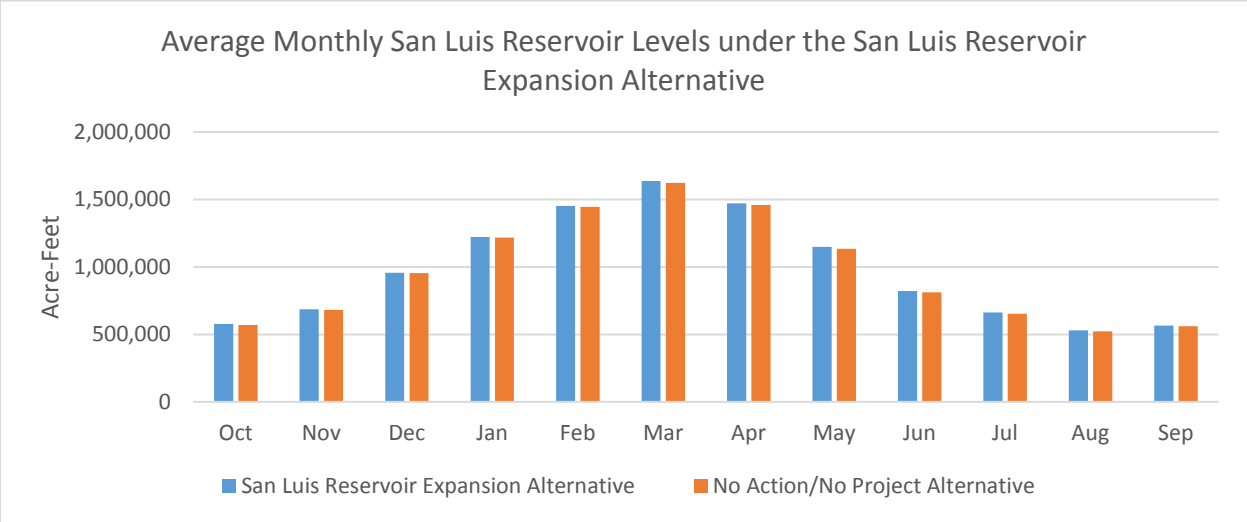
Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.3%	-0.2%	0.0%	0.4%	1.1%	2.4%	0.8%	0.0%	0.0%	0.2%	0.1%	0.1%
AN	1.7%	0.1%	-0.5%	1.6%	2.5%	0.2%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%
BN	0.2%	-0.9%	0.2%	0.0%	-1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
D	0.9%	-1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	-0.4%	-0.2%
C	0.0%	0.0%	-0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

These increased exports are comprised of water that would have otherwise been surplus Delta outflow in the No Action/No Project Alternative. The water rights for the CVP include provisions for the re-diversion of upstream storage withdrawals and diversion of surplus flows to San Luis Reservoir. The CVP would operate an expanded San Luis Reservoir within these existing water rights.

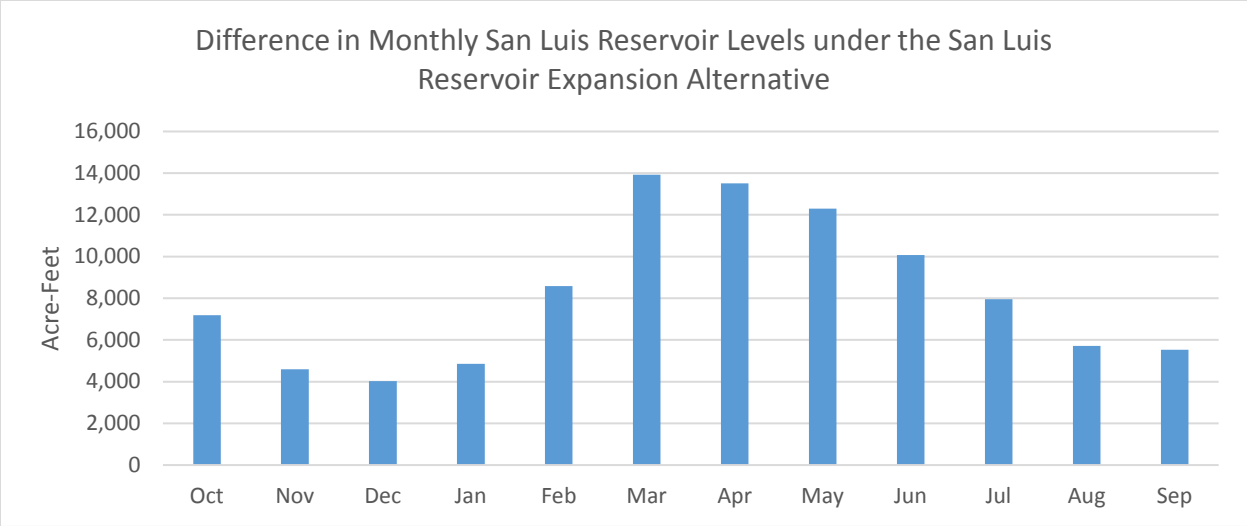
N.5.5 Changes in San Luis Reservoir Storage Levels

The San Luis Reservoir Expansion Alternative would generate slightly increased storage levels in San Luis Reservoir when compared to the No Action/No Project Alternative (see Appendix B for detailed modeling results). San Luis Reservoir would experience an average increase of 8 TAF in total storage and slightly greater than a 1 foot increase in reservoir elevation under this alternative. Figure N-19 displays the average monthly San Luis Reservoir storage levels under the San Luis Reservoir Expansion Alternative. Figure N-20 displays the difference in average monthly San Luis Reservoir storage levels compared to the No Action/No Project Alternative.



Note: Data results from CalSim modeling presented in Appendix B.

Figure N-19. Modeled Average Monthly San Luis Reservoir Levels under the No Action/No Project Conditions and the San Luis Reservoir Expansion Alternative



Note: Data results from CalSim modeling presented in Appendix B.

Figure N-20. Modeled Difference in Average Monthly San Luis Reservoir Levels between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative

N.6 Alternative 5 - Pacheco Reservoir Expansion Alternative

The Pacheco Reservoir Expansion Alternative would construct and operate a new dam and reservoir with an active storage capacity of approximately 140,800 AF. The new dam and reservoir would be constructed on Pacheco Creek 0.5 mile upstream from the existing North Fork Dam and would inundate most of the existing Pacheco Reservoir. Pacheco Reservoir would be filled using a combination of natural hydrology within the North Fork Pacheco Creek basin, including the East Fork, and by SCVWD-owned water from San Luis Reservoir under a CVP contract.

N.6.1 Deliveries to South-of-Delta CVP Contractors

Under the Pacheco Reservoir Expansion Alternative, average reservoir levels in San Luis Reservoir would likely be lower than existing conditions and the No Action/No Project Alternative because SCVWD would be able to withdraw their full contract amount of CVP water each year from San Luis Reservoir, even during low point years. This would result in less carryover water stored in the reservoir and lower overall levels during some years. Decreased carryover storage by SCVWD as a result of low point events could decrease deliveries to CVP south-of-Delta agricultural contractors in subsequent years when SCVWD was not able to access that carried over supply. The change in delivery of water to CVP south-of-Delta agricultural contractors would be the same as described for the Lower San Felipe Intake Alternative in Tables N-8 and N-9 and Figures N-3 and N-4; the change in water supply delivery would be minor.

N.6.2 Deliveries to South-of-Delta SWP Contractors

The Pacheco Reservoir Expansion Alternative would affect the operations of CVP supplies, but SWP supplies would remain unchanged. The frequency and duration of this impact would be the same as described for the Lower San Felipe Intake Alternative, as shown in Tables N-10 and N-11; there would be no difference in the SWP deliveries.

N.6.3 Deliveries to Santa Clara Valley Water District

Under this alternative, modeling results have predicted that there would be 17 years (out of the 82 calendar years analyzed) where San Luis Reservoir would be drawn below 300 TAF of storage (i.e. low point years) in at least one month. Under the Pacheco Reservoir Expansion Alternative, San Felipe Division CVP M&I deliveries would increase on average by 2,800 AF, as shown in Tables N-24 and N-25. Figure N-19 shows how the Pacheco Reservoir Expansion Alternative addresses SCVWD low point water supply interruptions along with treated water demand shortages in the No Action Alternative. Results show that the Pacheco Reservoir Expansion Alternative would allow uninterrupted delivery of SCVWD CVP M&I deliveries 14 out of the 17 low point years (on a calendar year basis) when compared to the No Action/No Project Alternative, partially reducing SCVWD unmet demand during low point events.

Table N-24. Averaged Modeled Difference in San Felipe Division Agricultural and M&I Deliveries between the No Action/No Project Conditions and Pacheco Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division Agricultural Deliveries													
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
San Felipe Division M&I Deliveries													
W	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
AN	1.2	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	5.1
BN	1.3	1.9	0.0	0.0	0.0	-2.0	0.0	0.0	0.0	0.0	2.0	1.4	4.6
D	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.5
C	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	3.5
All	0.6	0.8	0.1	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.7	1.1	2.8

Notes: Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-25. Averaged Modeled Difference in San Felipe Division Agricultural and M&I Deliveries between the No Action/No Project Conditions and Pacheco Reservoir Expansion Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
San Felipe Division Agricultural Deliveries													
W	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.1%	0.1%	0.1%	0.1%	0.1%	-0.5%	-0.6%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.4%
BN	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
D	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
C	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.3%	1.0%	1.1%	1.1%	1.1%	1.1%	1.1%	-0.2%
All	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
San Felipe Division M&I Deliveries													
W	0.0%	3.4%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
AN	21.3%	21.3%	0.0%	0.0%	0.0%	-0.2%	-0.1%	-0.2%	-0.2%	-0.2%	28.3%	-0.2%	5.2%
BN	22.1%	22.1%	-0.1%	-0.1%	-0.1%	-18.5%	-0.1%	-0.1%	-0.1%	-0.1%	25.7%	15.7%	4.9%
D	7.9%	3.8%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	21.1%	2.8%
C	6.4%	-0.2%	-0.2%	-0.2%	-0.2%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	74.8%	4.8%
All	8.7%	8.2%	1.1%	-0.1%	-0.1%	-3.2%	0.0%	-0.1%	-0.1%	-0.1%	7.4%	11.2%	2.9%

Notes: Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

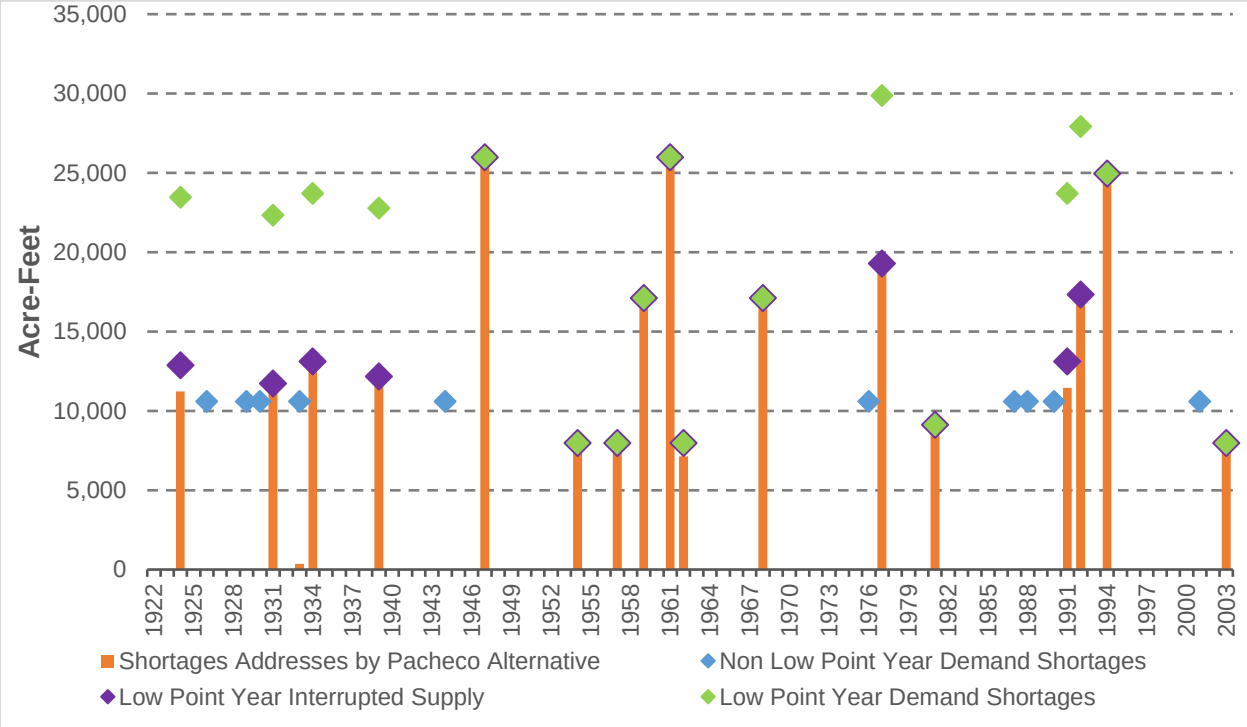


Figure N-21. Annual Shortages Addressed by the Pacheco Reservoir Expansion Alternative

The Pacheco Reservoir Expansion Alternative would require a new water right to store more flow from the North Fork Pacheco Creek and modify the use of this water to include fish preservation and enhancement. This water right would capture unused flow and would not affect downstream water supplies.

N.6.4 Changes in South-of-Delta Exports

Operation of the Pacheco Reservoir Expansion Alternative would increase total south-of-Delta exports in some years when compared to the No Action/No Project Alternative. Simulated Delta exports would increase by less than 1 percent in all months of all water-year types (Tables N-26 and N-27). In August, October, and November, there would be a less than 1 percent decrease in Delta exports. During most years Delta exports, would be unchanged.

Table N-26. Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and Pacheco Reservoir Expansion Alternative by Water Year Type (1,000 acre-feet)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.9	0.5	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	0.0	0.1	0.6	0.4	0.0	0.0	0.0	0.0	-0.1	-0.3	0.7
BN	0.2	-0.8	0.4	0.0	0.7	0.0	0.0	0.0	0.0	-0.2	0.7	0.3
D	0.0	-0.1	0.4	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.5	1.5
C	0.2	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	-1.0	1.6
All	0.3	-0.1	0.2	0.1	0.3	0.1	0.0	0.0	0.0	0.0	-0.2	0.7

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table N-27. Averaged Modeled Difference in Delta Exports between the No Action/No Project Conditions and Pacheco Reservoir Expansion Alternative by Water Year Type (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.2%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	-0.2%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
BN	0.0%	-0.2%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
D	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.4%
C	0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%	-0.7%	0.6%
All	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%

Notes: Modeling Period 1922-2003, Data results from CalSim modeling presented in Appendix B.
AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

These increased exports would divert what in the No Action/No Project Alternative what would have otherwise been surplus flow. The water rights for the CVP and SWP both include provisions for the re-diversion of upstream storage withdrawals and diversion of surplus flows to storage in San Luis Reservoir. Storage of water in Pacheco Reservoir previously diverted from the

Delta and stored in San Luis Reservoir under the existing CVP water right would require the addition of a point of re-diversion to that permit.

N.6.5 Changes in San Luis Reservoir Storage Levels

Under the Pacheco Reservoir Expansion Alternative, average reservoir levels in San Luis Reservoir would likely be lower than existing conditions and the No Action/No Project Alternative because SCVWD would be able to withdraw their full CVP water allocation each year from San Luis Reservoir, even during low point years. This would result in less carryover water stored in the reservoir and lower overall levels during some years. The frequency and duration of this impact would be the same as described for the Lower San Felipe Intake Alternative in Figures N-10 and N-11; the changes in water supply would be minor. When compared to the No Action/No Project Alternative, the reduction in San Luis Reservoir storage would average a 2 TAF decrease and less than a 1 foot decrease in reservoir elevation.

N.7 References

California Department of Water Resources (DWR). 2001. Sanitary Survey Update Report -Chapter 6 San Luis Reservoir.

--- .2012. 2012 Article 21 Water Program. Accessed on: 8/17/2016. Available at: http://www.water.ca.gov/swpao/docs/notices/12-04.pdf.

--- .2015. California State Water Project Final Delivery Reliability Report 2015. Accessed on: 8/23/2016. Available at: https://msb.water.ca.gov/documents/86800/144575dd-0be1-4d2d-aeff-8d7a2a7b21e4.

California Department of Water Resources (DWR), California Date Exchange Center (CDEC). 2018. *San Luis Reservoir Storage Levels*. Accessed on: 12/14/ 2018. Available at: http://cdec.water.ca.gov/cgi-progs/selectQuery?station_id=SNL&sensor_num=15&dur_code=M&start_date=1968-10-01&end_date=2016-07-01.

Mercury News. 2016. Algae in drinking water causes Santa Clara Valley water officials to scramble. July 24, 2016. Accessed on: 09/14/2016. Available at: http://www.mercurynews.com/2016/07/24/algae-in-drinking-water-causes-santa-clara-valley-water-officials-to-scramble-2/.

Santa Clara Valley Water District (SCVWD). 2005a. *Integrated Water Resources Planning Study, Draft*.

--- .2005b. *Urban Water Management Plan*.

--- .2009. The 2008 San Luis Reservoir Low Point Event: From the perspective of the Santa Clara Valley Water District. March 16, 2009.

--- .2010. *Santa Clara Valley Water District 2010 Urban Water Management Plan*. Accessed on: 10/31/2012.

--- .2012a. *How We Clean Your Water – Rinconada Waste Treatment Plant*. Accessed on: 10/31/2012.

--- .2012b. *How We Clean Your Water – Santa Teresa Waste Treatment Plant*. Accessed on: 10/31/2012.

--- .2012c. *How We Clean Your Water – Penitencia Waste Treatment Plant*. Accessed on: 10/31/2012.

--- .2015. 2015 Urban Water Management Plan.

--- .2016. Anderson Dam Seismic Retrofit Project Update. December 13, 2016. Accessed on 2/22/2017. Available here: http://www.valleywater.org/Services/AndersonDamAndReservoir.aspx.

United States Department of the Interior, Bureau of Reclamation (Reclamation). 2011a. San Luis Unit Project Webpage. Accessed on: 07/18/2016. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=San+Luis+Unit+Project

--- .2011b. San Felipe Division Project Webpage. Accessed on: 07/18/2016. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=San%20Felipe%20Division%20Project

--- .2015. CVP Contract Delivery Information. Accessed on: 8/23/2016. Available at: http://www.usbr.gov/mp/cvp-water/docs/cvp-water-deliveries.pdf

--- .2016a. Consolidated State-Federal San Luis Reservoir Daily Operations, August 2016. Accessed on: 09/14/2016. Available at: http://www.usbr.gov/mp/cvo/vungvari/snldop0816.pdf

--- .2016b. Summary of Water Supply Allocations. Accessed on 02/22/2017. Available at: https://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf.

--- .2016c. Central Valley Project Latest Water Contracts. Accessed on: 07/18/2016. Available at: http://www.usbr.gov/mp/cvp-water/docs/latest-water-contractors.pdf

United States Fish and Wildlife Service (USFWS). 2008. *Biological Opinion for Operation of State Water Project and Central Valley Project*.