San Luis Low Point Improvement Project

Initial Alternatives Information Report

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

Santa Clara Valley Water District
San Jose, California

San Luis and Delta Mendota
Water Authority
Los Banos, California

February 2008

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

San Luis Low Point Improvement Project

Initial Alternatives Information Report

Prepared for Reclamation by CDM under Contract No. 06CS204097C

U.S. Department of the Interior
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Executive Summary

This Initial Alternatives Information Report (IAIR) presents the formulation of the preliminary alternatives to address the planning objectives for the San Luis Low Point Improvement Project (SLLPIP) Feasibility Study (Study). The purpose of the SLLPIP is to address the delivery schedule uncertainty and water supply reliability problems associated with the San Luis Reservoir "low point." The initial alternatives will be carried forward for additional review in the Plan Formulation and Feasibility Report phases of the study. The alternative development process was implemented by the Study team, composed of representatives of U.S. Department of Interior, Bureau of Reclamation (Reclamation), Santa Clara Valley Water District (SCVWD), San Luis and Delta-Mendota Water Authority (SLDMWA), and consultants.

Purpose of Report

The IAIR for the SLLPIP is an interim document in the process of developing a Feasibility Study. The IAIR describes present and future baseline conditions, identifies problems and opportunities, sets forth purpose and need and planning objectives, formulates a range of measures and combines those measures into alternative plans. Complete alternatives that address the planning objectives are discussed in the IAIR as well as the related potential environmental impacts, and results of initial screening. A comparison of alternatives is provided to refine the alternatives that will be considered further in subsequent steps of the planning process to develop a Feasibility Study.

Project Background

In 2000, the CALFED Programmatic Record of Decision identified the need for a bypass canal that would connect the San Felipe Division to water delivered by the Sacramento-San Joaquin River Delta (Delta) pumping facilities, and increase use of water in San Luis Reservoir by up to 200 thousand acre-feet (TAF). SCVWD initiated the SLLPIP in 2001 and completed a *Draft Alternatives Screening Report* that investigated alternatives to address water supply reliability, operational flexibility, and water quality problems caused by the reservoir's low point.

In 2004, Congress authorized the Secretary of the Interior, acting through Reclamation, to conduct a feasibility study of San Luis Reservoir. This authorization is under CALFED Bay-Delta Program, CALFED Bay-Delta Authorization Act (Public Law 108-361) Section 103(f)(1)(A).

Section 103(f)(1)(A) states that "Funds may be expended for feasibility studies, evaluation, and implementation for the San Luis Reservoir Low Point Improvement Project, except that federal participation in any construction of an expanded Pacheco Reservoir shall be subjected to future congressional authorization."

In 2006, Reclamation, in cooperation with SCVWD and SLDMWA, prepared an Appraisal Report and a Plan of Study for the SLLPIP Study. The Plan of Study describes activities needed to accomplish the Study, the schedule, resources, budget, and the required coordination and management of the Study.

Study Area

The Study Area includes San Luis Reservoir and its related storage infrastructure, the Central Valley Project (CVP) San Felipe Division, and the CVP service areas of the SLDMWA (Figure ES-1). The SLDMWA was formed in 1992 by its member agencies to assume responsibility for the operations and maintenance of certain CVP facilities that deliver water to its member agencies, with the goal of optimizing operations and costs (SLDMWA undated).

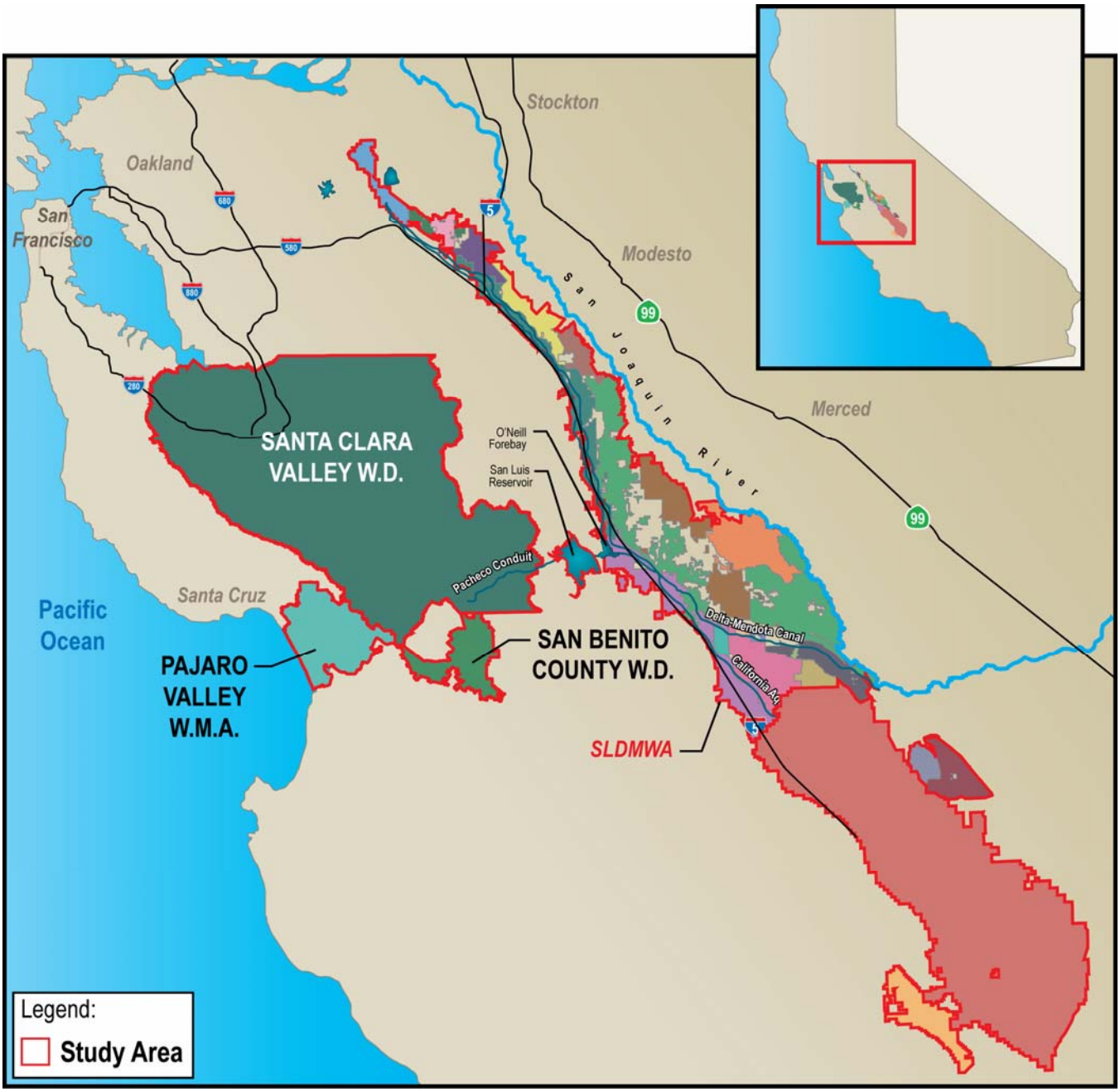

Figure ES-1. Study Area

San Luis Reservoir

The San Luis Reservoir, a jointly owned and operated federal and state facility, is in the San Luis Unit of the CVP, West San Joaquin Division. Figure ES-2 shows San Luis Reservoir and surrounding facilities.

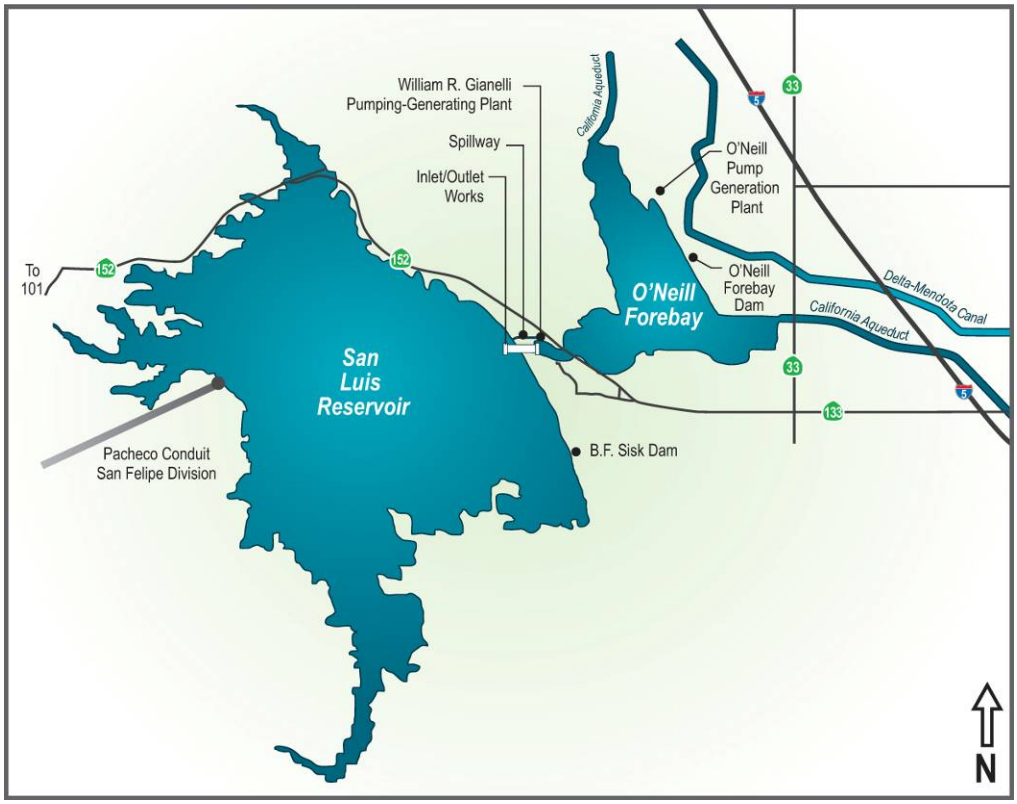

Figure ES-2. San Luis Reservoir and Associated Facilities

San Luis Reservoir stores water available from the CVP's Delta-Mendota Canal and State Water Project's (SWP) California Aqueduct during the rainy season, for delivery during summer and fall. The reservoir's capacity is 2.028 million acre-feet (MAF). Reclamation manages 47.6 percent of the reservoir's capacity and the California Department of Water Resources (DWR), owner of the SWP, manages the remaining 52.4 percent.

San Luis Reservoir serves as a storage facility for most CVP and SWP contractors. CVP contractors in the south Central Valley rely on exports from the C.W. "Bill" Jones Pumping Plant and San Luis Reservoir to meet summer demands. The C.W. "Bill" Jones Pumping Plant does not have enough pumping capacity to fully meet demands alone and CVP operators store additional water in San Luis Reservoir during the winter, when demands are low, to help meet summertime needs. When summer demands are high and the pumping plant

cannot provide enough water, Reclamation releases water stored in San Luis Reservoir.

Water Rights

Reclamation has water rights for off-stream storage at San Luis Reservoir for up to one MAF per year. The maximum diversion rate to off-stream storage is 4,200 cubic feet per second. San Luis Reservoir stores water from diversions directly out of the Delta during excess water supply conditions as specified in Water Rights Permit 15764. Additionally, rediversion of water stored previously in Trinity and Whiskeytown Reservoirs to off-stream storage in San Luis Reservoir is an established water right as specified in permits 11968, 11969, 11971, and 11973. However, this rediversion to storage does not allow for any additional amount of water to be stored above the one MAF per year limitation.

Low Point Issue

Conditions at San Luis Reservoir promote the growth of reservoir-wide algae during the summer months, when the reservoir reaches the lower range of water surface elevations.

- Algae blooms vary in size in different years, but generally reach diversion facilities when the reservoir has 300 TAF of water remaining in storage, which corresponds to a lake elevation approximately 35 feet above the Lower Pacheco Intake that serves the San Felipe Division (Figure ES-3).

- Reaching 300 TAF creates a risk for the San Felipe Division contractors because the San Luis Reservoir is the only CVP water source point that they can access.

- The low point issue arises when water levels fall below approximately 300 TAF, creating a water quality restriction that has the potential to interrupt a portion of the San Felipe Division's water supply.

In most years, the historical storage level in San Luis Reservoir has remained above 300 TAF; however, future conditions and operations may vary from historical ones, and the low point issue is likely to occur more frequently in the future. The water quality within the algal blooms is not suitable for agricultural water users with drip irrigation systems in San Benito County or for municipal and industrial water users relying on existing water treatment facilities in Santa Clara County. When the reservoir is at low water surface elevations, algal blooms in the vicinity of the Pacheco Intake facilities affect water supply diversions.

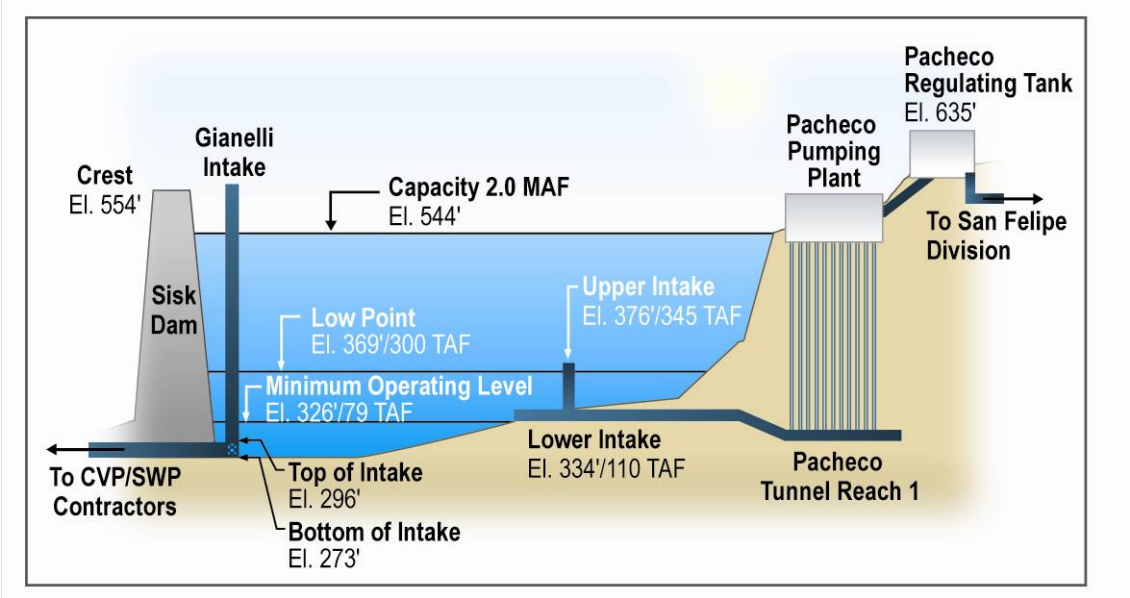

Figure ES-3. Reservoir Intake and Outlet Facilities

Need for Feasibility Study

The low point issue has the potential to affect: 1) the ability of south-of-Delta CVP and SWP contractors to divert water supplies; 2) the ability of the San Felipe Division contractors to divert water supplies during low point conditions; and 3) water quality.

The low point issue may affect the ability of San Luis Reservoir to provide water supply reliability and deliveries to south-of-Delta contractors. San Luis Reservoir is an off-stream storage facility providing Reclamation the ability to store water during wet seasons and deliver it during dry seasons. Use of the reservoir helps to maximize CVP supplies and contract deliveries. Any constraint in the release of water from San Luis Reservoir, including maintaining water levels to avoid the low point issue, could limit supplies.

The San Felipe Division relies on San Luis Reservoir as a conveyance facility to receive its CVP allocation. If either water quality or low water levels in San Luis Reservoir cause an interruption in diversions, then the San Felipe Division has no access to any of its CVP supplies. In the future, maximizing CVP and SWP deliveries might increase the frequency of occurrences of the low point issue and the risk of supply interruptions to the San Felipe Division.

Avoiding interruptions to the San Felipe Division's supply must be balanced with maintaining water supply reliability for other CVP and SWP contractors, for whom increased reliability may depend on the full use of all water in storage in the reservoir. The SLLPIP Study is needed to address the low point issue so

that Reclamation can operate San Luis Reservoir in a manner that contributes to the provision of reliable and uninterrupted supplies for all south-of-Delta CVP and SWP contractors.

Planning Objectives

SLLPIP objectives were developed based on the above-stated problems and opportunities. The objective of the SLLPIP is to optimize the water supply benefit of San Luis Reservoir while reducing additional risks to water users by:

- Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on San Luis Reservoir.
- Increasing the reliability and quantity of yearly allocations to south-of-Delta contractors dependent on San Luis Reservoir.
- Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on San Luis Reservoir without sacrificing accuracy of the allocation forecasts.

The SLLPIP may provide opportunities for ecosystem restoration.

Initial Alternative Results

The Study team developed 25 initial alternatives that included a combination of management measures. Initial alternatives fall into seven general categories:

- Institutional: non-structural measures, including agreements and exchanges that would reduce the likelihood of San Luis Reservoir reaching approximately 300 TAF or would provide alternate supplies for the San Felipe Division during times when the reservoir does fall below 300 TAF.
- Source Water Quality Control: improvements to San Luis Reservoir water quality that would reduce water supply interruptions for the San Felipe Division while continuing supplies for the rest of the San Luis and Delta-Mendota users.
- Water Treatment: new or enhanced raw water treatment capabilities using dissolved air flotation (DAF) that could treat San Luis Reservoir water and reduce or eliminate interrupted deliveries when algae blooms are in the vicinity of the Pacheco Intake.
- Conveyance: facilities that would allow San Felipe Division CVP supplies to bypass the San Luis Reservoir altogether or change the location of the

San Felipe Division's intake so that low water levels and algae are not a problem.

- Storage: facilities that would create additional storage, either on the San Felipe side of San Luis Reservoir or within the Central Valley, to provide an alternate water supply.

- Alternate Water Supplies: measures that would provide a new source of water to users in the San Felipe Division, reducing their demands on San Luis Reservoir water supplies.

- Combination Alternative: measures that work best in combination, augmenting efficient use of existing available water supplies and facilities to resolve the low point problem. The Alternative Water Supplies concept incorporates multiple strategies, such as source shifting, new supply development, additional treatment technology, reoperation, and operational agreements, which build upon one another either incrementally or in total, to achieve water supply reliability, water quality, and system flexibility project objectives and opportunities.

The Study team evaluated and screened the alternatives considering completeness, effectiveness, efficiency, and acceptability as required by the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&Gs). The Study team selected at least one alternative from each category to carry forward for analysis, maintaining a reasonable range of alternatives. The project team selected the alternative that appears to achieve the most benefits for the least cost relative to other alternatives within a category. If at least one alternative does not stand out within a category because of higher benefits or lower costs, then multiple alternatives from that category will be retained. Table ES-1 shows the retained initial alternatives.

At this conceptual stage of the Study, the performance evaluation of the alternatives was qualitative. Consistent with the P&Gs, much of the future SLLPIP work will center on refinement and quantitative measurement of benefits and costs.

Table ES-1. Retained Initial Alternatives

Category	Alternative	Included Measures
Institutional	Institutional Alternative	Banking, exchanges, and operating agreements and procedures
Source Water Quality Control	Algaecide Alternative	Algaecides, banking, exchanges, and groundwater storage
Treatment	Treatment at San Felipe Intake Alternative	DAF at San Felipe Intake, treatment at Rinconada, and exchanges
	Treatment at WTPs Alternative	DAF at WTPs, treatment at Rinconada, and exchanges
	Treatment at Pumping Plant Alternative	DAF at Coyote PP, treatment at Rinconada, and exchanges
Conveyance	Southerly Bypass Corridor Alternative	Southerly Bypass Corridor and exchanges
	Lower San Felipe Intake Alternative	Extend/Lower San Felipe Intake to Gianelli Inlet/Outlet Level and banking
Storage	Anderson Reservoir Expansion Alternative	Anderson expansion and exchanges
	Chesbro Reservoir Expansion Alternative	Chesbro expansion and exchanges
	Lower Pacheco Reservoir Alternative	Lower Pacheco (Pacheco Lake Reservoir) and exchanges
	Pacheco A Reservoir Alternative	Pacheco A Reservoir and exchanges
	San Benito Canyon Reservoir Alternative	San Benito Reservoir and exchanges
	Del Puerto Canyon Reservoir Alternative	Del Puerto Canyon Reservoir, banking, groundwater storage, and exchanges
	Ingram Canyon Reservoir Alternative	Ingram Canyon Reservoir and exchanges
	Quinto Creek Reservoir Alternative	Quinto Creek Reservoir and exchanges
Alternate Water Supplies	Los Vaqueros Expansion Alternative	Los Vaqueros Expansion, Anderson reoperation, San Francisco Public Utilities Commission (SFPUC) intertie, San Benito groundwater desalination, and exchanges
Combination	San Felipe Division Combination Alternative	San Felipe Division conveyance modification, groundwater storage, recycling, and exchanges

Key: DAF = Dissolved Air Filtration
WTPs = water treatment plants
PP = pumping plant
SFPUC = San Francisco Public Utilities Commision

Next Steps

The Plan Formulation Report (PFR) is the next major phase in the planning process. The PFR will present results of the initial alternatives evaluation, refine the alternatives, and identify comprehensive alternatives. After the PFR is complete, the Feasibility Report is the next step. The comprehensive alternatives developed in the PFR will be carried forward into the Feasibility Report. The Feasibility Report will evaluate and compare the final alternatives and identify a recommended plan. The Feasibility Report will also include an

Environmental Impact Statement/Environmental Impact Report to comply with National Environmental Policy Act and California Environmental Quality Act requirements.

Contents

Page

Page

List of Tables

List of Figures

Acronyms and Abbreviations

AF	acre-feet
BEA	Bureau of Economic Analysis
BMPs	Best Management Practices
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CO	Carbon monoxide
COA	Continued Operation Agreement
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DAF	dissolved air flotation
DOF	Department of Finance
DPR	Department of Parks and Recreation
DWR	California Department of Water Resources
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EWA	Environmental Water Account
HP	horsepower
IAIR	Initial Alternatives Information Report
IWRP	Integrated Water Resources Plan
mgd	million gallons per day
mg/L	milligrams per liter
M&I	municipal and industrial

MWD	Metropolitan Water District
NED	National Economic Development
NEPA	National Environmental Policy Act
NOx	Nitrogen oxide
msl	mean sea level
NWR	National Wildlife Refuge
PFR	Plan Formulation Report
P&Gs	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PM10	particulate matter with a diameter less than 10 micrometers
ppm	parts per million
PVWMA	Pajaro Valley Water Management Agency
Reclamation	Bureau of Reclamation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SBA	South Bay Aqueduct
SBCWD	San Benito County Water District
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SLDMWA	San Luis and Delta Mendota Water Authority
SLLPIP	San Luis Low Point Improvement Project
sq.	square
SR	State Route
SRA	San Luis Reservoir State Recreation Area
SWP	State Water Project
TAF	thousand acre-feet
TDS	total dissolved solids
the Projects	CVP and SWP
TOC	Total Organic Carbons
WTP	Water Treatment Plant

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Chapter 1
Introduction

1.1 Purpose of Report

The Initial Alternatives Information Report (IAIR) for the San Luis Low Point Improvement Project (SLLPIP) is an interim document in the process of developing a Feasibility Study. The IAIR describes present and future baseline conditions, identifies problems and opportunities, sets forth purpose and need and planning objectives, formulates a range of measures and combines those measures into alternative plans. Complete alternatives that address the planning objectives are discussed in the IAIR as well as the related potential environmental impacts, and results of initial screening. A comparison of alternatives is provided to refine the alternatives that will be considered further in subsequent steps of the planning process to develop a Feasibility Study.

1.2 Background

In 2000, the CALFED Programmatic Record of Decision (ROD) identified the need for a bypass canal that would connect the San Felipe Division to water delivered by the Sacramento-San Joaquin River Delta (Delta) pumping facilities, and increase use of water in San Luis Reservoir by up to 200 thousand acre-feet (TAF). Santa Clara Valley Water District (SCVWD) initiated the San Luis Low Point Improvement Project (SLLPIP) in 2001 and completed a *Draft Alternatives Screening Report* that investigated alternatives to address water quality and reliability problems caused by the reservoir's low point. In 2004, Congress authorized the Secretary of the Interior, through the Bureau of Reclamation (Reclamation), to prepare a feasibility study to address the water supply reliability issues caused by the low point. In 2006, Reclamation, in cooperation with SCVWD and the San Luis and Delta-Mendota Water Authority (SLDMWA), prepared a *Plan of Study* (Reclamation 2006a) and an *Appraisal Report* (Reclamation 2006b). The *Plan of Study* describes activities needed to accomplish the Study, as well as the schedule, resources, budget, and required coordination and management of the Study. The following sections describe San Luis Reservoir and the low point issue.

San Luis Reservoir

Construction of Sisk Dam in 1967 formed the San Luis Reservoir, a jointly owned and operated Federal and State facility in the San Luis Unit of the

Central Valley Project (CVP) West San Joaquin Division. Figure 1-1 shows San Luis Reservoir and local State Water Project (SWP) and CVP facilities.

San Luis Reservoir stores water available from the CVP's Delta-Mendota Canal (DMC) and SWP's California Aqueduct during the rainy season and delivers water during summer and fall. The reservoir's capacity is about 2.028 million acre-feet (MAF). Reclamation manages 47.6 percent of the reservoir's capacity and the California Department of Water Resources (DWR), owner of the SWP, operates the remaining 52.4 percent.

San Luis Reservoir water is delivered east, through the William R. Gianelli Pumping-Generating Plant and O'Neill Forebay to CVP and SWP contractors via the DMC and the California Aqueduct. Deliveries from San Luis Reservoir also flow west to the San Felipe Division of the CVP, which includes the SCVWD and the San Benito County Water District (SBCWD). This water is delivered through the Pacheco Pumping Plant, Tunnel, and Conduit; Hollister-Watsonville Conduit; and Santa Clara Conduit. In the future, Pajaro Valley Water Management Agency (PVWMA) could join the San Felipe Division if a new Pajaro pipeline is constructed.

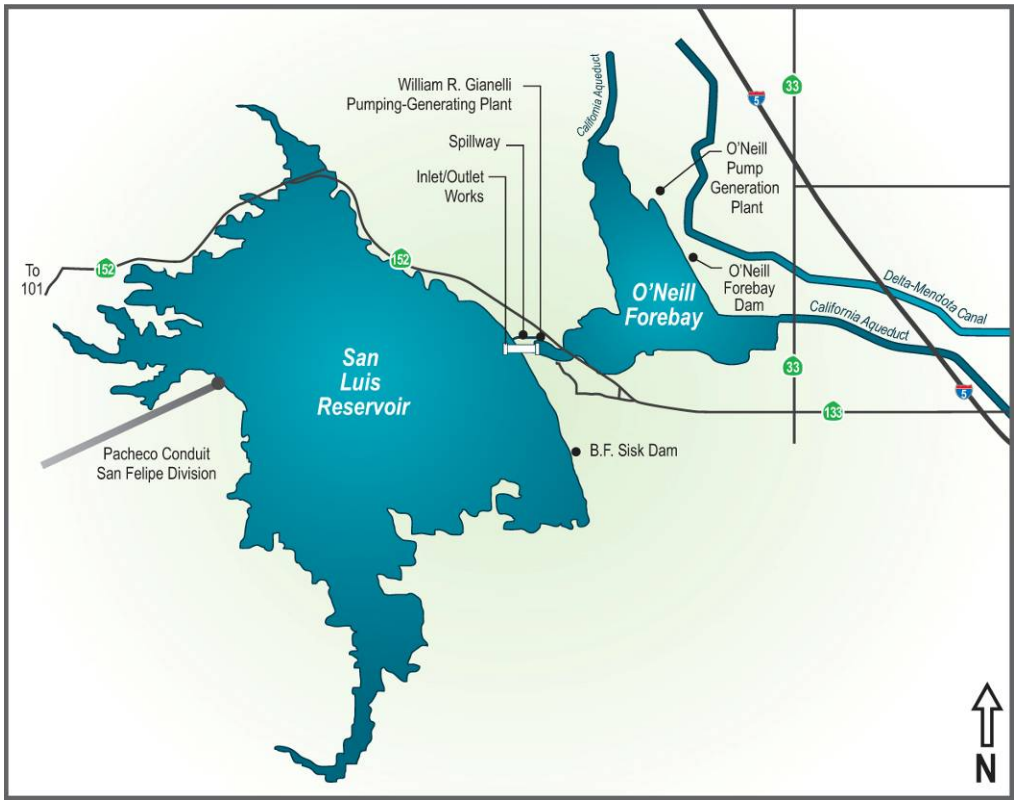

Figure 1-1. San Luis Reservoir and Associated Facilities

San Luis Reservoir is the major south-of-Delta storage facility for both the CVP and SWP. The CVP and SWP (Projects) use San Luis Reservoir to store wet-season Delta exports. During the non-irrigation season, the Delta pumps export flows in excess of those needed to meet in-Delta demands and water quality requirements. South-of-Delta demands are typically low during the wet season, so the Projects store these exports in San Luis Reservoir until needed. San Luis Reservoir typically fills in April, before the higher summer demands. Starting in April, the Projects draw on San Luis Reservoir to supplement Delta exports and meet south-of-Delta demands. San Luis Reservoir typically reaches its lowest point in late August or September.

Water Rights

Reclamation has water rights for off-stream storage at San Luis Reservoir for up to one MAF per year. The maximum diversion rate to off-stream storage is 4,200 cubic feet per second (cfs). San Luis Reservoir stores water from diversions directly out of the Delta during excess water supply conditions as specified in Water Rights Permit 15764. Additionally, rediversion of water stored previously in Trinity and Whiskeytown Reservoirs to off-stream storage in San Luis Reservoir is an established water right as specified in permits 11968, 11969, 11971, and 11973. However, this rediversion to storage does not allow for any additional amount of water to be stored above the one MAF per year limitation.

Low Point Issue

Figure 1-2 shows the intakes, tunnel, and pumping facilities that are San Luis Reservoir's primary facilities. The Upper Pacheco Intake is exposed when the reservoir drops below 376 feet above mean sea level or 345 TAF. If reservoir water levels continue to decline, the top of the Lower Pacheco Intake is exposed at 334 feet above mean sea level or 110 TAF. The Pacheco Pumping Plant is designed to pump water until the water levels reach 326 feet above mean sea level or 79 TAF, when the pumping facilities do not receive adequate water to allow pumping. This level corresponds to the Projects' established minimum operating level. This level is about 30 feet above the top of the Gianelli Intake.

Conditions at San Luis Reservoir promote the growth of reservoir-wide algae during the summer months, when the reservoir reaches the lower water surface elevations. Algae blooms vary in size in different years, but generally reach diversion facilities when the reservoir has approximately 300 TAF of water remaining in storage, which corresponds to a lake elevation approximately 35 feet above the Lower Pacheco Intake that serves the San Felipe Division (Figure 1-2). Reaching 300 TAF creates a risk for the San Felipe Division contractors because the San Luis Reservoir is the only CVP water source point that they can access. The low point issue arises when water levels fall below 300 TAF,

creating a water quality restriction that has the potential to interrupt a portion of the San Felipe Division's water supply.[1] In most years, the historical storage

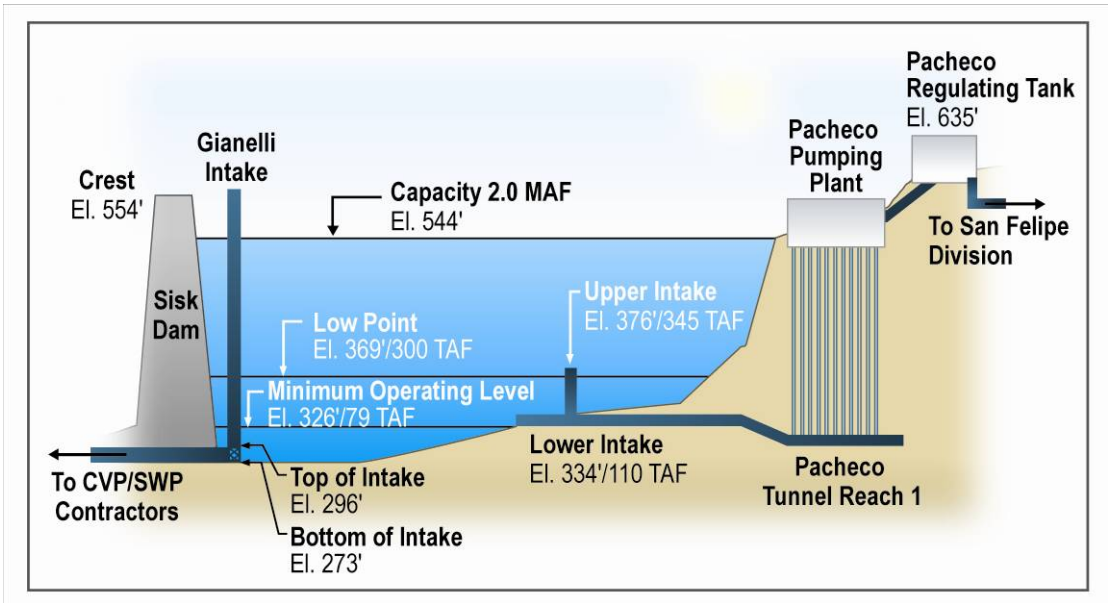

Figure 1-2. Reservoir Intake and Outlet Facilities

level in San Luis Reservoir has remained above 300 TAF; however, future conditions and operations may vary from historical ones, and it is expected that this water level is likely to be reached more often in the future. The water quality within the algal blooms is not suitable for agricultural water users with drip irrigation systems in San Benito County or for municipal and industrial water users relying on existing water treatment facilities in Santa Clara County.

1.3 Need for Feasibility Study

The low point issue has the potential to affect: 1) the ability of south-of-Delta Project contractors to divert water supplies; 2) the ability of the San Felipe Division contractors to divert water supplies during low point conditions; and 3) water quality.

The low point issue may affect the ability of San Luis Reservoir to provide water supply reliability and deliveries to south-of-Delta contractors. San Luis Reservoir is an off-stream storage facility providing Reclamation the ability to store water during wet seasons and deliver it during dry seasons. Use of the reservoir helps to maximize CVP supplies and contract deliveries. Any constraint in the release of water from San Luis Reservoir, including maintaining water levels to avoid the low point issue, could limit supplies.

[1] The "low point issue" is also defined in the Glossary (Section 9).

The San Felipe Division relies on San Luis Reservoir as a conveyance facility to receive its CVP allocation. If either water quality or low water levels in San Luis Reservoir cause an interruption in diversions, then the San Felipe Division has no access to any of its CVP supplies. In the future, maximizing CVP and SWP deliveries might increase the frequency of the low point issue and the risk of supply interruptions to the San Felipe Division.

Avoiding interruptions to the San Felipe Division's supply must be balanced with maintaining water supply reliability for other Project contractors, for whom increased reliability may depend on the full use of all water in storage in the reservoir. The SLLPIP Study is needed to address the low point issue so that Reclamation can operate San Luis Reservoir in a manner that contributes to the provision of reliable and uninterrupted supplies for all south-of-Delta Project contractors.

1.4 Federal Interest

Reclamation's participation in the SLLPIP could provide increased water supply reliability to CVP contractors. The 2006 SLLPIP Appraisal Report found that "Federal interest exists to address problems associated with delivery schedule reliability and water supply reliability in the study area, and to the extent possible, other service areas of the [CVP]."

1.5 Authorization and Appropriation

The SLLPIP Study is authorized by Title I of Public Law 108-361, CALFED Bay-Delta Authorization Act (October 25, 2004, 118 Stat. 1694), also known as the Water Supply Reliability, and Environmental Improvement Act (Act). Section 103(f)(1)(A) of the Act authorized the Secretary of the Interior to "expend funds for feasibility studies, evaluation, and implementation of the San Luis Low Point Improvement Project, except that Federal participation in any construction of the expanded Pacheco Reservoir shall be subject to future congressional authorization."

1.6 Study Area Location and Description

The Study Area includes San Luis Reservoir and its related storage infrastructure, the CVP San Felipe Division, and the CVP service areas of the SLDMWA, (Figure 1-3). The SLDMWA was formed in 1992 by its member agencies to assume responsibility for the operations and maintenance of certain CVP facilities that deliver water to its member agencies, with the goal of optimizing operations and costs (SLDMWA undated).

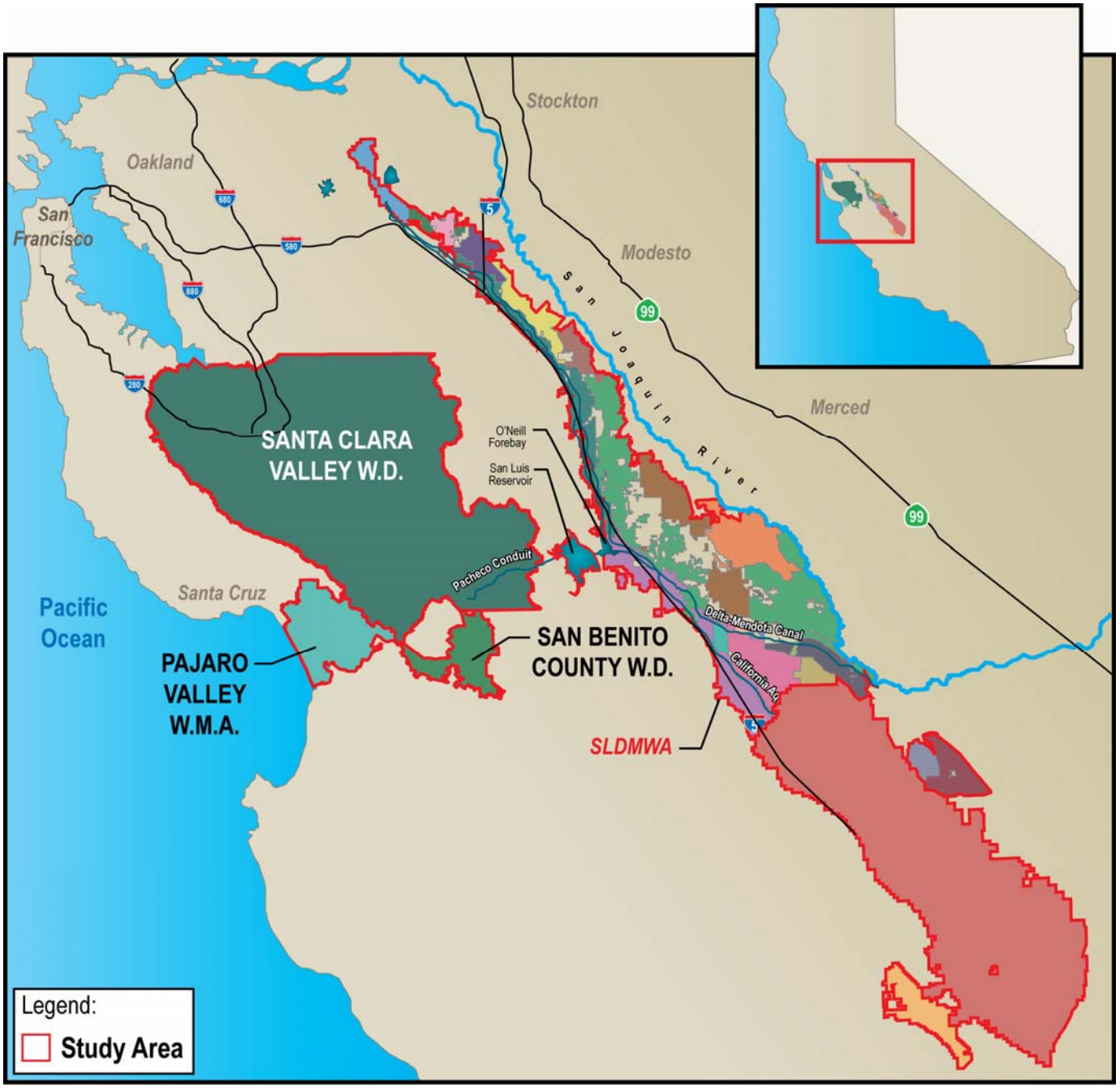

Figure 1-3. Study Area

1.7 Related Studies, Reports, Projects and Programs in the Region

Federal, State, and local agencies are participating throughout the state of California in a wide range of other projects and programs that have the potential to influence water supply conditions for both San Luis Reservoir and the water

agencies within the Study Area. The projects and programs listed below are in the Study Area and potentially relevant to the Study.

SCVWD SLLPIP Draft Alternative Screening Report

As described above, the CALFED ROD identifies the need for a "bypass canal to the San Felipe Unit at the San Luis Reservoir." The ROD recommended the allocation of California Proposition 13 funds administered by DWR to complete studies of the bypass canal and expanded local storage. Using these Proposition 13 funds, SCVWD initiated the SLLPIP in 2001 and completed the *Draft Alternatives Screening Report* in 2003. The report develops and screens alternatives to address the low point issue. SCVWD's work under the DWR grant focused on three objectives: (1) increase the operational flexibility of San Luis Reservoir by increasing the effective storage; (2) ensure that the San Felipe Division contractors are able to use their annual CVP contract allocation to meet their water supply and water quality commitments; (3) provide opportunities for project-related environmental and other improvements.

CALFED Integrated Storage Investigation

CALFED is evaluating the development of new surface water storage as a potential water management tool to meet the objectives of the CALFED Bay-Delta Program. The CALFED Integrated Storage Investigation identified two potential new reservoir sites within the SLLPIP Study Area. This IAIR utilized reservoir data from the CALFED report to define resource management measures. As a part of the Integrated Storage Investigation, CALFED conducted an initial screening of potential reservoir sites to identify potentially feasible alternatives and reported the findings in the 2000 *Initial Surface Water Storage Screening Report*. Of the 52 sites investigated in the initial screening, 12 potential reservoir sites were carried through for further investigation (CALFED 2000).

Shasta Lake Water Resources Investigation

The Shasta Lake Water Resources Investigation (SLWRI), a feasibility-level study of the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), Mid-Pacific Region, is being conducted under the general authority of Public Law 96-375 and the CALFED Bay-Delta Authorization Act, also known as Public Law 108-361. These statutes direct the Secretary of the Interior to engage in feasibility studies related to enlarging Shasta Dam and Reservoir. The SLWRI primary study area encompasses Shasta Dam and reservoir; inflowing rivers and streams, including the Sacramento River, McCloud River, Pit River; and Squaw Creek, and the Sacramento River downstream to Red Bluff Diversion Dam (RBDD).

The problems and needs in the study area were translated into primary and secondary planning objectives. The primary objectives of the SLWRI are to increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the RBDD; and increase water supplies and supply

reliability for agricultural, municipal and industrial (M&I), and environmental purposes to help meet future water demands, with a focus on enlarging Shasta Dam and Reservoir. The secondary objectives include, to the extent possible, preserving, restoring, and enhancing ecosystem resources in the Shasta Lake area and along the upper Sacramento River; reducing flood damages and improving public safety along the Sacramento River; developing additional hydropower capabilities at Shasta Dam; and preserving and increasing recreational opportunities at Shasta Lake.

The Initial Alternatives Information Report (IAIR) was completed in 2004 and a NOI to prepare an EIS was published in 2005 (Federal Register 2005).

Los Vaqueros Enlargement

Contra Costa Water District (CCWD), Reclamation, and DWR have jointly undertaken a series of studies to analyze the feasibility of expanding Los Vaqueros Reservoir while adhering to reservoir expansion principles established by CCWD. The project has two primary objectives and one secondary objective.

1. Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.

2. Increase water supply reliability for water providers within the San Francisco Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

3. Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

Several interim planning documents have been produced, such as the Initial Alternatives Information Report in September 2005, the Initial Economic Evaluation for Plan Formulation in July 2006, and the Design, Estimate and Construction Review Report in September 2007.

North-of-the-Delta Offstream Storage Investigation

The NODOS Investigation is a feasibility study being conducted by DWR and Reclamation. The NODOS Investigation is evaluating potential offstream surface water storage projects in the Sacramento Valley to enhance water management flexibility, increase the reliability of supplies, reduce diversions on the Sacramento River during critical fish migration periods, and provide storage

and operational benefits to other CALFED programs including Delta water quality and the Environmental Water Account..

In evaluating these objectives, the NODOS Investigation will address opportunities for ancillary hydropower generation benefits, recreation, and flood damage reduction. Congress provided NODOS feasibility study authority to Reclamation in the Omnibus Appropriations Act of 2003 (Public Law 108-7) and reaffirmed this authority in the Water Supply, Reliability, and Environmental Improvement Act, 2004 (Public Law 108-361).

The feasibility study will identify Federal and State interests in a new offstream reservoir that could provide up to 1.8 million acre-feet of storage for water supply reliability to the region for urban, agricultural, and environmental uses. Project planning will culminate in a Feasibility Report and Environmental Impact Statement/Environmental Impact Report.

Upper San Joaquin River Basin Storage Investigation

The USJRBSI is a feasibility study being performed by Reclamation and DWR. The objectives of the investigation are: enhance water temperature and flow conditions in the San Joaquin River and increase water supply reliability for agricultural and urban water users in the Friant Division, San Joaquin Valley areas, and other regions.

Federal authorization for the investigation was provided initially in Public Law 108-7, the omnibus appropriations legislation for fiscal year 2003. Subsequent authorization was provided in Public Law 108-361, the Water Supply, Reliability, and Environmental Improvement Act of 2004. Section 227 of the State of California Water Code authorizes DWR to participate in water resources investigations. The Study area encompasses the SJR watershed upstream from Friant Dam and the portions of the San Joaquin and Tulare Lake hydrologic regions served by the Friant-Kern and Madera Canals.

San Luis Drainage Feature Re-evaluation

The purpose of the San Luis Drainage Feature Re-evaluation Project is to identify a plan to provide agricultural drainage service to the CVP's San Luis Unit in accordance with the Ninth District Circuit Court decision that Reclamation provides drainage service to the San Luis Unit. The San Luis Drainage Feature Re-evaluation Project could affect operations of the San Luis Reservoir by altering the schedule for water deliveries.

Drainage service has been defined as managing the regional shallow groundwater table by collecting and disposing shallow groundwater form the rootzone of drainage-impaired lands and/or reducing contributions of water to the shallow groundwater table through land retirement. The related Record of Decision, signed in March 2007, selected the In-Valley/Water Needs Alternative for implementation. This alternative includes collection systems,

reuse areas, treatment, and disposal facilities, as well as the retirement of 194,000 acres of farmland. The In-Valley/Water Needs Alternative would retire enough lands to balance the internal water demand of the San Luis Unit with the expected available supply.

Reclamation is finalizing an estimate of project costs, which is expected to confirm the need for authorizing legislation to increase the appropriation ceiling for funding beyond what was authorized by the San Luis Act of June 3, 1960.

Delta-Mendota Canal Recirculation Feasibility Study

The purpose of the DMC Recirculation Study is to identify and evaluate the feasibility of implementing DMC recirculation as a means of accomplishing the objectives defined in the federal authorizing language. The Study, which is identified in the authorizing legislation as part of Reclamation's overall Program to Meet Standards, will determine whether Reclamation can, through the use of excess capacity in export pumping and conveyance facilities, provide greater flexibility in meeting the existing water quality standards and flow objectives for which the CVP has responsibility, reduce the demand on water from New Melones Reservoir (for use to improve water quality and flow), and assist the Secretary of the Interior (Secretary) in meeting any obligation to CVP water contractors using the New Melones Reservoir.

Central Valley Project Improvement Act

Implementation of the CVP Improvement Act (CVPIA)[2] changed the management of the CVP by making fish and wildlife protection a project purpose, equal to water supply for agricultural and urban uses. The CVPIA affects water exports from the Delta to San Luis Reservoir and increases operational pressures on the reservoir to meet south-of-Delta water demands. CVPIA Section 3406 (b)(2) authorized and directed the Secretary of the Interior among other actions to dedicate and manage 800 TAF of CVP yield annually for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized in CVPIA, to assist the State of California in its efforts to protect the waters of the San Francisco Bay-Delta Estuary, and to help meet obligations legally imposed on the CVP under State or Federal law following the date of enactment of the CVPIA.

CVPIA Section 3406(d)(1) required that the Secretary immediately provide specific quantities of water to the refuges referred to as "Level 2" supplies. The CVPIA requires delivery of the Level 2 water in all year types except critically dry water year conditions, when it can be reduced by 25 percent. Section 3406(d)(2) of the CVPIA refers to "Level 4" refuge water supplies, which are the quantities required for optimum habitat management of the existing refuge lands. Level 4 water supplies amount to about 163 TAF above Level 2 water

2 Title 34 of Public Law 102-575, the Reclamation Projects Authorization and Adjustment Act of 1992, signed October 30, 1992.

supplies. The availability of Level 4 refuge water supplies are influenced by the availability of water for transfer from willing sellers.

Environmental Water Account

The Environmental Water Account was established in 2000 by the CALFED ROD, and is described in detail in the EWA Operating Principles Agreement attachment to the ROD. In 2004, the EWA was extended to operate through the end of 2007, and is expected to again be extended, probably through 2011.

The original purpose of the EWA was to enable diversion of water by the SWP and CVP from the Delta to be reduced at times when aquatic life may be harmed while preventing the uncompensated loss of water to SWP and CVP contractors. The EWA replaced any water loss due to curtailment of pumping by purchase of surface or groundwater supplies from willing sellers and by taking advantage of regulatory flexibility and certain operational assets.

Five agencies administer the EWA. They are DWR and Reclamation (the Project Agencies) and the USFWS, the NMFS and the California Department of Fish and Game (the Management Agencies). The Project agencies acquire assets for the EWA; the Management Agencies recommend how the assets should be used to benefit the at-risk native fish species of the Bay-Delta estuary. Operation of the EWA Program is guided by the EWA Team (EWAT), which is comprised of technical and policy representatives from each of the five EWA Agencies. The EWAT coordinates its activities with the Water Operations Management Team.

The EWA will no longer operate in the same manner as it did from 2000 through 2007. The operation has changed effective in 2008 in response to the declining availability of public funding to acquire water assets and increasing asset needs for fishery protection. The EWA as extended is now a limited EWA that has fewer assets at its disposal and will focus on providing those assets to support the VAMP and related actions such as the post-VAMP shoulder. The EWA assets will include the following:

- Assuming implementation of the Lower Yuba River Accord, 60 TAF of water released annually from the Yuba River to the Delta would be a EWA asset through 2015, with a possible extension through 2025.
- EWA's operational assets that averaged 82 TAF per year from 2001-2006 and ranged from 0 to 150 TAF, depending on Delta hydrological and biological conditions.
- EWA will also have the ability to carry up to 100 TAF of debt to the SWP in support of VAMP and related actions.

Operations Criteria and Plan

The Long-term CVP Operations Criteria and Plan (OCAP), prepared by Reclamation and DWR in 2004, serves as a baseline description of the facilities

and operating environment of the CVP and SWP. The OCAP identifies the many factors influencing the physical and institutional conditions and decision making process under which the projects currently operate. Regulatory and legal requirements are explained, alternative operating models and strategies described. The immediate objective is to provide operations information for the Endangered Species Act, Section 7 consultation.

In 2005, results of annual surveys designed to indicate population levels of several pelagic organisms, including the delta smelt, were showing a precipitous decline. Reclamation re-initiated ESA consultation on OCAP with the Fish and Wildlife Service based on new information regarding the delta smelt, including the apparent decline in the population.

The consultation process requires the Fish and Wildlife Service to determine whether or not the operation of the projects would jeopardize the continued existence of the delta smelt, and to identify reasonable and prudent measures for the action agency to implement, thereby minimizing any adverse effects of the projects. Until the consultation process is complete, Reclamation is implementing the remedial actions required by a December 2007 court order (Federal District Court, Eastern District of California, in NRDC v. Kempthorne). However, the Court's remedial actions have limitations. These actions affect the operation of the pumps, which is only one of the factors affecting the Delta smelt. And because these actions were developed in litigation, they have not been subject to a careful scientific peer review. Therefore, it is uncertain whether they will be effective in protecting the smelt and be incorporated into the new OCAP.

Delta issues affecting salmon, steelhead, and sturgeon are likely to come to the fore front in the coming months based on a parallel lawsuit against the National Marine Fisheries Service. Reinitiation of ESA consultation on OCAP with the NMFS is also in process.

CVPIA Contract Renewals

The CVP has more than 100 water service contracts. Reclamation has negotiated renewals of long-term water service contracts for all CVP contractors, including those within the SLLPIP Study Area, as required by CVPIA Section 3404(c). As mandated by Section 3404(c), irrigation contracts have a term not exceeding 25 years and municipal and industrial contracts have a term not exceeding 40 years. Most contracts have been renewed; those contracts not yet renewed will be executed upon completion of the re-initiated consultation on the long-term operations of the CVP. All water service contracts contain terms and conditions for the delivery and use of CVP water, for the repayment of applicable capital construction costs, and for the reimbursement of annual operation and maintenance expenditures.

Reclamation recognizes that hydrologic, regulatory, and operational uncertainties constrain its ability to deliver CVP water and that such uncertainties may increase in importance as future water demands increase. Because of uncertainties, competing demands, and variable supplies, Reclamation and its contractors recognize that delivery of full contract quantities is not guaranteed and that deliveries may be equal to or less than historic deliveries. The SLLPIP may increase Reclamation's ability to deliver greater quantities of water, potentially equaling the maximum contract amounts. Furthermore, improved operations of San Luis Reservoir may provide a more reliable water supply for CVP contractors.

Delta-Mendota Canal/California Aqueduct Intertie

The DMC/California Aqueduct Intertie could increase deliveries from the Jones Pumping Plant to the DMC and San Luis Unit CVP contractors, which could reduce demands from San Luis Reservoir. Reclamation is preparing an EIS for the Intertie, which would include construction of a new pipeline and pumping plant between the DMC and the California Aqueduct. This intertie would allow Jones Pumping Plant to pump to its authorized capacity of 4,600 cfs when the California Aqueduct has available capacity, subject to all applicable export pumping restrictions for water quality and fishery protections. Use of the intertie would achieve multiple benefits, including helping to meet current water supply demands, allowing the CVP Delta export and conveyance facilities to be maintained and repaired, and providing operational flexibility to respond to emergencies. The Intertie would allow flow in both directions, which would provide additional flexibility to both CVP and SWP operations.

South of Delta Improvements Program

Reclamation and DWR are preparing plans for the South Delta Improvements Program, which could affect water deliveries from the Delta to San Luis Reservoir. The South Delta Improvements Program is intended to reduce the number of Chinook salmon that enter the south Delta through the Old River to reduce fish mortality, while maintaining water levels for south-of-Delta diversions and improving south-of-Delta water deliveries to CVP and SWP contractors by increasing diversions through the Clifton Court Forebay. The program would include: construction of new gates to protect fish and maintain water levels in the Delta; dredging of Middle River, Old River and West Canal to improve Delta flow conditions; extension of 24 existing agricultural diversions to deeper water in the Delta; and increase of the permitted SWP diversion at Clifton Court Forebay. Recent studies of pelagic organism decline in the Delta have affected the implementation schedule of the South Delta Improvements Program.

1.8 Report Organization

This report is organized as follows:

- Chapter 2 describes the problems and opportunities associated with the SLLPIP, the project objectives, and potential planning constraints.
- Chapter 3 describes the existing and likely future without project conditions.
- Chapter 4 describes the plan formulation approach as guided by the Federal planning process, and presents and screens potential resource management measures.
- Chapter 5 presents the initial alternatives (combination of resources management measures) for further evaluation.
- Chapter 6 presents the alternative screening process, and the identification of those alternatives deemed appropriate for further evaluation.
- Chapter 7 describes the Study development process, including next steps, project schedule, and public involvement.
- References
- Glossary

Chapter 2
Problems, Opportunities, Planning Objectives and Constraints

2.1 Problems and Opportunities

This section presents problems associated with the San Luis Reservoir low point issue and potential opportunities resulting from implementation of the SLLPIP. This identification of problems and opportunities supports the development of resource management measures and project alternatives.

2.1.1 Problems

The San Luis Reservoir low point issue causes two main water resource problems that need to be addressed by the SLLPIP: reduced certainty of meeting south-of-Delta delivery schedules during the year and decreased water supply reliability for south-of-Delta contractors.

Figure 2-1. San Luis Reservoir

Multiple factors affect the certainty and reliability of water supplies for south-of-Delta contractors, including growth in water demands, increasingly stringent regulatory requirements, and potential restricted operations because of the San Luis Reservoir low point constraints. These factors, in addition to the uncertainty of hydrologic conditions, contribute to CVP and SWP water supply reliability issues. Reclamation, in cooperation with SCVWD and SLDMWA, is preparing the Study to identify means for increasing delivery schedule certainty and water supply reliability. This section further describes the demonstrated need for the SLLPIP.

Factors Contributing to the Problems

Growth in Water Demand CVP contract amounts are not expected to increase; however, the proportion of municipal and industrial (M&I) demand has increased over time. Demand on the SWP is anticipated to increase over time to the full "Table A" amount. Water demands, especially during drought years, exceed supplies in many areas of California, including in the San Felipe Division. Because of growing statewide agricultural and M&I demands, both CVP and SWP facilities are expected to be severely stressed in the future. Local San Felipe Division demands and supply balances suggest that these agencies and other SLDMWA members will rely on their CVP contracts to meet much of their future demands. The effect of CVP water supply shortages will become more severe on these districts as the availability of alternative water supplies is reduced.

The California Department of Finance (DOF) projects that the state's population will increase from 37.1 million in 2006 to 49.2 million in 2030 and 59.5 million in 2050, with some of the major growth occurring in south Central Valley and inland southern California counties (DOF 2007). Water demands already exceed supplies throughout California, stressing the system severely during dry water years. Increasing water demands associated with this population growth will place additional pressure on CVP and SWP operations and facilities to meet contract allocations.

Water demand in the San Felipe Division is projected to grow with increases in population and expansion of the economy. SCVWD estimates that future water demands will increase 67.6 TAF, or about 18 percent, from 2004 to 2030 (SCVWD 2005a). The SCVWD *Integrated Water Resources Planning Study* (IWRP) (SCVWD 2005b) projects that dry year water shortages will grow over time from approximately 50 TAF in 2010 to 74 TAF by 2040 assuming that the San Luis Reservoir low point issue has been remedied. (If the low point issue is not addressed, this shortage would likely increase even more.) Water demands in SBCWD are also projected to increase. SBCWD estimates that M&I demands will increase from 10.7 TAF in 2002 to 11.5 TAF in 2020 and agricultural demands to increase from 54.1 TAF in 2002 to 74.9 in 2020. One of the uses of CVP supplies in SBCWD is to protect local groundwater basins; reduced CVP deliveries will likely increase the SBCWD groundwater use and cause an overdraft. The SBCWD's only outside source of water is its CVP supply.

Other CVP and SWP contractors' demands are also likely to increase in the future, primarily due to M&I demand increases associated with statewide population growth. M&I contractors in the SLDMWA, such as the City of Tracy, are experiencing these increases in demands. In addition, the Metropolitan Water District of Southern California (MWD), which is an SWP contractor, projects that its M&I water demands will increase from 4.1 MAF in 2010 to 4.7 MAF by 2040 (MWD 2005).

Regulatory Requirements Operation of the CVP and SWP has been constrained by water quality and environmental protection regulations, and potential changes could result in further constraints. Provisions of the Federal Endangered Species Act (ESA), Water Rights Decision 1485, Coordinated Operating Agreement, CVPIA, Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, the EWA, Central Valley Regional Water Quality Control Board Basin Plan Amendments, and the Delta Vision Planning Project could affect the water supply reliability for contractors that rely on water deliveries from the Delta. These regulations and institutional changes have:

- Reduced the amount of water delivered to the Delta for later delivery to south-of-Delta users, in order to support fish protection on the Trinity River;
- Reduced amounts of water that can be extracted from the Delta during certain periods of the year in order to prevent negative impacts to water quality, water levels, and fish present in the Delta; and
- Reserved a portion of the CVP yield for delivery to environmental uses.

These actions have affected the total supply of water available to CVP and SWP operators for delivery to contractors.

Project Operations The Federal share of San Luis Reservoir is managed by Reclamation's Central Valley Operations Office and the State share is managed by the SWP Operation Control Office. The reservoir is filled in the non-irrigation season (October through March) when supplies exceed demand in the Delta and drawn down in the spring and summer dry season (April through September). Reclamation and DWR determine annual CVP and SWP allocations based on the 79 TAF minimum operating pool as a drawdown limit. Of this pool volume, 38 TAF are allocated to the CVP and 41 TAF to the SWP.

Operational goals of both the CVP and SWP are to maximize annual water delivery under their respective contracts and to do so (to the extent possible) without drawing the reservoir down to the minimum level. The water elevation in San Luis Reservoir during the late summer and early fall periods varies from year to year depending on various conditions, including 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 the 300 TAF (the water level where 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. As expected,

during the drought periods of 1976–1977 and 1988–1992, the reservoir was drawn down to below 500 TAF. San Luis Reservoir was drawn down to a storage level of 79 TAF to facilitate repairs in 1981 and 1982. Over the last 10 years, the average reservoir level in late summer was greater than 650 TAF. However, in several past years, internal Reclamation forecasts have projected that San Luis Reservoir water levels would drop below 300 TAF and could affect water deliveries to the San Felipe Division. These forecasts have not been accurate because SWP contractor demands have been lower than estimated, but changing water supply conditions and increasing demands make continued long term storage above 300 TAF unlikely.

The reservoir has a maximum drawdown rate of 2 feet per day as a dam safety measure. During periods of high demand, the maximum drawdown rate can limit the availability of water stored in San Luis Reservoir.

Problems to be Addressed by the SLLPIP

Delivery Schedule Certainty Low levels in San Luis Reservoir during the summer could affect the Projects' ability to meet contractor schedules during peak demands because of supply interruptions generated by algae problems and drawdown of the reservoir below the intake levels.

San Luis Reservoir water is delivered to south-of-Delta contractors. Reclamation requests a delivery schedule from each contractor and then approves the appropriate schedules. The actual deliveries are, however, subject to uncertainty during the summer months because of operational constraints, varying temperature conditions, changing cropping patterns, and water transfers. The uncertainty associated with San Luis Reservoir water supply deliveries in turn affects San Felipe Division water delivery operations. When a potential low point issue is forecasted, San Felipe Division contractors adjust their water operations in ways that may not necessarily be cost-efficient to reduce the likelihood of supply interruptions. The frequency of low point forecasts is projected to increase in the future and the San Felipe Division contractors will likely not be able to adjust operations to fully mitigate impacts associated with the low point issue.

Water demands are typically at their peak during the summer months and contractors have the greatest need for water supply from San Luis Reservoir during the summer. For contractors, decreased water deliveries during the peak demands pose the greatest risks of potential economic and environmental losses associated with a water shortage.

Regulatory changes, project operations, and growth in water demand, will increase the pressure on San Luis Reservoir supplies in the future. The California Simulation Model II (CALSIM II) simulation, as reported in the 2006 SLLPIP *Appraisal Report*, modeled future reservoir elevations and the likelihood of supply interruption using current and predicted water demands. These modeling results are preliminary, and will change as the Study team

refines the model to better simulate San Luis Reservoir. The modeling results indicated that, based on predicted development, water demands in 2020 would require the full exercise of San Luis Reservoir storage, with drawdown to the minimum operating level of 79 TAF about 25 percent of the time, typically in the summer and fall months. As the reservoir is currently configured, this drawdown to minimum pool would interrupt CVP supply to the San Felipe Division and would increase the risks associated with water shortages. Figure 2-2 shows preliminary modeling estimates of the exceedance probabilities of San Luis Reservoir end of month storage levels under existing and future without project conditions.

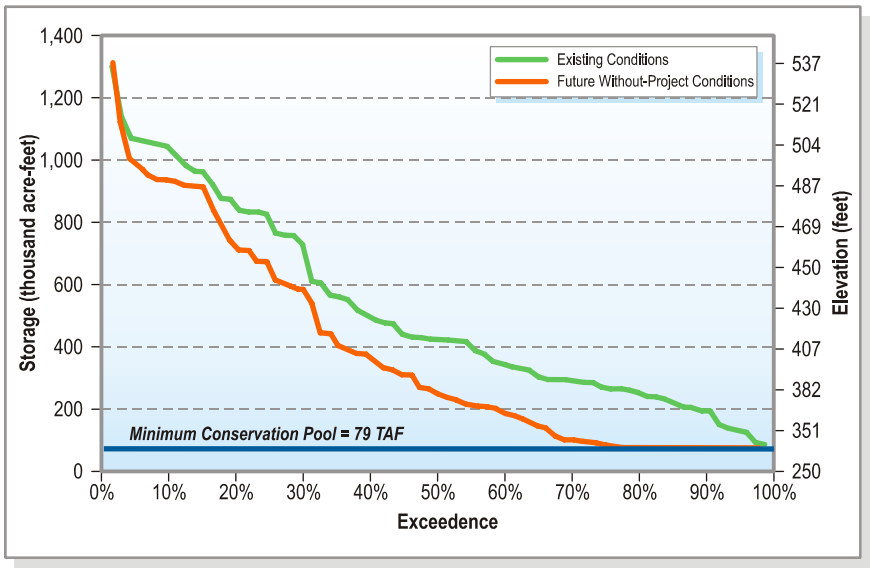

Figure 2-2. San Luis Reservoir Exceedance Probability

Water Supply Reliability Decreased water supply reliability affects contractors' ability to meet water demands. More stringent flow and water quality requirements in the Delta have restricted the amount of water that the CVP and SWP can pump. These limitations are causing water supply reliability concerns for south-of-Delta contractors.

The contractors' need for increased water supply reliability may compete with the need to avoid water supply interruptions, described above. Full exercise of the storage in San Luis Reservoir would cause reservoir levels to fall below 300 TAF and interrupt deliveries to the San Felipe Division.

Among south-of-Delta contractors, water supply reliability concerns have created interest in increasing CVP allocations. Reclamation forecasts annual CVP allocations so that its contractors can anticipate CVP water supplies and adjust operations accordingly. Reclamation bases the allocation forecasts on water supply available in storage, anticipated increases in storage and supply from inflow, and potential delivery limitations created by water quality and

environmental regulations. These allocations are established in stages, and generally are adjusted to be more accurate in each subsequent month, as more is known about water supply conditions. Early season forecasts are conservative, because conditions related to hydrologic patterns and use of environmental water are uncertain and Reclamation does not want to forecast allocations that cannot later be delivered.

The conservative early allocation is designed to help prevent delivery shortfalls later in the season, but has adverse effects on agricultural users who rely on the April allocation to make planting decisions for the season. Farmers may plant less acreage, plant lower value crops, or have difficulties in obtaining financing due to low water forecasts. The conservative early allocation also can prompt CVP contractors to secure water transfers or pump more groundwater, which are generally more expensive water supply options. At the end of the year, as a result of conservative estimates, San Luis reservoir could hold some water that could have been used to meet contractor demands.

2.1.2 Opportunities

Full Exercise of Storage in San Luis Reservoir
Implementation of the SLLPIP could allow the CVP and SWP to fully exercise San Luis Reservoir storage each year without stopping deliveries to the San Felipe Division. Reclamation would be able to use the full storage capacity of the reservoir without any concerns about water levels falling below 300 TAF.

Improved Water Quality During the late summer months, when San Luis Reservoir reaches low water levels that could trigger a low point issue, the San Felipe Division contractors might not be able to treat San Luis Reservoir water with their existing treatment facilities because of dense algae blooms. The algae could clog treatment plants' filters and could prevent clean water from passing through them. Algae-laden water also could clog irrigation systems for agricultural water users in the San Felipe Division. Implementing the SLLPIP could result in water quality improvements for M&I and agricultural customers beyond those possible in the future without the project.

Avoidance of Costs for Water Transfers and Other Alternative Supplies Because of decreased imported water supplies, contractors must often find alternate sources of water to meet demands. Some contractors purchase water on a year-to-year basis through water transfers. Depending on the hydrologic year and location of source water, transfers can range in price from $80 per acre-foot (AF) for north-of-Delta supplies to $280 per AF for south-of-Delta supplies. Dry year transfers have had prices as high as $460 per AF. Additional wheeling costs for deliveries through Project facilities could increase these transfer prices; for example, MWD charges $260 per AF for use of its conveyance facilities. DWR also charges a fee to convey supplies through the SWP system. The SLLPIP could reduce contractor need to identify additional water sources obtained through transfers or other sources.

Increased Cooperation San Luis Reservoir is central to both CVP and SWP operations and requires coordination among Reclamation, DWR, and contractors. Implementing the SLLPIP and allowing full exercise of San Luis Reservoir storage could further facilitate multi-agency cooperation by offering additional benefits for M&I, agricultural, and environmental water uses. Agencies could work together to maximize potential benefits of San Luis Reservoir storage to all south-of-Delta contractors and water uses.

System Conflict Reclamation currently plans its operations of San Luis Reservoir to reach the minimum operating level of 79 TAF, knowing that water levels are unlikely to decrease below 300 TAF because SWP contractors are storing water in San Luis Reservoir. Reclamation can draw the reservoir down to 79 TAF, but would likely receive substantial political pressure to maintain water levels that avoid supply interruptions to the San Felipe Division. If the cushion were not available, CVP operators would be forced to decide whether the reservoir should stay above 300 TAF to allow continued deliveries to San Felipe, or be allowed to drop below 300 TAF to utilize the water in storage. This could result in conflict among CVP users. Implementing the SLLPIP could avoid this conflict within the CVP system.

Operational Flexibility Operational flexibility allows water agencies to efficiently manage water supplies by increasing supply and storage options. Several SLLPIP measures propose new storage facilities or alternate water supplies within a local water agency. In years that the low point is not an issue, the local agency could use the additional storage for local water supplies. This would allow the agency to maximize use of surface and groundwater to meet both current and future water demands.

Ecosystem Restoration Increased south-of-Delta supplies stored in San Luis Reservoir during the summer months to avoid San Felipe Division supply interruption could be delivered to south-of-Delta National Wildlife Refuges as a part of the CVPIA Level 4 water delivery commitments. Additionally,

developing new water resource projects could produce ecosystem benefits throughout the study area.

2.2 Planning Objectives

SLLPIP objectives were developed based on the above-stated problems and opportunities. The objective of the SLLPIP is to optimize the water supply benefit of San Luis Reservoir while reducing additional risks to water users by:

- Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on San Luis Reservoir.

- Increasing the reliability and quantity of yearly allocations to south-of-Delta contractors dependent on San Luis Reservoir.

- Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on San Luis Reservoir without sacrificing accuracy of the allocation forecasts.

The SLLPIP may provide opportunities for ecosystem restoration.

The above objectives distinguish between certainty of meeting deliveries and the reliability of supplies. More specifically, certainty is related to meeting contractors' delivery schedules throughout the year as opposed to reliability, which is increasing yearly allocations to more closely match the contractual entitlements.

The objectives for increased certainty and reliability could lead to conflicts in operations of San Luis Reservoir. These issues are relevant to south-of-Delta contractors dependent on San Luis Reservoir. San Luis Reservoir serves as a storage facility to increase reliability for CVP contractors in the Central Valley. CVP contractors rely on both exports from the Jones Pumping Plant and San Luis Reservoir to meet summer demands. Full exercise of the reservoir helps to maximize CVP supplies, but any constraint in the release of water from San Luis Reservoir could limit supplies. The Jones Pumping Plant does not have enough pumping capacity to fully meet demands alone and CVP operators store additional water in San Luis Reservoir during the winter, when demands are low, to help meet summertime needs. If San Luis Reservoir dropped below the minimum conservation pool during times of high demands, the CVP would not be able to meet those demands and contractors would experience a supply interruption.

The San Felipe Division relies on San Luis Reservoir to receive its CVP allocation. Water supply interruptions are caused by water levels falling below approximately 300 TAF, which triggers water quality concerns in the San Felipe

Division that render the water unusable with existing treatment facilities, or by water levels falling below the minimum conservation pool. If water quality in San Luis Reservoir becomes a problem, then the San Felipe Division will not have useable water supply from CVP with their existing facilities. If water levels in San Luis Reservoir, reach the minimum pool, then the San Felipe Division has no way to access any of its CVP supplies. SBCWD has no access to any other imported water without the CVP supply. In the future, maximizing CVP supplies and changing storage patterns for state contractors might increase the frequency of the low point issue and the risk of supply interruptions to the San Felipe Division.

Avoiding water supply interruptions is a trade-off with increasing water supply reliability. Water supply interruptions are currently avoided because SWP contractors have left water in storage, thus maintaining water levels in San Luis Reservoir above approximately 300 TAF. However, increasing water supply reliability requires the full use of the CVP and SWP water stored in San Luis Reservoir and a corresponding increase in the risk of supply interruptions.

Similarly, announcing higher allocations earlier in the year has some trade-offs with the other two objectives. Announcing higher allocations earlier in the year increases the risk that the Projects may not be able to supply the water that was forecasted – a decrease in water supply reliability. The SLLPIP will attempt to meet these three objectives without having to trade one for the other by developing safety nets to protect against supply interruptions.

2.3 Planning Constraints

Constraints provide limits on the planning process based on institutional, legal, and physical restrictions. Alternatives for the SLLPIP must adhere to the following constraints:

- Regulations: The SLLPIP must follow all relevant Federal, State, and local laws and regulations, including National Environmental Policy Act (NEPA), California Environmental Quality Act (CEQA), the Fish and Wildlife Coordination Action, Clean Air Act, Clean Water Act, Federal and State Endangered Species Acts, and the CVPIA.

- Physical Limitations: The reservoir's capacity is 2.028 MAF. Reclamation manages 47.6 percent of the reservoir's capacity and DWR manages the remaining 52.4 percent

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Chapter 3
Existing and Likely Future “Without Project” Conditions

3.1 Existing Conditions

The following sections briefly describe the existing settings of various environmental resources in the study area. The study area for each resource may differ slightly based on the type of impacts anticipated.

3.1.1 Physical Resources

Hydrology and Water Supply

San Luis Reservoir Historically, the San Luis Reservoir area was tributary to the San Joaquin River. The construction of water supply infrastructure, including Harvey O. Banks Pumping Plant (Banks Pumping Plant), Jones Pumping Plant, San Luis Reservoir, O’Neill Forebay, the Delta-Mendota Canal, and California Aqueduct, has redirected natural runoff in the region to meet the State’s water supply needs. Rainfall in the area mainly occurs from November to April with an average annual precipitation of 18 inches in the upper watershed and 9 inches near O’Neill Forebay (SCVWD 2003b).

San Luis Reservoir has a capacity of 2.028 MAF and is primarily filled with exports from the Delta. Natural inflow into the reservoir is minor, and occurs from Cottonwood Creek, Portuguese Creek, and San Luis Creek and their tributaries. Section 1.4 describes operations of San Luis Reservoir.

San Felipe Division The San Felipe Division has a moderate climate with hot, dry summers and cool, wet winters. Average annual rainfall in the city of San Jose is about 14 inches. Santa Clara County includes all or part of five watersheds south of San Francisco Bay. The Coyote Watershed is the largest covering 322 square (sq.) miles and consists of all the land that drains into Coyote Creek or its 29 tributaries. Other watersheds in the county are the Guadalupe (170 sq. miles), Uvas-Llagas (104 sq. miles), Lower Peninsula (98 sq. miles), and West Valley (85 sq. miles) watersheds (SCVWD Undated). San Benito County is encompassed within the Pajaro River watershed, which is approximately 1,300 sq. miles (SBCWD 2003).

SCVWD supplies water to local water retail agencies that provide water to customers in Santa Clara County. Local runoff, groundwater, water recycling, conservation, and imported water make up SCVWD supplies. SCVWD

manages 10 reservoirs and three interconnected groundwater subbasins. SBCWD supplies include local surface water and groundwater and imported CVP water. SBCWD supplies CVP water to three local water retailers (Sunnyslope County Water District, City of Hollister and Stonegate) and to agricultural customers, and uses it for replenishing groundwater supplies. Groundwater is pumped from the San Benito County portion of the Gilroy-Hollister Groundwater Basin. SBCWD manages three storage reservoirs, Hernandez and Paicines Reservoirs, for local runoff and groundwater recharge, and San Justo Reservoir, for CVP supplies.

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in the San Joaquin Valley. The valley has a semi-arid climate with hot, dry summers and mild winters. Major surface water resources in the San Joaquin Valley are the San Joaquin River and its tributaries, water supply reservoirs and canals, and managed wetlands. The San Luis and Delta-Mendota CVP contractors are on the west side of the San Joaquin River. Reclamation delivers CVP supplies to the contractors from Jones Pumping Plant or San Luis Reservoir via the DMC or San Luis Canal. A network of locally-owned canals and pipelines diverts water from the San Luis Canal and DMC for delivery within the CVP contractors' service areas.

Water Quality

San Luis Reservoir San Luis Reservoir and O'Neill Forebay are within the jurisdiction of the Central Valley Regional Water Quality Control Board (RWQCB). The Central Valley RWQCB Basin Plan identifies beneficial uses for surface water bodies that are critical for maintaining and improving water quality. Beneficial uses of San Luis Reservoir and O'Neill Forebay water are agricultural, municipal, and industrial water supply, recreation uses, and fish and wildlife enhancement.

During the summer months, especially in the late summer, San Luis Reservoir's water quality suffers from algal growth. Algae grow at the reservoir's surface and extend to average depths of 30 feet. If algae enter the intake facilities, they can clog filters, disrupting the treatment process and deliveries. Algae also cause taste and odor problems in drinking water.

Algae naturally occur in surface waters as single cells or groups of cells. Algae are more common in water rich with nutrients, primarily nitrogen and phosphorus. The algae blooms are photosynthetic and need light to grow. When light, temperature, and nutrient levels (a low nitrogen to phosphorus ratio) are conducive, algae growth accelerates and the algae multiply into blooms. This typically occurs in the warmer months. Algae can move vertically in the water column to take advantage of optimum light and nutrient conditions; therefore, they may not always be seen at the surface.

San Felipe Division Santa Clara County is within the jurisdiction of the San Francisco Bay RWQCB. According to the San Francisco Bay RWQCB Basin

Plan, the beneficial uses of Santa Clara County water are municipal and domestic supply, agricultural supply, industrial process supply, groundwater recharge, recreation, and fish and wildlife habitat. San Benito County is within the jurisdiction of the Central Coast RWQCB.

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors also lie within the San Joaquin River Basin and are under the jurisdiction of the Central Valley RWQCB. The Basin Plan for the Sacramento River and San Joaquin River Basins lists the beneficial uses for the San Joaquin River Basin as domestic, municipal, agricultural and industrial supply, power generation, recreational uses, navigation, and preservation and enhancement of fish and wildlife.

Factors affecting water quality in the San Joaquin River Basin include the upstream development of Friant Dam and dams on other tributaries, natural runoff, agricultural return flows, urbanization, recreation, construction, grazing, logging, and operations of flow-regulating facilities. The application of irrigated water in the western portion of the San Joaquin Valley has increased the leaching of minerals from soils, increasing salts and trace elements (selenium, molybdenum, arsenic, and boron) in the groundwater, streams, and the San Joaquin River (Reclamation 2005b).

Groundwater

San Luis Reservoir The area west of B.F. Sisk Dam does not overlie any groundwater aquifers because the bedrock underlying the area is highly consolidated. Some groundwater can be found in fractures and joints of the bedrock and yield is limited to the size, location, orientation, interconnection between the fractures, and recharge potential (SCVWD 2003b). The Delta-Mendota Subbasin of the San Joaquin Valley Groundwater Basin underlies the area east of San Luis Reservoir. Natural recharge in the subbasin is estimated to be 8 TAF and applied recharge is about 74 TAF. Annual urban extractions are estimated to be about 71 TAF and agricultural extractions are estimated to be 491 TAF (DWR 2003).

Water quality in the subbasin is influenced by geologic materials. Water within the shallowest 10 feet of most of the subbasin is typically saline. The subbasin also has some localized areas with high iron, fluoride, nitrate, and boron (DWR 2003).

San Felipe Division SCVWD uses groundwater from the Santa Clara Valley subbasin, the Coyote subbasin, and the Llagas subbasin. The Santa Clara Valley subbasin, in the northern part of the county, is bounded by the Diablo Range and Santa Cruz Mountains. Natural recharge in an average year in the Santa Clara subbasin is about 32 TAF. SCVWD artificially recharges the subbasin through stream channels in the alluvial plane upstream of the confined zone and off-stream percolation ponds. SCVWD estimated that artificial recharge into the subbasin in 2004 was about 67 TAF. SCVWD estimates that the operation long-

term storage capacity of the subbasin is 350 TAF and withdrawals should not exceed 200 TAF a year because of subsidence concerns (SCVWD 2005a).

SCVWD estimates that average annual natural recharge is about 2,600 AF in the Coyote subbasin and about 19 TAF in the Llagas subbasin. Recharge of locally conserved and imported water into the Coyote and Llagas subbasins is about 31 TAF per year (SCVWD 2005a). Table 3-1 shows groundwater pumping in all three subbasins for 1999–2004.

Table 3-1. Historical Groundwater Pumping in Santa Clara County

Year	Subbasin			Total (AF)
	Coyote	Llagas	Santa Clara Valley	
1999	8,387	45,198	106,805	160,390
2000	7,894	44,285	112,647	164,826
2001	6,892	47,052	115,358	169,302
2002	6,721	44,602	104,659	155,982
2003	6,796	41,616	96,485	144,897
S 2004	7,290	45,876	105,715	158,881

S
Source: *SCVWD 2005a*
Key: AF= Acre feet

In general, groundwater quality in SCVWD subbasins is very good; the groundwater can be delivered to customers almost always without treatment. In some areas, elevated nitrate concentrations have been found.

San Benito County overlays the southern portion of the Gilroy-Hollister groundwater basin. The groundwater storage capacity of the San Benito County portion of the basin is approximately 500 TAF within 200 feet of the ground surface (SBCWD 2003). The average annual safe groundwater yield is estimated to be approximately 54 TAF (SBCWD 2003). Groundwater levels have been relatively stable from 1999–2004 and storage increased under the wetter conditions in 2005. Total groundwater pumping in 2006 was about 19 TAF: 12 TAF for agricultural uses and 7,304 AF for M&I uses.

Groundwater quality in SBCWD is marginally acceptable for potable and irrigation supplies. Water quality constituents of concern include salinity, sodium, chloride, sulfate, nitrate, boron, arsenic, hardness and trace elements (SBCWD 2003).

San Luis and Delta-Mendota CVP Contractors The San Luis Unit CVP contractors overlie the westside subbasin of the San Joaquin Valley Groundwater Basin. The westside subbasin consists mainly of Westlands Water District lands. The westside subbasin contains an upper and lower aquifer separated by a layer of Corcoran Clay. Available storage is estimated to be 6 MAF (DWR 2006). Recharge into the basin occurs through seepage of Coast Range streams and deep percolation of agricultural irrigation.

The amount of groundwater pumped generally depends on the CVP allocation. From 1995 to 1999, CVP deliveries to Westlands Water District averaged 91 percent, which decreased groundwater pumping and allowed the groundwater surface elevation to increase 116 feet. In contrast, from 2000–2004, CVP deliveries averaged 65 percent, and groundwater surface elevations fell 41 feet. Groundwater levels would have decreased further if the district had not participated in water transfers. Table 3-2 shows Westlands Water District groundwater pumping from 1995–2005.

Table 3-2. Westlands Water District Groundwater Pumping

Crop Year	Pumping AF	Elevation feet	Elevation Change feet
1995	150,000	27	78
1996	50,000	49	22
1997	30,000	63	14
1998	15,000	63	0
1999	20,000	65	2
2000	225,000	43	-22
2001	215,000	25	-18
2002	205,000	22	-3
2003	160,000	30	8
2004	210,000	24	-6
2005	75,000	56	32

Source: *Westlands Water District 2006*
Key: AF= Acre feet

Groundwater quality in the Westside subbasin is generally poor. The groundwater is high in dissolved solids, averaging 500 parts per million (ppm) with a range of 64 ppm to 10,700 ppm (Reclamation 2005a). Dissolved solids concentrations typically decrease with depth; the lower confined zone has less dissolved solids. Calcium, magnesium, sodium, bicarbonates, selenium, sulfate, and chlorides are also present.

Geology, Soils, and Seismicity

San Luis Reservoir San Luis Reservoir is in the foothills of the Diablo Range, which is the easternmost principal uplift of the central Coast Ranges. The Diablo Range has a rugged topography, with areas in excess of 1,000 feet in elevation in the area of San Luis Reservoir. Most soils in the area are loam or clay textured and range from shallow to deep and slowly to moderately permeable. San Luis Reservoir is in a seismically active area. The Ortigalita Fault has multiple segments and studies have agreed that two segments run under the reservoir. The recurrence interval for larger magnitude events on the Origalita Fault is from 2,000 to 5,000 years on the entire fault and 10,000 to 25,000 years on individual segments. The Calaveras and San Andreas Faults are 23 and 28 miles away, respectively (SCVWD 2003b).

San Felipe Division Santa Clara County consists of the Santa Clara Valley and lies at the southern end of San Francisco Bay, at the base of the Diablo Range, which is an uplifted mass of Mesozoic sedimentary rock. The Santa Clara Valley is characterized as a basin filled with Cenozoic sediments; the

valley floor contains alluvial fan and flood plain deposits of the late Quaternary (SCVWD 2007). The Calaveras Fault runs lengthwise through the middle of Santa Clara County. The Hayward Fault is to the west of the Calaveras Fault, and terminates about halfway through the County. The Sargent Fault is in the southwestern portion of the County. The San Andreas Fault runs along the western border of Santa Clara County.

San Benito County includes the Hollister and San Juan Valleys, which are bounded by the Diablo and Gabilan mountain ranges. The valley floor is underlain by young, unconsolidated deposits, including Quaternary alluvium and terrace deposits. The San Andreas Fault runs diagonally through San Benito County, with the northern portion of the fault lying east of Aromas and San Juan Batista. The Calaveras Fault enters San Benito County at San Felipe Lake and terminates south of Hollister. The Quin Sabe/Ausaymas Fault Zone is east of the Calaveras Fault (SBCWD 2003).

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in the San Joaquin Valley. The San Joaquin Valley floor consists of several geomorphic land types including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. The alluvial sediments on the western and southern parts tend to have lower permeability than the eastside deposits. In the valley trough lay fine-grained deposits. The San Joaquin Valley also has lakebed deposits, mainly comprising the Corcoran Clay member. Subsidence is problematic in the western San Joaquin Valley due to shallow groundwater elevations and compaction of the soil interstitial spaces that had once been filled with groundwater (Reclamation 2005b). There are no fault lines within the San Joaquin Valley.

Air Quality

San Luis Reservoir San Luis Reservoir is subject to frequent, strong wind primarily because of its proximity to the Pacheco Pass, which is a wind gap in the Diablo Range between the San Joaquin and Santa Clara Valleys. The strongest winds occur in the summer months when the Diablo Range acts as a barrier between the western cool, moist air and the eastern hot, dry air. Winds are westerly with maximum speeds of about 30 to 40 miles per hour.

San Luis Reservoir is in the western portion of the San Joaquin Valley Air Basin, which includes Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, and part of Kern Counties. The San Joaquin Valley Air Basin is in nonattainment status for particulate matter with a diameter less than 10 micrometers (PM10) and ozone emissions as defined by State and Federal ambient air quality standards. The monitoring stations nearest to the reservoir are in Gilroy, Merced, and Turlock, and are affected by agricultural and industrial activities. The area surrounding San Luis Reservoir is largely rural and has few pollutant sources; therefore, the immediate area has lower pollutant

concentrations, which are likely lower than State and Federal air quality standards (SCVWD 2003b).

San Felipe Division Santa Clara County is in the San Francisco Bay Area Air Basin, which also includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and portions of Solano and Sonoma Counties. The region’s summer climate is dominated by a semi-permanent high pressure system centered over the northeastern Pacific Ocean that results in few storms and steady northwest winds. In the winter, the high pressure system weakens, storms are frequent, temperature inversions are weak or nonexistent, and winds are moderate. The potential for air pollution is generally low. According to Federal standards, the San Francisco Bay Area Air Basin has a nonattainment status for ozone and an attainment status for PM10 emissions. According to California ozone and PM10 standards, the basin is designated a nonattainment area (California Air Resources Board 2006).

San Benito County is in the North Central Coast Air Basin, which also includes Santa Cruz and Monterey Counties. Like the Bay Area Air Basin, the North Central Coast Air Basin is subject to a semi-permanent high pressure system in the Pacific Ocean. In the fall, winds become weak and pollutants can accumulate. According to Federal standards, the North Central Coast Air Basin has an unclassified/attainment status for ozone and an unclassified status for PM10 emissions. According to California ozone and PM10 standards, the basin is designated a nonattainment area (California Air Resources Board 2006).

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in the San Joaquin Valley Air Basin. During the summer in the San Joaquin Valley Air Basin, the Pacific high-pressure system moves north, and no precipitation or major storms occur, creating daily inversion layers of cool air over warm air. Surrounding mountains and upper watersheds of the region are at higher elevations than summer inversion layers. As a result, the region is highly susceptible to pollutant accumulation over time.

Most of the CVP contractors’ service area supports agricultural land uses. Crop cycles, including land preparation and harvest, contribute to pollutant emissions, primarily particulate matter. Groundwater pumping with diesel engines also emits air pollutants through exhaust. The primary pollutants emitted by diesel pumps are nitrogen oxide, total organic carbons, carbon monoxide, and particulates; nitrogen oxide is considered an ozone precursor. By state standards, the San Joaquin Valley Air Basin is in severe nonattainment for ozone and nonattainment for PM10 emissions (California Air Resources Board 2006).

Land Use

San Luis Reservoir San Luis Reservoir is part of the San Luis Reservoir State Recreation Area (SRA), which is operated by California Department of Parks and Recreation (DPR). The SRA also includes O'Neill Forebay, Los Banos Creek Reservoir, San Luis Wildlife Area, and O'Neill Forebay Wildlife Area. State parks near the SRA are Pacheco State Park, Henry Coe State Park and Great Valley Grassland State Park. Reclamation owns the land of the San Luis Reservoir SRA, which is over 27,000 acres (Reclamation and DPR 2005). DPR maintains and operates the land for recreational purposes. Reclamation also set aside lands of the San Luis Wildlife Area and O'Neill Forebay Wildlife Area for wildlife preservation and mitigation, which is managed by California Department of Fish and Game (DFG).

San Felipe Division Santa Clara County is in the South San Francisco Bay Area. The northern part of the county is highly urban, home to the major cities of San Jose, Santa Clara, Mountain View, and Sunnyvale. The southern part is more rural, except for the growing cities of Gilroy and Morgan Hill. Pasture is the main agricultural land use within the county. Crops include bell peppers, lettuce and grapes. In 2004, of the 835,226 acres mapped in Santa Clara County, 427,392 were in agricultural use, 187,176 acres were urbanized, 8,452 acres were water, and 212,206 acres were "other." Of the agricultural land, 38,746 acres were classified as "important farmland" (California Department of Conservation 2006).

Irrigated agriculture, rangeland, and pasture are the primary land uses in San Benito County. Row crops and orchards are typically grown in the valley, while rangeland pasture is dominant in the foothill area. Primary row crops include lettuce, bell peppers, onions, celery, and broccoli and primary orchards are apples and walnuts. Hollister and San Juan Bautista are the only incorporated cities in San Benito County. In 2004, of the 889,391 acres mapped in San Benito County, 675,180 were in agricultural use, 7,644 acres were urbanized, 1,140 acres were water, and 205,427 acres were "other." Of the agricultural land, 71,563 acres were classified as "important farmland" (California Department of Conservation 2006).

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in western Stanislaus, Merced, Fresno, San Joaquin and King Counties. Agriculture is the primary land use in the service areas. Table 3-3 lists the land uses in Stanislaus County. Of the agricultural land, 376,003 acres were classified as "important farmland." Stanislaus County supports livestock production including chickens and cattle. Major crops in the county are corn silage, almonds, and walnuts. Stanislaus County has 9 incorporated cities, including Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford.

Table 3-3. San Luis and Delta-Mendota CVP Contractors – Land Use

County	Total Acres	Agriculture	Urban	Water	Other
Stanislaus	869,338	750,513	61,171	5,596	52,058
Merced	1,261,420	1,162,954	34,943	16,970	46,547
Fresno	2,441,616	2,225,797	110,897	4,911	100,011
San Joaquin	912,602	771,768	83,409	11,648	45,777
Kings	890,782	840,650	30,768	66	19,298

Source: Department of Conservation 2006

Table 3-3 lists the land uses in Merced County. Of the agricultural land, 589,324 acres were classified as "important farmland." Merced County supports livestock production including chickens and cattle. Major crops in the county are almonds, silage, and alfalfa. Merced County has 6 incorporated cities: Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced.

Over 2 million acres in Fresno County are in agriculture (Table 3-3). Of the agricultural land, 1,391,544 acres were classified as "important farmland." Major crops in the county are grapes, almonds, tomatoes, and cotton. Fresno County also produces cattle, calves, and milk. Fresno County has 15 incorporated cities: Clovis, Coalinga, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, Sanger, San Joaquin, and Selma.

In San Joaquin County 624,115 of the 771,768 acres of agriculture land are classified as "important farmland." Major crops produced in San Joaquin County are grapes, alfalfa, corn, almonds, tomatoes and walnuts. Table 3-3 lists the land uses in San Joaquin County. San Joaquin County has 7 incorporated cities: Escalon, Lathrop, Lodi, Manteca, Ripon, Stockton, and Tracy.

Within Kings County, 607,157 acres of the agricultural land (Table 3-3) were classified as "important farmland." Major crops in the county are cotton, alfalfa, and tomatoes. Kings County also supports cattle and calves. Kings County has 4 incorporated cities: Avenal, Concoran, Hanford, and Lemoore.

3.1.2 Biological Resources

Fisheries

San Luis Reservoir Because San Luis Reservoir is an off-stream facility, there is no natural fishery. Fish species in the reservoir have either been directly introduced or transported via the California Aqueduct and Delta-Mendota Canal. Although there are fish screens at the CVP and SWP pumps, fish eggs, larvae, small juveniles, and invertebrates can pass through the screen and be transported to San Luis Reservoir. Species found in the reservoir include black crappie, brown bullhead, carp, channel catfish, Chinook salmon, green sunfish, hitch, largemouth bass, prickly sculpin, Sacramento blackfish, Sacramento perch, Sacramento splittail, spotted bass, starry flounder, striped bass,

Sacramento sucker, threadfin shad, wakasagi, and white catfish (SCVWD 2003b).

San Felipe Division Many rivers and streams provide habitat for fish (e.g., steelhead trout and Chinook salmon) within Santa Clara County, including the Guadalupe River, Coyote Creek, Stevens Creek, and Penitencia Creek. The Fisheries and Aquatic Habitat Collective Effort is a collaborative agreement between the SCVWD, and several local, State, and Federal agencies that aims to improve and maintain habitat in three water bodies (Coyote Creek, Guadalupe River, and Stevens Creek) while guaranteeing water for the water district.

The San Benito River, Pajaro River, Pacheco Creek and other nearby streams provide habitat for several fish species, including steelhead, Monterey roach, speckled dace, Sacramento sucker, and mosquitofish (SBCWD 2003). The Steelhead south/central California evolutionarily significant unit has a Federally Threatened and California Special Species of Concern status and could occur in San Benito County. Although its distribution in San Benito County is poorly known, this fish species may occur in any tributary of the Pajaro River that is unobstructed.

San Luis and Delta-Mendota CVP Contractors The primary land use in the San Luis and Delta-Mendota CVP contractors study area is agricultural; the San Joaquin River crosses Fresno County and supports the San Joaquin Trout Hatchery.

Vegetation and Wildlife

San Luis Reservoir The major habitats within the San Luis Reservoir study area consist of lacustrine, annual grassland, valley foothill riparian, freshwater emergent wetland, and blue oak woodland. Lacustrine and annual grassland are the dominant habitats. Appendix A includes a list of plant and wildlife species in the habitats.

Lacustrine habitat makes up the majority of the San Luis Reservoir basin. During the wet season, the San Luis Reservoir is inundated, but during the spring and summer months when water levels are withdrawn, 15–30 vertical meters of substrate become exposed along its banks. Many species thrive and form a wetland habitat when the water levels recede during these months. The lower portions of the exposed reservoir substrate are lush with hydrophytes such as barnyard grass, bulrush, Mexican sprangletop, and water smartweed. Red willow (Salix laevigata) forms stands along the bottoms of the exposed reservoir and often spreads to the high water line.

Annual grassland forms the major terrestrial habitat in the San Luis Reservoir basin. Most grassland areas have not been grazed recently and are dominated by tall annual grasses interspersed with shrubs and forbs. The dominant grassland species are wild oats (Avenna spp.), soft chess brome (Bromus hordeaceus), and

ripgut brome (Bromus diandrus). Other common grassland plants include common forbs and shrubs such as lupine and buckwheat.

San Felipe Division The SCVWD service area includes four habitat/vegetation types: baylands, freshwater, grassland/savannah and chaparral/forest (SCVWD 2007). DFG’s Natural Diversity Data Base lists 39 “special plant species, subspecies or varieties” known to occur within Santa Clara County. Permanent and seasonal populations of wildlife species exist in the diverse habitat types and relatively undeveloped upper watersheds and baylands (SCVWD 2007). The Coyote Watershed (excluding the most northern area), Uvas/Llagas Watershed, and Pacheco Watershed contain diverse natural community types, including a variety of grasslands, serpentine, oak woodlands, mixed riparian forests, scrub/chaparral, marshes and other aquatic areas. Appendix A contains a preliminary list of the natural communities and covered species typically found in these communities.

In San Benito County, habitats include developed, annual grassland, coastal oak woodland, valley oak woodland, coastal scrub, riverine, valley foothill riparian, and freshwater emergent wetland. Primary land uses in San Benito County include agricultural lands and the urban areas of Hollister and San Juan Bautista. Grasslands occur mostly throughout the foothills above the valley floor areas, the hills southwest and east of Hollister. Coastal oak woodlands consist predominantly of coast live oak in addition to valley oak, blue oak, and foothill pine. Coastal scrub typically includes coyote brush, lupines, California sagebrush, and California lilac. The riverine habitat in San Benito County comprises the bed and banks of the San Benito and Pajaro Rivers, Tres Pinos Creek, Santa Ana Creek, Arroyo Dos Picachos, Arroyo de la Viboras, and Pacheco Creek. The amount of vegetation along any of these river corridors is dependent upon current land uses, topography, and changes in hydrology. Appendix A includes a list of plant and wildlife species in the habitats.

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in western Stanislaus, Merced, Fresno, San Joaquin and King Counties. The majority of the land is used for agriculture, with vegetation dominated by cereal rye, barley, wheat, milo, corn, dry beans, safflower, alfalfa, cotton, tomatoes, lettuce, Bermuda grass, ryegrass, tall fescue, almonds, walnuts, peaches, plums, grapes, and other fruits and vegetables. This list of crops is only a subset of the total crops grown in these areas. Most of the crops are annuals, which are planted in spring and harvested during summer or fall. Wheat and other dryland grains are planted in the fall and harvested in the late spring or early summer. Sugar beets can be harvested in the spring as well.

Wildlife use of these areas depends upon the growing season along with crop type, level of disturbance, and available cover. These upland crop fields provide foraging habitat for a variety of birds and rodents, as shown in Appendix A.

Many of these species feed on crops and other invertebrates found in the fields. The irrigation ditches along the upland cropland may contain wetland vegetation such as cattails, which provides habitat for some birds.

3.1.3 Social Resources

Cultural Resources

San Luis Reservoir In the later pre-historic and early historic times, the Northern Valley Yokuts, part of the larger Yokut Indian group, occupied the San Luis Reservoir and O'Neill Forebay area. Evidence also shows that the Costanoan of the Ohlone had a strong influence on the Yokut in the San Luis area because of the passage through the Pacheco Pass, which facilitated trade of goods and cultural traits. Population estimates of the Northern Valley Yokuts range from 11,000 to 31,000. They mainly inhabited areas around waterways and on the eastern side of the San Joaquin River. The Northern Valley Yokuts had first contact with the Europeans in the early 1800s when Spanish explorers came to the Delta region. European diseases were a primary factor in the decline of the native tribes (SCVWD 2003b).

A total of 49 historic and prehistoric sites have been identified within the San Luis Reservoir SRA. Many of the sites have been destroyed by construction of the dam or are inundated part of the year by San Luis Reservoir. Most of the sites at San Luis Reservoir are prehistoric (Reclamation and DPR 2005). No thorough archeological study of the reservoir has been performed, so additional potential historical resources may be undocumented.

San Felipe Division The Castanoan Indians, or Ohlone, occupied Hollister, San Juan, and Santa Clara Valleys. The Ohlones extended from the San Francisco coast south past Carmel and about 60 miles inland. The Ohlone were hunter-gatherers and relied on acorns and seafood. The Ohlone population has been estimated at around 10,000, but declined to below 2,000 when the first mission was established and settlers brought diseases.

Santa Clara and San Benito counties have over 100 places listed on the National Register of Historic Places or as California Historic Landmarks. Place are listed for their historic significance related to architecture/engineering, people, events, or information potential (National Park Service 2006).

San Luis and Delta-Mendota CVP Contractors The Northern Valley and Southern Valley Yokuts occupied the area in the San Luis Unit. The Yokuts extended from the crest of the Coast Diablo easterly into the foothills of the Sierra Nevada, north to the American River in the case of the Northern Valley Yokuts, and south to Buena Vista and Kern Lakes at the southernmost end of the Great Central Valley in the case of the Southern Valley Yokuts. The Yokuts were hunters and gathers with deer, acorn, avian, and aquatic resources as their primary staples.

Merced, Stanislaus, Kings, San Joaquin, and Fresno Counties have about 110 places listed on the National Register of Historic Places or as California Historic Landmarks. Most are listed for architectural and engineering significance (National Park Service 2006).

Recreation

San Luis Reservoir San Luis Reservoir offers multiple recreation opportunities including boating, water skiing, fishing, hiking, camping, and picnicking. The San Luis SRA has 192 individual camp sites, 3 group camp sites, and 155 picnic sites. The Basalt Area and San Luis Creek Area are the most popular sites (Reclamation and DPR 2005). The SRA is open year round.

The reservoir has 65 miles of shoreline with two boat ramps: one at the Basalt Area at the southwest portion of the reservoir, and one at Dinosaur Point at the northwestern portion of the reservoir. Power boats, ski boats, and fishing boats are allowed from sunrise to sunset. Both boat ramps are accessible above a water elevation of 340 feet. Peak usage occurs in November at the Basalt boat ramp and in February at the Dinosaur Point boat ramp (SCVWD 2003b). Fish commonly caught in San Luis Reservoir include largemouth black bass, striped bass, crappies, bluegill, shad, and perch. There are no designated beaches or swimming areas at San Luis Reservoir, but O'Neill Forebay has popular swimming areas, in addition to boating, fishing, and camping opportunities.

San Felipe Division Santa Clara County has 28 county parks that offer a variety of recreational activities, including hiking, boating, fishing, picnicking, swimming, and biking. County parks do not allow swimming and wading. Anderson Lake County Park surrounds the county's largest reservoir. The park offers water-based recreation, including power and non-power boating, fishing, and use of personal watercraft. Non-water recreation includes picnicking, hiking, running, cycling, skating, and horseback riding (County of Santa Clara Department of Parks and Recreation 2006). San Benito County recreation sites include San Justo Reservoir and the Pinnacles National Monument. At the reservoir, activities include boating, fishing, and windsurfing, as well as mountain biking and hiking. The Pinnacles Monument is a day-use park that provides over 30 miles of hiking trails. The park encompasses 24,000 acres and is home to a variety of spring wildflowers and wildlife (SBCWD 2003b).

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP service area is primarily agricultural and does not offer many recreational opportunities. The San Luis and Merced National Wildlife Refuges provide some wildlife viewing and nature walking activities.

Socioeconomics

San Luis Reservoir The San Luis Reservoir SRA is a popular recreation facility in Merced County. In Fiscal Year (FY) 2005/2006, annual visitation was 449,154, which generated total revenues of $592,480 (DPR 2006). Of total visitation, paid day use attendance was 372,166; free day use attendance was

44,104; and camping attendance was 32,884 (DPR 2006). The closest cities to the reservoir are Gustine, approximately 15 miles northeast, and Los Banos, approximately 12 miles east.

San Felipe Division In 2006, Santa Clara County had a population of 1,773,258. Santa Clara population is projected to be 2,152,963 by 2030 (DOF 2006). In 2004, total industry earnings were over $84 billion in Santa Clara County. Professional and technical services made up the largest industry, with over $14 billion in earnings (Bureau of Economic Analysis [BEA] 2006). In 2005, Santa Clara County was ranked 29th in California for total value of agricultural production, at about $250 million. The top commodities in 2005 in terms of value of production were nursery crops, mushrooms, bell peppers, flowers, and steers and heifers (California Agricultural Commission [CAC] 2006). In 2005, Santa Clara County had an unemployment rate of 5.5 percent (California Employment Development Department [EDD] 2006). Manufacturing and professional and business services were the largest employers, employing 19.7 and 19.4 percent of total industry employment, respectively (EDD 2006). Transportation, trade, and utilities (15.0 percent), educational and health services (11.0 percent), and government enterprise (10.8 percent) were also large employers (EDD 2006).

In 2006, San Benito County had a population of 57,627. By 2030, San Benito County population is projected to be 84,727 (DOF 2006). In 2005, San Benito County had an unemployment rate of 7.9 percent (EDD 2006). Government enterprise and agriculture were the largest employers, employing 18.3 and 16.4 percent, respectively. Trade, transportation, and utilities (15.8 percent), manufacturing (15.8 percent), and natural resources, mining, and construction (10.7 percent) were also large employers (EDD 2006). In 2004, total industry earnings were over $937 million in Santa Benito County (BEA 2006). In 2005, San Benito County was ranked 28th in California for total value of agricultural production, at about $269 million. The top commodities in 2005 in terms of value of production were lettuce, nursery stock, vegetable and row crops, wine grapes, and bell peppers (CAC 2006).

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are in the counties of Merced, Fresno, Kings, San Joaquin and western Stanislaus. In 2006, Merced County had a population of 246,751. Merced County population is projected to be 437,880 by 2030 (DOF 2006). In 2004, total industry earnings were over $3.6 billion in Merced County (BEA 2006). In 2005, Merced County was ranked fifth in California for total value of agricultural production, at about $2.4 billion. The top commodities in 2005 in terms of value of production were milk, chickens, almonds, and cattle and calves (CAC 2006). In 2005, Merced County had an unemployment rate of 9.3 percent (EDD 2006). Government enterprise and manufacturing were the largest employers, employing 20.4 and 16.2 percent of total industry employment, respectively (EDD 2006). Transportation, trade, and utilities

(15.9 percent) and agriculture (15.6 percent) were also large employers (EDD 2006).

In 2006, Fresno County had a population of 899,514. Fresno County population is projected to be 1,297,476 by 2030 (DOF 2006). In 2004, total industry earnings were over $16.7 billion in Fresno County (BEA 2006). In 2005, Fresno County ranked first in California for total value of agricultural production, at about $4.6 billion. The top commodities in 2005 in terms of value of production were grapes, almonds, milk, tomatoes, and cattle and calves (CAC 2006). In 2005, Fresno County had an unemployment rate of 9.0 percent (EDD 2006). Government enterprise and trade, transportation, and utilities were the largest employers, employing 20.6 and 17.2 percent of total employment, respectively (EDD 2006). Educational and health services (11.1 percent), professional and business services (8.6 percent), and manufacturing (7.9 percent) were also large employers (EDD 2006).

Kings County had a population of 147,729 in 2006. Kings County population is projected to be 223,767 by 2030 (DOF 2006). In 2004, total industry earnings were over $2.3 billion in Kings County (BEA 2006). In 2005, Kings County ranked ninth in California for total value of agricultural production, at about $1.4 billion. The top commodities in 2005 in terms of value of production were milk, cotton, cattle and calves, pistachios and alfalfa (CAC 2006). In 2005, Fresno County had an unemployment rate of 9.0 percent (EDD 2006). In 2005, the unemployment rate in Kings County was 9.4 percent (EDD 2006). Government enterprise was the largest employer, employing 33.7 percent of total industry employment. Trade, transportation and utilities (14.0 percent), educational and health services (9.5 percent), and manufacturing (7.1 percent) were also large employers.

San Joaquin County had a population of 674,323 in 2006. In 2030, the population of San Joaquin County is projected to be 1,229,757 (DOF 2004). In 2004, total industry earnings were over $11 billion in San Joaquin County and the county ranked seventh in California for total value of agricultural production, at (BEA 2006). In 2005, San Joaquin County had an unemployment rate of 7.6 percent (EDD 2006). The top commodities in terms of value of production were milk, grapes, almonds, tomatoes and walnuts (CAC 2006). Trade, transportation and utilities, and government enterprise were the largest employers, employing 22.2 and 18.0 percent, respectively (EDD 2006). Educational and health services (11.6 percent) and manufacturing (9.4 percent) were also large employers.

Stanislaus County had a population of 514,370 in 2006. In 2030, the population of Stanislaus County is projected to be 744,599 (DOF 2004). In 2004, total industry earnings were over $8.9 billion in Stanislaus County (BEA 2006). In 2005, Stanislaus County ranked sixth in California for total value of agricultural production, at about $2.0 billion. The top commodities in 2005 in terms of value

of production were milk, almonds, cattle and calves, chickens, and walnuts (CAC 2006). In 2005, Stanislaus County had an unemployment rate of 8.3 percent (EDD 2006). Trade, transportation and utilities, and government enterprise were the largest employers, employing 20.3 and 15.4 percent, respectively (EDD 2006). Manufacturing (12.0 percent) and educational and health services (11.3 percent) were also large employers.

Environmental Justice

Environmental justice refers to equitable rights to healthy environmental conditions for poor and minority populations relative to other populations.

San Luis Reservoir San Luis Reservoir is in Merced County. Environmental justice background for Merced County is described below for the San Luis and Delta-Mendota contractors.

San Felipe Division In 2003, 145,624 (8.8 percent) of the population in Santa Clara County was estimated to be below the poverty threshold. The county's median household income in 2003 was $68,167 (U.S. Census Bureau [USCB] 2006). In 2004, the majority of Santa Clara County residents were white, about 43 percent of total residents. About 26 percent of the county's population was Asian and 25 percent was Hispanic. Table 3-4 summarizes the 2004 estimates of population by race in Santa Clara County.

In 2003, 5,152 (9.2 percent) of the population in San Benito County was estimated to be below the poverty threshold. The county's median household income in 2003 was $56,391 (USCB 2006). In 2004, the majority of San Benito County residents were Hispanic, about 52 percent of total residents. About 43 percent of the county's population was white. Table 3-4 summarizes the 2004 estimates of population by race in San Benito County.

Table 3-4. 2004 Estimates of Population by Race in Santa Clara and San Benito Counties

	Santa Clara	% of Total	San Benito	% of Total
Total Population	1,743,584	100.00%	57,246	100.00%
White	749,142	42.97%	24,387	42.60%
Black	46,501	2.67%	558	0.97%
American Indian	6,377	0.37%	351	0.61%
Asian	463,268	26.57%	1,390	2.43%
Pacific Islander	7,787	0.45%	84	0.15%
Multirace	37,746	2.16%	820	1.43%
Hispanic	432,763	24.82%	29,656	51.80%

Source: *California Department of Finance 2006*
Key: % = Percent

San Luis and Delta-Mendota CVP Contractors The San Luis and Delta-Mendota CVP contractors are within the counties of Fresno, Merced, Kings, San Joaquin and western Stanislaus. In 2003, 42,463 (18.2 percent) of the population in Merced County was estimated to be below the poverty threshold. The county's median household income in 2003 was $36,738; California's

median household income was $48,440 (USCB 2006). In 2004, the majority of Merced County residents were Hispanic, about 52 percent of total residents. About 37 percent of the county's population was white. Table 3-5 summarizes the 2004 estimates of population by race in Merced County.

In 2003, 20.6 percent of the population in Fresno County was estimated to be below the poverty threshold. The county's median household income in 2003 was $35,952 (USCB 2006). In 2005, the majority of Fresno County residents were Hispanic, about 46.9 percent of total residents. About 37.1 percent of the county's population was white. Table 3-5 summarizes the 2004 estimates of population by race in Fresno County.

In 2003, 18.2 percent of the population in Kings County was estimated to be below the poverty threshold. The county's median household income in 2003 was $36,105 (USCB 2006). In 2005, the majority of Kings County residents were Hispanic, about 47 percent of total residents. About 39.7 percent of the county's population was white. Table 3-5 summarizes the 2004 estimates of population by race in Kings County.

In 2003, 14.7 percent of the population in San Joaquin County was estimated to be below the poverty threshold. The county's median household income in 2003 was $42,749 (USCB 2006). In 2005, the majority of San Joaquin County residents were white, about 41 percent of total residents. About 34.7 percent of the county's population was Hispanic. Table 3-5 summarizes the 2004 estimates of population by race in San Joaquin County.

In 2003, 14.2 percent of the population in Stanislaus County was estimated to be below the poverty threshold. The county's median household income in 2003 was $41,524 (USCB 2006). In 2004, the majority of Stanislaus County residents were white, about 51.8 percent of total residents. About 37.6 percent of the county's population was Hispanic. Table 3-5 summarizes the 2004 estimates of population by race in Stanislaus County.

Table 3-5. 2004 Estimates of Population by Race in Fresno, Kings, and Stanislaus Counties

	Merced	% of Total	Fresno	% of Total	Kings	% of Total	San Joaquin	% of Total	Stanislaus	% of Total
Total Population	238,454	100%	875,973	100%	143,925	100%	664,116	100%	500,154	100%
White	88,130	36.90%	325,448	37.20%	59,550	41.30%	272,288	41.00%	260,457	52.10%
Black	6,955	2.90%	43,191	4.90%	11,441	7.90%	52,465	7.90%	12,171	2.40%
American Indian	1,242	0.52%	6,911	0.79%	1,358	0.94%	8,634	1.30%	4,032	0.81%
Asian	14,459	6.10%	77,668	8.90%	3,864	2.70%	91,648	13.80%	23,158	4.60%
Pacific Islander	293	0.12%	703	0.08%	195	0.14%	3,321	0.50%	1,668	0.33%
Multirace	3,595	1.50%	11,364	1.3%	1,998	1.40%	22,580	3.40%	9,693	1.90%
Hispanic	123,780	51.90%	410,688	46.90%	65,519	45.60%	230,448	34.70%	188,975	37.80%

Source: *California Department of Finance 2006*
Key: % = Percent

Visual and Aesthetic Resources

San Luis Reservoir San Luis Reservoir is in the grassy foothills of the Diablo Range in western San Joaquin Valley near historic Pacheco Pass. The reservoir can be viewed while traveling west on State Route (SR) 152 off of Interstate 5 in Merced County. The reservoir is a significant visual feature in the regional landscape as the water and shoreline contrast sharply with the rolling hills. Visual quality of the lake is the greatest during the winter when water levels are high. In the summer, the drawdown in the reservoir creates a "bath tub ring," which deteriorates visual quality.

The area surrounding the reservoir is a pastoral landscape of annual grassland, valley foothill riparian, and blue oak woodland. Wildflowers can be viewed in the early spring in grassland areas. Developed areas around the reservoir are SR-152, B.F. Sisk Dam and other reservoir infrastructure, boat ramps, parking and day use areas, and the Romero Visitor Center, which provides informational brochures and telescopes for reservoir viewing. SR-152 is proposed for designation as a scenic highway because of its scenic vistas.

San Felipe Division The major visual features of Santa Clara County include the Santa Clara Valley, the Diablo Range on the east, the Santa Cruz Mountains on the west, and the Baylands to the north. Vegetation on the Diablo Range is mainly grasslands, chapparal, and oak savannah. The Santa Cruz Mountains have grasslands and oak in the foothills, and mixed hardwood, dense evergreen forests, and redwoods in the upper elevations. The Baylands area has large salt evaporation ponds. Northern Santa Clara County is highly urbanized with a vast transportation network of highways and roads. The SCVWD operates ten reservoirs in Santa Clara County that contribute to the visual landscape of the county.

The Hollister and San Juan Valleys bordered by the foothills of the Diablo and Gabilan Ranges make up the visual landscape of San Benito County. High-intensity agricultural lands, including row crops and orchards, make up most of the valley floor. The urban areas of Hollister and San Juan Bautista include historical areas, single story commercial areas, and new residential developments.

San Luis and Delta-Mendota CVP Contractors The visual character of the San Joaquin Valley is primarily broad landscapes of agricultural fields, interspersed with regional infrastructure (roads and canals) and a variety of urbanized areas. Interstate 5 is the main corridor through the CVP service area. Historical changes from grasslands and extensive marsh areas to cropland and orchards have changed the visual variety in the San Joaquin Valley. Farmers rotate crops regularly, leaving a portion of the fields idle most years. The valley floor is primarily irrigated agriculture, which is not a visually distinctive landscape. Important visual resources on the valley floor include the San Luis National Wildlife Refuge Complex (the San Luis and Merced National Wildlife

Refuges), which is in the northern San Joaquin Valley in the Grasslands Ecological Area. This 160,000-acre area contains a third of the wetlands remaining in the Central Valley, and includes the Los Banos, Volta, and North Grasslands wildlife areas (U.S. Fish and Wildlife Service [Service] Undated), Great Valley Grasslands State Park, and over 100 privately-owned duck clubs.

Power

San Luis Reservoir The State of California operates and maintains the William R. Gianelli Pumping Plant (formerly the San Luis Pumping Plant) under an agreement with Reclamation. This joint Federal/State facility, at San Luis Dam, lifts water with pump turbines from the O’Neill Forebay into the San Luis Reservoir for offstream storage. During the irrigation season, water released from San Luis Reservoir generates energy as it flows back through the pump turbines to the forebay. Each of the eight pumping-generating units has a 63,000-horsepower motor and a capacity of 53,000 killowatts as a generator. As a pumping plant to fill San Luis Reservoir, each unit lifts 1,375 cfs at a design dynamic head of 290 feet. As a generating plant, each unit passes 1,640 cfs at the same head (Reclamation undated).

San Felipe Division The San Felipe Division includes two pumping plants: the Pacheco Pumping Plant and the Coyote Pumping Plant. The Pacheco Pumping Plant is at the end of Pacheco Tunnel Reach 1 and lifts San Luis Reservoir water 309 feet through the Diablo Mountains. The Coyote Pumping Plant is at the end of the Santa Clara Conduit, near Anderson Reservoir.

San Luis and Delta-Mendota CVP Contractors O’Neill Pumping-Generating Plant is on the DMC in Merced County, 70 miles from the Jones Pumping Plant and 12 miles west of Los Banos. O’Neill Dam and Forebay are joint Federal/State facilities on the San Luis Creek, 2.5 miles downstream from San Luis Dam. The O’Neill Pumping-Generating Plant is a conventional plant consisting of an intake channel leading off the DMC and six pump-generating units. Normally, these units operate as pumps to lift water 45 to 53 feet into the O’Neill Forebay. The forebay also releases water to the DMC. During releases to the DMC, the O’Neill plant generates electricity. When operating as pumps and motors, each unit, with a 6,000 horsepower motor, can discharge 700 cfs. When operating as turbines and generators, each unit has a generating capacity of about 4,200 killowatts. The authorizing legislation for the plant states that power generated at the facility cannot be used for commercial purposes (Reclamation Undated).

The Dos Amigos Pumping Plant, a joint Federal/State facility 17 miles south of the forebay, is a relift plant in the San Luis Canal. The plant contains six pumping units, each with a 40,000-horsepower motor, capable of delivering 2,200 cfs at 125 feet of head (Reclamation Undated).

3.2 Likely Future Without Project Conditions

The without project conditions represent the likely future conditions in the study area if the SLLPIP is not implemented. In the future, water levels in San Luis Reservoir could fall below 300 TAF more often than under existing conditions. Current modeling, which will be refined as the study moves forward, estimates that San Luis Reservoir could reach the minimum operating level of 79 TAF about 25 percent of the time. The low point issue affects both delivery schedule certainty and water supply reliability for south-of-Delta contractors. Under the without project conditions, San Felipe Division contractors could not rely on San Luis Reservoir water supplies to meet M&I and agricultural water demands during months where water levels are below approximately 300 TAF. San Luis Reservoir deliveries to San Luis Delta-Mendota contractors could also be reduced if Reclamation operates the reservoir to avoid the low point issue. Under the without project conditions, Reclamation could face this system conflict in years that San Luis Reservoir water levels would reach approximately 300 TAF. Water supply reductions to contractors could affect their ability to meet customer water demands. Section 2.1 further describes underlying components that contribute to water supply problems under without project conditions.

Under the without project conditions, effects could occur to hydrology and water supply, groundwater, and socioeconomics. Changes in hydrology, regulatory requirements, and CVP and SWP operations, alone or in combination, could affect the future storage in the reservoir. Natural variations in hydrologic conditions would change supplies available in San Luis Reservoir. Future droughts would reduce water supplies and deliveries to south of Delta contractors. Global climate change could decrease snow pack in the Sierras, which would affect the amount and timing of Delta exports. A 2006 California Climate Change Center report estimated that under a low emissions global climate change scenario, California's temperatures would increase 3 to 5.5 degrees Fahrenheit in the next 30 years. This would result in a 30 to 60 percent loss in Sierra snowpack, 6 to 14 inches of sea level rise and up to 1.5 times more critically dry years. Global climate change and other unexpected catastrophes, such as a major flood or earthquake, could cause levee failure or damage to the pumps, which could decrease or stop water exports from the Delta. A 2003 U.S. Geological Survey study concludes that there is a 62 percent probability of at least one magnitude 6.7 or greater quake striking the San Francisco Bay region before 2032. Changing environmental and Delta water quality regulations could also reduce Delta exports to San Luis Reservoir. These hydrologic and regulatory changes could decrease water supplies and reliability to south of Delta contractors, including agricultural contractors in the south Central Valley.

CVP and SWP operations of San Luis Reservoir could also change under the future without project condition. Reclamation currently plans the operation of

San Luis Reservoir to reach a minimum pool of 79 TAF. SWP contractors, primarily MWD, currently use San Luis Reservoir for carryover storage, which maintains higher water levels in the reservoir. However, because of decreasing Colorado River supplies and increasing water demands, SWP contractors could use more of their north-of-Delta water supplies and decrease carryover storage in San Luis Reservoir. Therefore, under the future without project condition, reservoir water levels could fall below 300 TAF regularly. Below 300 TAF, algae growth in the reservoir could affect deliveries to the San Felipe Division, and below 79 TAF, water levels are too low for the San Felipe Division to receive water through the lower Pacheco intake.

With less reliable surface water supplies, contractors would rely more on groundwater to meet water demands. Groundwater pumping could exceed the safe yield of the basin, creating overdraft conditions. Depending on the location of the contractor, decreased groundwater levels could result in land subsidence and/or seawater intrusion. Excessive groundwater use could affect the future sustainability of the resource.

Under the future without project condition, decreases in surface water and groundwater supplies and increases in demands could increase the risk and frequency of water shortages. Water shortages, when water demands exceed supplies, result in multiple economic impacts. Farmers’ net revenues could decrease because of less crop production or higher production costs. Farmers might idle crop acreage because of the lack of irrigation water or they might use more expensive groundwater supplies. As groundwater levels decreased, pumping costs would be more expensive and energy consumption for pumping would increase. Decreased water supply reliability could affect cropping decisions, including how much and the type of crop planted.

In the event of a water shortage, urban and municipal water districts could turn to more expensive local supplies. Even the risk of a shortage could result in economic costs for districts because they incur costs when planning for new supplies. Increased district costs could be passed to the consumer through higher water rates, which could decrease disposable income. If local water supplies were not available, districts could require mandatory conservation efforts for residential and commercial customers. If commercial water use was curtailed, local economic output could decrease.

If San Luis Reservoir levels fell below 300 TAF more frequently, the without project condition could include direct and indirect effects to water quality, soils, air quality, land use, recreation, visual, vegetation and wildlife, and power. Some environmental resources would not change from the current settings under the without project conditions. Table 3-6 summarizes potential effects to all resources under the without project conditions. Potential effects are preliminary and will be further evaluated in the Plan Formulation Phase.

Table 3-6. Summary of Potential Effects Under Future Without Project Conditions

Resource	Potential Without Project Conditions Effects
Hydrology and Water Supply	Decreased water supplies, supply reliability, and operational flexibility
Water Quality	Decreased water levels could degrade water quality or increase algae growth
Groundwater	Increased groundwater pumping could increase groundwater overdraft, subsidence and/or seawater intrusion
Geology, Soils, Seismicity	Reduced water supply could induce subsidence with increased use of groundwater resources
Air Quality	Reduced supply could affect air quality with increased short term farm fallowing
Land Use	Decreased water supply reliability; farmers might decrease irrigated crop acreage
Fisheries	No effects
Vegetation and Wildlife	Increased drawdown of water levels could affect natural communities and species
Cultural Resources	No effects
Recreation	Decreased water levels could reduce access to boat ramps
Socioeconomics	Decreased crop production and farmer net income, increased costs for CVP M&I contractors, potential increase in M&I customer rates that could decrease disposable income
Environmental Justice	No effects
Visual and Aesthetic Resources	More frequent water level decreases could produce a more prominent “bathtub ring” and degrade the visual landscape
Power	Actively using San Luis Reservoir storage could affect quantity and timing of power generation and use

Key: CVP = Central Valley Project
M&I = Municipal and Industrial

Chapter 4
Plan Formulation Approach

4.1 Planning Process

4.1.1 Federal Planning Process Overview

The SLLPIP Feasibility Study process is guided by the Federal P&Gs. The P&Gs outline a planning process for the formulation and evaluation studies performed by major Federal water resources development agencies. The planning process is intended to formulate reasonable plans responsive to Federal, State, and local objectives.

The P&Gs state that the Federal objective of water and related land resource project planning is to contribute to National Economic Development while protecting the nation's environment. The P&Gs describe the Federal objective as a national goal. The process, which includes evaluation and consideration of all possible alternatives, is designed to develop a plan that provides the most economical and environmentally acceptable Federal action. The P&Gs distinguish the study objective from the Federal objective as more specific in terms of expected or desired outputs.

Figure 4-1 outlines the steps included in the Federal planning process for a feasibility study and scheduled dates for completion for the SLLPIP. Reclamation completed an Appraisal Study for the SLLPIP in May 2006.

Figure 4-1. Feasibility Study Planning Process

To meet the study objectives, the planning process follows the P&Gs' structured, six-step planning approach. The structured approach, listed below, adjusts to the identification of new information relevant to the project alternatives with a reiteration of the initial steps in the planning process.

1. Define the water and related land resource problems, opportunities, objectives, and constraints while coordinating among Federal, State, and local authorities, and the public.

2. Inventory and forecast existing and without project future conditions in the study area relative to the identified problems, opportunities, and constraints.

3. Formulate alternative plans by exploring a full range of possible solutions.

4. Evaluate plans relative to existing and without project future conditions.

5. Compare the plans to No Action and to each other.

6. Select the recommended plan based on the comparison of plans.

4.1.2 Alternative Development Approach

The Study team implemented the alternative development process shown in Figure 4-2.

Figure 4-2. Alternative Formulation Process

Identify Measures

The first step in developing alternatives was to identify potential management measures, which could include programs, projects, or policies that would help achieve the objectives. These measures are not full alternatives, and do not fully achieve the objectives independently. The team identified measures based on SCVWD's past work on the project, other water resource studies, and the team's technical understanding of the project's problems, opportunities, and objectives. SCVWD's efforts included an extensive public outreach effort, which resulted in the inclusion of measures suggested by the project stakeholders and the general public. This initial list of measures was the result of collaborative suggestions from the Study team and was not constrained in any way. Section 4.2 describes the initial measures.

Screen Resource Management Measures

The Level 1 screening then examined the initial list of measures to screen out the measures that have "fatal flaws." This effort screened out measures because they were not technically or institutionally viable, or if they would not make progress towards meeting the objectives. The Study team evaluated the

measures according to the technical and institutional viability criteria on a pass or fail basis. Measures that passed both technical and institutional viability criteria were then evaluated against the project objectives. The Study team developed a 3-part rating scale for each project objective. Section 4.3 describes the Level 1 screening effort in more detail. The list remaining after the Level 1 screening includes a variety of measures that when combined may be viable alternatives.

Formulate and Screen Initial Alternatives

Measures that are technically and institutionally viable and that would make at least moderate progress towards achieving one of the three objectives were retained for Level 2 screening. The Study team then combined the remaining measures into alternatives. The Level 2 screening evaluated how well the alternatives met the Federal planning criteria (completeness, effectiveness, efficiency, and acceptability).

The Study team developed performance measures for each of the Federal criteria. Performance measures may be quantitative or qualitative and they evaluate how well the alternative meets the criteria. The Study team created rating scales for each performance measure and used the rating scales to evaluate how well each alternative would achieve the criteria. Sections 5 and 6 describe alternative formulation and the Level 2 screening process in more detail.

The Study team used the results of the Level 2 screening to qualitatively select for further study the alternatives which seemed to provide the most net benefits. Benefits were not quantified in monetary terms for the Level 2 screening.

4.2 Management Measures

Sections 4.2.1 through 4.2.6 present brief descriptions of 88 management measures that have been or are under consideration as means to address the SLLPIP objectives. This presentation of measures includes all measures identified in the SCVWD Alternatives Screening Report, potential water treatment measures identified by the Study team, and additional surface water storage options described in the CALFED Initial Surface Water Storage Screening Report. These descriptions explain how each measure might help to address the delivery interruptions caused by the low point issue, and are grouped into Institutional Agreements (4.2.1), Source Water Quality Control (4.2.2), Water Treatment (4.2.3), Conveyance (4.2.4), Local Reservoir Storage (4.2.5), and Alternate Water Supplies (4.2.6). Where applicable, these descriptions note factors that might render the measure not technically viable from an engineering standpoint.

4.2.1 Institutional Agreements

Institutional Agreements include non-structural measures that could reduce the likelihood of an occurrence of the low point issue by arranging alternate supplies to users of San Luis Reservoir water, or that would provide alternate supplies for the San Felipe Division during times when a low point issue does occur. Figure 4-3 shows the locations of the banking, exchanges, and operational agreement measures.

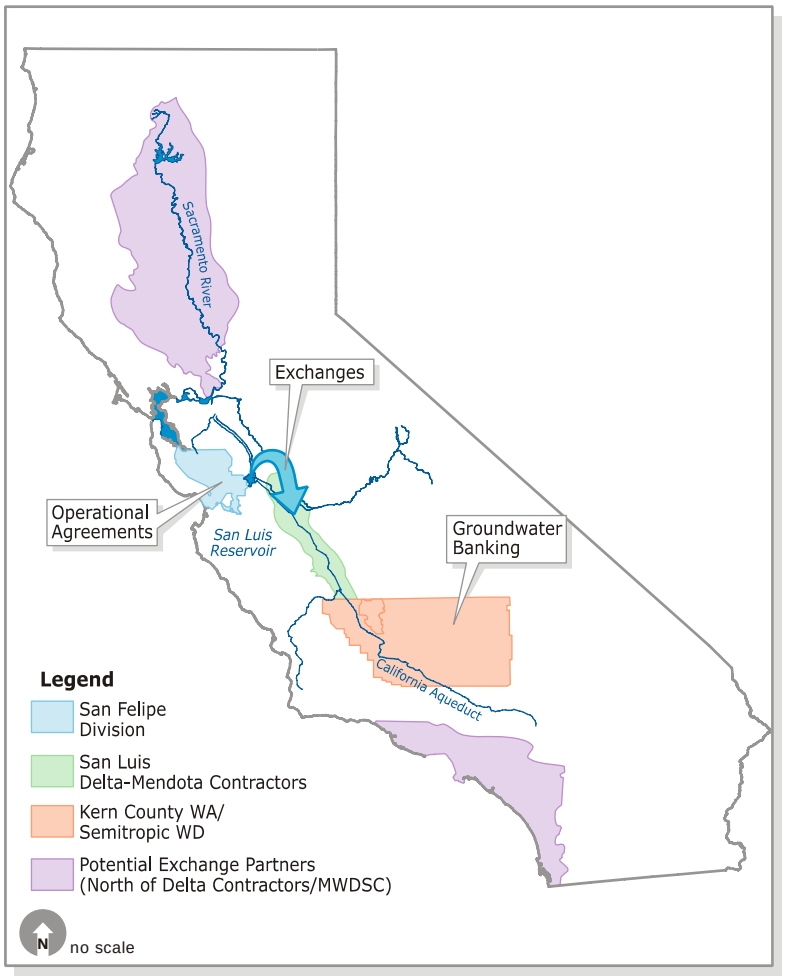

Figure 4-3. Institutional Management Measure

Banking

Water banking involves delivery, storage, and extraction of groundwater supplies over an extended number of years. This measure would include participating in an existing bank, such as Semitropic Water District in Kern County, and would not include construction associated with creating a new bank. Under this measure, Reclamation could store CVP supplies in a groundwater bank and request the water in years with a low point issue. In these years, Reclamation would use the extracted water to maintain increased water

levels in San Luis Reservoir by exchanging the extracted water for supply that would otherwise be drawn from San Luis Reservoir. Exchanged water could be delivered to the San Felipe Division through San Luis Reservoir or, if delivered to SCVWD only, the South Bay Aqueduct (SBA). Water delivered through San Luis Reservoir could still be subject to seasonal algae growth in the reservoir. Use of the South Bay Aqueduct to deliver traded Delta water supplies would be limited by the aqueduct's conveyance capacity as well as that of SCVWD's untreated water transmission system. Groundwater banks have several operational constraints that could limit the amount of water stored and extracted. Putting water into the bank could take several years, and pumping capacity, especially in dry years, could limit the amount of withdrawal. The extraction rate would depend on Reclamation's level of participation in the bank. Because of these limitations, decisions to execute this measure would need to be made far in advance of a potential low point issue.

Exchanges or Transfers

Exchanges are agreements to trade water with the guarantee of return within one contract year. Water transfers are the purchase of water supplies from a willing seller. Either exchanges or transfers could allow Reclamation to maintain water levels in San Luis Reservoir at or above 300 TAF while continuing deliveries to contractors. MWD would be a potential source for exchanges; it participates in similar exchanges as part of other programs (such as source shifting with the EWA). Reclamation entered into a source shifting agreement with MWD to avoid a low point issue in the past. Reclamation also acquired and stored Level 4 refuge water supplies in San Luis Reservoir to help the low point issue. Other potential transfer sources include Yuba County Water Agency and Placer County Water Agency. SCVWD has arranged transfers with both of these agencies in the past.

Operating Agreements and Procedures

Operating agreements and procedures could be used to reduce late summer demands for San Luis Reservoir water, which would have the potential to address the low point issue. The San Felipe Division contractors could reoperate their water supply systems cooperatively to reduce reliance on CVP supplies during occurrences of the low point issue. Reoperation could include modifying delivery schedules or reoperating local supply reservoirs. The San Luis and Delta-Mendota contractors could also modify operations of the SLDMWA to coordinate water supplies among member agencies.

SCVWD has an agreement with the San Francisco Public Utilities Commission (SFPUC) for an emergency water supply delivered through an intertie. This agreement is only for specified emergencies, and the low point issue may not fit within the definition of emergency supply. However, if contract agreements could be reached, the SFPUC intertie could provide up to 3,680 AF per month. Section 4.2.6, Alternate Water Supplies, describes expanding use of the intertie.

Rescheduling

Reclamation currently allows irrigation and M&I contractors to reschedule water deliveries from one contract year to the next when storage capacity is available in San Luis Reservoir. Rescheduling operations could enable shifting of deliveries to the winter months for storage and holding of available water supplies for later delivery. The San Felipe Division contractors could leave some water in storage to allow higher water levels in the following year, which could reduce the likelihood of an occurrence of the low point issue. However, water left in San Luis Reservoir may revert to CVP ownership on or around April 15 if the CVP fills up its portion of San Luis Reservoir storage.

4.2.2 Source Water Quality Control

The source water quality control measures focus on improvements to San Luis Reservoir water quality that would reduce future water supply interruptions for the San Felipe Division while continuing supplies for the rest of the San Luis and Delta Mendota users. Some of these measures would be designed to address the problem algae directly (e.g., by removing it), while others would be designed to change the conditions that are favorable to algae growth. All of these source water quality control measures would be intended to reduce the effect that algae could have on CVP supplies to the San Felipe Division. Figure 4-4 outlines the intermediate intake and managed stratification measures.

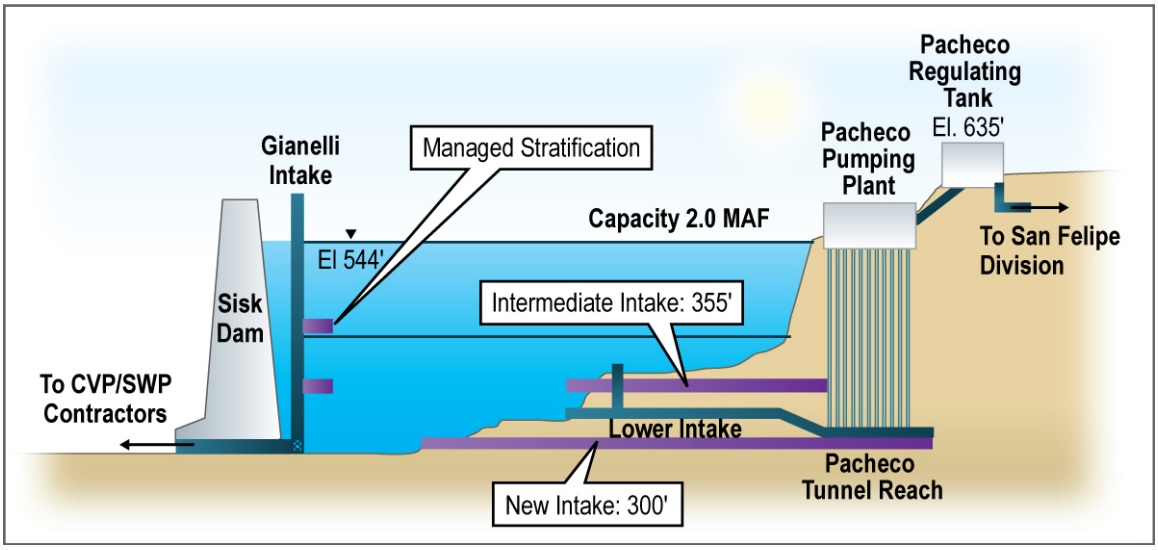

Figure 4-4. New Intake Management Measures

Algae Harvesting

Under this measure, boats with a fine strainer would skim the reservoir surface and collect floating algae. Reservoir algae are typically harvested with a specially-designed boat equipped for surface water suction and filtration or centrifugation. A gravity-based rotating screen unit could collect algae in

batches from the surface of the reservoir and simultaneously dewater the algae. Depending on the density of the algae, the removal rate would be about 6,000 gallons per hour; collected algae would need to be stored and trucked off the site. Algae are typically found at the reservoir surface, growing to a depth of 30 feet. This measure would not allow algae collection all the way to the 30-foot depth, but would focus on algae near the water surface. Harvesting would need to occur in the morning when most algae are at the surface, and could not occur during windy conditions when the algae would be too dilute and could not be strained.

Algaecides/Herbicides (for Algae or Macrophytes)

To implement this measure, which is commonly used on small- to medium-sized lakes, algaecide would be applied to San Luis Reservoir to limit algae blooms in the water. Reduction of algal growth would alleviate some of the taste and odor problems created by the algae and lessen filter clogging in water treatment plants that receive water from the reservoir. Algaecides can be applied with boats or helicopters. Algaecide must be applied at the early stages of bloom development, when the cell densities are low, to avoid the release of excessive toxins. Common algaecides are copper-based, such as copper sulfate or copper chelate (e.g., Cutrine Plus, copper citrate). Use of copper sulfate has been decreasing because of its high water solubility, copper levels, and toxicity to fish. Copper chelate algaecides tend to be more effective than copper sulfate in reducing algae because they stay suspended in the water column longer. Copper chelate algaecides also have lower levels of elemental copper and are less toxic to fish. Some algae could develop a resistance to algaecides that are used too frequently.

Barley Straw (to absorb algae and nutrients)

Barley straw could be used to absorb algae and nutrients in San Luis Reservoir. After the straw had absorbed the algae and nutrients, it would need to be removed from the reservoir. The reservoir's size and uses are limiting factors on the potential use of barley straw to address algae in San Luis Reservoir. Approximately 500 tons of straw would be needed to remove the algae. Delivering and applying the barley straw to the 12,520 acres of surface area of San Luis Reservoir and later removing it would be very difficult. Barley straw would also cause potential aesthetic and recreation impacts by deteriorating the lake's visual quality, disrupting recreation opportunities, and creating potential boat navigation problems.

Coffer Dam Around Intake

Under this measure, Reclamation would construct a coffer dam around the Pacheco Intakes to isolate a portion of the reservoir. This would allow Reclamation more operational flexibility within the reservoir to manage the quality of water near the Pacheco intakes and reduce supply interruptions

caused by the algae. Water in the isolated portion would still be from the Delta, and would be high in nutrients. Because the isolated water would still be conducive to algae growth, the isolated portion of the reservoir could experience problems similar to those in the rest of the reservoir. The isolation of the area could, however, effectively reduce the size of the reservoir that would need algae management, allowing the application of measures normally suited to small water bodies.

Dilution/Flushing (Local Runoff)

Under this measure, Reclamation would dilute the nutrient-rich water in San Luis Reservoir with higher quality, low-nutrient water. This water would limit the development of algae within the reservoir. Because San Luis Reservoir is off-stream and local streams provide little runoff, the bulk of the water stored in the reservoir must be imported. Identifying an additional water supply of sufficient amount and higher quality to dilute the water currently delivered to San Luis Reservoir would be difficult and would limit the usefulness of this measure.

Dredging

This measure would be intended to affect the conditions that promote algae growth in San Luis Reservoir by removing reservoir floor sediments. Nutrients found in the floor sediments of shallow water bodies can be released into the reservoir's water column. These released nutrients can promote algae growth, which degrades the water quality. Dredging permanently removes the contaminated upper layer of sediments from the reservoir floor and leaves the original, low-nutrient sediments. The soil at the bottom of San Luis Reservoir does not release nutrients to the water column and does not contribute to algae growth; therefore, this measure would not be effective in reducing algae growth in San Luis Reservoir.

Fish Grazers on Algae or Macrophytes

This measure would involve stocking the reservoir with Triploid, or sterile, grass carp, which are a vegetarian fish commonly used to control nuisance plant growth by eating it. This technique is used in drainage and water supply channels and closed ponds (golf courses, recreational lakes in parks) to prevent the engineered fish from migrating into streams and rivers. The DFG has strict regulations on the use of grass carp and requires a permit for stocking. Stocking is not allowed in any major drainage or water that is connected to streams, rivers, lakes or reservoirs, and must be carefully monitored because it is difficult to remove the fish once present, especially from large water bodies. Too many grass carp in the lake can result in overharvesting of the macrophytes that serve as fish habitat. Because of the extent of the algae problem in San Luis Reservoir, an excessive amount of fish would be necessary, which limits the usefulness of this measure. Furthermore, the proximity of San Luis Reservoir to

the Delta and the rest of the state's water system limits the viability of implementing this measure.

Floating Covers

Floating covers can be used to cut off algae growth in reservoirs by blocking sunlight in the water column. These covers, typically made of plastic fabric, develop folds as the reservoir is drawn down and flatten out as the reservoir is refilled. Cutting off sunlight to the algae would prevent algal photosynthesis, but would reduce oxygen levels in the reservoir. Lower oxygen levels can create new water quality issues, as organisms that thrive in low oxygen conditions produce sulfur- or nitrogen- containing compounds that cause taste and odor problems. Low oxygen levels would also increase fish mortality in the reservoir. A factor limiting the technical viability of this measure is the large (12,520 acres) surface area of San Luis Reservoir.

Intermediate Intake for Pacheco Pumping Plant

This concept would involve construction of a third intake port at the San Felipe Division's existing Pacheco Intake. The new intake would be at 355 feet mean sea level (msl), between the two existing intakes at 376 feet msl and 334 feet msl. The intermediate intake would provide an additional access point and create improved reservoir flexibility. Reclamation could divert water at locations in the water column where algae are not present. The low point issue becomes a concern when the water levels in San Luis Reservoir are low enough that algae reaches the lower Pacheco Intake; therefore, an intermediate intake would not enable increased diversions.

Isolate Portion (Arm) of San Luis Reservoir

This measure would dedicate a portion of the reservoir to the San Felipe Division by isolating a portion or arm for the exclusive use of the San Felipe Division contractors. A new dam, piping and pumping infrastructure would be developed to fill the isolated arm. The isolated area of the reservoir would be accessed by the existing Pacheco Intake. Isolating a section of the reservoir would reduce Reclamation's overall flexibility for water deliveries and could potentially degrade water quality for both water bodies. This option would not likely improve water supply reliability for any contractors.

Macrophyte (Water Weed) Harvesting

The purpose of this measure is to reduce nutrient loading in a water body through removal of water weeds, which contribute nutrients to lake water. Water weed harvesters cut plant material growing in the reservoir below the water line and then collect the floating or entangled debris left behind. The harvesters use a rotating screen to collect this floating debris and then place it on a floating platform for transport to land for disposal. The applicability of this measure may be limited in that the major source of the nutrients that support

algae growth in San Luis Reservoir is the water delivered through the CVP and SWP, rather than nuisance weeds. Nuisance weeds do not contribute significantly to the algae problem in San Luis Reservoir.

Managed Stratification (Modify Gianelli Inlet/Outlet Works)

Managed stratification would allow for reservoir water diversion from additional elevations. Water from a reservoir is typically diverted from the upper hypolimnion, which is the lowest water layer of the reservoir and typically has the highest quality. San Luis Reservoir has a thick epilimnion, which is the upper, typically algae-laden layer. Under this measure, Reclamation would construct additional intakes at the Gianelli Inlet/Outlet to withdraw water at different levels, including the epilimnion prior to summer algae growth, allowing higher quality water to be diverted from the Pacheco Intakes. Because the epilimnion water would be serving the Gianelli Intake, more of the hypolimnion would remain available for diversion at the Pacheco Intake. Reclamation would be able to divert higher quality water through the Pacheco Intake later into the year. However, the lowest Pacheco Intake would still be subject to algae blooms in the late summer months. In the event of algae growth at low water levels, deliveries to the San Felipe Division could still be interrupted, and other CVP contractors would receive water with algae.

Mechanical Destratification and Lake Mixing

This measure involves mixing water in the reservoir mechanically with propeller pumps or with compressed air to blend warm, upper-level water that supports the most algae with the cooler, deeper water below. Moving the warmer, nutrient-rich water to the lower, colder water levels could slow algae growth in the reservoir. Mechanically destratifying the 600 billion gallon water column in San Luis Reservoir would require the construction of a large system of piping to distribute compressed air or propellers.

Nutrient Harvesting from Fish or other Biota

The nutrient harvesting measure would collect fish (and harvest algae and aquatic macrophytes as described above), to reduce the contribution of nitrogen and phosphorus in the reservoir. This collection operation would extract these nutrient contributors from the lake and deposit them in a location isolated from the reservoir's drainage basin to prevent runoff contribution of these nutrients back into the reservoir. As noted above, the effectiveness of this operation would be limited, because the major source of the nutrients that support algae growth in San Luis Reservoir is the Delta water delivered through the CVP and SWP. Nuisance weeds and fish do not contribute significantly to the algae problem in San Luis Reservoir.

Oxygenation or Aeration

Oxygenation or aeration can reduce algae in large lakes and directly reverse eutrophication. Eutrophication of lakes, caused by a high level of nutrients, supports algae blooms. When algae decays, oxygen levels deplete; this in turn releases toxic substances bound to oxidized lake sediments and increases fish mortality. Oxygenation or aeration of eutrophic lakes helps to prevent the release of toxic substances and nutrients that can migrate up the water column and further degrade water quality. Oxygenation involves pumping oxygen bubbles into the water to increase dissolved oxygen levels and reverse the release of nutrients and metals. This is typically more effective than aeration, which releases air (only 20 percent oxygen). Examples of technologies available for oxygenation and aeration include enclosed air lift pump towers, perforated hose laid across the reservoir floor, and underwater pure oxygen no-bubble mixing systems.

Pathogens of Algae or Macrophytes

This measure would apply pathogens of algae and macrophytes to kill weeds and algae in the reservoir. This technique has been shown to work in some agricultural systems; however, applying pathogens to kill blue green algae (the type of algae in San Luis Reservoir) is not an effective control mechanism because of the species' ability to develop resistance to the pathogens.

Sediment Sealing (Fabric Liners, Chemical Barriers)

This measure proposes the sealing of sediment on the reservoir floor using fabric liners or chemical barriers to limit algae growth supported by nutrients found on the reservoir floor. Fabric liners limit growth by cutting off sediments on the floor from light by physically covering the sediments. This measure is typically applied to areas smaller than that in San Luis Reservoir. Spreading a chemical barrier, such as Alum, on the reservoir floor can be used to reduce internal loading of soluble phosphate and its promotion of algae growth. The major source of the nutrients that support algae growth in San Luis Reservoir is the Delta water delivered through the CVP and SWP. The soil at the bottom of San Luis Reservoir does not release substantial amounts of nutrients to the water column, and does not contribute to algae growth; therefore, this measure would not be effective in reducing nutrient levels.

Shading (Dyes) to Minimize Light for Photosynthesis

This measure involves the use of pond dyes to reduce light penetration to the reservoir. Various pond dyes are on the market to control algae growth. Because San Luis Reservoir has a 12,520 acre surface area and stores up to 2,028 TAF of water, implementing this measure would require large quantities of dyes to effectively shade the reservoir. This could result in undesirable coloration on the surface, which could potentially affect recreation use and visual quality at San Luis Reservoir.

Use Calero as Wetland

This measure includes use of SCVWD's existing Calero Reservoir as a wetland to treat water extracted from the Pacheco Intake of San Luis Reservoir. After treatment in the wetland, the water would flow into the San Felipe Division distribution systems. To treat the water from San Luis Reservoir, approximately 25,000 acres of wetland would be needed. The existing Calero reservoir, at 9,000 acres, is too small to provide the treatment needed and the conversion of Calero Reservoir to a managed wetland would reduce the available pool for water storage.

Water Level Fluctuation

Implementing this measure would lower water levels for a fixed time to kill rooted and floating aquatic plants (waterweeds) that contribute nutrients to the water. This approach has been used in reservoirs to increase large sport fish stocks by eliminating nesting sites (which support larger quantities, but smaller fish). The major source of the nutrients that support algae growth in San Luis Reservoir is the water delivered through the CVP and SWP, and nuisance weeds do not contribute significantly to the algae problem. Water level fluctuation could negatively affect annual supplies by decreasing the water in storage (by releasing it to the aqueducts) during times of the year when there was no demand for stored water.

Wetlands Algae Filter (Off-line Wetlands)

The wetlands algae filter measure would utilize wetlands to filter small particles from the San Luis Reservoir water. Water containing algae would be pumped from the reservoir surface and passed through a newly constructed wetland. After treatment, the water would go back into the Pacheco Conduit for distribution to the San Felipe Division. Approximately 25,000 acres or 39 sq. miles of wetlands would be needed near San Luis Reservoir to treat the water delivered to the San Felipe Division.

4.2.3 Water Treatment

These water treatment measures focus on enhancing or adding new raw water treatment capabilities in facilities between San Luis Reservoir and San Felipe Division users. Some of these measures would improve raw water quality en route to treatment plants in the San Felipe Division; others would enhance raw water treatment capabilities at treatment plants within the San Felipe Division. Enhancements and additions to raw water treatment within the San Felipe Division could reduce or eliminate the necessity to interrupt deliveries when algae blooms are in the vicinity of the Pacheco Intake. Figure 4-5 indicates the location of the dissolved air flotation (DAF) measures.

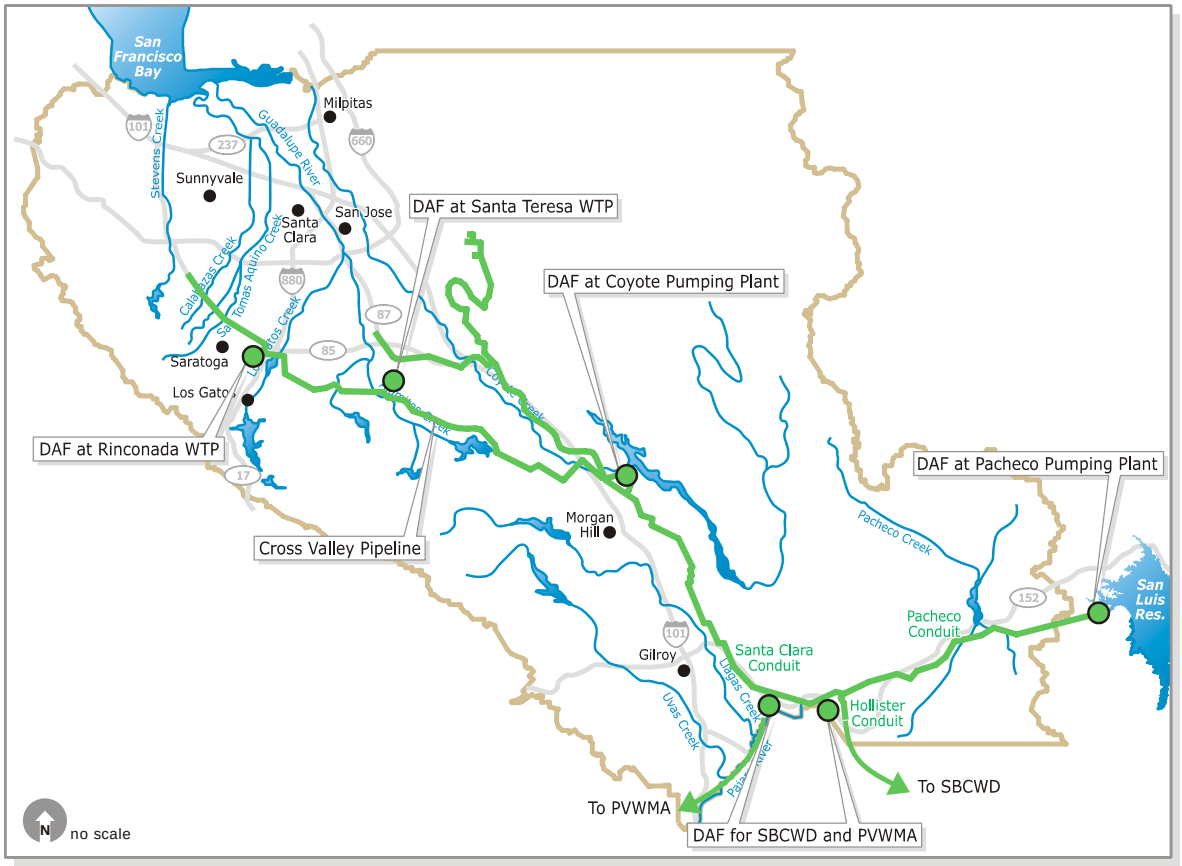

Figure 4-5. DAF Management Measures

DAF near San Felipe Intake

DAF releases large quantities of microbubbles into the water to float particles, such as algae, to the water surface. Scrapers or overhead weirs physically remove the floating materials from the surface while the clear water passes through the bottom of the DAF tank. DAF treatment could prevent the clogging of irrigation systems and filtration systems caused by algae, but would not address taste and odor problems for drinking water. Under this measure, new DAF treatment works would be constructed between the Pacheco Pump Station and the Pacheco Tunnel. The new facility would provide pre-treatment of San Luis Reservoir water for distribution to SCVWD water treatment plants (WTPs) as well as SBCWD and PVWMA. The Pacheco DAF system would be designed to treat the full flow capacity of the Pacheco Tunnel (317 million gallons per day [mgd] or 30.1 TAF per month).

DAF at Coyote Pumping Plant (plus San Benito and Pajaro)

As part of this measure, a new DAF treatment plant would be built between the Santa Clara Conduit and the Coyote Pump Station to treat the full discharge of

the Santa Clara Conduit (213 mgd or 20.3 TAF per month). The Coyote Treatment Plant would provide pretreatment of San Luis Reservoir water for distribution to SCVWD treatment plants. SCVWD facilities downstream from Coyote Pump Station, including agricultural users and all customers receiving water from Santa Teresa and Rinconada WTPs, would receive DAF-treated water. Additionally, new DAF treatment plants would be constructed to treat San Felipe Division water allocated to San Benito County (71 mgd or 6.7 TAF per month) and the future Pajaro Pipeline (33 mgd or 3.1 TAF per month).

DAF at Santa Teresa and Rinconada (plus San Benito and Pajaro)

This measure would include the installation of DAF treatment at SCVWD's Santa Teresa and Rinconada WTPs. The existing sedimentation basins at the Santa Teresa WTP would be retrofitted with DAF equipment, converting the plant from gravity separation to flotation separation. At the Rinconada WTP new process tanks would be installed near the east end of the parking area to perform DAF separation during periods of high algae loading. Additionally, under this measure, new DAF treatment plants would be constructed to treat San Felipe Division water going to SBCWD (71 mgd or 6.7 TAF per month) and the future Pajaro Pipeline (33 mgd or 3.1 TAF per month).

Ozone Addition to Raw Water at Each Treatment Facility

Ozone can be used to modify algal cell structure to make it more easily filtered at existing SCVWD water treatment plants. The Santa Teresa WTP already has ozone generation facilities; modifications would consist of adding a small ozone contactor at the front end of the plant and perhaps adding another ozone generator to allow higher ozone doses. Adding ozone at the front end of the plant (in addition to where it is currently added) might result in better plant performance than that achievable by the current process of conventional treatment (ozone and granulated active carbon/sand filtration). Adding other chemicals (such as sulfuric acid or ammonia) to control bromate formation would also be necessary if ozone was applied to the raw water. The Rinconada WTP does not have ozone generation facilities, so modifications at Rinconada WTP would also include installation of ozone generation.

Potassium Permanganate Addition to Raw Water along the Santa Clara Conduit

This measure would add potassium permanganate to the raw water along the Santa Clara Conduit. Providing up to 3 hours reaction time prior to treatment at existing SCVWD water treatment plants would improve the removal of algae by a conventional treatment process and permit more efficient treatment plant performance.

4.2.4 Conveyance

Conveyance measures include facilities that would allow San Felipe Division supplies to bypass the San Luis Reservoir altogether, as well as measures to change the location of the San Felipe Division's intake within San Luis Reservoir to a location or locations that would be less affected by the low point issue. Figure 4-6 indicates the potential layouts of the pipeline and aqueduct conveyance measures.

Highway 152 Pipeline/Tunnel

This measure includes construction of a pipeline or tunnel that would run along the northern edge of San Luis Reservoir to connect the O'Neill Forebay to the Pacheco Pumping Plant. Water delivered to the San Felipe Division would bypass San Luis Reservoir and would not experience water supply interruptions because of algae growth or San Luis Reservoir water levels dropping below the lower Pacheco intake.

While this measure would have a low cost compared to other bypass measures, preliminary discussions with the California Department of Transportation indicate that Reclamation may not be able to obtain an easement along SR-152.

Holladay Aqueduct

The Holladay Aqueduct measure involves the construction of a bypass pipeline that would begin near the City of Patterson and extend westward to a terminus at the crest of the Diablo range. From this terminus, the water would flow down existing natural stream channels into Coyote and Anderson Reservoirs. The Holladay Aqueduct route would be approximately 26 miles long with an elevation gain of 2,200 feet. The route would travel primarily through Franciscan rock material and Great Valley Sequence material. This rock material could make the Holladay Aqueduct a more challenging bypass measure to complete than other proposed bypass routes, which avoid construction in hard rock material.

Northerly Bypass Corridor

The northerly bypass corridor would deliver water from a new pump station installed on the California Aqueduct to the outlet portal of the existing Pacheco Tunnel Number 2. Water would need to be pumped approximately 925 feet over the hills of the Diablo Range to the Pacheco Conduit. Under this measure, water delivered to the San Felipe Division would bypass San Luis Reservoir. This bypass system would be a combination of two pipelines and one tunnel. The diameter of the pipelines and tunnel would be 10.0 feet and the delivery capacity would be 490 cfs. Siting the pump station on the California Aqueduct would require an exchange between the SWP and the CVP. Alternately, the intake and pump station could be constructed at the head of O'Neill Forebay.

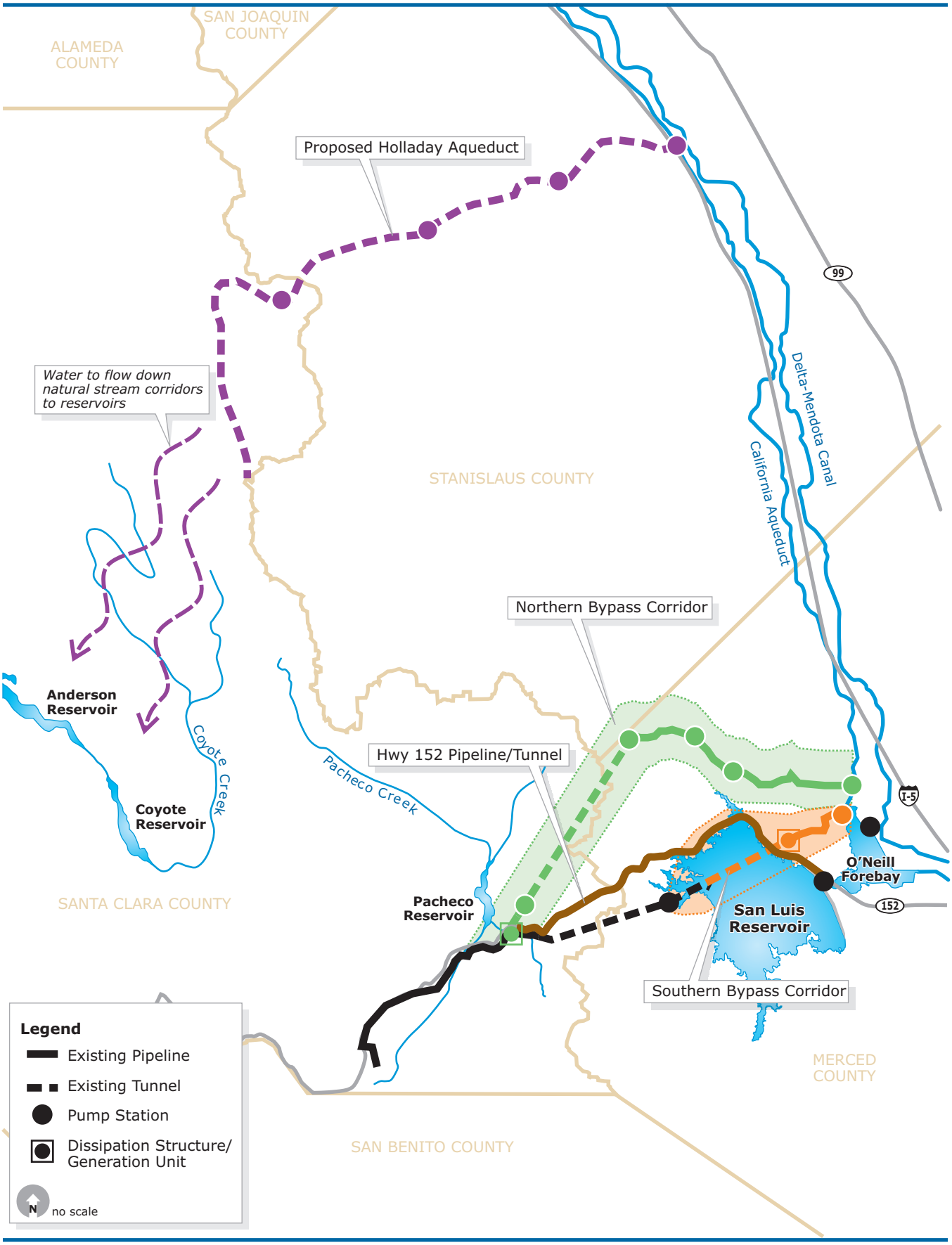

Figure 4-6 – Conveyance Measures

Southerly Bypass Corridor

Under this measure, Reclamation would construct a pipeline and tunnel to connect the O'Neill Forebay to the Pacheco Pumping Plant. Water delivered to the San Felipe Division would bypass San Luis Reservoir. The southern bypass corridor would extend from the head of O'Neill Forebay to the Pacheco Pumping Plant with a major portion of the bypass system tunneled underneath the San Luis Reservoir. The diameter of the pipeline and tunnel would be 9.5 feet, with a delivery capacity of 490 cfs. Water would need to be pumped 360 feet from O'Neill Forebay to the highest point in the pipeline.

Extend and Lower San Felipe Intake to Gianelli Inlet/Outlet Level

Under this measure, Reclamation would construct a lower San Felipe intake at an elevation of about 300 feet, which is similar to the elevation of the Gianelli Inlet/Outlet. Because of the reservoir's topography, the new intake would need to be about 4.3 miles long. With a new, lower intake, the reservoir could be drawn down to lower levels, while maintaining a 30-foot buffer above both the intakes to the San Felipe Division and the Gianelli Pumping- Generating Plant. This buffer would prevent algae from entering the intakes because most algae are found within 30 feet of the reservoir surface. Figure 4-4 shows the potential layout of a new, extended San Felipe Intake in San Luis Reservoir.

Ranney Collectors in San Luis Reservoir

Ranney Collectors would replace the upper and lower Pacheco Intakes to deliver water to the San Felipe Division. Ranney Collectors are shallow wells or infiltration galleries that draw water from the ground rather than the surface supply. Ranney Collectors are limited by well size and by the capacity of the porous alluvium or constructed infiltration gallery. Existing Ranney facilities are typically small, ranging from 2 to 20 mgd. Under this measure, the Ranney Collectors would extend the reach of the existing Upper Pacheco Intake to a lower elevation that would not be affected by algae. Because of the geologic features of San Luis Reservoir, Ranney wells would need to have an infiltration gallery or direct lake intake. The infiltration galleries would be constructed to simulate the permeable media found alongside or in most streambeds. Infiltration galleries would be dug to an elevation of 320 feet because beyond this depth it would be more efficient to extend the Pacheco intake to a lower elevation. Delivering 317 mgd to the San Felipe Division would require 50 to 100 wells and 20 to 40 miles of infiltration gallery.

San Felipe Division Conveyance Modification

Under this measure, modifications would be made to existing conveyance facilities in the San Felipe Division to improve the efficiency of water delivery and use within the Division. Currently, San Felipe Division contractors have

limited conveyance abilities, both between districts and within individual districts. SCVWD has multiple reservoirs that are used primarily for groundwater recharge, and that are not directly connected to the SCVWD water delivery system or CVP water distribution pipelines. This measure includes conveyance projects to improve the flexibility of the San Felipe Division to fully use available storage and deliver water throughout the entire service area. Conveyance modifications would allow for San Luis Reservoir supplies to be delivered and stored earlier in the season, avoiding the later season low point issues. Projects would include the development of a pipeline connecting Lexington Reservoir, which is currently operated as an off line groundwater recharge facility, to the SCVWD water delivery system; conveyance infrastructure to allow SWP water from the SBA to be delivered throughout the service area; and development of new groundwater wells in SCVWD and SBCWD to optimize use of groundwater basins, withstanding water quality issues.

4.2.5 Local Reservoir Storage

Local reservoir storage measures would provide additional storage, either on the San Felipe Division side of San Luis Reservoir or within the Central Valley, to provide an alternate water supply. Facilities on the west side of San Luis Reservoir would allow storage of CVP water when available earlier in the year for use during the low point months. Facilities in the Central Valley would provide an alternate source of water for contractors, to allow San Luis Reservoir to stay above 300 TAF and prevent supply interruptions to the San Felipe Division. Figure 4-7 indicates the locations of existing local reservoirs that could be expanded.

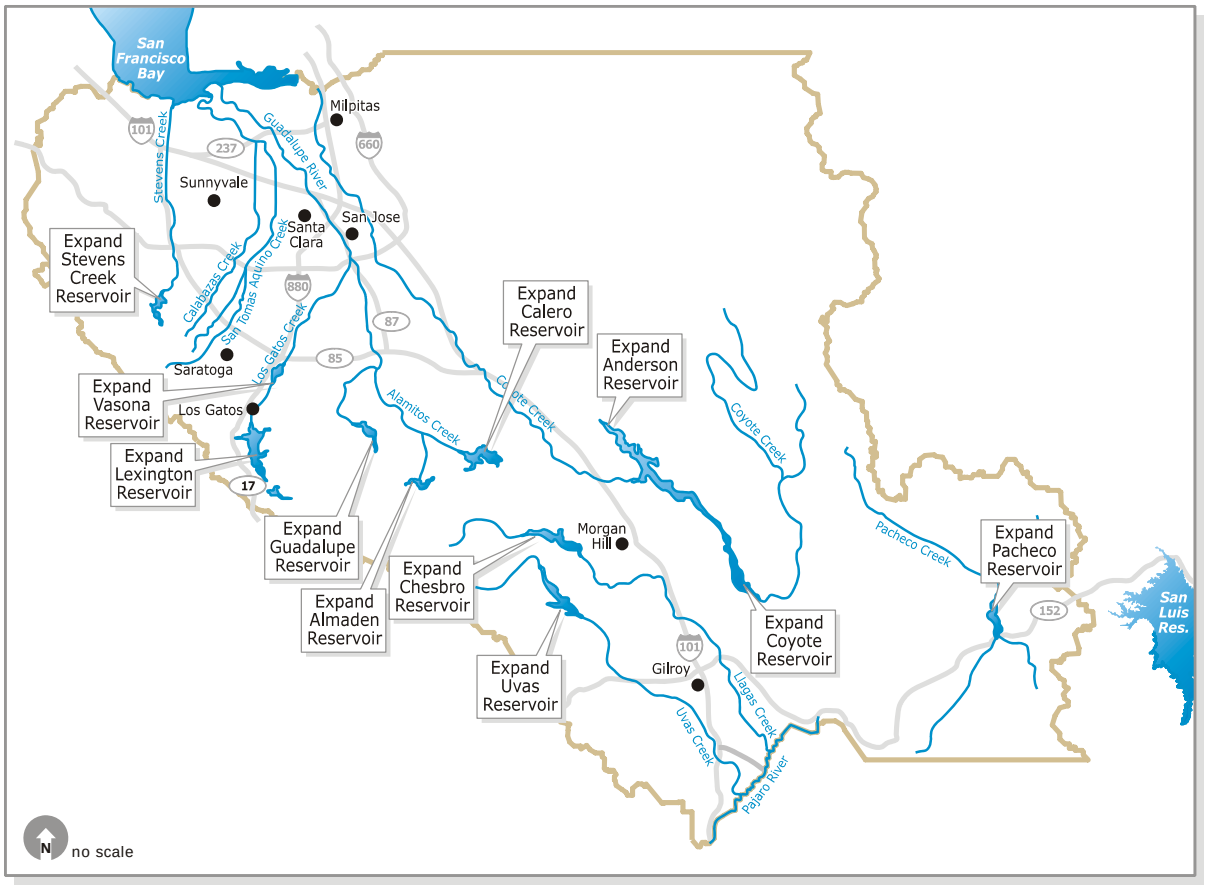

Figure 4-7. Existing San Felipe Division Reservoirs

4.2.5.1 More Storage at Existing Dam and Reservoir Sites

Almaden This measure would involve expansion of Almaden Reservoir from 1.5 TAF to 150 TAF. A very large embankment volume would be required for the expanded dam. Raising the reservoir would inundate the community of Twin Creeks, which contains 40 or more structures, and could affect Sierra Azul Open Space Preserve and Almaden Quicksilver County Park. The community of New Almaden, which is a National Historic Landmark for its significance as California's first mining operation in 1845 before the Gold Rush, would be less than 3,000 feet downstream of the expanded dam. Conveyance facilities might traverse the Shannon Fault and areas with high liquefaction potential. The Berrocal Fault Zone would likely pass close to or through the expanded reservoir.

Anderson The existing Anderson Dam is on Coyote Creek approximately 2 miles east of Morgan Hill. Anderson Dam is a zoned, compacted earth and rock embankment with a volume of approximately 3.3 million cubic yards. This measure would raise Anderson Dam 35 feet, increasing Anderson Reservoir's capacity from 89 TAF to 189 TAF. The reservoir area would increase about 635 acres from its existing boundary, and would inundate over 50 structures. The dam site is close to the Calaveras Fault and the Silver Creek Fault passes

through the area of proposed dam expansion. A new pipeline and pump station would be needed to convey water to the Cross Valley Pipeline.

Calero The Calero Reservoir is on Calero Creek at the south end of Calero Valley. The reservoir's existing capacity is about 10 TAF. Raising the reservoir would inundate approximately 35 structures, about 3 miles of McKean/Uvas Road, a small portion of Bailey Road, and could affect Calero Reservoir County Park. The existing Calero pipeline would also require relocation. The reservoir expansion would require lengthening the earth dam over 3,000 feet and constructing a series of saddle dams (approximately 1.6 miles in length) with a relatively large embankment volume. Borrow materials are not available near the reservoir and would need to be transported to the site. The potential expanded dam site may in an area with high liquefaction potential.

Chesbro The Chesbro Reservoir is on Llagas Creek, west of Morgan Hill. The reservoir's existing capacity is about 9 TAF. Raising the reservoir would inundate approximately 40 structures, about 1 mile of Uvas Road, 1.5 miles of Willow Springs Road, and 1 mile of Oak Glen Avenue. Expansion would also affect Chesbro Reservoir Park. The reservoir expansion would require several large saddle dams along the northern and western boundary of the expanded reservoir. A new embankment would also be necessary for the main dam. To impound upstream watershed flows, associated pumping and diversion facilities would need to be constructed. The new conveyance facilities would traverse areas with high liquefaction potential and require a complex pipeline crossing through Highway 101.

Coyote Coyote Reservoir is on Coyote Creek about five miles southeast of Morgan Hill. The existing reservoir capacity is about 23 TAF. Expanding the reservoir would inundate approximately 20 structures and affect Coyote Lake Park. To achieve an additional 100 TAF of storage capacity, the existing dam would need to be raised over 200 feet and extended in length over 2,000 feet. Large saddle dams would also be required. Borrow sites for dam construction do not exist near the reservoir and materials would need to be transported to the site. Calaveras fault extends beneath the left abutment of existing Coyote Dam.

Guadalupe Guadalupe Reservoir is on Guadalupe Creek next to Hicks Road. The reservoir's existing storage capacity is about 3,200 AF. The new reservoir would inundate about 1 mile of Hicks Road and might affect Sierra Azul Open Space Preserve and Almaden Quicksilver County Park. The San Antonio Mine would also be within the new dam footprint. Expanding the dam would require a very large embankment volume, which would require trucking in of extensive borrow materials. The Berrocal and Shannon Fault Zones would pass close to or through the expanded site.

Lexington Lexington Reservoir is on Los Gatos Creek, south the town of Los Gatos. The reservoir's existing capacity is 19.4 TAF. Expanding the reservoir would require relocation of a few miles of Highway 17, would inundate Alma

Fire Control Station, Lexington School, and possibly Alma College and Chemeketa Park, and might affect Sierra Azul Open Space. Lexington Reservoir is north of Santa Teresa WTP, which would require construction of long conveyance infrastructure with a complex alignment. The reservoir is in close proximity to the San Andreas Fault Zone.

Lower Pacheco (Pacheco Lake Reservoir) The Lower Pacheco Reservoir could be expanded up to 150 TAF in a relatively undeveloped area. The existing dam, constructed in 1939, is owned by the Pacheco Pass Water District. The site has highly weathered shale bedrock that probably extends to a significant depth under the base foundation of the site. This foundation condition would be relatively difficult to mitigate if the site were developed. The left abutment of the dam is near a large landslide complex. Conveyance facilities might traverse areas with high liquefaction potential.

Pacheco A The Pacheco A Reservoir could be expanded up to 150 TAF in a relatively undeveloped area. The site has highly weathered shale bedrock that probably extends to a significant depth under the left abutment, creating geotechnical stability concerns. This abutment condition might be relatively difficult to mitigate if the site is developed. Conveyance facilities might traverse areas with high liquefaction potential.

Pacheco B The Pacheco B Reservoir could be expanded up to 150 TAF in a relatively undeveloped area. The region's topography could support a reservoir with good storage capacity with reasonable sized dams. Construction materials are also likely available and of good quality near the site. The site is further from the Calaveras Fault than other sites considered. A small portion of the reservoir would be within Henry Coe State Park. The reservoir is upstream of the Pacheco Conduit and would require moderate pumping. Conveyance facilities might traverse localized areas with high liquefaction potential.

San Luis Reservoir This measure would raise the B.F. Sisk Dam and San Luis Reservoir level to add approximately 200 TAF of storage, to make up for the storage capacity lost because of the low point issue. The reservoir currently has a maximum storage capacity of approximately 2,028 TAF, a water level to avoid algae problems at 300 TAF, and a structural minimum pool of approximately 79 TAF. This measure would raise B.F. Sisk Dam approximately 15 feet, creating an additional 200 TAF of storage capacity and increasing maximum storage capacity to 2,228 TAF, increasing the useable storage capacity to about 1,900 TAF if the water levels are maintained above 300 TAF. At 300 TAF of storage and below, the layer of algae extending approximately 30 feet down from the reservoir surface would still disrupt deliveries to the San Felipe Division and full exercise of San Luis Reservoir storage would not be possible without other operational or facility changes.

Stevens Creek Stevens Creek Reservoir is on Stevens Creek about 2 miles southwest of Cupertino. The existing capacity of the reservoir is 3.5 TAF.

Expanding the reservoir would inundate approximately 50 structures, including Camp Sycamore and Camp Cooney, and would affect portions of Monte Bello Open Space Preserve, Fremont Older Open Space Preserve, and Stevens Creek County Park. A very large main dam volume would be required to expand to the reservoir and sufficient borrow material might not be available near the site. Stevens Creek Reservoir is downstream/north of Santa Teresa WTP, which would require long conveyance infrastructure with complex crossings through roadways, utilities, and developments. Conveyance facilities would cross the Berrocal Fault Zone and could traverse areas with high liquefaction potential.

Upper Pacheco The Upper Pacheco Reservoir could be expanded up to 150 TAF in a relatively undeveloped area. The region's topography could support a reservoir with good storage capacity with reasonable sized dams. Construction materials are also likely available and of good quality near the site. The Pacheco B site may have higher quality rock relative to this site. The Upper Pacheco site is further from the Calaveras Fault than the other sites considered. A portion of the reservoir would be within Henry Coe State Park. The reservoir is upstream of the Pacheco Conduit and would require only moderate pumping. Conveyance facilities might traverse localized areas with high liquefaction potential.

Uvas Uvas Reservoir is on Uvas Creek upstream of the intersection of Watsonville and Uvas Roads. The reservoir's existing capacity is 9.9 TAF. Raising the reservoir would inundate approximately 20 structures and require relocation of about 6 miles of Uvas Road. A very large main dam volume would be required to expand to the reservoir and sufficient borrow material might not be available near the site. The reservoir is over 5 miles away from conveyance pipelines to the San Felipe Division and construction of conveyance infrastructure would include a complex pipeline crossing through Highway 101. The dam site and conveyance facilities might be in areas with high liquefaction potential.

Vasona Vasona Reservoir is on Los Gatos Creek within the town of Los Gatos. The reservoir's existing capacity is about 400 AF. Any raise of the dam would inundate portions of the community of Los Gatos, including over 100 structures and several schools. Portions of State Highways 9 and 17 would need to be relocated. Vasona Reservoir is north of Santa Teresa WTP, which would require long and complex conveyance facilities through the town of Los Gatos.

4.2.5.2 New Dams and Reservoir Sites

Ausaymas The Ausaymas site would only accommodate a 10 TAF reservoir. The topography within the site would require construction of a large embankment dam volume relative to the potential storage volume. The site is near the Pacheco Conduit and would not require major conveyance infrastructure.

Blue Ridge The Blue Ridge site would have storage capacity for 52 TAF. A portion of the reservoir would inundate Henry Coe State Park. The site is at a relatively high elevation in the Coyote Creek Watershed, which would result in high pumping costs. The site is also relatively far from the Santa Clara Conduit and would require extensive conveyance infrastructure. Conveyance facilities might traverse areas with high liquefaction potential and would cross the Calaveras, Silver Creek, and Coyote Creek Faults.

Cedar Creek The Cedar Creek site has sufficient topography to support a reservoir of at least 150 TAF. A large embankment volume would be required for the new dam relative to the available storage volume. The site has a limited availability of construction materials that could be used to develop an embankment. The dam site and conveyance facilities might be in areas with high liquefaction potential.

Clarks Canyon The Clarks Canyon site has available storage capacity for about 44 TAF. A very large embankment volume would be required for the new dam relative to the available storage volume. The site is at a relatively high elevation in the Anderson Reservoir Watershed, which would result in high pumping costs. The site is also relatively far from the Santa Clara Conduit and would require extensive conveyance infrastructure. Conveyance facilities would traverse the Calaveras and Coyote Creek Faults.

Coe The Coe site has sufficient topography to support a reservoir of at least 150 TAF. The entire reservoir would be within Henry Coe State Park. The site would be at a higher elevation than most other sites and would require a long pipeline to the Hollister Bifurcation. This would result in higher pumping and operational costs. Conveyance facilities would traverse the Calaveras and Coyote Creek Faults.

Harper The Harper site has available storage capacity for about 34 TAF. A very large embankment volume would be required for the new dam relative to the available storage volume. The site is close to the Pacheco Conduit; therefore, very little conveyance infrastructure and pumping would be required. Conveyance facilities might traverse areas with high liquefaction potential.

Los Osos The Los Osos site has sufficient topography to support a reservoir of at least 150 TAF. The site is downstream of the Hollister Conduit Bifurcation; however, an alternative conveyance route, through Coyote and Anderson Reservoirs, would reduce infrastructure needs and pumping costs. A portion of the reservoir would be within Henry Coe State Park. The dam site is within the Calaveras Fault Zone and includes areas with high liquefaction potential. Conveyance facilities would traverse the Calaveras and Coyote Creek Faults.

North Fork Pacheco The North Fork Pacheco site has available storage capacity for about 46 TAF. A large embankment volume would be required for the new dam relative to the available storage volume. The entire reservoir

would be within Henry Coe State Park. The site is at a high elevation in the Pacheco watershed, which would increase pumping and operational costs. The site would require a long pipeline to the Pacheco Conduit. Conveyance facilities would traverse the Calaveras and Coyote Creek Faults.

Packwood The Packwood site has sufficient topography to support a reservoir of at least 150 TAF; however, the site has a limited availability of construction materials that could be used to develop an earthfill embankment. The reservoir site is near the Calaveras Fault and largely consists of areas with high liquefaction potential. The site is also at a relatively long distance and at a high elevation in the Anderson Watershed relative to the Santa Clara Conduit, which would result in high pumping costs. Conveyance facilities would be required to either cross or be routed around Anderson Reservoir. The conveyance facilities would transverse the Calaveras, Silver Creek, and Coyote Creek Faults.

San Benito Reservoir The San Benito site would have storage capacity for 60 TAF. The site is south of the Hollister Conduit Bifurcation, near the town of Hollister, and would require the development of back feeding capacity along the Hollister Conduit to support deliveries to the SCVWD and PVMWA. The reservoir would provide flood control capacity for the Pajaro River, increased groundwater recharge for the aquifer area below the reservoir footprint, and new recreation opportunities. Environmental impacts associated with the facility include potential impacts to steelhead migration along the Pajaro and San Benito Rivers, the potential for inundation of structures near the reservoir footprint, and the potential for seismic activity in the area near the proposed dam site (Pajaro River Watershed Flood Prevention Agency 2003).

San Felipe The San Felipe site has available storage capacity for about 42 TAF. A large embankment volume would be required for the new dam relative to the available storage volume. Saddle dams with a relatively large embankment volume would also be necessary. The reservoir site largely consists of areas with moderate to very high liquefaction potential and the Calaveras Fault Zone would pass through the reservoir. The Coyote Pump Station could provide some of the pumping capacity required to fill a reservoir at the site. Conveyance facilities would traverse the Silver Creek and Coyote Creek Faults.

Smith Creek The Smith Creek site has available storage capacity for about 29 TAF. The site is relatively distant from the Santa Clara Conduit and would require extensive conveyance pipelines. The site is also at a relatively high elevation in the Smith Creek watershed, which would result in high pumping costs. Conveyance facilities might traverse the Calaveras, Silver Creek, and Coyote Creek Faults and areas with high liquefaction potential.

South Fork Pacheco The South Fork Pacheco site has available storage capacity for about 7 TAF. A large embankment volume would be required for the new dam relative to the available storage volume. The site would be near the

Pacheco Conduit at a low elevation and would not require extensive conveyance infrastructure or pumping.

Del Puerto Reservoir A new off-stream reservoir on Del Puerto Creek, northwest of Patterson in Stanislaus County and west of the California Aqueduct, could create 191 TAF of new surface storage capacity. The potential for development partnership with a local water district has been identified and could result in some form of a project cost sharing agreement.

Ingram Canyon Reservoir A new reservoir in Ingram Canyon, northwest of Patterson in Stanislaus County and west of the California Aqueduct, could create between 333 and 1,201 TAF of new surface water storage capacity.

Quinto Creek Reservoir A new off-stream surface water storage reservoir on Quinto Creek could create between 332 and 381 TAF of new surface water storage capacity. The potential reservoir site is west of the California Aqueduct and southwest of the town of Gustine with portions of the proposed reservoir in Merced County and portions in Stanislaus County.

Garzas Reservoir A new off-stream reservoir on Garzas Creek in Stanislaus County could create between 139 and 1,754 TAF of new surface water storage capacity. The reservoir could inundate up to 15 miles of Garzas Creek and 2,600 acres of habitat. The inundation zone was identified by the Service as critical habitat for both the San Joaquin kit fox (Vulpes macrotis mutica) listed as endangered and the California red-legged frog (Rana aurora draytonii) listed as threatened by the ESA. The Service reported that construction of the Garzas Reservoir could create a long term risk to their long term survival and recovery. The land the reservoir would inundate is owned and managed by the Nature Conservancy and was purchased in part through mitigation funds set aside for impacts created by the CVP, by the Department of Interior. The property has a perpetual conservation easement, to protect fish and wildlife value, that specifically precludes reservoir construction.

Little Salado-Crow Reservoir The Little Salado-Crow Reservoir in Stanislaus County could create between 132 and 250 TAF of new surface storage, and could inundate up to 3,000 acres. The reservoir would be shallow with high evaporation losses.

Los Banos Grandes Los Banos Grandes Reservoir would be an off-stream reservoir connected to the California Aqueduct south of O'Neill Forebay and San Luis Reservoir with a potential storage range of 275 to 2,030 TAF. Los Banos Grandes has the potential to be significantly less expensive than other off-aqueduct surface water storage options (CALFED 2000). The reservoir inundation footprint of up to 13,000 acres and 13 miles of intermittent stream habitat might not be easily mitigated. The inundation footprint would flood the largest existing stand of Central California Sycamore Alluvial Woodland; this stand represents approximately one quarter of the total remaining natural

community. It is estimated that attempts to mitigate this lost woodland with the generation of a new stand would take in excess of 200 years to reach a maturity level equivalent to the existing stand. This inundation footprint could also negatively affect six species listed as endangered or threatened by the California or Federal ESA. These species include the San Joaquin kit fox (Federal Endangered/State Threatened) with displacement of the only known remaining population of kit fox inhabiting valley floor grassland. This inundation would flood 50 known kit fox dens and up to 425 potential dens and isolate up to 65 kit foxes with significant long term effects on gene flow between populations north and south of the reservoir (CALFED 2000).

Orestimba Reservoir A new off-stream reservoir on Orestimba Creek in Stanislaus County could create between 295 and 1,137 TAF of new surface water storage capacity. The reservoir would inundate up to 33 miles of Orestimba Creek and 2,200 acres of habitat. The inundation zone was identified by the Service as critical habitat for both the San Joaquin kit fox (Vulpes macrotis mutica) listed as endangered and the California red-legged frog (Rana aurora draytonii) listed as threatened by the ESA. The Service reported that construction of the Orestimba Reservoir could create a long term risk to their survival and recovery. The land the reservoir would inundate is owned and managed by the Nature Conservancy and was purchased in part through mitigation funds set aside for impacts created by the CVP, by the Department of the Interior. The property has a perpetual conservation easement, to protect fish and wildlife value, that specifically precludes reservoir construction.

Romero Reservoir A new off-stream reservoir on Romero Creek in Merced County could create 184 TAF of new surface water storage capacity.

4.2.6 Alternate Water Supplies

These alternate water supply measures would provide a new source of water to users in the San Felipe Division, reducing their demands for CVP water from the San Luis Reservoir. Figure 4-8 indicates the locations of the following measures: desalination, increased groundwater storage, expansion of Los Vaqueros Reservoir, expansion of Calaveras Reservoir, and SBA management.

Demand Side Management in the San Felipe Division

Water conservation measures in the San Felipe Division could lower San Felipe Division water demands on San Luis Reservoir during the low point months. San Felipe Division contractors are already implementing urban and/or agricultural conservation measures, which limit the amount of water reductions available under this measure. In its 2003 IWRP, SCVWD investigated water conservation options and identified 64 TAF per year of water savings that could be realized through conservation efforts (SCVWD 2005b). The conservation measures identified in the IWRP are already included in SCVWD's long range planning horizon calculations and would not help to resolve SCVWD's low

point related water supply reliability and certainty problems. PVWMA has proposed implementing cost-effective, voluntary agricultural and urban water conservation measures that could save up to 5 TAF per year. To achieve higher levels of conservation, PVWMA would need to implement mandatory conservation measures that could be capital and cost intensive (PVWMA 2002). SBCWD is also implementing and planning for future demand reduction measures for M&I and agricultural water use. Specifically, SBCWD identified goals to reduce M&I water demands by 1 percent per year and improve agricultural efficiency to 85 percent (SBCWD 2002). The capacity to reduce the need for CVP supplies through additional demand side management options (beyond the measures already identified) may not be available.

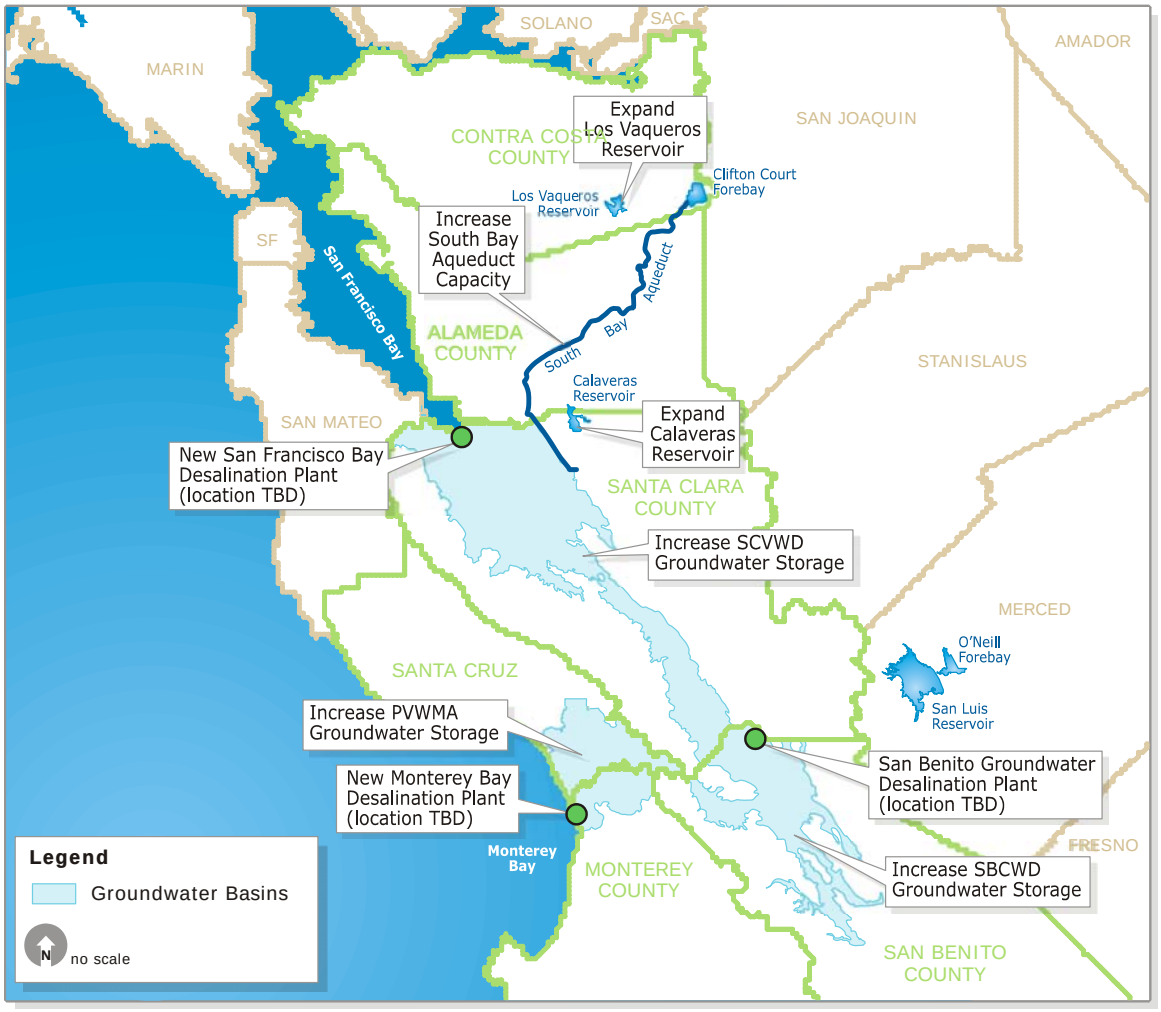

Figure 4-8. Alternate Water Supplies

Desalination: Monterey Bay

This measure would involve construction of a new 317-mgd desalination plant adjacent to Monterey Bay and the Moss Landing Power Plant. This facility would expand upon (or be independent from) the facility near Moss Landing that local agencies are considering. The plant would use the existing water intake at the power plant, along with supplemental intake structures, to bring seawater to the desalination plant. Permeate from the plant would contain approximately 330 mg/L total dissolved solids (TDS), which is less than the 500mg/L TDS level considered safe for drinking. A new, 96-inch diameter potable water pipeline would extend north along Elkhorn Slough, and then follow the proposed Pajaro Pipeline route to the Watsonville Turnout on the Santa Clara Conduit. This pipeline would replace the proposed 48-inch Pajaro Pipeline. At the turnout, most of the flow would divert northward along the Santa Clara Conduit, while approximately 71 mgd would flow the opposite direction to the Hollister Conduit. A pump station totaling 46,730 horsepower (HP) would be constructed to lift water from the Monterey Bay facility to the Santa Clara and Hollister Conduits. The Monterey Bay desalination plant would only supply water to the San Felipe Division during periods of poor water quality in the San Luis Reservoir. For the remainder of the year, the facility could supply water to communities along the coast in Monterey and Santa Cruz Counties. This facility would be designed to fully replace the scheduled deliveries to SCVWD, PVWMA, and SBCWD from San Luis Reservoir during supply interruptions created by the low point issue.

Desalination: San Benito Groundwater Basin

This measure would construct a new 53-mgd demineralization plant near Hollister to treat brackish groundwater for delivery to the Hollister Conduit. Water from the plant would contain approximately 60 mg/L TDS. Water from the plant would be blended with approximately 18 mgd of raw groundwater, which would produce water containing about 250 mg/L TDS. About 20 groundwater wells would be constructed to extract 85 mgd of groundwater for demineralization and blending. During wet years, groundwater wells would recharge groundwater with San Luis Reservoir water. A 7,865-HP pumping facility would be constructed to distribute water along the Hollister Conduit. This facility would be designed to fully replace the scheduled deliveries to SBCWD from San Luis Reservoir during supply interruptions created by the low point issue.

Desalination: San Francisco Bay

This measure would involve construction of a new 317-mgd desalination plant to treat seawater from San Francisco Bay for distribution to all San Felipe Division participants during periods of poor water quality in the San Luis Reservoir. The desalination plant would produce water containing approximately 330 mg/L TDS. A new 102-inch pipeline would follow along the Hetch Hetchy and Milpitas pipeline routes to the Piedmont Valve yard. From

the valve yard, some water would be delivered to the Rinconada treatment plant via the Central Pipeline. The remaining water would be delivered to Santa Teresa WTP, south county customers, Pajaro Pipeline, and Hollister Conduit via the Snell Pipeline and a new 42- to 54-inch pipeline that parallels Snell Pipeline. Pumping requirements to convey water would increase to 18,313-HP at the desalination facility, 14,880-HP at the valve yard, and 13,810-HP at Santa Teresa WTP. A future tie-in to the Hetch Hetchy Pipeline could deliver reverse osmosis treated water from the desalination plant to the existing San Francisco Bay Division pipelines when desalinated water is not needed to replace San Luis Reservoir water. This facility would be designed to fully replace the scheduled deliveries to SCVWD, PVWMA, and SBCWD from San Luis Reservoir during supply interruptions created by the low point issue.

Desalination: San Benito Groundwater Basin, San Francisco Bay, and Monterey Bay

This measure would develop three facilities, one at the San Francisco Bay, one at the Monterey Bay, and one in San Benito County. A new 213-mgd desalination plant near the San Jose Regional Water Pollution Control Facility would treat water for delivery to SCVWD. A second, 33-mgd desalination plant would treat Monterey Bay water to supply water to the PVWMA. A 53-mgd demineralization plant near Hollister would treat brackish groundwater for delivery to SBCWD. These desalination facilities would provide water to the water agencies near them and would be designed to fully replace the scheduled deliveries from San Luis Reservoir during supply interruptions created by the low point issue.

Los Vaqueros Expansion

Reclamation, DWR, and Contra Costa Water District are preparing a feasibility study of the potential expansion of the Los Vaqueros Reservoir with and without the expansion of the SBA. Additional water stored in Los Vaqueros could reduce the effects of San Luis Reservoir supply interruptions caused by the low point issue through deliveries of stored Los Vaqueros water to the San Felipe Division in lieu of deliveries from San Luis Reservoir. An expanded Los Vaqueros Reservoir and SBA, with development of a connection between Los Vaqueros Reservoir and Bethany Reservoir, could deliver up to 100 TAF to San Luis Reservoir during the low point months through the California Aqueduct. This measure would help avoid occurrences of the low point issue by maintaining water levels in San Luis Reservoir above approximately 300 TAF. This scenario depends on the completion of the planned SBA expansion and the availability of 100 TAF of Delta supply during the summer low point months. Reclamation could store a minimum of 180 TAF of drought year water supply in an expanded Los Vaqueros Reservoir. The expanded SBA could deliver a maximum of 25 TAF of water per month to the SBA Contractors, an increase of 7 TAF per month from the current 18 TAF per month. This measure would also

require changes and enlargements to the SBA contractor conveyance system to distribute the increased deliveries.

More Storage in SCVWD Groundwater Basin

This measure includes groundwater storage and use in addition to that included in SCVWD's current or existing plans. In 2001, SCVWD completed its Groundwater Management Plan, which described existing groundwater management programs and documented future management goals (SCVWD 2001). SCVWD manages its basin to maintain the maximum storage possible without creating high groundwater problems. During dry periods, when local and imported water supplies do not meet water needs, stored groundwater is used to make up the difference. However, the use of this storage must be balanced with the potential occurrence of land subsidence. SCVWD has limited control over pumping by local retailers and the available groundwater supply is nearly fully utilized at current levels of development. Potential supplies could be available during supply interruptions caused by the low point issue in normal and wet years, but groundwater would not be available in dry or critical years. The groundwater storage measures identified in the SCVWD IRWP and *Groundwater Management Plan* are already included in SCVWD's long range planning horizon calculations and would not resolve low point related water supply reliability and certainty problems. Table 4-1 shows the available groundwater storage and extraction capacity in the SCVWD groundwater basin.

Table 4-1. Available Groundwater Storage and Extraction Capacity (SCVWD[1])

	Water Year Type				
	Critically Dry	**Dry**	**Below Normal**	**Above Normal**	**Wet**
Available Groundwater[2]	0	0	17.5 TAF	17.5 TAF	20 TAF

Notes:
[1]Values originally presented in the 2003 SLLPIP Draft Alternative Screening Report Technical Appendices. Groundwater storage capacities for the SBCWD were not developed in the technical appendices and will be developed as a part of the PFR Phase of the SLLPIP Feasibility Study.
[2]2003 SLLPIP Draft Alternative Screening Report Technical Appendices estimated below and above normal water year values assuming 50% of the net available groundwater in water year 2000, wet year value estimated at 20,000 AF
Key: TAF = thousand acre feet
SLLPIP = San Luis Low Point Improvement Project
SBCWD = San Benito County Water District
PFR = plan formulation report

Options from SBCWD Basin Management Plan

This measure includes groundwater use that is not included in current or existing plans of SBCWD. The 2003 SBCWD *Groundwater Management Plan* outlines ongoing and potential projects to improve local water supply conditions. SBCWD has municipal, industrial, and agricultural water treatment and basin recharge operations and groundwater banking programs in place. In its *Groundwater Management Plan*, SBCWD outlined plans for: construction of conveyance facilities connecting the multiple sub-basins in the SBCWD and shifting supplies in overabundance to basins experiencing localized overdraft; expanded groundwater banking operations both in SBCWD groundwater

aquifers and at already operating groundwater banks outside of SBCWD; and construction of groundwater treatment facilities to make use of supplies with high salt levels. Based on existing and planned used for groundwater within the district, limited groundwater might be available during supply interruptions caused by the low point issue.

Options from PVWMA Basin Management Plan

This measure includes groundwater use that is not included in current or existing plans of PVMWA. The 2002 PVWMA *Basin Management Plan* describes projects that PVWMA is planning to improve the groundwater overdraft conditions that are causing seawater intrusion into its groundwater aquifers. The *Basin Management Plan* reported that of the PVWMA's total demand of 71.5 TAF per year, approximately 69 TAF is being supplied through local groundwater extraction. This plan also projected that demand in the year 2040 would be 80.5 TAF. The *Basin Management Plan* identified a preferred alternative that included measures to minimize groundwater pumping near the coast through: the construction of new distribution infrastructure to deliver water to coastal farms; diversion of surface water supplies in area rivers, streams and sloughs to percolation ponds for groundwater recharge; recycling waste water through increased treatment for use as agricultural supply and basin recharge; development of access to CVP supply (when possible); and out-of-basin groundwater banking (PVWMA 2002). Only a very limited supply of groundwater may be available in the future during a supply interruption caused by the low point issue.

Water Recycling in SCVWD

Recycling wastewater within SCVWD could offset potable water demands and reduce the required CVP deliveries from San Luis Reservoir. SCVWD investigated water recycling options in its 2003 IWRP. The IWRP identified 33 TAF of water recycling capacity that SCVWD plans to implement as part of its future water supply for landscape and agriculture irrigation and industrial uses within SCVWD (SCVWD 2003c). Wastewater generation is typically lower during the summer, when the San Felipe Division would need supplies in lieu of CVP deliveries. SCVWD has identified facilities to recycle most dry-season discharge, and substantial amounts of additional wastewater for treatment may not be available to implement this measure.

Re-Operation of Anderson Reservoir

Anderson Reservoir is a SCVWD storage reservoir with a capacity of 89 TAF and is used for local runoff collection, flood control, and recreational uses. The reservoir has a connection to the Santa Teresa WTP and is classified as an emergency supply source by the Department of Health Services. The reservoir could be reoperated with the intent of storing CVP supply conveyed through San Luis Reservoir during non-low point months. Anderson Reservoir has a

drawdown limit of 6 TAF per month designed to prevent bank erosion problems that have occurred in the past. Current recreational activities on Anderson Reservoir would have to be reduced if it were used as a regular water supply storage facility.

SFPUC Expanded Calaveras Reservoir

Calaveras Reservoir, operated by the SFPUC, is used to store up to about 97 TAF of water for users in Alameda, Santa Clara, San Mateo, and San Francisco Counties. The hydraulic dam was built in the 1920's and is adjacent to the Calaveras Fault. In 2001 the California Division of Safety of Dams, in response to seismic safety questions, restricted storage levels in Calaveras Reservoir to approximately 40 percent of its maximum capacity. The SFPUC Capital Improvements Program identified the replacement and potential expansion of Calaveras Reservoir as one of 37 regional water supply infrastructure improvement projects necessary to maintain SFPUC's transmission system reliability. The SFPUC is planning a project to develop a new dam with the same storage capacity as the original hydraulic dam, with design features to facilitate potential future enlargement, but enlargement is not currently being considered by the SFPUC (SFPUC Undated). The project is scheduled to initiate construction in 2009 and conclude in 2011 (SFPUC Undated).

SFPUC Intertie

In 1999, SCVWD and the SFPUC entered into an agreement for emergency water supply. The agreement covers the ownership, use, and operation of an intertie and pump station facility in Milpitas. The intertie is designed to provide up to 40 mgd (122.7 AF per day) from the SFPUC to SCVWD or from SCVWD to SFPUC. The facility is intended for use during emergency situations or during periods of planned critical facilities maintenance. Emergency situations are defined in the agreement as: "(1) Actual or imminent failure of facilities, such as major pipelines, treatment plants, or pumping stations; (2) Major disruptions in water supply caused by natural conditions, manmade disasters or temporary regulatory conditions; or (3) A water shortage emergency declared under California Water Code 5 350 et seq." The low point issue may not fit within the definition of emergency supply; however, if contract agreements could be reached, the SFPUC intertie has the potential to provide up to 3,680 AF per month during low point months.

4.3 Management Measure Screening

The Level 1 screening process evaluated measures based on technical viability, institutional viability, and the ability to meet the project objectives. This screening did not determine whether measures were absolutely viable, but rather looked for fatal flaws that would make a measure unviable. Further analysis

during the feasibility study process could show that a particular measure that was carried forward during Level 1 screening was actually unviable. If measures did not pass the technical and institutional viability criteria, they were dropped from the analysis immediately. Measures that passed both technical and institutional viability criteria were then evaluated against the project objectives using defined rating scales.

4.3.1 Technical and Institutional Screening Criteria

The technical and institutional viability criteria take into account essential factors that the measures were required to meet. Technical viability addresses the general engineering viability of the measures. This criterion asks the question: can the measure be constructed or implemented to effectively address the low point issue? For example, some source water quality control measures might not be viable because the size of the reservoir might inhibit their effectiveness.

Because of the complex engineering associated with expanding or building new surface storage reservoirs, the Study team defined more specific criteria to describe the measures' technical viability. These criteria address each potential reservoir's capacity, elevation, proximity to infrastructure, ratio of additional dam volume to additional reservoir storage capacity, and geotechnical concerns. Appendix B further defines the new or expanded reservoir storage criteria.

Institutional viability accounts for the institutional aspects of a measure, including regulatory and environmental compliance and public acceptance. Regulatory issues could arise for measures that would require changes to contracts or operations or measures that require involvement of multiple agencies. Environmental compliance considers CEQA and NEPA issues, potential ESA conflicts, or any potential permitting problems. The public acceptance aspect of this criterion relates to the general public reaction to a measure. If the Study team believed the public could successfully prevent implementation of a measure, it was screened out. As it did for technical viability, the Study team further defined this criterion for new or expanded reservoirs, as described in Appendix B.

Figure 4-9 shows the results of the Level 1 screening; measures that would not be viable are indicated by blue shading in the technical and institutional viability columns of the figure.

4.3.2 SLLPIP Objectives Screening Criteria

The Study team also evaluated the measures relative to the project objectives. Figure 4-9 depicts the evaluation results with circles. In general, a full circle in figure 4-9 means the measure performs "well" relative to the objective, a partially full circle means the measure performs "moderately," and an empty

circle means the measure does not meet the objective. This section describes the screening evaluation for each objective.

Objective 1: Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on San Luis Reservoir.

This objective reflects the certainty related to meeting contractors' delivery schedules within a given year. If the reservoir falls below 300 TAF, the low point issue would affect the delivery schedule for San Felipe Division contractors dependent on San Luis Reservoir by reducing water deliveries during the late summer months when water quality is a problem. Fully exercising San Luis Reservoir would interrupt water deliveries to the San Felipe Division because the water levels would fall below the Lower Pacheco intake elevation. These uncertainties in water deliveries increase the contractors' risk of not meeting water demands. Even a forecast that San Luis Reservoir might have a low point issue would affect San Felipe Division water management and costs as districts plan for and invest in alternate supplies to replace CVP deliveries interrupted by the low point issue. Measures that perform well in relation to this objective would reduce the risk to the contractors by increasing the certainty of annual CVP deliveries from San Luis Reservoir.

The rating scale for this criterion considers the measure's potential to reduce risk to south-of-Delta contractors associated with the threat of cancellation or drops in scheduled CVP deliveries for each management measure. The scale is as follows:

- Performs well (full circle) - Reduces contractors' risk of not meeting delivery schedule.
- Performs moderately (partial circle) - Partially reduces contractors risk of not meeting delivery schedule.
- Does not meet objective (empty circle) - Does not reduce contractors' risk of not meeting delivery schedule.

Objective 2: Increasing the reliability and quantity of yearly allocations to south-of-Delta contractors dependent on San Luis Reservoir.

This objective addresses the quantity and level of reliability related to increasing allocations in all or most years to more closely match the CVP contractual allocations. In the future, the low point issue could prevent full use of storage in San Luis Reservoir, which would reduce the quantity and reliability of CVP supplies. Measures that allow full exercise of storage in San Luis Reservoir would increase the quantity and reliability beyond the future without project conditions. Some measures could provide quantity and reliability beyond that possible through full exercise of San Luis Reservoir

storage. These measures generally introduce new storage or supplies into the system.

The rating scales for this objective reflect the ability of a measure to increase quantity and reliability. Measures that go beyond San Luis Reservoir storage would perform the best and be designated by a full circle in figure 4-9. The rating scale is as follows:

- Performs well (full circle) - Improves the reliability and quantity of annual allocations to south-of-Delta contractors dependent on San Luis Reservoir by increasing reliability and quantity in excess of that which would be created by full exercise of San Luis Reservoir storage or a functional equivalent.
- Performs moderately (partial circle) - Improves the reliability and quantity of annual allocations to south-of-Delta contractors dependent on San Luis Reservoir by fully exercising storage in San Luis Reservoir.
- Does not meet objective (empty circle) - Makes little or no improvement in the reliability or the quantity of annual allocations to south-of-Delta contractors dependent on San Luis Reservoir.

Objective 3: Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on San Luis Reservoir without sacrificing accuracy of the allocation forecasts.

This objective, which primarily applies to agricultural contractors, addresses Reclamation's ability to improve early season CVP forecasts. Currently, Reclamation releases conservative estimates in the early spring of the expected annual CVP allocation. CVP agricultural contractors must plan their water supply and irrigation season based on these estimates. If Reclamation could provide earlier forecasts that projected higher allocations, CVP agricultural contractors might be able to plan for more acreage and/or higher value crops. This objective is directly related to the reliability and quantity of water supplies. Fixing the low point issues could allow Reclamation to fully exercise storage at San Luis Reservoir without interrupting San Felipe Division supplies, which could allow for less conservative early season estimates. Measures that provide additional safety nets would allow even more accurate forecasts.

The rating scale for this objective reflects the ability of the measure to improve Reclamation's early season CVP forecasts. The scale is as follows:

- Performs well (full circle) - Provides the ability to announce final allocations in the early spring with little risk of revision by increasing supplies in excess of the benefit that would be created by full exercise of San Luis Reservoir storage or a functional equivalent.

- Performs moderately (partial circle) - Provides the ability to announce a less conservative estimate of final allocation in early spring by fully exercising San Luis Reservoir storage or a functional equivalent.
- Does not meet objective (empty circle) - Provides little or no change in allocation estimate and final allocation timing.

4.3.3 Level 1 Screening Results

Figure 4-9 presents the results of the Level 1 screening, and indicates which measures will go on into Level 2 screening. Measures that are technically and institutionally viable and received at least one “performs moderately” rating (a partially full circle in figure 4-9) related to one of the three project objectives were retained for Level 2 screening because they would make some contribution towards the objectives, and could thereby be combined with other viable measures to form a preliminary alternative. Figure 4-9 also notes why the eliminated measures are not being carried forward.

SLLPP Level 1 Project Measure Screening

Measures	Viability		Ability to Meet Project Objectives			Screening Results	Notes
	Technical	Institutional	Reduces Delivery Schedule Risk	Increases Annual Allocation Reliability	Provides for Earlier Annual Allocation		
Institutional Agreements							
Banking			◒	◒	◒		
Exchanges			◒	○	○		
Operating Agreements and Procedures			◒	○	○		
Rescheduling			○	○	○		*If rescheduled water is not used by April 15th (when VAMP flows begin), the water reverts to CVP water without refund and is not available to address the low point problem.*
Source Water Quality Control							
Algae Harvesting			◒	○	○		
Algaecides/Herbicides (for algae or macrophytes)			◒	○	○		
Barley Straw (to absorb algae and nutrients)	■	■					*Because of its large size, San Luis Reservoir would require 500 tons of barley straw, which would be expensive and difficult and likely affect recreation activities at the reservoir.*
Coffer Dam Around Intake	■						*Isolating a portion of water in the reservoir would not improve and could further degrade water quality.*
Dilution/Flushing (Local Runoff)	■						*Supply of local high quality water large enough to dilute San Luis supplies is not available.*
Dredging	■						*Reservoir floor does not contribute significantly to algae growth; Delta exports are the main source of nutrients.*
Fish Grazers on Algae or Macrophytes	■	■					*Fish that graze on algae are not well suited to San Luis because these fish can reduce habitat for game fish species.*
Floating Covers	■	■					*San Luis Reservoir has a 12,520 acre surface area. A floating cover would be infeasible because of the reservoir's size and impact on existing recreational uses.*
Intermediate Intake for Pacheco Pumping Plant			○	○	○		*Developing an intermediate intake for the San Felipe Division would not enable increased diversions; a lower intake would be needed.*
Isolate Portion (Arm) of San Luis Reservoir		■					*Isolating a portion of water in the reservoir would not improve and could further degrade water quality.*
Macrophyte (Water Weed Harvesting)			○	○	○		*Nuisance weeds in San Luis do not contribute significantly to algae growth; Delta exports are the main source of nutrients.*
Managed Stratification (Modify Gianelli Inlet/Outlet Works)			◒	○	○		
Mechanical Destratification and Lake Mixing	■	■					*Mechanical destratification would not be feasible because of the large reservoir size.*
Nutrient Harvesting from Fish or other Biota	■	■					*Fish and water weeds are not a major contributor to algae growth; Delta exports are the main source of nutrients.*
Oxygenation or Aeration	■						*Oxygenating or aerating San Luis Reservoir would not be feasible because of the large reservoir size.*
Pathogens of Algae or Macrophytes	■						*Blue green algae build up resistance to pathogens, minimizing their effectiveness.*
Sediment Sealing (Fabric liners, chemical barriers)	■						*The reservoir floor does not contribute significantly to algae growth; Delta exports are the main source of nutrients.*
Shading (Dyes) to Minimize Light for Photosynthesis	■	■					*San Luis Reservoir has a 12,520 acre surface and stores 2 million acre-feet of water; limiting algae growth by applying dyes would be infeasible because of reservoir size and the impact on existing recreational uses.*
Use Calero Reservoir as Wetlands	■	■					*The 9,000-acre Calero Reservoir is not large enough for the estimated 25,000 acres of wetland needed to treat the water stored in San Luis Reservoir. Converting an existing water storage reservoir to a water treatment facility would be politically infeasible because of the loss in local surface storage.*
Water Level Fluctuation		■					*Water weeds are not a major contributor to algae growth; Delta exports are the main source of nutrients.*
Wetlands Algae Filter (Off-line wetlands)	■						*Constructing the estimated 25,000 acres of wetland needed to treat the water stored in San Luis would not be technically feasible.*
Water Treatment							
Dissolved Air Flotation (DAF) near San Felipe Intake			◒	◒	◒		
DAF at Coyote Pumping Plant (plus San Benito and Pajaro)			◒	◒	◒		
DAF at Santa Teresa and Rinconada (plus San Benito and Pajaro)			◒	◒	◒		
Add ozone to raw water as it enters water treatment facilities			◒	◒	◒		
Add potassium permangante to raw water along the Santa Clara Conduit			◒	◒	◒		

Symbol Key ■ *Not Technically or Institutionally Viable* ○ *Does Not Meet Project Objective* ◒ *Partially Meets Project Objective* ● *Meets Project Objective* *Measure Screened Out* *Measure Retained for Level 2 Screening*

Figure 4-9 – SLLPIP Level 1 Management Measure Screening

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SLLPP Level 1 Project Measure Screening

Measures	Viability		Ability to Meet Project Objectives			Screening Results	Notes
	Technical	Institutional	Reduces Delivery Schedule Risk	Increases Annual Allocation Reliability	Provides for Earlier Annual Allocation		
Conveyance							
Highway 152 Pipeline/Tunnel	■						*Caltrans would likely not provide pipeline easements.*
Holladay Aqueduct			●	◒	◒		
Northerly Bypass Corridor			●	◒	◒		
Southerly Bypass Corridor			●	◒	◒		
Extend/Lower San Felipe Intake to Gianelli Inlet/Outlet Level			◒	◒	◒		
Ranney Collectors in San Luis Reservoir	■						*The floor of the reservoir is not geotechnically suited to ranney collectors; therefore, 20-40 miles of infiltration galleries would need to be constructed at the bottom of the reservoir.*
San Felipe Division Conveyance Modifications			●	◒	◒		
Local Reservoir Storage: More Storage at Existing Dam and Reservoir Sites							
Almaden		■					*Almaden Reservoir would be 3,000 feet upstream from New Almaden (a National Historic Landmark).*
Anderson			●	●	●		
Calero	■						*An expanded Calero Reservoir would be in an area with liquefiable soils and would not have acceptable dam materials in the vicinity of construction.*
Chesbro			●	●	●		
Coyote	■						*An expanded Coyote Reservoir would have an active fault running under its left abutment.*
Guadalupe	■						*An expanded Guadalupe Reservoir would have too high an elevation, and would potentially have active faults running through the expanded site.*
Lexington	■	■					*An expanded Lexington Reservoir would be greater than 5 miles from the nearest conveyance facilities and would require relocation of several miles of Highway 17.*
Lower Pacheco (Pacheco Lake Reservoir)			●	●	●		
Pacheco A			●	●	●		
Pacheco B		■					*The Pacheco B Reservoir would inundate a portion of Henry Coe State Park.*
Raise San Luis Reservoir			◒	◒	◒		
Stevens Creek	■						*An expanded Stevens Creek Reservoir would be greater than 5 miles from the nearest conveyance facilities and would be an inefficient site (large dam size compared to the storage volume).*
Upper Pacheco		■					*The Upper Pacheco Reservoir would inundate a portion of Henry Coe State Park.*
Uvas	■						*An expanded Uvas Reservoir would be greater then 5 miles from the nearest conveyance facilities.*
Vasona	■	■					*An expanded Vasona Reservoir would be greater than 5 miles from the nearest conveyance facilities and would inundate portions of Los Gatos.*
Local Reservoir Storage: New Dams and Reservoir Sites							
Ausaymas	■						*Ausaymas Reservoir would have too high an elevation and would be an inefficient site (large dam size compared to the storage volume).*
Blue Ridge	■						*Blue Ridge Reservoir would inundate a portion of Henry Coe State Park, would have too high an elevation, and would be greater than 5 miles from the nearest conveyance facilities.*
Cedar Creek	■						*Cedar Creek Reservoir would involve a dam and storage facility on liquefiable soils and would not have acceptable dam material in the vicinity for construction.*
Clarks Canyon	■						*Clarks Canyon Reservoir would have too high an elevation and would be an inefficient site (large dam size compared to the storage volume).*
Coe	■	■					*Coe Reservoir would inundate a portion of Henry Coe State Park, would have too high an elevation, and would be greater than 5 miles from the nearest conveyance facilities.*

Symbol Key ■ *Not Technically or Institutionally Viable* ○ *Does Not Meet Project Objective* ◒ *Partially Meets Project Objective* ● *Meets Project Objective* ■ *Measure Screened Out* ■ *Measure Retained for Level 2 Screening*

Figure 4-9 – SLLPIP Level 1 Management Measure Screening

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SLLPP Level 1 Project Measure Screening

Measures	Viability		Ability to Meet Project Objectives			Screening Results	Notes
	Technical	Institutional	Reduces Delivery Schedule Risk	Increases Annual Allocation Reliability	Provides for Earlier Annual Allocation		
Local Reservoir Storage: New Dams and Reservoir Sites, continued							
Harper	■						*Harper Reservoir would be an inefficient site (large dam size compared to the storage volume).*
Los Osos		■					*Los Osos Reservoir would inundate portions of Henry Coe State Park.*
North Fork Pacheco	■	■					*North Fork Pacheco Reservoir would have too high an elevation, would be greater than 5 miles from the nearest conveyance facilities, and would be an inefficient site (large dam size compared to the storage volume).*
Packwood	■						*Packwood Reservoir would have too high an elevation.*
San Benito			◒	◒	◒		
San Felipe	■						*San Felipe Reservoir would have too high an elevation and would be an inefficient site (large dam size compared to the storage volume).*
Smith Creek	■						*Smith Creek Reservoir would have too high an elevation, would be greater than 5 miles from the nearest conveyance facilities, and would be an inefficient site (large dam size compared to the storage volume).*
South Fork Pacheco	■						*South Fork Pacheco Reservoir would have too high an elevation and would be an inefficient site (large dam size compared to the storage volume).*
Del Puerto Reservoir			●	●	●		
Ingram Canyon Reservoir			●	●	●		
Quinto Creek Reservoir			●	●	●		
Garzas Reservoir		■					*A reservoir at Garzas Creek would inundate an area with a permanent conservation easement created for CVP mitigation.*
Little Salado Crow Reservoir	■						*Little Salado Crow Reservoir would not be large enough to meet needs.*
Los Banos Grandes Reservoir		■					*Potential environmental impacts would lead to significant difficulty in implementation.*
Orestimba Reservoir		■					*Orestimba Reservoir would inundate an area with a permanent conservation easement created for CVP mitigation.*
Romero Reservoir	■						*Romero Reservoir would not be large enough to meet needs.*
Alternate Water Supplies							
Demand-Side Management in SCVWD	■						*SCVWD has implemented or is planning to implement most demand-side management measures as part of its baseline water supply.*
Desalination: Monterey Bay			●	●	●		
Desalination: San Benito Groundwater Basin			●	●	●		
Desalination: San Francisco Bay			●	●	●		
Desalination: San Benito Groundwater Basin, San Francisco Bay, and Monterey Bay			●	●	●		
Enlarged SBA/Los Vaqueros Expansion			◒	○	○		
Los Vaqueros Expansion			◒	○	○		
More Storage in SCVWD Groundwater Basin			◒	◒	◒		
Options from SBCWD Basin Management Plan			◒	◒	◒		
Options from PVWMA Basin Management Plan			◒	◒	◒		
Recycling in SCVWD			◒	○	○		*SCVWD is planning to recycle most dry-season discharge as part of its baseline water supply.*
Re-Operation of Anderson Reservoir			◒	○	○		
SFPUC Expanded Calaveras Reservoir	■	■					*SFPUC is not planning to expand Calaveras Reservoir as a part of its ongoing dam replacement project.*
SFPUC Intertie			◒	◒	◒		

Symbol Key ■ *Not Technically or Institutionally Viable* ○ *Does Not Meet Project Objective* ◒ *Partially Meets Project Objective* ● *Meets Project Objective* ■ *Measure Screened Out* ■ *Measure Retained for Level 2 Screening*

Figure 4-9 – SLLPIP Level 1 Management Measure Screening

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Chapter 5
Initial Alternatives Development

5.1 Initial Alternatives Development

Thirty-four resource management measures passed the Level 1 screening process; Figure 4-9 shows the retained measures. These include all measures that passed technical and institutional viability screening and received at least one rating of "performed moderately" (one half full circle on Figure 4-9, the screening summary figure) for the project objectives. The Study team developed initial alternatives from the retained measures. Initial alternatives include one measure or a combination of measures. Measures were combined to improve performance relative to the project objectives. The Study team sought to develop alternatives that would meet all three project objectives, indicated by a full circle in the Level 1 screening figure. If a measure would not perform well for all the project objectives, it was combined into an alternative.

As presented in the Level 1 rating scales, a measure would only receive a "performed well" rating if it: (1) reduced the risk of delivery shortages by addressing late summer algae growth and water levels falling below the Pacheco Intake; (2) increased water supply reliability beyond that available from San Luis Reservoir; and (3) allowed for aggressive early season CVP forecasts by providing reliable water supplies beyond those available in San Luis Reservoir.

The Study Team developed 23 alternatives to meet the above criteria. Each retained measure is included in at least one initial alternative. The alternatives continue to represent each measure category: institutional agreements, source water quality control, water treatment, conveyance, storage, and alternate water supplies. A combination alternative was also added and represents its own category. This diversity of alternative types allows for a wide range of alternatives to be evaluated through the Feasibility Study process.

In general, the initial alternatives would achieve the three project objectives; however, every alternative would not meet each of the objectives to the same extent. The Study team included exchanges in most alternatives to meet the objectives of south-of-Delta contractors (generally, objectives 2 and 3). Exchanges would provide water supplies for the south-of-Delta contractors beyond San Luis Reservoir supplies; this would improve reliability and allow Reclamation to make more aggressive forecasts.

The Study Team had more difficulty in combining measures that would reasonably provide additional water supplies for the San Felipe Division beyond those available through use of San Luis Reservoir. Exchanges would not be as effective for that purpose because the San Felipe Division is not fully connected to the state's water system. Because of conveyance limitations, CVP deliveries to the San Felipe Division must go through San Luis Reservoir, and SWP water that is delivered to the San Felipe Division through the SBA is only accessible to northern Santa Clara County. Therefore, exchanges would not help the entire San Felipe Division. The Study team could have combined other measures to fully meet the project objectives for the San Felipe Division; however, the resulting alternatives would likely require very intensive and expensive construction activities, which is not realistic for this evaluation.

5.2 Overview of Initial Alternatives

The initial alternatives represent the same general categories that the resource management measures did. However, measures from one category were combined with measures from another category to develop an alternative. Figure 5-1 shows the alternatives with the measures included in each category.

5.2.1 Features and Impacts Common to Many Alternatives

Groundwater banking and exchanges are included in many of the alternatives. These measures would have similar operations and would provide similar benefits under each alternative. The impacts associated with these measures would also be similar under all of the alternatives in which they are included. Further, at this stage in the planning process, the level of knowledge regarding potential construction impacts is similar for all of the alternatives. To avoid text repetition, groundwater banking, exchanges, and general construction impacts are described here once for all of the alternatives. Specific descriptions of the alternatives begin in Section 5.3.

Groundwater Banking

Groundwater banking operations, through water supply withdrawal and delivery from regional groundwater banks, would slow the drawdown of San Luis Reservoir in years that the low point issue is projected to occur. This withdrawal of stored water would reduce demands on San Luis Reservoir and allow water levels in the reservoir to stay high enough to continue deliveries to the San Felipe Division longer in the year than would otherwise be possible. Implementation of this measure would involve accessing previously developed groundwater storage facilities; no new facility construction would be required as a result of the groundwater banking agreements.

Category	Alternative	Included Measures
Institutional	Institutional Alternative	*Banking, exchanges, and operating agreements and procedures*
Source Water Quality Control	Algae Harvesting Alternative	*Algae harvesting, banking, exchanges, and groundwater storage*
	Algaecide Alternative	*Algaecides, banking, exchanges, and groundwater storage*
	Managed Stratification Alternative	*Managed stratification, DAF at Gianelli, exchanges, and operating agreements and procedures*
Treatment	Treatment at San Felipe Intake Alternative	*DAF at San Felipe Intake, treatment at Rinconada, and exchanges*
	Treatment at WTPs Alternative	*DAF at WTPs, treatment at Rinconada, and exchanges*
	Treatment at Pumping Plant Alternative	*DAF at Coyote PP, treatment at Rinconada, and exchanges*
Conveyance	Holladay Aqueduct Alternative	*Holladay Aqueduct and exchanges*
	Northerly Bypass Corridor Alternative	*Northerly Bypass Corridor and exchanges*
	Southerly Bypass Corridor Alternative	*Southerly Bypass Corridor and exchanges*
	Lower San Felipe Intake Alternative	*Extend/Lower San Felipe Intake to Gianelli Inlet/Outlet Level and banking*
Storage	Anderson Reservoir Expansion Alternative	*Anderson expansion and exchanges*
	Chesbro Reservoir Expansion Alternative	*Chesbro expansion and exchanges*
	Lower Pacheco Reservoir Alternative	*Lower Pacheco (Pacheco Lake Reservoir) and exchanges*
	Pacheco A Reservoir Alternative	*Pacheco A Reservoir and exchanges*
	San Luis Reservoir Expansion Alternative	*Raise San Luis Reservoir and exchanges*
	San Benito Reservoir Alternative	*San Benito Reservoir and exchanges*
	Del Puerto Canyon Reservoir Alternative	*Del Puerto Canyon Reservoir, banking, groundwater storage, and exchanges*
	Ingram Canyon Reservoir Alternative	*Ingram Canyon Reservoir and exchanges*
	Quinto Creek Reservoir Alternative	*Quinto Creek Reservoir and exchanges*
Alternate Water Supplies	Monterey Bay Desalination Alternative	*Monterey Bay desalination and exchanges*
	San Francisco Bay Desalination Alternative	*San Francisco Bay desalination and exchanges*
	Combined Desalination Alternative	*San Benito groundwater desalination, San Francisco Bay desalination, Monterey Bay desalination, and exchanges*
	Enlarged SBA/Los Vaqueros Expansion Alternative	*Enlarged SBA/Los Vaqueros Expansion, San Benito groundwater desalination, and exchanges*
	Los Vaqueros Expansion Alternative	*Los Vaqueros Expansion, Anderson reoperation, SFPUC intertie, San Benito groundwater desalination, and exchanges*
Combination	San Felipe Division Combination Alternative	*San Felipe Division conveyance modification, groundwater storage, recycling, and exchanges*

Figure 5-1 – Measures Combined into Alternatives

Water banking is not a completely reliable measure. Water withdrawn from a groundwater bank must have been stored in prior years. The utility of a groundwater bank for the SLLPIP depends on a series of year types that would allow time to put water into the bank before the low point issue may arise. The use of water stored in groundwater banks is also limited by the need for early notice to the groundwater banks to withdraw the stored water. The Semitropic Groundwater Bank makes its stored water delivery commitments in May before final determination of a low point issue is made. The contractual costs of storing and withdrawing water from regional groundwater banks would be the major implementation costs associated with this measure.

Groundwater banking would not result in substantial environmental impacts. Banking groundwater would temporarily increase groundwater levels, which could reduce potential overdraft conditions.

Water Exchanges and Transfers

Water exchanges and transfers would create access to additional water supplies to supplement storage in San Luis Reservoir. In years when San Luis Reservoir is projected to fall below 300 TAF, operators could obtain water exchanges or transfers to replace the water that would be withdrawn from San Luis Reservoir and maintain the 300 TAF storage level. Additionally, exchanges could provide a safety net in all years to allow higher allocations earlier in the year. Announcing higher allocations earlier in the year would increase the use of San Luis Reservoir, and in some years it could result in full use of the stored water before the end of the high demand season. If more aggressive allocations led to potential water supply interruptions, exchanges would provide an alternate source of water for contractors.

Exchanges and transfers are also not completely reliable. Exchanges and transfers depend on the spot market, the sellers' willingness to participate, and available Delta export capacity; these factors might not result in the full quantity needed in every year with a low point issue. Transfers can also vary in price depending on the source of the water, its location, and the amount transferred. Further, transfers during dry years can be an expensive water supply source. Transfers would provide some operational flexibility for south-of-Delta contractors.

Depending on the type of transfers, some biological, physical, and social resources could be affected; however, in general, transfers would not result in substantial environmental impacts. Water transfers could change the flow and timing of water in north-of-Delta rivers. This might affect riparian vegetation, fisheries, and water quality. Groundwater substitution transfers could decrease groundwater levels. Depending on the source of water, water transfers might cause some social impacts. Reservoirs drawn below normal operating conditions could expose cultural resources or affect recreation opportunities. Idling cropland (which could be employed to make water available for transfer or exchange) could have economic effects.

Construction Related Environmental Impacts

Except for the initial alternative in the institutional agreements category, all other initial alternatives include some degree of construction, which could affect environmental resources. This IAIR discusses all construction effects qualitatively because alternative design details are not known at this stage in the planning process. In general, construction related impacts would be more severe in previously undisturbed or undeveloped areas than in already-developed areas. Construction could increase air pollutant emissions, disturb soils, increase erosion, disrupt local traffic patterns, increase noise levels, disrupt public utilities, expose cultural resources, change land uses, and deteriorate habitat. The level of impacts would likely increase with larger construction projects. Construction impacts would generally be temporary and could be mitigated by implementing Best Management Practices (BMPs).

5.3 Descriptions of Initial Alternatives

The descriptions in this section present, for each of the initial alternatives: a summary of the measures included in the alternative; an explanation of operations under the alternative; and an overview of the alternative's potential environmental impacts. Section 5.2 discussed the general impacts of groundwater banking, exchanges, and construction; these impacts would be associated with any alternatives in which these measures or construction occur. Where these descriptions include quantities of water supplies, the quantities refer to amounts that would be provided or made available per year.

5.3.1 Institutional Agreements

This category includes one initial alternative.

Institutional Alternative

The Institutional Alternative combines groundwater banking agreements, water exchange agreements, and cooperative agreements for operational changes among the water districts in the region. Groundwater banking would provide up to 50 TAF per year, exchanges and transfers would provide up to 150 TAF per year, and operating agreements and procedures would provide a small additional amount.

Operations This alternative would use groundwater banking, exchanges, and transfers to keep San Luis Reservoir water levels above 300 TAF, as described in Section 5.2.1. The water supply benefit provided by groundwater banking and exchanges would not prevent interruptions to San Felipe Division supply in all years. In years when water levels drop below 300 TAF, operators could rely on agreements and procedures established with water agencies in the region to provide additional supply. For example, an already established operating agreement that could be expanded as a part of this project is the agreement SCVWD has with the SFPUC to deliver emergency water supplies through an existing intertie between the two systems during severe drought events.

In some years, the potential benefits of this alternative would be functionally equivalent to a fully-exercised reservoir; however, groundwater banking, exchanges, and transfers might not be available in the necessary quantities every year in which the low point issue occurs. While banking and exchanges would function as safety nets to allow increased allocations in other alternatives, this alternative would rely heavily on them to prevent supply interruptions and allow full exercise of the reservoir. Consequently, they would not be able to substantially help increase allocations earlier in the year.

Potential Environmental Effects and Mitigation Measures Section 5.2.1 describes the potential impacts of banking and exchanges. Operating agreements would not result in substantial environmental impacts. This alternative would not require any construction.

5.3.2 Source Water Quality Control Alternatives

This category contains three initial alternatives that each includes one source water quality control measure and several institutional measures to supplement San Luis Reservoir water supplies. Source water quality control methods are intended to reduce algae within San Luis Reservoir to reduce supply interruptions. Each alternative in this category includes exchanges, and two alternatives include banking, which are described at the beginning of Section 5.2. These alternatives would have fewer construction-related impacts than alternatives in other categories.

Algae Harvesting Alternative

This alternative combines algae harvesting on the San Luis Reservoir surface, groundwater banking operations, exchanges, and increased groundwater storage in the San Felipe Division. The quantity of water available from algae harvesting is uncertain; it would allow an estimated 50 TAF of increased diversions. This alternative would also include 50 TAF of banking, 100 TAF of exchanges, and a small amount of groundwater storage within the San Felipe Division.

Operations Under this alternative, gravity based rotating screens would collect algae from the upper layer of San Luis Reservoir. Approximately 109 boats would be needed to cover the reservoir's surface area. The algae would then need to be dried and trucked outside of the watershed to a landfill for disposal. Algae harvesting would not remove all algae from the reservoir, but would make the algae layer thinner. With algae harvesting, preliminary estimates show that the reservoir could be drawn down to 250 TAF (rather than 300 TAF) before algae reached the Lower Pacheco intake.

Banking would work concurrently with algae harvesting to slow the water level declines in the reservoir. This alternative includes groundwater storage as an alternate supply for the San Felipe Division during occurrences of the low point issue. Should the reservoir reach 250 TAF (the new level that triggers a low point issue), San Felipe Division contractors would shift to locally-stored

groundwater to meet their needs. This groundwater use would be in addition to existing recharge and withdrawals from the groundwater basins. Accessing this storage would require the construction of new recharge facilities and withdrawal wells. In many areas of the San Felipe Division, the groundwater aquifers are already fully utilized; therefore, the quantities available from additional storage would be limited. Exchanges would provide a safety net for more aggressive allocations. Figure 5-2 illustrates operations of this and the Algaecide Alternative.

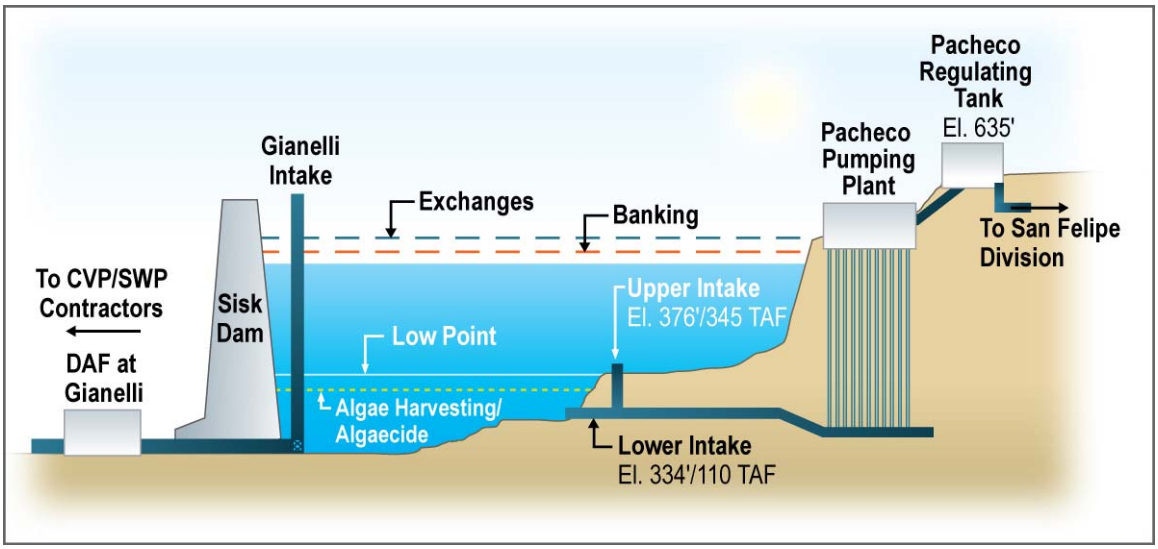

Figure 5-2. Algae Harvesting and Algaecide Alternatives

Potential Environmental Effects and Mitigation Measures Algae harvesting operations would have minimal impacts on other biological resources in the reservoir. Harvesting boats are slow moving and would only extract algae blooms within 4 feet of the reservoir surface, which would have little or no effect on fish or existing habitat. The algae harvesting operations could affect recreational use at San Luis Reservoir by impeding recreational boating or fishing. Harvesting operations would only occur late summer to early fall, when the reservoir could experience a low point issue; therefore, impacts would be intermittent. Algae drying beds could change some existing land uses near the reservoir. Section 5.2.1 describes the potential impacts of banking, exchanges, and construction.

Algaecides Alternative

This alternative combines the application of algaecides on the San Luis Reservoir surface, groundwater banking operations, exchanges, and increased groundwater storage in the San Felipe Division. The quantity of water available from application of algaecides is uncertain; it would allow an estimated 50 TAF of increased diversions from San Luis Reservoir. This alternative would also

include 50 TAF of banking, 100 TAF of exchanges, and a small amount of groundwater storage within the San Felipe Division.

Operations The use of algaecides on San Luis Reservoir would begin as the reservoir approached the 300 TAF level. A container boat with a 275 gallon capacity would be needed to apply the algaecide across the reservoir's surface.

Algaecide application would not fully remove the algae from the reservoir, but would make the algae layer thinner. With algaecide application, preliminary estimates show that the reservoir could be drawn down to 250 TAF (rather than 300 TAF) before algae reached the Lower Pacheco Intake. Banking, groundwater storage, and exchanges would function in this alternative in the same way that they would in the Algae Harvesting Alternative.

Potential Environmental Effects and Mitigation Measures Application of algaecides on San Luis Reservoir could affect biological resources in the reservoir by causing the bioaccumulation of toxic algaecides in fish and birds that inhabit the reservoir. Algaecides could affect San Luis Reservoir water quality by raising the concentration of toxics in the water column. Operations supporting algaecide applications could increase air pollutant emissions. The algaecide application operations could affect recreational use at San Luis Reservoir by impeding recreational boating or fishing. Applying algaecides would require fewer boats than algae harvesting, so the recreational impacts would be smaller in scale. Algaecide operations would only occur late summer to early fall, when the reservoir could experience a low point issue; therefore, impacts would be intermittent. Section 5.2.1 describes the potential impacts of groundwater storage and banking and exchanges.

Managed Stratification Alternative

This alternative combines managed stratification at San Luis Reservoir, DAF treatment at the Gianelli Outlet, exchanges, and operating agreements between water agencies. Managed stratification would allow approximately 200 TAF of increased diversions from San Luis Reservoir each year, operating agreements would provide a small additional amount, and exchanges would provide up to 100 TAF, but would only occur in some years.

Operations Managed stratification of San Luis Reservoir would use new intakes at the Gianelli Inlet/Outlet Structure to withdraw water from the reservoir surface to remove nutrient rich water from the surface prior to the development of algae blooms during the summer months. Under this alternative, the reservoir could be drawn down to 250 TAF (rather than 300 TAF) before algae reached the Lower Pacheco intake.

To support managed stratification, a DAF treatment facility at the Gianelli Outlet would reduce algae levels in water extracted from the surface of San Luis Reservoir. (See Section 5.3.3 for more information on the operations of DAF facilities.) This DAF treatment would help to prevent impacts on SLDMWA

water users' irrigation infrastructure. This treatment would make water extracted with managed stratification more useable and would support potential drawdown to 100 TAF.

The water supply benefit provided by managed stratification and DAF treatment at the Gianelli Inlet/Outlet would not prevent interruptions to San Felipe Division supply in all years. Operating agreements would provide an alternate source of water to the San Felipe Division when water levels were below 100 TAF. Additionally, exchanges would provide a safety net to allow higher allocations earlier in the year. Figure 5-3 illustrates operations of the Managed Stratification Alternative.

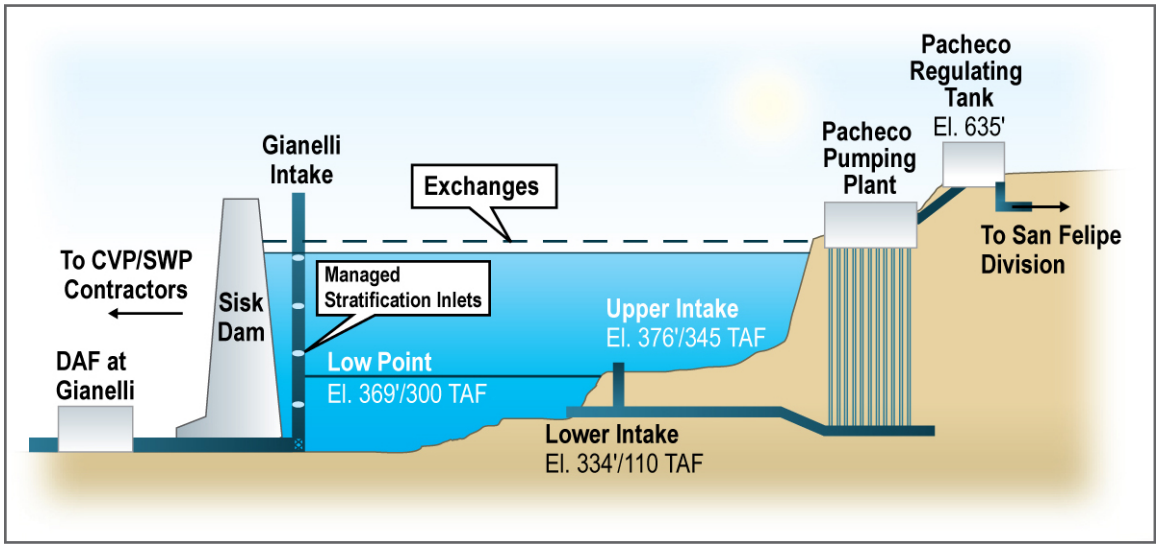

Figure 5-3. Managed Stratification Alternative

Potential Environmental Effects and Mitigation Measures The new intake facility in this alternative would be constructed underwater on the Gianelli Intake. This construction would cause temporary impacts on biological resources and recreation in the vicinity of the construction, could affect sensitive species habitat, and would result in other impacts from construction, operating agreements, and exchanges as described above. Impacts associated with managed stratification would also include the potential for noise and emissions during operations.

5.3.3 Water Treatment Alternatives

The Study Team developed three water treatment alternatives. Dissolved air filtration, increased treatment at Rinconada WTP, and exchanges are included in each of these alternatives, which only vary by the location and construction of DAF treatment. Alternatives in this category propose combinations of adding DAF to existing treatment plants and building new DAF plants separately from existing facilities. Regardless of the construction features, DAF alternatives would contribute similarly to project objectives. DAF treatment would treat

algae-laden water extracted from the Lower Pacheco Intake and reduce potential supply interruptions to south-of-Delta contractors.

In addition to the DAF facilities, all three alternatives include upgrades at SCVWD's Rinconada treatment plant to increase its effectiveness in treating drinking water with higher algae concentrations. The treatment plant upgrades would result in a facility with conventional treatment (i.e., chemical coagulation, flocculation, and sedimentation), ozonation, and granular media filtration using granular activated carbon and sand. SCVWD has upgraded the Santa Teresa WTP to include these facilities, but would need to make similar modifications to the Rinconada WTP.

All three alternatives include exchanges to provide a safety net that would allow more aggressive allocations. Section 5.2.1 describes exchanges. Figure 5-4 illustrates the measures in the treatment alternatives.

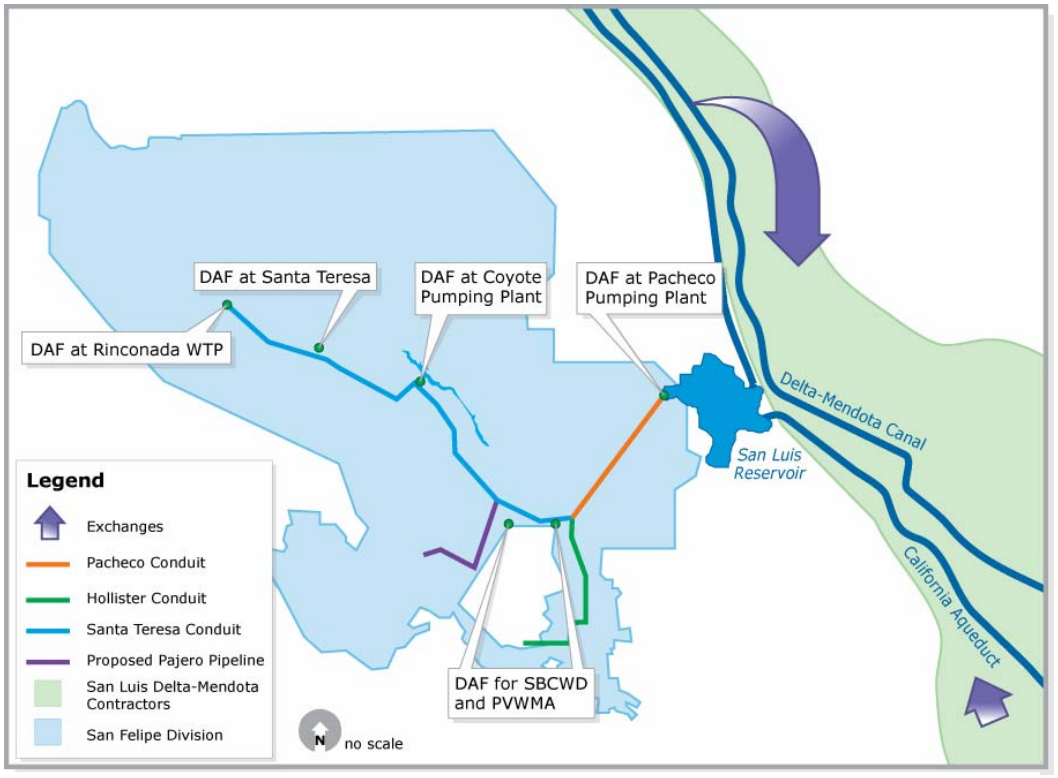

Figure 5-4. Treatment Alternatives

Treatment at San Felipe Intake Alternative

This alternative combines a new DAF plant near the Pacheco Pumping Plant, upgraded treatment at the Rinconada WTP, and exchanges.

Operations The new DAF plant at the Pacheco Pumping Plant would treat water going to all users in the San Felipe Division. Water would be treated for algae before distribution through the Pacheco Conduit. The alternative also

includes approximately 100 TAF of exchanges, which would only occur in some years.

Potential Environmental Effects and Mitigation Measures The impacts of this alternative would be primarily construction related. Construction-related impacts are described in Section 5.2.1. Depending on the exact location of construction, existing land uses and habitats could be permanently affected. Construction of a single DAF plant would have fewer environmental impacts than construction of multiple plants serving San Felipe Division contractors.

Treatment at Water Treatment Plants Alternative

This alternative includes adding DAF to the Santa Teresa WTP, upgrading treatment at the Rinconada WTP, building new DAF treatment plants for SBCWD and PVMWA, and negotiating exchanges. The alternative includes approximately 100 TAF of exchanges and transfers; exchanges would only occur in some years.

Operations This alternative would require construction of two new facilities in unidentified areas near the Hollister Conduit and the Pajaro Pipeline, to serve SBCWD and PVWMA, respectively. Water treated for algae at these facilities would continue to the districts' distribution systems. New DAF treatment at existing SCVWD plants would pretreat San Luis Reservoir water before treatment for potable uses. After DAF and conventional treatment, water would be distributed to SCVWD customers.

Potential Environmental Effects and Mitigation Measures The impacts of this alternative would be primarily construction related. Construction-related impacts are described in Section 5.2.1. Construction of new DAF plants for SBCWD and PVMWA would cause environmental impacts depending on the habitat and existing development at the sites. Adding treatment to existing SCVWD plants would not likely affect environmental resources.

Treatment at Pumping Plant Alternative

This alternative includes building three new DAF facilities, upgrading treatment at the SCVWD Rinconada WTP, and implementing exchanges. This alternative includes approximately 100 TAF of exchanges and transfers; exchanges would only occur in some years.

Operations This alternative requires construction of three new DAF facilities: one at the Coyote Pumping plant to serve SCVWD and two in unidentified areas near the Hollister Conduit and Pajaro Pipeline to serve SBCWD and PVWMA, respectively. San Luis Reservoir water would be delivered to these facilities for DAF treatment of algae and then onward to the districts for potable treatment or agricultural uses. Exchanges and transfers would provide a safety net for more aggressive allocations.

Potential Environmental Effects and Mitigation Measures The construction impacts of this alternative would vary depending on the location of DAF treatment plants. Impacts on environmental resources would be fewer if the sites were already disturbed. In general, this alternative could result in more environmental impacts than the other DAF alternatives because three new treatment plants are proposed, rather than one or two. BMPs would mitigate impacts on levels similar to those of those achievable under other alternatives.

5.3.4 Conveyance Alternatives

The Study team developed five initial alternatives that focus on conveyance. The conveyance alternatives would allow San Felipe Division supplies to bypass the San Luis Reservoir altogether or change the location of the San Felipe Division's intake within San Luis Reservoir to a location or locations that would be less affected by the low point issue.

The San Luis Reservoir bypass alternatives would all operate in the same way. CVP water would completely bypass San Luis Reservoir; therefore, it would not be affected by the low point issue. Bypass alternatives differ in their points of CVP water diversion and delivery to the San Felipe Division. Exchanges would provide a safety net for more aggressive allocations.

All bypass alternatives would have construction impacts; the scale of construction required for bypass facilities would be larger than for previous alternatives. Construction operations could also affect some habitat near the reservoir, but support operations for construction in the reservoir would likely be staged from already-developed areas. The location of the conveyance facility, length of the route, and selected alignment could increase potential construction effects to habitat and other resources, including sensitive species habitat.

Operating the facilities, particularly the pump stations, could have minor impacts associated with biological resources, noise, or air quality; however, few sensitive receptors would be in the vicinity of the potential facilities. Operating pump stations would also increase energy use. Section 5.2.1 discusses the potential impacts associated with exchanges.

Holladay Aqueduct Alternative

This alternative includes construction of the Holladay Aqueduct and exchanges. The Holladay Aqueduct alignment includes a pipeline from the California Aqueduct to the crest of the Diablo Range, from where the water would be directed into natural stream channels and into the San Felipe Division service area. The alternative also includes approximately 100 TAF of exchanges and transfers; exchanges would only occur in some years. Figure 5-5 illustrates the Holladay Aqueduct Alternative and other bypass alternatives described below.

Potential Environmental Effects and Mitigation Measures The Holladay Aqueduct would traverse the eastern slope of the Diablo Range in an

undeveloped area. Constructing this pipeline would cause temporary, construction-related impacts on biological and physical resources, and the length of the pipeline route would result in moderate impacts before mitigation. BMPs would help reduce the severity of these impacts. This alternative would also offer some potentially beneficial environmental impacts associated with the discharge of water into local creeks.

Northerly Bypass Corridor Alternative

This alternative includes the northerly bypass corridor and exchanges (figure 5-5). The northern bypass would route the San Felipe Division's water around the north side of San Luis Reservoir. The alternative also includes approximately 100 TAF of exchanges and transfers; exchanges would only occur in some years.

Potential Environmental Effects and Mitigation Measures The northerly bypass facility would follow Romero Creek up Romero Canyon and run west toward Williams Canyon across areas that are currently undeveloped. Constructing this pipeline would cause moderate, construction-related impacts on resources because of the length of the facilities and current land use along the route; BMPs would help reduce the severity of these impacts.

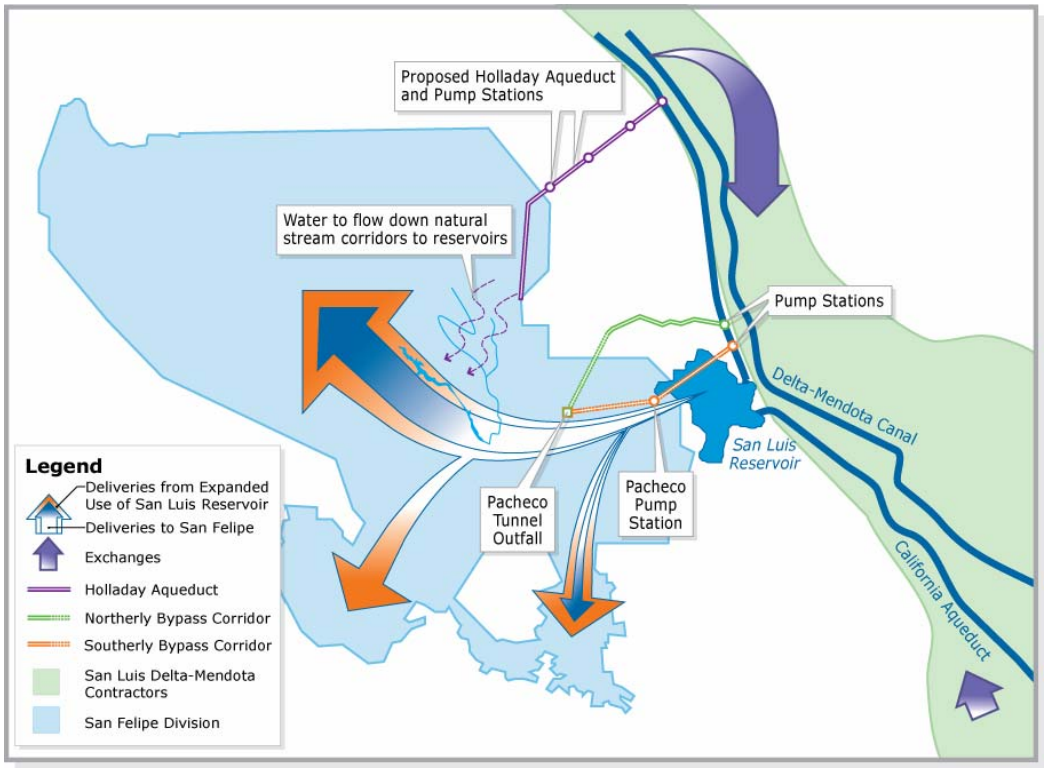

Figure 5-5. Conveyance Bypass Alternatives

Southerly Bypass Corridor Alternative

This alternative combines the southerly bypass corridor and exchanges (Figure 5-5). The southern bypass would extend from the O'Neill pumping plant through a tunnel underneath San Luis Reservoir to the San Felipe Division. The alternative also includes approximately 100 TAF of exchanges and transfers; exchanges would only occur in some years.

Potential Environmental Effects and Mitigation Measures Environmental impacts for surface conveyance facilities would be similar among all conveyance alternatives, and would depend on the exact alignment and the resources present along that alignment. Because the majority of the southerly bypass route would be a tunnel under San Luis Reservoir, environmental impacts could be fewer for the southerly bypass route than for the northerly route.

Lower San Felipe Intake Alternative

This alternative combines extending and lowering the San Felipe Intake to the same elevation as the Gianelli Inlet/Outlet and banking. Groundwater banking would provide approximately 50 TAF in some years. Section 5.2.1 discusses groundwater banking operations and potential impacts.

Operations The top of the Gianelli intake is at elevation 296 feet msl, which is 30 feet below the minimum operating level of San Luis Reservoir. Lowering the San Felipe Division's intake to the same level as the Gianelli intake would provide 30 feet of depth in which to accommodate the algae layer between the water surface and the top of intake, even at the minimum operating level. A pipeline extension would connect the new San Felipe Intake to the Pacheco Pumping Plant. The San Felipe Division would use the new intake to withdraw water from below the algae layer without interruptions, even when the reservoir was at low water surface elevations. Figure 5-6 depicts this alternative.

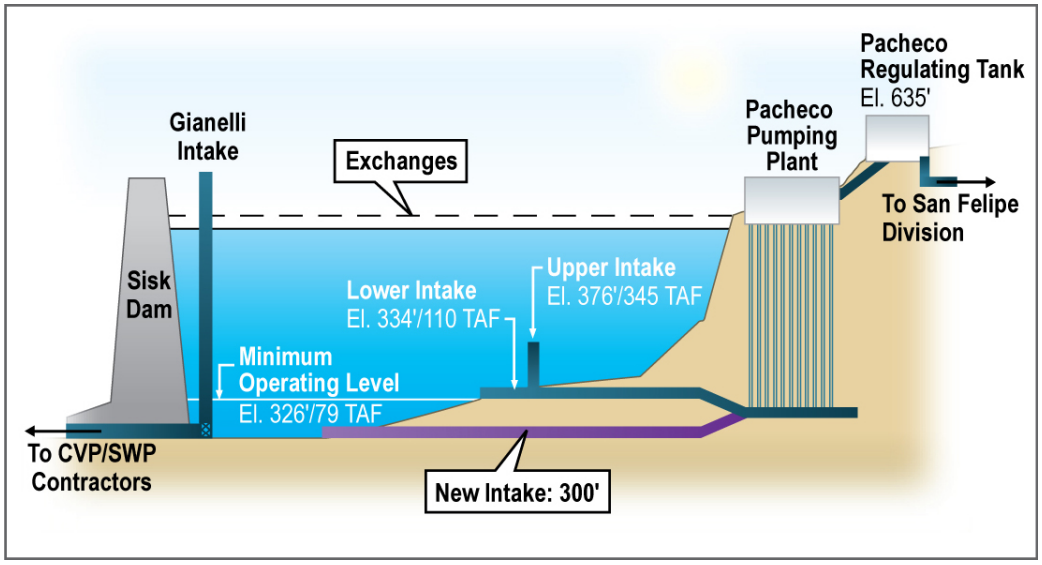

Figure 5-6. Lower San Felipe Intake Alternative

Potential Environmental Effects and Mitigation Measures This alternative would extend the intake across the reservoir floor in an area typically inundated, which could have moderate impacts on biological resources in the reservoir. As noted above, construction operations could also affect some habitat near the reservoir, but support operations for construction in the reservoir would likely be staged from already-developed areas. Construction operations would require drawdown of the reservoir, potentially exposing erodible soil. This reservoir drawdown could also limit access to stored water supplies. Extending and lowering the San Felipe Intake could interrupt recreational use of the reservoir during construction related drawdowns.

5.3.5 Storage Alternatives

The Study team developed eight initial alternatives that focus on increased storage. The operations of the storage facilities would vary depending on their locations relative to San Luis Reservoir. Facilities on the west side of San Luis Reservoir would allow storage of CVP water when available earlier in the year for use during the months when water levels drop below approximately 300 TAF. Facilities in the Central Valley would provide an alternate source of water to contractors to allow San Luis Reservoir to stay above 300 TAF to prevent supply interruptions to the San Felipe Division. The facilities on the west side of San Luis Reservoir (as well as increasing the size of San Luis Reservoir itself) are paired with exchanges. Exchanges would provide a safety net to allow more aggressive allocations; Section 5.2.1 discusses the environmental impacts that could be associated with exchanges.

Anderson Reservoir Expansion Alternative

This alternative includes expanding Anderson Reservoir and exchanges. Expanding Anderson Reservoir would increase capacity from 89 TAF to 189 TAF with a dam raise of approximately 35 feet. The alternative also includes approximately 100 TAF of exchanges and transfers, which would only occur in some years.

Operations Additional storage would prevent supply interruptions to the San Felipe Division. CVP water from San Luis Reservoir could be delivered to Anderson Reservoir prior to San Luis Reservoir water levels reaching approximately 300 TAF and would substitute for late summer CVP deliveries to the San Felipe Division. The reservoir's location in the SCVWD would require the development of reverse flow capacity on the Santa Clara Conduit to allow delivery of additional stored CVP supply from Anderson Reservoir to the SBCWD and PVMWA. Developing this reverse flow capacity would require development of an additional pipeline and pump station at Anderson Reservoir. This alternative would allow the full exercise of San Luis Reservoir by maintaining San Felipe Division deliveries from storage in Anderson Reservoir while operators draw San Luis Reservoir down to the minimum conservation pool to continue supplies to other south-of-Delta contractors. Exchanges would provide a safety net to allow more aggressive allocations. Figure 5-7 shows this alternative and other reservoir expansion alternatives described below.

Potential Environmental Effects and Mitigation Measures Expanding Anderson Reservoir could affect biological resources by inundating habitats supporting sensitive species along the reservoir shoreline. The expanded reservoir footprint would have minimal impacts on other biological resources in the area because of the developed nature of residential areas surrounding the existing reservoir. The new dam site is close to the active Calaveras Fault and crosses the Silver Creek Faults. The expanded footprint would inundate approximately 100 structures, a County Park, and a known hazardous waste site. Using Anderson Reservoir as a water supply reservoir instead of emergency storage would affect recreational use by restricting some water contact activities.

Chesbro Reservoir Expansion Alternative

This alternative includes an expanded Chesbro Reservoir and exchanges (Figure 5-7). Expanding Chesbro Reservoir would increase capacity at the reservoir from 9 TAF to 150 TAF with a dam raise of approximately 190 feet. The alternative also includes approximately 100 TAF of exchanges and transfers, which would only occur in some years.

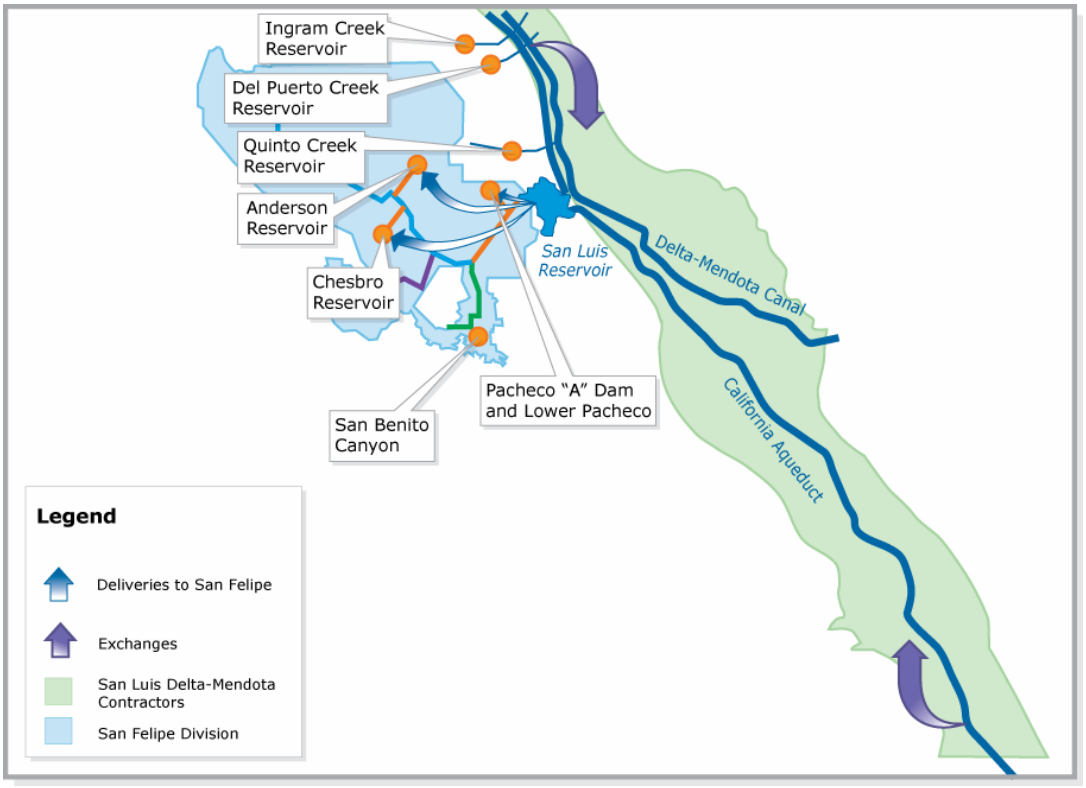

Figure 5-7. Storage Alternatives

Operations This alternative would operate like the Expand Anderson Reservoir alternative. CVP water from San Luis Reservoir could be delivered to

Chesbro Reservoir prior to the low point months and would substitute for late summer CVP deliveries to the San Felipe Division. Exchanges would provide a safety net to allow more aggressive allocations.

Potential Environmental Effects and Mitigation Measures Expanding Chesbro Reservoir could affect biological resources by inundating sensitive species habitat. The expanded footprint would inundate Chesbro Reservoir Park and approximately 40 structures surrounding the reservoir. Conveyance infrastructure would require a complex crossing of Highway 101, a major corridor through the region, which would affect traffic.

Lower Pacheco Reservoir Alternative

This alternative includes an expanded Lower Pacheco Reservoir at the Lower Pacheco site and exchanges (Figure 5-7). Expanding the reservoir at the Lower Pacheco site would increase capacity from 6.1 TAF to 150 TAF with a dam raise of approximately 175 feet. The alternative also includes approximately 100 TAF of exchanges and transfers, which would only occur in some years.

Operations CVP water from San Luis Reservoir could be delivered to Lower Pacheco Reservoir prior to the low point months and would substitute for late summer CVP deliveries to the San Felipe Division. The reservoir's location upstream of the Hollister Conduit Bifurcation would allow delivery of additional CVP supply stored in Lower Pacheco Reservoir during wet water years to the SCVWD, SBCWD, and PVMWA without construction of any reverse flow capacity. This alternative would allow the full exercise of San Luis Reservoir by maintaining San Felipe Division deliveries from storage in Lower Pacheco Reservoir while operators draw San Luis Reservoir down to the minimum conservation pool to continue supplies to other south-of-Delta contractors. Exchanges would provide a safety net to allow more aggressive allocations.

Potential Environmental Effects and Mitigation Measures Expanding Lower Pacheco Reservoir could affect sensitive species habitat in the inundation area. Potential geologic impacts could occur from expansion of the reservoir because the site is on highly faulted, sheared, and weathered bedrock. A large landslide complex encompassing about 300 acres would be near the left abutment area. The proposed expansion area is largely undeveloped ranch land. Inundating this area would affect several structures and ranch land.

Pacheco A Reservoir Alternative

This alternative includes expansion of Pacheco A Reservoir and exchanges (Figure 5-7). Expanding the reservoir at the Pacheco A site would increase capacity at the SCVWD-owned reservoir from 6.1 TAF to 150 TAF with a dam raise of approximately 185 feet. The alternative also includes approximately 100 TAF of exchanges and transfers, which would only occur in some years.

Operations Operations under this alternative would be the same as under the Expand Lower Pacheco Reservoir Alternative. The reservoir is also upstream of the Hollister Conduit Bifurcation, which would allow deliveries to the San Felipe Division without construction of any reverse flow capacity.

Potential Environmental Effects and Mitigation Measures The Pacheco A Reservoir site is relatively close to the Lower Pacheco Reservoir. Environmental impacts for this alternative would be similar to those of Expand Lower Pacheco Alternative. The Pacheco A Reservoir site does not have a large landslide complex; therefore, geologic hazards associated with this alternative would be less likely than with the previous one.

San Luis Reservoir Expansion Alternative

This alternative includes raising San Luis Reservoir and exchanges. Raising B.F. Sisk Dam 15 feet would create an additional 200 TAF of storage capacity at San Luis Reservoir, bringing total storage capacity to 2,200 TAF. The alternative also includes approximately 100 TAF of exchanges and transfers, which would only occur in some years.

Operations Raising San Luis Reservoir would delay the time at which algae would cause a supply interruption at the Lower Pacheco Intake. The San Felipe Division would be able to receive water when the reservoir was at levels at which algae growth is not a problem; however, supply interruptions could still occur if water levels dropped to 300 TAF. Exchanges would allow more aggressive allocations. Figure 5-8 illustrates this alternative.

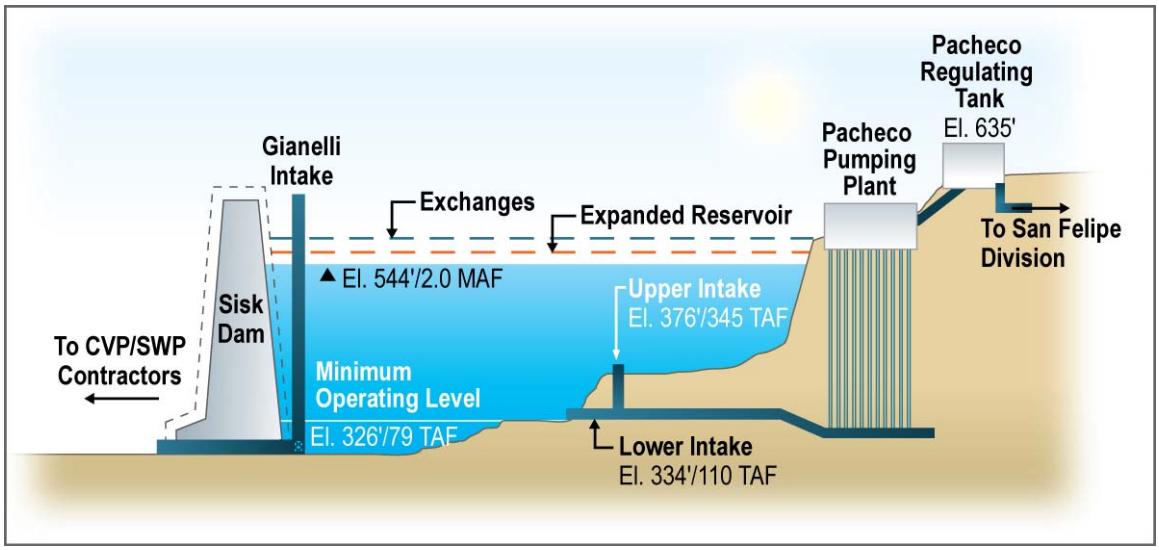

Figure 5-8. Raise San Luis Reservoir Alternative

Potential Environmental Effects and Mitigation Measures The expanded reservoir surface would inundate approximately 1,500 acres of shoreline around the perimeter of the reservoir. Construction could affect some habitat near the reservoir, but the expanded dam site is already largely developed. The 1,500 acres inundated by the expanded dam could affect land uses in the area and require relocation of highway alignment and visitor facilities. Reservoir level fluctuations during construction activities could interrupt recreation activities at San Luis Reservoir.

San Benito Reservoir Alternative

This alternative includes construction of a new reservoir on the San Benito River and exchanges. A new reservoir on the San Benito River could create 60 TAF of surface storage capacity in San Benito County.

Operations CVP water from San Luis Reservoir could be delivered to San Benito Reservoir prior to the low point months and would substitute for late summer CVP deliveries to the San Felipe Division. The reservoir's location in San Benito County downstream of the Hollister Conduit Bifurcation would require the construction of reverse flow facilities to allow delivery of additional CVP supply stored in San Benito Reservoir during wet water years to the SCVWD, SBCWD, and PVMWA. This alternative would allow the full exercise of San Luis Reservoir by maintaining San Felipe Division deliveries from storage in San Benito Reservoir while operators draw San Luis Reservoir down to the minimum conservation pool to continue supplies to other south-of-Delta contractors. Exchanges would provide a safety net to allow more aggressive allocations.

Potential Environmental Effects and Mitigation Measures Construction of a new reservoir on the San Benito River could inundate approximately 1,600 acres of land at an average depth of 38 feet. The reservoir could inundate native shrubland and grazing land. The San Benito River and Pajaro River also support steelhead populations with the potential for impacts to steelhead migration generated by the new reservoir. The proposed reservoir is in an area with potential seismic activity. The new reservoir could also inundate existing structures near the proposed dam site (Pajaro River Watershed Flood Prevention Authority 2003).

Del Puerto Canyon Reservoir Alternative

This alternative includes construction of a new reservoir at Del Puerto Creek, banking, groundwater storage in the San Felipe Division, and exchanges (Figure 5-7). Del Puerto Canyon Reservoir could create 191 TAF of new surface storage capacity.

Operations A new off-stream reservoir on the east side of San Luis Reservoir would help to address water supply interruptions created by the San Luis Reservoir low point issue. The new reservoir could store CVP supplies during wet water years and these supplies could be delivered to south-of-Delta

contractors during years with potential low point issues to slow the decline of San Luis Reservoir water levels. San Luis Reservoir would continue to store water for delivery to the San Felipe Division. Exchanges would provide an additional safety net to keep San Luis Reservoir water levels higher. The additional south-of-Delta storage created at Del Puerto Canyon reservoir would likely be under pressure for allocation every year, rather than just years with a low point issue, because of south-of-Delta water supply shortages in normal and dry water years.

Potential Environmental Effects and Mitigation Measures Del Puerto Canyon Reservoir could inundate up to 2,000 acres. The reservoir could inundate small wetlands in narrow riparian strips, small farm ponds, or intermittent creeks or drainage channels. Special status species may be present in the inundation area. The new reservoir might inundate some structures along a dirt road that follows the creek.

Ingram Canyon Reservoir Alternative

This alternative includes construction of a new off-stream reservoir at Ingram Canyon and exchanges (Figure 5-7). The size of Ingram Canyon Reservoir could range from 330 to 980 TAF.

Operations Operations under the Ingram Canyon Reservoir Alternative would be the same as in the Del Puerto Canyon Reservoir Alternative.

Potential Environmental Effects and Mitigation Measures Ingram Canyon Reservoir could inundate 2,500 to 4,500 acres. Sensitive species may be present in the inundation area and wetlands are present along streams in the watershed. Construction of the reservoir would permanently affect these species and habitat. The new reservoir might inundate some structures along Ingram Creek Road.

Quinto Creek Reservoir Alternative

This alternative includes construction of a new reservoir at Quinto Creek and exchanges (Figure 5-7). Storage capacity at Quinto Creek Reservoir could range from 330 to 380 TAF.

Operations Operations under the Quinto Creek Reservoir Alternative would be the same as in the Ingram Canyon Reservoir Alternative.

Potential Environmental Effects and Mitigation Measures Quinto Creek Reservoir could inundate 2,500 to 3,200 acres. The reservoir could inundate small wetlands in narrow riparian strips, small farm ponds, or intermittent creeks or drainage channels. Special status species may be present in the inundation area. The new reservoir might inundate some structures along a dirt road that follows the creek.

5.3.6 Alternate Water Supply Alternatives

The Study team developed five initial alternatives that include alternate water supplies. Three of the alternatives propose desalination facilities in one or more areas. The remaining two alternatives propose use of Los Vaqueros Reservoir. Alternate water supply measures would replace the San Felipe Division's CVP supplies from San Luis Reservoir during the low point months. Exchanges, described in Section 5.2.1, are included in all of these Alternate Water Supply Alternatives. Exchanges would provide a safety net to allow more aggressive allocations; Section 5.2.1 discusses the potential environmental impacts associated with exchanges.

Monterey Bay Desalination Alternative

This alternative combines desalination at Monterey Bay with exchanges. Desalination would provide the San Felipe Division with an alternative source of water and exchanges would supplement San Luis Reservoir supplies to increase water supply reliability for the other south-of-Delta contractors.

This alternative involves construction of a desalination facility and a distribution system to connect to the San Felipe Division. The desalination plant would have a capacity of 317 mgd, which is enough to fully replace the scheduled deliveries to SCVWD, PVWMA, and SBCWD from San Luis Reservoir during supply interruptions created by the low point issue. This alternative would also require the installation of pipelines along the Pajaro pipeline route to the Watsonville Turnout, from where water would flow through the Santa Clara and Hollister conduits to SCVWD and SBCWD.

Operations The desalination facility could provide water to the San Felipe Division during potential low point months. During this time, operators would be able to draw San Luis Reservoir down to its minimum conservation pool to continue supplies to other contractors through the Gianelli intake. Exchanges would provide a safety net to allow more aggressive allocations. Figure 5-9 illustrates the Monterey Bay Desalination Alternative and other desalination alternatives described below. When the desalination facility was not needed for the San Felipe Division, it could supply water to communities along the coast in Monterey and Santa Cruz Counties.

Potential Environmental Effects and Mitigation Measures The desalination facility could affect marine species and habitat because of sea water intake and brine disposal. The facility would likely use the existing intake at Moss Landing, which would result in fewer potential biological impacts than construction of a new intake. Brine disposal could also cause environmental impacts, in that brine is much higher in TDS than sea water and could affect marine life. Coastal regions provide habitat for many different species, and the desalination facility could permanently remove important habitat.

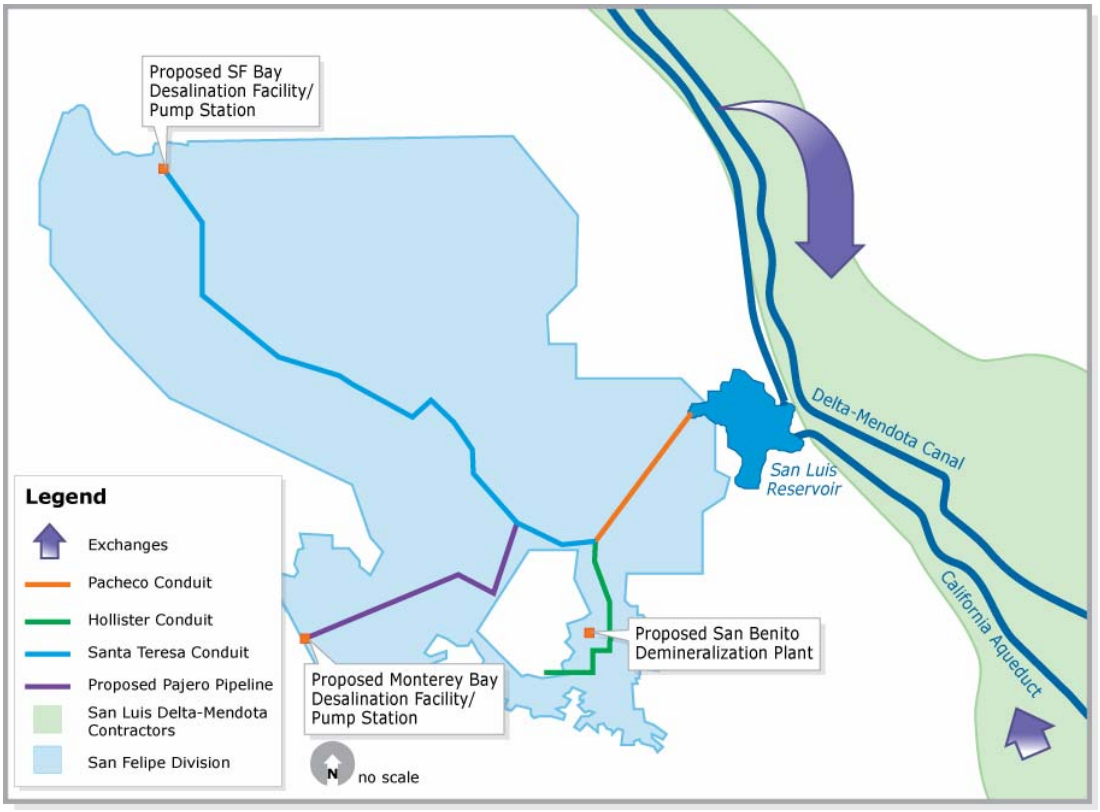

Figure 5-9. Desalination Alternatives

A new 317-mgd desalination facility would require 18 to 30 acres, and would permanently change land uses along the coast. Depending on the location, a sea water desalination facility could disrupt coastal recreation activities. Some beach or coastal areas near the site might need to be closed to the public either permanently or temporarily during construction. A 317-mgd facility might deteriorate the visual landscape of the area. An additional impact is that operation of the desalination facility could require large amounts of energy.

San Francisco Bay Desalination Alternative

This alternative combines desalination at San Francisco Bay with exchanges (Figure 5-9). The desalination plant would have a capacity of 317 mgd, which is enough to fully replace the scheduled deliveries to SCVWD, PVWMA, and SBCWD from San Luis Reservoir during supply interruptions created by the low point issue.

Operations The desalination plant in this alternative would operate the same as in the Monterey Bay Desalination Alternative. When the facility was not needed for the San Felipe Division, it could supply water to other San Francisco Bay Area communities. Exchanges would provide a safety net for higher allocations.

Potential Environmental Effects and Mitigation Measures The desalination facility could affect marine species and habitat because of sea water intake and brine disposal. The facility would require a new water intake that could increase entrapment and entrainment of marine species. Brine disposal could also cause environmental impacts. Brine is typically two to three times higher in TDS than San Francisco Bay water and could affect marine life.

The coastline of the San Francisco Bay is largely developed. Construction activities would be in highly populated, urban areas, a factor that increases the potential for public impacts. Depending on its location, a desalination facility could disrupt recreation activities around the bay. Some areas might need to be closed to the public either permanently or temporarily during construction. A 317-mgd facility might deteriorate the visual landscape of the bay area. Operation of the desalination facility would require large amounts of energy.

Combined Desalination Alternative

This alternative includes seawater desalination at Monterey Bay and San Francisco Bay, brackish water desalination in San Benito County, and exchanges (Figure 5-9). A 33-mgd desalination facility would treat Monterey Bay water for delivery to PVWMA. Pipelines and a pump station would be required to convey water from the facility to the proposed Pajaro pipeline. This alternative also includes a second, 213 mgd desalination facility to treat San Francisco Bay water for SCVWD. Pipelines and pump stations would be constructed to deliver water from the facility to the Santa Teresa and Rinconada WTPs for distribution to water users. A third desalination facility would treat brackish groundwater in the San Benito groundwater basin for SBCWD. This facility would treat 53 mgd of brackish groundwater and blend it with 18 mgd of raw groundwater, for a total plant capacity of 71 mgd. Approximately 20 new supply wells would extract groundwater and recharge the basin with San Luis Reservoir water during wet years. Pipelines and a pump station would be required to deliver water to the Hollister Conduit.

Operations The desalination plants would have a combined capacity of 317 mgd and would replace the scheduled deliveries to SCVWD, PVWMA, and SBCWD from San Luis Reservoir during supply interruptions created by the low point issue. When the facilities were not needed for the San Felipe Division, they could supply water to nearby communities. Exchanges would provide a safety net for higher allocations.

Potential Environmental Effects and Mitigation Measures The sea water desalination facilities would have effects similar to those described for the Monterey Bay and San Francisco Bay Desalination Alternatives. Because the facilities would be smaller under this alternative, effects could be less severe. A brackish water desalination plant would have fewer environmental impacts than the sea water desalination plants. Brackish groundwater withdrawal would not cause impacts on marine life; however, brine disposal would be required and could have biological impacts, depending on the disposal method. Brine from

brackish desalination would be lower in TDS than that of seawater desalination. The brackish water desalination facility would cause fewer recreation and visual impacts than the desalination plants.

Enlarged South Bay Aqueduct and Los Vaqueros Expansion Alternative
This alternative includes increased capacity at the SBA, expansion of Los Vaqueros Reservoir, a new groundwater desalination facility in the SBCWD, and exchanges. Expanding the SBA and Los Vaqueros Reservoir could create access to 100 TAF of stored water supply for the San Felipe Division to use in lieu of CVP supplies delivered from San Luis Reservoir during low point months. Exchanges would provide a safety net to allow more aggressive allocations.

Operations The SBA conveys water to the Alameda County Water District, Zone 7 Water Agency, and SCVWD. Because of the conveyance infrastructure configuration in the San Felipe Division, CVP supplies via the SBA can only be delivered to SCVWD. Water stored in Los Vaqueros and conveyed through the SBA as currently configured is limited to 18 TAF per month.

Expansion of the SBA could increase its maximum capacity to 25 TAF per month, allowing it to convey higher volumes of Los Vaqueros Reservoir water. Supplies delivered using expanded reservoir and SBA capacity could stand in for some, but not all of the San Luis Reservoir supply delivered to the San Felipe Division during low point months. To provide some of the additional supply that would be needed, this alternative also includes a groundwater desalination facility that could deliver approximately 32 TAF during low point months to serve SBCWD.

This combination of new facilities would allow for water supplies to be delivered to the San Felipe Division during the low point periods. When needed, operators would be able to draw San Luis Reservoir down to the minimum conservation pool to continue supplies to contractors that receive water from the Gianelli outlet. Figure 5-10 illustrates the Los Vaqueros Expansion alternatives.

Potential Environmental Effects and Mitigation Measures Expanding the SBA and Los Vaqueros Reservoir could affect biological resources by disrupting sensitive species habitat in the construction and inundation areas. Construction of the reservoir expansion and groundwater desalination plant could have impacts as discussed previously, and would include temporary impacts on recreation in the reservoir. Operation of a groundwater desalination plant in the SBCWD could have noise and air quality impacts. Brine disposal could cause impacts on biological resources; however, the impacts associated with groundwater desalination would be less severe than those of seawater desalination, as described above.

Los Vaqueros Expansion Alternative

This alternative includes an enlarged Los Vaqueros Reservoir, reoperation at Anderson Reservoir, increased access to supplies through the SFPUC Intertie, a groundwater desalination facility in the SBCWD, and exchanges (Figure 5-10). Expanding Los Vaqueros Reservoir could create access to 72 TAF of stored water supply for use by the San Felipe Division in lieu of CVP supplies delivered from San Luis Reservoir during low point months. Exchanges would provide a safety net to allow more aggressive allocations.

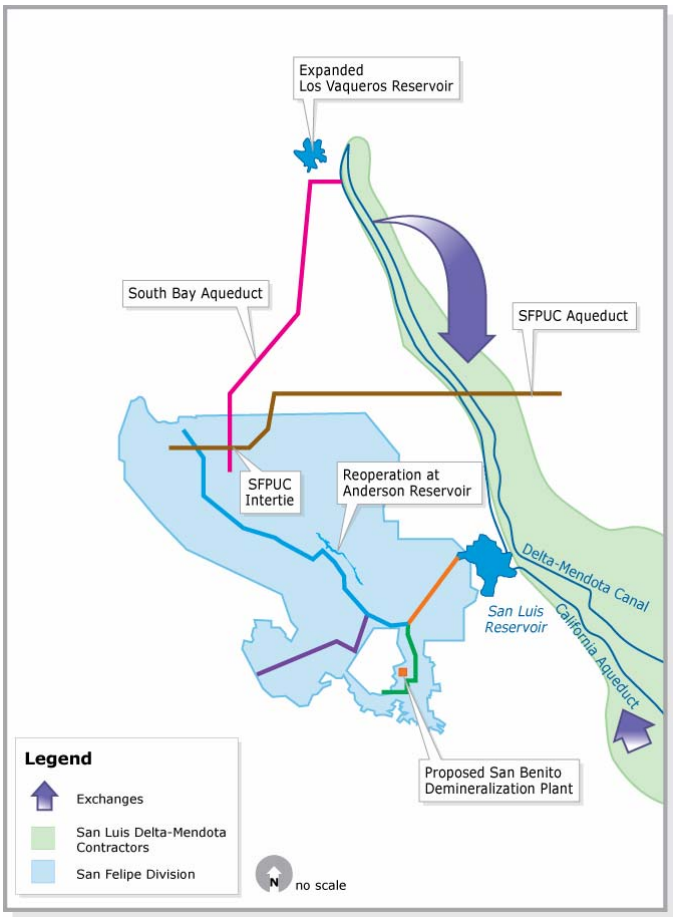

Figure 5-10. Los Vaqueros Expansion Alternatives

Operations To supplement supplies delivered from San Luis Reservoir and an expanded Los Vaqueros Reservoir, as described above, reoperation of Anderson Reservoir from its current use as a flood control facility could make its 89 TAF capacity available for use in the San Felipe Division. If Anderson Reservoir supply was to be delivered to the SBCWD and PVMWA, return flow infrastructure would be required to convey supplies back to the Hollister Bifurcation.

This alternative would change current agreements for deliveries through the SFPUC Intertie, through which the San Felipe Division could receive up to 15 TAF of water supplies during the low point months. The groundwater desalination facility in this alternative would function like the one in the Enlarged SBA and Los Vaqueros Expansion Alternative.

Potential Environmental Effects and Mitigation Measures The general impacts of expanding Los Vaqueros Reservoir and constructing SBCWD groundwater desalination facilities are described above. Expanding use of the SFPUC intertie would not require any additional construction, and the intertie would be used rarely; therefore, impacts associated with this measure would be minor. The primary impacts associated with Anderson reoperation would be associated with recreation. SCVWD currently allows extensive recreation on the reservoir. If Anderson Reservoir became a primary water supply, recreational use at the reservoir would have to be curtailed.

5.3.7 Combination Alternative

The Study team developed a combination alternative that draws on a number of resource measures to maximize water management operations in the San Felipe Division.

San Felipe Division Combination Alternative

This alternative combines modifications to the San Felipe Division conveyance system, additional groundwater storage in the SCVWD and SBCWD basins, expansion of water recycling operations in SCVWD, and exchanges.

Operations This alternative differs from the above conveyance alternatives because it focuses on measures to increase local water supplies and improve conveyance and operational flexibility within the San Felipe Division. Improvements in operational efficiency within the San Felipe Division could reduce demands on San Luis Reservoir water during the months with a potential low point issue. New conveyance infrastructure would allow San Felipe Division contractors to better manage local reservoirs and groundwater basins to meet water supply needs. Conveyance system modifications would include construction of a pipeline connecting Lexington Reservoir to the SCVWD conveyance system, the development of new groundwater wells in the SCVWD and SBCWD service areas, and development of new groundwater recharge facilities in SCVWD and SBCWD. Recycled water would be used to offset potable water demands to further reduce demands on San Luis Reservoir supplies during the low point months.

Potential Environmental Effects and Mitigation Measures The route for the conveyance pipeline connecting Lexington Reservoir to the SCVWD system has not been identified; constructing this pipeline could cause temporary, construction-related impacts on biological and physical resources. The environmental effects associated with increases in groundwater storage are outlined in Section 5.2.1.

Chapter 6
Evaluation of Initial Alternatives

6.1 Level 2 Screening Process

The Level 2 screening process evaluated how well the initial alternatives would meet the Federal criteria: completeness, effectiveness, acceptability, and efficiency. This section further describes these criteria and their application in the Level 2 screening process.

6.1.1 Criteria and Performance Measures

Completeness

The completeness criterion addresses whether the alternative would account for all investments or other actions necessary to realize the planned effects. This criterion considers how well the alternative would achieve the planning objectives. The Study team developed three performance measures for the completeness criterion that correspond to the three primary objectives (avoiding supply interruptions, increasing deliveries, and announcing higher allocations earlier in the year). Increasing opportunities for environmental restoration is a secondary objective, but these opportunities would increase if delivery quantities increased (a performance measure for the primary objectives). Therefore, the Study team did not include a separate performance measure for environmental restoration opportunities.

Effectiveness

The effectiveness criterion addresses how well an alternative would alleviate problems and achieve opportunities. Performance measures for this criterion evaluate the amount of San Luis Reservoir storage exercised and whether the alternative would increase local operational flexibility. The remaining problems and opportunities were similar to those addressed by completeness performance measures.

Acceptability

The acceptability criterion addresses the viability of an alternative with respect to acceptance by state and local entities and compatibility with existing laws. The Level 1 screening considered institutional viability, and eliminated any measures with fatal flaws related to public acceptance. The Level 2 screening, therefore, focuses on a preliminary look at environmental effects, which will be further developed through CEQA and NEPA analysis. The performance measures for this criterion consider alternatives' potential environmental impacts to biological, physical, and social resources in the study area.

Efficiency

The efficiency criterion addresses how well an alternative would deliver economic benefits from a project cost standpoint. Performance measures associated with the completeness and effectiveness criteria qualitatively address each alternative's benefits. The Study team defined the performance measure for the efficiency criterion as the costs of the alternative. Among alternatives that deliver essentially the same benefits, alternatives that are relatively less costly would be more efficient.

6.2 Rating Initial Alternatives

Figure 6-1 shows the rating scales used in the Level 2 screening process. Each scale has four levels, dark green through purple. A dark green rating indicates that the alternative would meet the criterion fully and a purple rating indicates that the alternative would not meet the criterion. Section 6.2 explains the ratings for each alternative, organized by performance measure, and Section 6.3 discusses the evaluation results.

6.2.1 Completeness

Avoiding Supply Interruptions

This performance measure examines the potential to avoid supply interruptions in the future, which is the first objective:

"Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on San Luis Reservoir."

This objective is related to all south-of-Delta contractors dependent on San Luis Reservoir, but some contractors have different factors that could cause supply interruptions. Users in the San Felipe Division could experience supply interruptions caused by algae in the reservoir or by low water levels within the reservoir. If reservoir operators try to minimize these interruptions by holding water levels above 300 TAF, then other contractors could experience interruptions caused by operational constraints.

Planning Criterion	Performance Measures	Rating Scales
Completeness	Potential for supply interruptions	*Reduces the risk of supply interruption created by algae and water levels during low point months at San Luis*
		Reduces the risk of supply interruption created by algae during low point months at San Luis
		Provides a small reduction in the risk of supply interruption created by algae during low point months at San Luis
		Provides no change in risk of low point supply interruption
	Amount of water delivered to south-of-Delta contractors	*Increases the quantity of water delivered to south-of-Delta contractors in excess of what a fully exercised San Luis Reservoir could provide*
		Increases the quantity of water delivered to south-of-Delta contractors by fully exercising San Luis Reservoir or a functional equivalent
		Increases the quantity of water delivered to south-of-Delta contractors by increasing effective storage at San Luis Reservoir or a functional equivalent
		Provides no change in the quantity of water delivered to south-of-Delta contractors
	Potential to allow more aggressive allocations	*Allows Reclamation to announce final allocations in the early spring with little risk of revision by creating access to water supply in excess of the quantity provided by a fully exercised San Luis*
		Allows Reclamation to announce a less conservative estimate of final allocation in the early spring by providing for the full exercise of San Luis or a functional equivalent
		Allows Reclamation to announce a slightly less conservative estimate in early spring by increasing effective storage at San Luis Reservoir or a functional equivalent
		Provides for no change in the allocation estimate and final allocation timing
Effectiveness	Amount of San Luis storage exercised	*Provides access to storage in excess of a fully exercised San Luis*
		Provides access to storage in a fully exercised San Luis
		Provides access to increased effective storage in San Luis
		Provides no change in exercised San Luis storage
	Local operational flexibility	*Improves local operational flexibility through substantial increases in storage and conveyance options within the local area*
		Improves local operational flexibility through minor increases in storage and conveyance options within the local area
		Improves local operational flexibility through changing SLR operations
		Provides no change in local operational flexibility
Acceptability	Impacts to biological resources (fisheries, vegetation, and wildlife)	*Benefits biological resources*
		Creates no impact or temporary or minor, but mitigable, adverse impacts to biological resources
		Creates moderate, but mitigable, impacts to biological resources
		Creates unmitigable impacts to biological resources
	Impacts to physical resources (groundwater, air quality, land use, etc.)	*Benefits physical resources*
		Creates no impact or temporary or minor, but mitigable, adverse impacts to physical resources
		Creates moderate, but mitigable impacts to physical resources
		Creates unmitigable impacts to physical resources
	Impacts to social resources (cultural, recreation, transportation, etc.)	*Benefits social resources*
		Creates no impact or temporary or minor, but mitigable, adverse impacts to social resources
		Creates moderate, but mitigable, impacts to social resources
		Creates unmitigable impacts to social resources
Efficiency	Costs	*Has relatively low estimated cost*
		Has relatively low to medium estimated cost
		Has relatively medium to high estimated cost
		Has high estimated cost

Figure 6-1 – Level 2 Screening Criteria

The ratings correspond to the risk of potential supply interruptions. Many alternatives scored a light green, which corresponds to fully exercising San Luis Reservoir without interrupting deliveries to the San Felipe Division. These alternatives address the potential interruptions to the San Felipe Division associated with water quality in the reservoir. By allowing full exercise of the reservoir, these alternatives also address the potential interruptions to the other contractors dependent on San Luis Reservoir.

Alternatives that would provide extra protection for interruptions to the San Felipe Division caused by low water levels would score a dark green. Alternatives that would reduce potential supply interruptions, but not fully address interruptions associated with water quality would result in a yellow rating. A purple rating means no improvement related to this objective. Table 6-1 shows the ratings for each alternative with a brief explanation.

Table 6-1. Alternative Ratings for Avoiding Supply Interruptions

Category	Alternative	Rating	Explanation
Institutional	Institutional Alternative	Yellow	Banking and exchanges may not be available in all low point years at the necessary quantities to prevent interruptions.
Source Water Quality Control	Algae Harvesting Alternative	Light Green	Harvesting algae or applying algaecides would reduce algae layer and slow reservoir declines to prevent algae-related interruptions.
	Algaecide Alternative	Light Green	
	Managed Stratification Alternative	Light Green	This alternative would reduce algae growth, and siphon off remaining algae to treatment near Gianelli.
Treatment	Treatment at San Felipe Intake Alternative	Light Green	The three treatment alternatives would treat the algae-laden water on the San Felipe Division side of the reservoir, thereby avoiding algae-related supply interruptions.
	Treatment at WTPs Alternative	Light Green	
	Treatment at Pumping Plant Alternative	Light Green	
Conveyance	Holladay Aqueduct Alternative	Dark Green	The three bypass alternatives would provide a direct San Felipe Division water conduit that did not route water through San Luis Reservoir; therefore, these alternatives would completely avoid reservoir-related interruptions for the San Felipe Division.
	Northerly Bypass Corridor Alternative	Dark Green	
	Southerly Bypass Corridor Alternative	Dark Green	
	Lower San Felipe Intake Alternative	Light Green	A new intake at a lower level would avoid algae-related supply interruptions.
Storage	Anderson Reservoir Expansion Alternative	Dark Green	Storage facilities on the west side of San Luis Reservoir would provide an alternate source of supply for the San Felipe Division and fully exercise San Luis Reservoir for other contractors.
	Chesbro Reservoir Expansion Alternative	Dark Green	
	Lower Pacheco Reservoir Alternative	Dark Green	
	Pacheco A Reservoir Alternative	Dark Green	

Category	Alternative	Rating	Explanation
	San Luis Reservoir Expansion Alternative	Light Green	Expanding the reservoir would provide the same amount of water to contractors as it addressed the algae problem, but San Felipe Division contractors could still experience interruptions if the reservoir reached 300 TAF.
	San Benito Canyon Reservoir Alternative	Light Green	San Benito Reservoir would provide alternative storage location for the San Felipe Division and increase the exercise of San Luis Reservoir
	Del Puerto Canyon Reservoir Alternative	Light Green	Storage facilities on the east side of San Luis Reservoir would allow San Luis Reservoir water levels to stay above 300 TAF, addressing the algae-related interruptions.
	Ingram Canyon Reservoir Alternative	Light Green	
	Quinto Creek Reservoir Alternative	Light Green	
Alternate Water Supplies	Monterey Bay Desalination Alternative	Dark Green	Desalination facilities would provide an alternate source of supply for the San Felipe Division and fully exercise San Luis Reservoir for other contractors.
	San Francisco Bay Desalination Alternative	Dark Green	
	Combined Desalination Alternative	Dark Green	
	Enlarged SBA/Los Vaqueros Expansion Alternative	Light Green	Conveyance limitations within the San Felipe Division might not allow these alternate water supplies to reach all users and prevent all supply interruptions.
	Los Vaqueros Expansion Alternative	Light Green	
Combination	San Felipe Division Combination Alternative	Light Green	Conveyance improvements and groundwater storage would facilitate deliveries from San Luis Reservoir before low point months and recycling and exchanges would supplement supplies inaccessible during the low point months.

Increasing Deliveries

This performance measure relates to the second objective:

"Increasing the reliability and quantity of annual allocations to south-of-Delta contractors dependent on San Luis Reservoir."

As owners and operators of San Luis Reservoir, Reclamation and DWR can choose to exercise the reservoir fully and drop water levels to the minimum conservation pool every year. Reclamation currently operates to this level. However, as low point issues become more frequent in the future without the project, Reclamation would likely experience substantial political pressure to reserve some water in San Luis Reservoir to allow continued deliveries to the San Felipe Division. The without project conditions assume that Reclamation would likely need to compromise between the San Felipe Division and the other contractors in the future to some extent, which would result in not fully exercising San Luis Reservoir.

As discussed in Chapter 2, several factors have limited (or may limit in the future) the delivery quantities associated with the CVP and SWP. Changing

regulations and biological requirements have particularly affected Project yield. Decreasing Project yields have caused contractors to look for potential modifications that would allow deliveries to increase to previous levels. Alternatives that would allow full exercise of San Luis Reservoir (or its functional equivalent) received a light green rating. However, some alternatives might allow delivery increases greater than those possible through full operation of San Luis Reservoir. For example, alternatives that include storage or alternate supplies might allow use of these facilities to increase delivery quantities even in years without a low point issue. These alternatives received a dark green rating.

Alternatives that received a yellow rating would make some increases in deliveries compared to the without project conditions, but these increases would be smaller than those associated with full exercise of San Luis Reservoir. A purple rating indicates no change in delivery quantities. Table 6-2 shows the ratings for each alternative.

Table 6-2. Alternative Ratings for Increasing Deliveries

Category	Alternative	Rating	Explanation
Institutional	Institutional Alternative	Yellow	Banking and exchanges may not be available in sufficient quantities to allow full exercise of San Luis Reservoir.
Source Water Quality Control	Algae Harvesting Alternative	Light Green	The source water quality control alternatives would allow the functional equivalent of full exercise of San Luis Reservoir.
	Algaecide Alternative	Light Green	
	Managed Stratification Alternative	Light Green	
Treatment	Treatment at San Felipe Intake Alternative	Light Green	The treatment alternatives would allow the full exercise of San Luis Reservoir.
	Treatment at WTPs Alternative	Light Green	
	Treatment at Pumping Plant Alternative	Light Green	
Conveyance	Holladay Aqueduct Alternative	Light Green	The conveyance alternatives would allow full exercise of San Luis Reservoir.
	Northerly Bypass Corridor Alternative	Light Green	
	Southerly Bypass Corridor Alternative	Light Green	
	Lower San Felipe Intake Alternative	Light Green	
Storage	Anderson Reservoir Expansion Alternative	Dark Green	Storage facilities could increase delivery quantities by providing benefits in years when San Luis Reservoir does not experience a low point issue.
Combination	San Felipe Division Combination Alternative	Light Green	The combination alternative would allow for full exercise of San Luis Reservoir

Category	Alternative	Rating	Explanation
	Chesbro Reservoir Expansion Alternative	Dark Green	
	Lower Pacheco Reservoir Alternative	Dark Green	
	Pacheco A Reservoir Alternative	Dark Green	
	San Luis Reservoir Expansion Alternative	Light Green	The San Luis Reservoir expansion would allow the functional equivalent of full exercise of San Luis Reservoir.
	San Benito Reservoir Alternative	Light Green	Surface water storage and exchanges would allow the functional equivalent of full exercise of San Luis Reservoir.
	Del Puerto Canyon Reservoir Alternative	Light Green	Surface water storage, groundwater storage, recycling and exchanges would allow the functional equivalent of full exercise of San Luis Reservoir.
	Ingram Canyon Reservoir Alternative	Dark Green	Storage facilities could increase delivery quantities by providing benefits in years when San Luis Reservoir does not experience a low point issue.
	Quinto Creek Reservoir Alternative	Dark Green	
Alternate Water Supplies	Monterey Bay Desalination Alternative	Dark Green	The desalination alternatives could increase deliveries by operating in years when San Luis Reservoir does not experience a low point issue and offsetting deliveries from San Luis Reservoir.
	San Francisco Bay Desalination Alternative	Dark Green	
	Combined Desalination Alternative	Dark Green	
	Enlarged SBA/Los Vaqueros Expansion Alternative	Light Green	The Los Vaqueros Expansion alternatives would allow the functional equivalent of full exercise of San Luis Reservoir.

More Aggressive Allocations

This performance measure relates to the third objective:

"Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on San Luis Reservoir without sacrificing accuracy of the allocation forecasts."

Allocations are updated every month, and are typically not final until the summer. Farmers, however, need to make planting and water source decisions earlier in the year, and typically use the April 15 allocation as a basis for these decisions. Allocations on April 15 are often conservative to reflect the unknowns in the system, particularly upcoming precipitation patterns and pumping from the Delta. Alternatives that include safety nets would allow higher allocations earlier in the year by providing another source of water in case conditions vary from predictions.

As discussed in Chapter 5, almost all of the alternatives include safety nets, either through extra storage (surface water or groundwater) or exchanges. The only alternative without these safety nets is the Institutional Alternative. The Institutional Alternative includes high quantities of banking and exchanges to

meet the low point issue. These sources are somewhat uncertain, and they would likely not provide enough water to either fully address the low point issue or provide safety nets. The Institutional Alternative therefore received a yellow rating, denoting only a small improvement relative to the without project conditions. All other alternatives received a dark green rating.

6.2.2 Effectiveness

Amount of San Luis Reservoir Storage Exercised

This performance measure examines how well the alternatives would make use of the opportunity to fully utilize the water in storage in San Luis Reservoir. As discussed for previous performance measures, several alternatives are designed to provide a functionally equivalent benefit to a fully exercised San Luis Reservoir. These alternatives do not, however, fully make use of the opportunity associated with stored water in San Luis Reservoir.

The rating scales measure the quantity of storage utilized in each alternative. A yellow rating indicates that an alternative would result in increased use of water in storage in San Luis Reservoir, but not in full drawdown of the reservoir. Alternatives with yellow ratings are generally those that would provide functionally equivalent benefits, such as source water quality control. A light green rating denotes an alternative that would fully utilize water in storage in San Luis Reservoir. An alternative with a dark green rating would result in full use of storage in San Luis Reservoir and exercise of additional storage (either surface water or groundwater storage). Table 6-3 shows the alternative ratings with brief explanations.

Table 6-3. Alternative Ratings for Amount of San Luis Reservoir Storage Exercised

Category	Alternative	Rating	Explanation
Institutional	Institutional Alternative	Yellow	Banking and exchanges would help to maintain San Luis Reservoir water levels; operating agreements would allow some increased water use.
Source Water Quality Control	Algae Harvesting Alternative	Yellow	The source water quality control measures would allow increased use of San Luis Reservoir, but they would be supplemented with banking and exchanges to slow water level declines.
	Algaecide Alternative	Yellow	
	Managed Stratification Alternative	Light Green	Managed stratification, coupled with operating agreements, would allow full exercise of San Luis Reservoir.
Treatment	Treatment at San Felipe Intake Alternative	Light Green	The treatment alternatives would include full exercise of storage in San Luis Reservoir.
	Treatment at WTPs Alternative	Light Green	
	Treatment at Pumping Plant Alternative	Light Green	
Conveyance	Holladay Aqueduct Alternative	Light Green	The conveyance alternatives would include full exercise of storage in San Luis Reservoir.

Category	Alternative	Rating	Explanation
	Northerly Bypass Corridor Alternative	Light Green	
	Southerly Bypass Corridor Alternative	Light Green	
	Lower San Felipe Intake Alternative	Dark Green	In addition to fully exercising storage in San Luis Reservoir, this alternative would include exercise of storage in a groundwater banking facility.
Storage	Anderson Reservoir Expansion Alternative	Dark Green	The storage alternatives on the west side of San Luis Reservoir would include full exercise of storage in San Luis Reservoir and use of new storage.
	Chesbro Reservoir Expansion Alternative	Dark Green	
	Lower Pacheco Reservoir Alternative	Dark Green	
	Pacheco A Reservoir Alternative	Dark Green	
	San Luis Reservoir Expansion Alternative	Yellow	The San Luis Reservoir Expansion Alternative would not include use of the last 300 TAF of water in storage.
	San Benito Reservoir Alternative	Yellow	San Benito Reservoir would increase the exercise of storage in San Luis Reservoir and use of new storage.
	Del Puerto Canyon Reservoir Alternative	Yellow	The storage alternatives on the east side of San Luis Reservoir would increase the exercise of storage in San Luis Reservoir and use of new storage.
	Ingram Canyon Reservoir Alternative	Yellow	The storage alternatives on the east side of San Luis Reservoir would increase the exercise of storage in San Luis Reservoir and use of new storage.
	Quinto Creek Reservoir Alternative	Yellow	
Alternate Water Supplies	Monterey Bay Desalination Alternative	Light Green	The alternate water supply alternatives would include full exercise of storage in San Luis Reservoir.
	San Francisco Bay Desalination Alternative	Light Green	
	Combined Desalination Alternative	Light Green	
	Enlarged SBA/Los Vaqueros Expansion Alternative	Light Green	
	Los Vaqueros Expansion Alternative	Light Green	
Combination	San Felipe Division Combination Alternative	Light Green	The combination alternative would include full exercise of storage in San Luis Reservoir.

Local Operational Flexibility

This performance measure examines how well the alternatives would make use of the opportunity to improve operational flexibility. Some measures have the potential to add operational flexibility for some contractors during years that they would not be needed for the low point issue. Generally, alternatives that include non-structural or minor measures that improve local flexibility (like groundwater banking) received a light green rating, and alternatives with measures that make greater improvements in local flexibility (like new storage or conveyance) received a dark green rating. A small increase in local operational flexibility would result from resolving conflicts between the conveyance and storage needs at San Luis Reservoir related to the low point

issue; measures in which this would be the only improvement received a yellow rating. Purple ratings indicate that no change in local operational flexibility would result. Table 6-4 includes the ratings and explanations for this performance measure.

Table 6-4. Alternative Ratings for Local Operational Flexibility

Category	Alternative	Rating	Explanation
Institutional	Institutional Alternative	Light Green	Operating agreements and procedures could increase local flexibility.
Source Water Quality Control	Algae Harvesting Alternative	Light Green	These alternatives include groundwater banking and groundwater storage, which would improve local operational flexibility.
	Algaecide Alternative	Light Green	
	Managed Stratification Alternative	Light Green	Operating agreements and procedures could increase local flexibility.
Treatment	Treatment at San Felipe Intake Alternative	Yellow	The treatment alternatives would address the low point issues within the reservoir, but would not include other local measures.
	Treatment at WTPs Alternative	Yellow	
	Treatment at Pumping Plant Alternative	Yellow	
Conveyance	Holladay Aqueduct Alternative	Dark Green	The bypass alternatives would provide substantial increases in operational flexibility for the San Felipe Division because the San Felipe Division could access CVP water through either San Luis Reservoir or through the bypass facility.
	Northerly Bypass Corridor Alternative	Dark Green	
	Southerly Bypass Corridor Alternative	Dark Green	
	Lower San Felipe Intake Alternative	Light Green	This alternative includes groundwater banking, which would improve local operational flexibility.
Storage	Anderson Reservoir Expansion Alternative	Dark Green	These storage alternatives would provide substantial increases in local operational flexibility.
	Chesbro Reservoir Expansion Alternative	Dark Green	
	Lower Pacheco Reservoir Alternative	Dark Green	
	Pacheco A Reservoir Alternative	Dark Green	
	San Luis Reservoir Expansion Alternative	Yellow	Expanding San Luis Reservoir would address the low point issues within the reservoir, but would not include or otherwise address local operational flexibility.
	San Benito Reservoir Alternative	Dark Green	The San Benito Reservoir Alternative would provide substantial increases in local operational flexibility.
	Del Puerto Canyon Reservoir Alternative	Dark Green	These storage alternatives would provide substantial increases in local operational flexibility.
	Ingram Canyon Reservoir Alternative	Dark Green	
	Quinto Creek Reservoir Alternative	Dark Green	

Category	Alternative	Rating	Explanation
Alternate Water Supplies	Monterey Bay Desalination Alternative	Dark Green	Local desalination facilities would provide substantial increases in local operational flexibility.
	San Francisco Bay Desalination Alternative	Dark Green	
	Combined Desalination Alternative	Dark Green	
	Enlarged SBA/Los Vaqueros Expansion Alternative	Light Green	These alternatives include brackish groundwater desalination facilities, which would provide substantial increases in local operational flexibility. However, the central measure of these alternatives is the expansion of Los Vaqueros reservoir, which would be out of the control of the project partners. These factors offset each other and result in a light green rating.
	Los Vaqueros Expansion Alternative	Light Green	
Combination	San Felipe Division Combination Alternative	Light Green	This alternative increases available storage and conveyance options in the San Felipe Division, which would improve local operational flexibility.

6.2.3 Acceptability

The acceptability planning criterion has three performance measures: impacts to biological resources, impacts to physical resources, and impacts to social resources. The rating scale measures the severity of these impacts and whether they are mitigable. Table 6-5 includes the ratings and explanations for the acceptability performance measures.

Most of the alternatives would have temporary, construction-related impacts that would not continue after construction was completed. Alternatives with only these types of impacts scored a light green (for minor, mitigable impacts). The explanations in Table 6-5 focus on additional impacts that warranted a yellow (moderate, mitigable impacts) or a purple (impacts that may be unmitigable) rating.

Table 6-5. Alternative Ratings for Acceptability

Category	Alternative	Biological Impacts	Physical Impacts	Social Impacts	Explanation
Institutional	Institutional Alternative	Light Green	Light Green	Light Green	Institutional measures would have minor impacts (or no impacts).
Source Water Quality Control	Algae Harvesting Alternative	Light Green	Light Green	Yellow	The 109 harvesting boats would have moderate effects on recreation.
	Algaecide Alternative	Yellow	Yellow	Yellow	Application of copper chelate could increase toxics, affecting biological resources, water quality, and recreation.
	Managed Stratification Alternative	Light Green	Light Green	Light Green	Managed stratification would cause only minor, temporary construction-related impacts.
Treatment	Treatment at San Felipe Intake Alternative	Yellow	Light Green	Light Green	The treatment alternatives all involve construction of facilities on undeveloped land, which would have moderate effects on biological resources.

Category	Alternative	Biological Impacts	Physical Impacts	Social Impacts	Explanation
	Treatment at WTPs Alternative	Yellow	Light Green	Light Green	
	Treatment at Pumping Plant Alternative	Yellow	Light Green	Light Green	
Conveyance	Holladay Aqueduct Alternative	Light Green	Yellow	Light Green	The length of the pipeline (26 miles) would result in moderate impacts to biological and physical resources. The biological impacts would be offset by the discharges to local creeks, which could benefit biological resources.
	Northerly Bypass Corridor Alternative	Yellow	Yellow	Light Green	The length of the pipeline (17 miles) would result in moderate impacts to biological and physical resources.
	Southerly Bypass Corridor Alternative	Light Green	Light Green	Light Green	Tunneling under the reservoir would avoid most impacts other than those that are temporary and construction-related.
	Lower San Felipe Intake Alternative	Yellow	Light Green	Light Green	Extending the intake along the reservoir floor could have moderate impacts on biological resources.
Storage	Anderson Reservoir Expansion Alternative	Purple	Purple	Purple	Expanding Anderson Reservoir could inundate habitat for sensitive species near the water's edge (biological resources); it would inundate 100 structures and a park (physical resources), and it would substantially reduce recreation (social resources).
	Chesbro Reservoir Expansion Alternative	Purple	Purple	Yellow	These storage facilities would have relatively large footprints, causing substantial impacts to biological resources (by inundating habitat) and physical resources (by inundating structures and parks). Social impacts would be moderate.
	Lower Pacheco Reservoir Alternative	Purple	Purple	Yellow	
	Pacheco A Reservoir Alternative	Purple	Purple	Yellow	
	San Luis Reservoir Expansion Alternative	Purple	Purple	Yellow	
	San Benito Reservoir Alternative	Purple	Purple	Yellow	
	Del Puerto Canyon Reservoir Alternative	Purple	Purple	Yellow	
	Ingram Canyon Reservoir Alternative	Purple	Purple	Yellow	
	Quinto Creek Reservoir Alternative	Purple	Purple	Yellow	
Alternate Water Supplies	Monterey Bay Desalination Alternative	Purple	Yellow	Yellow	Brine disposal could have substantial impacts on biological resources near the outfall and moderate impacts to water quality. Desalination facilities could also have moderate impacts to coastal recreation.
	San Francisco Bay Desalination Alternative	Purple	Yellow	Yellow	
	Combined Desalination Alternative	Purple	Yellow	Yellow	
	Enlarged SBA/Los Vaqueros Expansion Alternative	Yellow	Yellow	Yellow	Initial analysis shows that a Los Vaqueros Expansion could cause moderate impacts to environmental resources.

Category	Alternative	Biological Impacts	Physical Impacts	Social Impacts	Explanation
	Los Vaqueros Expansion Alternative	Yellow	Yellow	Yellow	
Combination	San Felipe Division Combination Alternative	Light Green	Light Green	Light Green	Developing a new pipeline connecting Lexington Reservoir and the SCVWD system could have some minor impacts on biological, physical and social resources.

6.2.4 Efficiency

As discussed above, the efficiency planning criterion prioritizes alternatives that would achieve benefits for the least cost. The above performance measures evaluate the benefits provided by each alternative; therefore, the performance measure for efficiency focuses on cost.

An IAIR uses existing information to formulate an initial set of alternatives. Cost data exists on most, but not all, measures that were combined into alternatives. The costs are generally in 2002 dollars. Construction costs have escalated dramatically since these estimates, so a new analysis is necessary to determine potential costs. However, the 2002 costs provide some information with which to compare the alternatives on a relative basis. Appendix C includes existing cost information for the measures included in the initial set of alternatives. The ratings of each alternative were based on this cost information.

6.3 Alternative Evaluation Results

Figure 6-2 shows the results of the Level 2 screening of alternatives. The Study Team used these results to further narrow the list of alternatives to carry forward into the plan formulation phase.

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SLPPP Level 2 Alternative Screening

Category	Alternatives	Screening Criteria								
		Completeness			Effectiveness		Acceptability			Efficiency
		Potential for supply interruptions	*Delivery quantities for south-of-Delta contractors*	*Potential to allow more aggressive allocations*	*Amount of San Luis storage exercised*	*Local operational flexibility*	*Impacts to biological resources*	*Impacts to physical resources*	*Impacts to social resources*	*Cost*
Institutional	Institutional Alternative									
Source Water Quality Control	Algae Harvesting Alternative									
	Algaecide Alternative									
	Managed Stratification Alternative									
Treatment	Treatment at San Felipe Alternative									
	Treatment at WTPs Alternative									
	Treatment at Pumping Plant Alternative									
Conveyance	Holladay Aqueduct Alternative									
	Northerly Bypass Corridor Alternative									
	Southerly Bypass Corridor Alternative									
	Lower San Felipe Intake Alternative									
Storage	Anderson Reservoir Expansion Alternative									
	Chesbro Reservoir Expansion Alternative									
	Lower Pacheco Reservoir Alternative									
	Pacheco A Reservoir Alternative									
	San Luis Reservoir Expansion Alternative									
	San Benito Reservoir Alternative									
	Del Puerto Canyon Reservoir Alternative									
	Ingram Canyon Reservoir Alternative									
	Quinto Creek Reservoir Alternative									
Alternate Water Supplies	Monterey Bay Desalination Alternative									
	San Francisco Bay Desalination Alternative									
	Combined Desalination Alternative									
	Enlarged SBA/Los Vaqueros Expansion Alternative									
	Los Vaqueros Expansion Alternative									
Combination	San Felipe Division Combination Alternative									

Legend *Fully Meets Criterion* · *Partially Meets Criterion* · *Makes Some Progress Towards Meeting Criterion* · *Does Not Meet Criterion*

Figure 6-2 – SLLPIP Level 2 Alternative Screening

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The Study team selected at least one alternative from each category to carry forward for analysis, maintaining a reasonable range of alternative types. The Study team selected the alternative that appears to achieve the most benefits for the least cost relative to other alternatives within a category. This comparison was qualitative because a full analysis of net benefits (benefits minus costs) does not yet exist for the initial alternatives. If at least one alternative did not stand out within a category because of higher benefits or lower costs, then multiple alternatives from that category will be retained. Much of the future feasibility work will center on refinement and quantitative measurement of benefits and costs to enable selection of a preferred plan consistent with the P&Gs.

Table 6-6 shows which alternatives the Study Team retained for further analysis in the plan formulation phase. The discussions below provide the reasons for selecting the retained alternatives. In addition to these selected alternatives, a No-Action/No-Project Alternative will also be retained for comparison and further analysis.

6.3.1 Institutional

The Level 2 screening only analyzed one alternative in the institutional category: banking, exchanges, and operating agreements and procedures. This alternative will move forward.

6.3.2 Source Water Quality Control

The benefits associated with these three alternatives are very similar. The alternatives scored the same for all of the completeness performance measures. The managed stratification alternative performed slightly better than the other alternatives according to the effectiveness and acceptability criteria, and algaecides performed somewhat worse for acceptability. The primary differentiator for these measures is cost. Algae harvesting would be the most expensive of the three because of the high costs associated with the harvesting boats and physical removal of the algae. Managed stratification would have more moderate costs, but still would have costs associated with modifying the Gianelli Outlet and constructing DAF facilities near the outlet. Algaecides would have substantially lower costs than the other two alternatives with similar benefits; therefore, the algaecides alternative will move forward.

6.3.3 Treatment

The three treatment alternatives vary by the location for the DAF treatment facilities. These alternatives' benefits would not vary by location, and their costs would vary only slightly. Because the potential costs and benefits do not differentiate between the three alternatives, all three will move forward. However, they will be combined into one alternative that will include the three potential sites during subsequent study.

6.3.4 Conveyance

The four conveyance alternatives have similar benefits. The three bypass facilities scored identically for completeness and effectiveness, but the Southerly Bypass Corridor received the highest ratings for acceptability because the tunnel would have few environmental impacts. The Southerly Bypass Corridor would also have the lowest costs of the three bypass facilities, and will be retained for further analysis. Lowering the San Felipe Intake received slightly lower ratings for completeness, effectiveness, and acceptability than the Southerly Bypass Corridor; however, it also would have lower costs than the bypass alternative. The Lower the San Felipe Intake Alternative and Southerly Bypass Corridor will move forward.

6.3.5 Storage

The analysis of storage facilities still has several gaps. The purpose of the IAIR is to use existing information to develop initial alternatives; some information was not available for these facilities. Raising San Luis Reservoir will not be retained because it would provide fewer benefits at greater costs than the other storage facilities. Further narrowing the remaining list of storage alternatives is not possible with the currently available information.

6.3.6 Alternate Water Supplies

The three desalination alternatives would have much higher costs than any other alternative in the Level 2 screening (greater than $2.2 billion). Additionally, they would likely have unmitigable biological impacts associated with the ocean discharge of brine. The benefits of these alternatives are not great enough to justify the high costs; therefore, these alternatives will not move forward.

The remaining two alternatives involve the Los Vaqueros Expansion. The Los Vaqueros alternative that includes expansion of the South Bay Aqueduct would be the more expensive of the two, which would provide similar benefits. Therefore, the other Los Vaqueros Expansion Alternative (which includes reoperation of Anderson Reservoir, the SFPUC intertie, San Benito groundwater desalination, and exchanges) will move forward.

6.3.7 Combination

The Level 2 screening only analyzed one alternative in this category: San Felipe Division conveyance modification, groundwater storage, recycling, and exchanges. This alternative will move forward.

Table 6-6 summarizes the alternative evaluation results.

Table 6-6. Retained Alternatives

Category	Alternative	Included Measures	Retained?
Institutional	Institutional Alternative	Banking, exchanges, and operating agreements and procedures	Yes
Source Water Quality Control	Algae Harvesting Alternative	Algae harvesting, banking, exchanges, and groundwater storage	No
	Algaecide Alternative	Algaecides, banking, exchanges, and groundwater storage	Yes
	Managed Stratification Alternative	Managed stratification, DAF at Gianelli, exchanges, and operating agreements and procedures	No
Treatment	Treatment at San Felipe Intake Alternative	DAF at San Felipe Intake, treatment at Rinconada, and exchanges	Yes
	Treatment at WTPs Alternative	DAF at WTPs, treatment at Rinconada, and exchanges	Yes
	Treatment at Pumping Plant Alternative	DAF at Coyote PP, treatment at Rinconada, and exchanges	Yes
Conveyance	Lower San Felipe Intake Alternative	Extend/Lower San Felipe Intake to Gianelli Inlet/Outlet Level and banking	Yes
	Holladay Aqueduct Alternative	Holladay Aqueduct and exchanges	No
	Northerly Bypass Corridor Alternative	Northerly Bypass Corridor and exchanges	No
	Southerly Bypass Corridor Alternative	Southerly Bypass Corridor and exchanges	Yes
Storage	Anderson Reservoir Expansion Alternative	Anderson expansion and exchanges	Yes
	Chesbro Reservoir Expansion Alternative	Chesbro expansion and exchanges	Yes
	Lower Pacheco Reservoir Alternative	Lower Pacheco (Pacheco Lake Reservoir) and exchanges	Yes
	Pacheco A Reservoir Alternative	Pacheco A Reservoir and exchanges	Yes
	San Benito Canyon Reservoir Alternative	San Benito Reservoir and exchanges	Yes
	San Luis Reservoir Expansion Alternative	San Luis Reservoir expansion and exchanges	No
	Del Puerto Canyon Reservoir Alternative	Del Puerto Canyon Reservoir, banking, groundwater storage, and exchanges	Yes
	Ingram Canyon Reservoir Alternative	Ingram Canyon Reservoir	Yes
	Quinto Creek Reservoir Alternative	Quinto Creek Reservoir	Yes
Alternate Water Supplies	Monterey Bay Desalination Alternative	Monterey Bay desalination and exchanges	No
	San Francisco Bay Desalination Alternative	San Francisco Bay desalination and exchanges	No
	Combined Desalination Alternative	San Benito groundwater desalination, San Francisco Bay desalination, Monterey Bay desalination, and exchanges	No
	Enlarged SBA/Los Vaqueros Expansion Alternative	Enlarged SBA/Los Vaqueros Expansion, San Benito groundwater desalination, and exchanges	No
	Los Vaqueros Expansion Alternative	Los Vaqueros Expansion, Anderson reoperation, SFPUC intertie, San Benito groundwater desalination, and exchanges	Yes
Combination	San Felipe Division Combination Alternative	San Felipe Division conveyance modification, groundwater storage, recycling, and exchanges	Yes

Key: DAF = Dissolved Air Filtration
WTPs = water treatment plants
PP = pumping plant
SBA = South Bay Aqueduct
SFPUC = San Francisco Public Utilities Commission

6.4 Findings

The following findings reflect results of the initial phase of the Feasibility Study for the SLLPIP:

- San Luis Reservoir low point conditions promote the growth of reservoir-wide algae during the summer months, when the reservoir reaches a storage volume of 300 TAF. At this storage volume, a water quality restriction exists with the potential to interrupt a portion of the San Felipe Division's water supply.
- The low point issue may affect the ability of San Luis Reservoir to provide water supply reliability and deliveries to south-of-Delta Project contractors.
- If water quality in San Luis reservoir becomes a problem, then San Felipe Division does not have useable water supply from CVP with its existing treatment facilities.
- The SLLPIP study is needed to address the low point issue so that Reclamation can improve the operations of San Luis Reservoir to provide more reliable and uninterrupted supplies to south-of-Delta Project contractors.
- On the basis of identified water resources problems, the following planning objectives were identified:
    - Avoiding supply interruptions when water is needed by increasing the certainty of meeting the requested delivery schedule throughout the year to south-of-Delta contractors dependent on San Luis Reservoir.
    - Increasing the reliability and quantity of yearly allocations to south-of-Delta contractors dependent on San Luis Reservoir.
    - Announcing higher allocations earlier in the season to south-of-Delta contractors dependent on San Luis Reservoir without sacrificing accuracy of the allocation forecasts.
- In addition to the above planning objectives, consideration should be given to providing ecosystem restoration.
- The Study team developed 25 initial alternatives that include a combination of management measures.

- Federal interest exists in a feasibility study that primarily focuses on improving the certainty of the delivery of annual allocations to south-of-Delta contractors dependent on San Luis Reservoir.

6.5 Conclusion

The Federal Feasibility Study should continue for resolving water resources problems in the study area, particularly through alternatives to address San Luis Reservoir operations and delivery. The Feasibility Study program should be closely coordinated with SLDMWA, the San Felipe Division, and other stakeholders.

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Chapter 7
Public Participation and Next Steps

7.1 Feasibility Study Schedule

The Study process and major completion dates are outlined in Figure 7-1. The Plan Formulation is the next major phase in the Feasibility Study process, which will culminate in an interim Plan Formulation Report (PFR). The PFR will present results of the initial alternatives evaluation, refine the alternatives, identify comprehensive alternatives and potential effects, and estimate preliminary costs and benefits. The Final PFR is scheduled for completion in December 2007.

Figure 7-1. Feasibility Study Planning Process

After the PFR is complete, the Feasibility Report is the next step in the Study process; the Feasibility Report is scheduled for completion in June 2009. The comprehensive alternatives developed in the PFR will be carried forward into the Feasibility Report. The Feasibility Report will evaluate and compare the final alternatives and identify a recommended plan. The Feasibility Report will also include an EIS/EIR to comply with NEPA and CEQA requirements.

7.2 Public Participation Plan

The Study was originally initiated by the SCVWD in 2001 using Proposition 13 funds to complete a Draft Alternatives Screening Report that investigated potential solutions to the low point issues. Public scoping activities were conducted throughout the development of the Alternatives Screening Report, and included multiple public scoping meetings and briefings to stakeholder groups.

Public scoping efforts will continue as part of the ongoing Study. Public outreach activities will include additional environmental scoping meetings as required by NEPA and CEQA at the San Luis Reservoir area, in the service area of the West San Joaquin Division of the CVP, and in the San Felipe Division of

the CVP. Public outreach conducted in support of the Plan Formulation phase and CEQA and NEPA compliance will result in a Scoping Report that describes the public outreach efforts in terms of issues that were raised by stakeholders, information that was presented at the meetings, potential environmental compliance issues that were identified as a part of the scoping process, and a description of future public outreach activities to support completion of the Feasibility Study.

Public outreach activities will include stakeholder workshops, periodic project newsletters for stakeholders and interested members of the public, and a website with status information.

7.3 Next Steps

The PFR phase will continue analysis of the initial alternatives retained following the Level 2 screening. The PFR will evaluate and compare the alternatives for benefits, costs, potential resource impacts and associated mitigation measures, and will identify a tentatively selected plan. It will also include a preliminary cost allocation. Technical evaluations to be completed as a part of the Plan Formulation phase include: hydrologic and hydraulic analyses, geotechnical studies, engineering designs and cost estimates, real estate evaluations and costs, economic assessments, evaluation of environmental conditions, and cultural resources evaluations. To the extent possible, these evaluations are described below.

Hydrologic and Hydraulic Analyses

The hydrologic analyses will investigate the potential effect of the comprehensive alternatives on water supply operations, water temperature, fishery production and mortality, and geomorphology. The analyses will also include flow frequency estimation for potential new reservoir sites and rainfall runoff characteristics estimation. The hydraulic analyses will include investigation of the projected river flows versus stage relationships for the comprehensive alternatives, and evaluations to support the construction or modification of existing and proposed reservoirs identified in the IAIR.

Geotechnical Studies

The geotechnical studies will investigate geology and soils information, data on regional seismicity, and groundwater to support alternative evaluation during the development of building plans for physical features identified in the comprehensive alternatives.

Engineering Designs and Cost Estimates

Appraisal level engineering designs and cost estimates will be developed for the comprehensive alternatives. The PFR will identify the potential issues and outstanding design and construction issues that will need to be resolved during development of the Feasibility Report.

Real Estate Evaluations and Costs

The real estate evaluation and cost estimate analysis will assess potential real estate requirements for the comprehensive alternatives and develop value estimates of the land that would be purchased. The real estate investigation would assess potential borrow areas, major relocation areas, mitigation lands, and ecosystem restoration lands.

Economic Assessment

The economic analysis will evaluate and compare net economic benefits of the alternatives. The analysis will be consistent with the P&Gs and recent CALFED Common Assumptions efforts. In the Plan Formulation phase, the economic analysis will identify benefits and begin the quantification process, by identifying estimation methods, collecting data, and calculating preliminary benefits estimates.

The SLLPIP would primarily provide water supply benefits to contractors within the Study area. The economic analysis will define water supplies and demands under the without project conditions and the alternatives and identify the likelihood of a shortage. Benefits to M&I water users will be quantified by identifying an appropriate value of water under different hydrologic conditions. Benefits to agricultural users will be estimated using the Central Valley Production Model. Agricultural water supply benefits would occur through changes in net farm income, through avoided groundwater pumping costs or increased acreage of basic crops.

In addition to quantifying net benefits, the PFR will include a preliminary cost allocation and apportionment (i.e., allocation to purpose). This preliminary assessment will tentatively identify assignment of costs between the Federal government and non-Federal entities.

Evaluate Environmental Conditions

The PFR will include a discussion of the existing environmental conditions in the study area and a more detailed evaluation of the alternatives' environmental effects relative to those identified in this IAIR. Alternatives' environmental impacts will vary based on the location of the alternative and proposed infrastructure. To the extent possible, the environmental impacts analysis will rely on technical data and results from the engineering designs, hydrologic and hydraulic analyses, geotechnical studies, and cultural resources evaluation to identify potential environmental effects. These analyses will be carried forward into the EIS/EIR.

Cultural Resource Evaluations

A cultural resource evaluation to estimate the potential impacts of alternative implementation on any historical, architectural, and archeological resources will support the evaluation of comprehensive alternatives as a part of the Plan Formulation process. The cultural resource evaluation will be completed in coordination with the State Historic Preservation Officer.

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Glossary

acre foot - The volume of water that would cover 1 acre to a depth of 1 foot, or 325,851 gallons of water.

algae bloom – Accelerated growth of algae that typically occurs during warmer months when light, temperature, and nutrient levels are conducive to growth.

aquifer - Underground layer of porous rock, sand, etc. that contains water.

banking - Water banking involves delivery, storage, and extraction of water supplies in groundwater banks over an extended number of years.

bedrock - The solid rock that underlies all soil, sand, clay, gravel, and other loose materials on the earth's surface.

brackish water - Water that contains more sea salts than fresh water, but less than the open sea.

CALFED Bay-Delta Program – a consortium of state and federal agencies working with stakeholders to develop long-term solutions for restoring the Bay-Delta.

California Endangered Species Act (CESA) - California legislation that prohibits the "take" of plant and animal species designated by the CDFG as either endangered or threatened. Take includes hunting, pursuing, catching, capturing, killing, or attempting such activity. See Fish and Game Code Section 2050-2116.

California Environmental Quality Act (CEQA) - California legislation that requires State, regional, and local agencies to prepare environmental impact assessments for proposed projects that will have significant environmental effects and to circulate these documents to other agencies and the public for comment before making decisions. See Public Res. Code Sections 21001.1, 21002, 21080; Guidelines 15002(c).

Central Valley Project (CVP) - As defined by Section 3403(d) of the CVPIA, "all Federal reclamation projects located within or diverting water from or to the watershed of the Sacramento and San Joaquin rivers and their tributaries as authorized by the Act of August 26, 1937 (50 Stat. 850) and all Acts amendatory or supplemental thereto ...."

Central Valley Project Improvement Act (CVPIA) - Federal legislation that modified the operations of the Federal CVP by making the CVP fish and wildlife objectives equal to agricultural, municipal, industrial, and hydropower water uses.

chaparral -Habitat that consists of a dense cover of perennial, mostly evergreen shrubs, generally 1 to 3 meters in height.

cofferdam - A watertight enclosure, open at the top, that is pumped dry to expose the bottom of a body of water so that construction may be undertaken in the dry.

dissolved air filtration (DAF) - This process releases large quantities of microbubbles into the water to float particles, such as algae, to the surface. Scrapers or overhead weirs physically remove the floating materials from the surface while the clear water passes through the bottom of the DAF tank.

diversions - The action of taking water out of a river system or changing the flow of water in a system for use in another location.

ecosystem - A recognizable, relatively homogeneous unit that includes organisms, their environment, and all the interactions among them.

Environmental Impact Report (EIR) - A detailed written report, required by the CEQA, analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, and cumulative impacts.

Environmental Impact Statement (EIS) - A detailed written statement, required by the National Environmental Policy Act (NEPA), analyzing the environmental impacts of a proposed action, adverse effects that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance of long-term productivity, and any irreversible and irretrievable commitment of resources.

erosion - A gradual wearing away of soil or rock by running water, waves, or wind. Surface displacement of soil caused by weathering, dissolution, abrasion, or other transporting.

exchanges or transfers - Exchanges are agreements to trade water with the guarantee of return within one contract year. Water transfers are the purchase of water supplies from a willing seller.

Federal Endangered Species Act (ESA) - Federal legislation that requires Federal agencies, in consultation with the USFWS and NOAA Fisheries, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of these species. The act requires Federal agencies to conserve these species and their habitats and ranges to the extent practicable.

historic property - Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. As a general guideline, a cultural resource should be at least 50 years old to be considered as a historic property.

historical resource - Per CEQA guidelines, a resource listed or eligible for listing on the California Register of Historical Resources.

initial alternative - A single resource management measure or a combination of resource management measures to better meet SLLPIP project objectives.

institutional agreements - Non-structural measures that could reduce the likelihood of San Luis Reservoir reaching its low point by arranging alternate supplies to users of San Luis Reservoir or would provide alternate supplies for the San Felipe Division during times when the low-point is reached.

low point issue – San Luis Reservoir storage level - approximately 300 TAF; when algae blooms in the reservoir typically reach diversion facilities, which corresponds to a lake elevation approximately 35 feet above the Lower Pacheco Intake that serves the San Felipe Division.

macrophyte – aquatic plants large enough to be seen with the unaided eye, typically larger than algae.

managed stratification - The process of using pumps to withdraw water from the reservoir surface to remove nutrient rich water from the surface prior to the development of algae blooms during the summer months.

management measure –features, activitiesp, programs, policies, or projects that would address the planning objectives and/or constraints.

Metropolitan Water District of Southern California (MWD) - The consortium of 26 cities and water districts in Southern California that provides drinking water to Orange, San Diego, San Bernardino, Los Angeles, and Ventura counties. MWD is the State Water Project's largest contractor.

mitigation - To moderate, reduce, or alleviate the impacts of a proposed activity.

National Economic Development (NED) – Increases in the net value of the national output of goods and services, expressed in monetary units.

National Environmental Policy Act - Federal legislation establishing the national policy that environmental impacts will be evaluated as an integral part of any major federal action. Requires the preparation of an environmental impact statement (EIS) for all major federal actions significantly affecting the quality of the human environment.

O'Neill Forebay - The waterbody at the foot of Sisk Dam that connects the California Aqueduct and Delta Mendota Canal to San Luis Reservoir.

overdraft – Withdrawal of water from an aquifer in excess of the amount of water that recharges the basin over a given time period.

Pacheco Pumping Plant - The facility that pumps water west from the San Luis Reservoir to the San Felipe Division of the CVP. The Pacheco Pumping plant extracts water from San Luis Reservoir through an upper and lower intake with the lower intake at an elevation 30 feet above the Gianelli Intake.

planning criteria – Defined in the Federal P&Gs as completeness, effectiveness, efficiency and acceptability. Alternative plans, including the NED plan, should be formulated in consideration of these criteria.

planning objectives – Specific, agreed-upon objectives to address opportunities and problems associated with the San Luis Low Point Improvement Project.

recharge – Flow to groundwater from precipitation, irrigation, spreading basins, or other sources of water.

Regional Water Quality Control Board - Regional agencies granted authority under the Porter Cologne Act to establish water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses.

riparian habitat - The assortment of plants adjacent to a natural watercourse such as a river or stream. Riaparian habitat provides support to aquatic and terrestrial wildlife by providing shade and stabilizing banks around the water bodies.

San Felipe Division - A division of the CVP that provides supplemental water to the Santa Clara Valley Water District and the San Benito County Water District with provisions to expand deliveries to the Pajaro Valley Water Management Agency.

San Luis Delta Mendota Water Authority (SLDMWA) - An organization formed in 1992 by the water agencies within the project study area that assumes responsibility for the operations and maintenance of certain Central Valley Project facilities that deliver water to its member agencies, with the goal of optimizing operations ad costs.

sensitive species - Listed species, species that are candidates for listing, and other species that have been designated as species of special concern by Federal or State agencies or scientific organizations (see "special-status species").

special-status species - Species that are in at least one of the following categories: listed as threatened or endangered under the Federal ESA; proposed for Federal listing under the ESA; Federal candidates under ESA; listed as threatened or endangered under the CESA; candidates under CESA; plants listed as rare under the California Native Plant Protection Act; California fully protected species or specified birds under various sections of the California Fish and Game Codes; California species of special concern; California Native Plant Society List 1A, lB, 2, or 3 species; or other native species of concern to CALFED.

State Water Project (SWP) - A California State water conveyance system that pumps water from the Delta for agricultural, urban domestic, and industrial purposes. The SWP was authorized by legislation in 1951.

Study team - The SLLPIP study team has representatives from the Bureau of Reclamation, the Santa Clara Valley Water District, the San Luis Delta Mendota Water Authority, and the consultant team.

subsidence – Sinking of the land surface due to overdraft of a basin.

take - Under the ESA, "To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" in regard to federally listed, endangered species of wildlife (16 USCA 1532[19]). "Harm" is further defined as an act "which actually kills or take threatened species injures". Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter" (50 CFR 17.3). Under the California Fish and Game Code, take is defined as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code Section 86).

total dissolved solids (TDS) - A water quality parameter defining the concentration of dissolved organic and inorganic chemicals in water, usually expressed in milligrams per liter (mg/L).

total organic carbons (TOC) - A measure of the concentration of organic carbon in water, determined by oxidation of the organic matter into carbon dioxide.

Water Quality Control Plan - Water Quality Control Plans (Basin Plans) are required by the California Water Code (Section 13240) and supported by the Federal Clean Water Act. This plan dictates water quality standards that meet Federal and State regulation

watershed - An area that drains to a particular channel or river, usually bounded peripherally by a natural divide of some kind such as a hill, ridge, or mountain.

wetlands - Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mudflats, and natural ponds. An area characterized by periodic inundation or saturation, hydric soils, and vegetation adapted for life in saturated soil conditions.

William R. Gianelli Pumping Generating Plant - The facility that brings water east from the San Luis Reservoir by way of the O'Neill Forebay to the CVP and SWP via the Delta-Mendota Canal and the California Aqueduct. The Gianelli Intake is 30 feet below the Lower Pacheco Intake.

Appendix A
Vegetation and Wildlife in the Study Area

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Appendix A
Vegetation and Wildlife in the Study Area

This appendix accompanies Section 3.1.2 Biological Resources. The following tables identify wildlife species, habitat types, and special status species that have been documented in the study area. Depending on the alternative, some of these species and habitats could be affected. Further environmental analysis is necessary to identify specific alternatives' effects on vegetation and wildlife. The tables are from various sources, noted at the end of each table.

Table A-1. San Luis Reservoir Basin Vegetation and Wildlife Species by Habitat Type

Common Name	Scientific Name	Habitat(s)	Status
Plants			
Cocklebur	*Xanthium strumarium*	L, F	-
Bermuda grass	*Cynodon dactylon*	L	-
Clustered dock	*Rumex conglomeratus*	L	-
Swamp timothy grass	*Crypsis schoenoides*	L, F	-
Barnyard grass	*Echinochloa crus-galli*	L, F	-
Bulrush	*Scirpus maritimus*	L	-
Mexican sprangletop	*Leptochloa uninervia*	L, F	-
Water smartweed	*Polygonum sp.*	L	-
Red willow	*Salix laevigata*	L, F	-
Muleflat	*Baccharis salicifolia*	L, F	-
Wild oats	*Avena spp.*	G	-
Soft chess brome	*Bromus hordeaceus*	G	-
Ripgut brome	*Bromus diandrus*	G	-
Prickly lettuce	*Lactuca serriola*	G	-
Turkey mullein	*Eremocarpus setigerus*	G	-
Vinegar weed	*Trichostema lanceolata*	G	-
Milkweed	*Asclepias fascicularis*	G	-
Tarweed	*Holocarpha virgata*	G	-
Great Valley gumplant	*Grindelia camporum ssp. Camporum*	G	-
Lupine	*Lupinus sp.*	G	-
California buckwheat	*Eriogonum fasiculatum var. polifolium*	G	-
Black mustard	*Brassica nigra*	G	-
Coyote brush	*Baccharis pilularis*	G	-
Saltbushes	*Atriplex polycarpa and Atriplex lentiformis ssp. Lenitiformis*	G	-
Milk thistle	*Silybum marianum*	G	-
Coyote thistle	*Eryngium castrense*	G	-
Indian sweetclover	*Melilotus indica*	G	

Common Name	Scientific Name	Habitat(s)	Status
purple needlegrass	*Nasella pulchra*	G	-
Owl's clover	*Orthocarpus spp.*	G	-
Lagophylla	*Lagophylla ramosissima*	G	-
Red willow	*Salix lasiandra*	V	-
Fremont cottonwood	*Populus fremontii*	V	-
California sycamore	*Platanus racemosa*	V	-
Cattails	*Typha latifolia*	V, F	-
Iris-leaved juncus	*Juncus xiphioides*	F	-
Bulrush spp.	*Scirpus spp.*	F	-
Nutsedges	*Cyperus spp.*	F	-
Dock	*Rumex spp.*	F	-
Dallis grass	*Paspalum dilatatum*	F	-
Tule	*Scirpus acutus var. occidentalis*	F	-
Flatsedge	*Cyperus eragrostis*	F	-
Willow herb	*Epilobium brachycarpum*	F	-
Creeping wild-rye Leymus triticoides	*Leymus triticoides*	F	-
Bristly ox-tongue	*Picris echioides*	F	-
Stinging nettle	*Uritica dioica*	F	-
Baltic Rush	*Juncus balticus*	F	-
Rabbitsfoot grass	*Polypogon monspeliensis*	F	-
Italian ryegrass	*Lolium multiflorum*	F	-
Saltgrass	*Distichlis spicata*	F	-
Blue oak	*Quercus douglasii*	B	-
Heartscale	*Atriplex cordulata*	G	FSC, 1B
Brittlescale	*Atriplex depressa*	G	1B
San Joaquin spearscale	*Atriplex joaquiniana*	G	FSC, 1B
Lesser Saltscale	*Atriplex minuscula*	G	1B
Lost Hills crownscale	Atriplex vallicola	G	1B
Tiburon Indian paintbrush	*Castilleja affinis ssp. neglecta*	G	ST
Recurved Larkspur	*Delphinium recurvatum*	G	FSC, 1B
Hoover's eriastrum	*Eriastrum hooveri*	G	Delisted 2003
Spiny-sepaled button-celery	*Eryngium spinosepalum*	G	1B
Hall's Tarplant	*Deinandra halliana*	G	1B
Congdon's Tarplant	*Centromadia parryi* spp. *congdonii*	G	1B
Pale-yellow Layia	*Layia heterotricha*	G	1B
San Joaquin woolythreads	*Lembertia congdonii*	G	FE
Panoche peppergrass	*Lepidium jaredii* ssp. *album*	G	1B
Red-flowered Lotus	*Lotus rubriflorus*	G	1B
Showy Madia	*Madia radiata*	G	1B
Merced Phacelia	*Phacelia ciliata v*ar. *opaca*	G	1B
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	G	SE
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	G	SE
Rock Sanicle	*Sanicula saxatilis*	G	SR

Common Name	Scientific Name	Habitat(s)	Status
Most Beautiful Jewel-flower	*Streptanthus albidus* ssp. *peramoenus*	G	1B
Amphibians			
Pacific tree frog	*Pseudacris (Hyla) regilla*	L, V, F	-
California red-legged frog	*Rana aurora draytonii*	L, V	FT, CSC
California tiger salamander	*Ambystoma californiense*	L, G, F	PT, CSC
Western toad	*Bufo boreas*	L, G, V, F, B	-
Bullfrog	*Rana catesbeiana*	V	-
Foothill yellow-legged frog	*Rana boylii*	G	CSC
Reptiles			
Western fence lizard	*Sceloporus occidentalis*	L, G, V, B	-
Garter snake	*Thamnophis sirtalis*	L, V, F	-
Western skink	*Eumeces skiltonianus*	G	-
Gopher snake	*Pituophis melanoleucus*	G, V	-
Racer	*Coluber constrictor*	G, V	-
Southern alligator lizard	*Elgaria multicarinata*	V, B	-
Gilbert's skink	*Eumeces gilberti*	B	-
Common king snake	*Lampropeltis getulus*	B	-
Western rattlesnake	*Crotalus viridis*	B	-
Western Pond Turtle	*Clemmys marmorata pallida*	G	CSC
San Joaquin Whipsnake	*Masticophis flagellum ruddocki*	G	CSC
Birds			
Brewer's Blackbird	*Euphagus cyanocephalus*	L	-
Red-winged Blackbird	*Agelaius phoeniceus*	L, F	-
Black Phoebe	*Sayornis nigricans*	L	-
Killdeer	*Charadrius vociferous*	L	-
Black-crowned Night Heron	*Nycticorax nycticorax*	L	-
Double-crested Cormorant	*Phalacrocorax auritis*	L	CSC
Barn Owl	*Tyto alba*	L, G	-
American Coot	*Fulica americana*	L	-
Pied-billed Grebe	*Podilymbus podiceps*	L	-
Common Merganser	*Mergus merganser*	L	-
Eared Grebe	*Podiceps nigricollis*	L	-
Western Grebe	*Aechmophorus occidentalis*	L	-
American White Pelican	*Pelicanus erythrorhynchos*	L	-
Mallard	*Anas platyrhnchos*	L, F	-
American Wigeon	*Anas americana*	L	-
Ring-billed Gull	*Larus delewarensis*	L	-
Northern Pintail	*Anas acuta*	L	-
Osprey	*Pandion haliaetus*	L	CSC
Bald Eagle	*Haliaeetus leucocephalus*	L	Proposed for Delisting, SE
California Gull	*Larus californicus*	L	CSC
Green Heron	*Butorides virescens*	L	-

Common Name	Scientific Name	Habitat(s)	Status
Common Moorhen	*Gallinula chloropus*	L, F	-
Savannah Sparrow	*Passerculus sandwichensis*	G	-
Western Meadowlark	*Sturnella neglecta*	G, F	-
Lesser Goldfinch	*Carduelis psaltria*	G	-
Long-billed Curlew	*Numenius americanus*	G	-
American Pipet	*Anthus rubescens*	G	-
Red-tailed Hawk	*Buteo jamaicensis*	G, V	-
Golden Eagle	*Aquila chrysaetos*	G	CSC, PR
American Kestrel	*Falco sparverius*	G, V	-
Great Horned Owl	*Bubo virginianus*	G, B	-
Chestnut-backed Chickadee	*Poecile rufescens*	V	-
Bushtit	*Psaltriparus minimus*	V	-
Nuttall's Woodpecker	*Picoides nuttallii*	V, B	-
Downy Woodpecker	*Picoides pubescens*	V	-
Bewick's Wren	*Thryomanes bewickii*	V	-
California Towhee	*Pipilo crissalis*	V	-
Spotted Towhee	*Pipilo maculatus*	V	-
Song Sparrow	*Melospiza melodia*	V, F	-
Cooper's Hawk	*Accipiter cooperii*	V, G	CSC
Pacific-slope Flycatcher	*Empidonax dificilis*	V	-
California Yellow Warbler	*Dendroica petechia brewsteri*	V	CSC
Black-headed Grosbeak	*Pheucticus melanoleucus*	V	-
Bullock's Oriole	*Icerus bullockii*	V	-
Greater Yellowlegs	*Tringa melanoleuca*	F	-
Ruddy Duck	*Oxyura jamaicensis*	F	-
Snowy Egret	*Egretta thula*	F	-
European Starlings	*Sturnus vulgaris*	F	-
Common Snipe	*Gallinago gallinago*	F	-
Common Yellowthroat	*Geothylpis trichas*	F	-
Mourning Dove	*Zenaida macroura*	B	-
Western Scrub-jay	*Aphelocoma californica*	B	-
Oak Titmouse	*Baeolophus inornatus*	B	-
Acorn Woodpecker	*Melanerpes formicivorus*	B	-
Ruby-crowned Kinglet	*Regulus calendula*	B	-
Yellow-rumped Warbler	*Dendroica coronata*	B	-
American Peregrine Falcon	*Falco peregrinus anatum*	G	Federally Delisted, ST, FP
Swainson's Hawk	*Buteo swainsoni*	G, V	Status
Aleutian Canada goose	*Branta canadensis leucoparia*	G	Delisted 2001
Greater Sandhill Crane	*Grus canadensis tabida*	G	ST, FP
California Horned Lark	*Eremophila alpestris actia*	G	CSC
Long-billed Curlew	*Numenius americanus*	G	CSC
Northern Harrier	*Circus cyaneus*	G	CSC
Merlin	*Falco columbarius*	G	CSC
Prairie Falcon	*Falco mexicanus*	G	CSC
White-Tailed Kite	*Elanus leucurus*	G, V	FP

Common Name	Scientific Name	Habitat(s)	Status
Ferruginous Hawk	*Buteo regalis*	G	CSC
Western Burrowing Owl	*Athene cunicularia hypugea*	G	CSC
Long-eared Owl	*Asio otus*	G	CSC
Loggerhead Shrike	*Lanius ludovicianus*	G	FE
Least Bell's Vireo	*Vireo bellii pusillus*	V	FE, SE
Mammals			
Black-tailed hare	*Lepus californicus*	L	-
Raccoon	*Procyon lotor*	L, V, F	-
Long-tailed weasel	*Mustela frenata*	L, V, F	-
Coyote	*Canis latrans*	L, G, V	Harvest species
Bobcat	*Felis rufus*	L, G, V, B	-
Black-tailed deer	*Odocoileus hemionus columbianus*	L, G, V, B	-
California ground squirrel	*Spermophilus beecheyi*	G	-
Botta's pocket gopher	*Thomomys bottae*	G	-
Western harvest mouse	*Reithrodontomys megalotis*	G, V	-
California vole	*Microtus californicus*	G, V, F	FE, ST
American badger	*Taxidea taxus*	G	-
San Joaquin kit fox	*Vulpes macrotis mutica*	G	-
California bat	*Myotis californicus*	G	-
Pallid bat	*Antrozous pallidus*	G, B	-
Ornate shrew	*Sorex ornatus*	V	-
Deer mouse	*Peromyscus maniculatus*	V, B	-
Virginia opossum	*Didelphis virginiana*	V	-
Striped skunk	*Mephitis mephitis*	V	-
Broad-footed mole	*Scapanus latimanus*	V	-
Red bat	*Lasiurus blossevillii*	V	-
Big brown bat	*Eptesicus fucus*	V	-
Yuma bat	*Myotis yumanensis*	V, F	-
Gray fox	*Urocyon cinereoargenteus*	F, B	-
San Joaquin Pocket Mouse	*Perognathus inornatus*	G	Sensitive Species Designated by BLM

Source: SCVWD 2003c.

Habitat Codes

L= Lacustrine

G=Annual Grassland

F= Freshwater Emergent Wetland

V= Valley Foothill Riparian

B= Blue Oak Woodland

Status Codes

FE = Listed as Endangered under ESA

FT = Listed as Threatened under ESA

PT = Proposed for listing as Threatened under ESA

FSC = Federal species of management concern

PR = Protected under the Bald and Golden Eagle Protection Act

SE = Listed as Endangered under CESA

ST = Listed as Threatened under CESA

FP = Fully protected under California Fish and Game Code

Habitat Codes

Status Codes

CSC = California Species of Concern
SR= State-listed Rare
1B= Rare, threatened or endangered in California and elsewhere

Table A-2. Status and Potential Occurrence of Special-Status Plant and Animal Species in the San Luis Reservoir Basin

Common Name	Scientific Name	Status
Plants		
Tracy's Eriastrum	*Eriastrum tracyi*	SR, CNPS 1B
Bogg's Lake Hedge-Hyssop	*Gratiola heterosepala*	SE, CNPS 1B
Delta Button-Celery	*Eryngium racemosum*	SE, CNPS 1B
Hartweg's Golden Sunburst	*Pseudobahia bahiifolia*	FE, SE, CNPS 1B
Rock Sanicle	*Sanicula saxatilis*	SR, CNPS 1B
Animals		
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	FT
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*	FT
California Red-Legged Frog	*Rana aurora draytonii*	FT, CSC
California Tiger Salamander	*Ambystoma californiense*	PT, CSC
Least Bell's Vireo	*Vireo bellii pusillus*	FE, SE
Bald Eagle	*Haliaeetus leucocephalus*	Federally proposed for Delisting, SE
American Peregrine Falcon	*Falco peregrinus anatum*	Federally Delisted, SE, FP
Southern Willow Flycatcher	*Empidonax trailii extimus*	FE, SE
Little Willow Flycatcher	*Empidonax trailii brewsteri*	SE
Western Burrowing Owl	*Athene cunicularia hypugea*	CSC
Swainson's Hawk	*Buteo swainsoni*	ST
Golden Eagle	*Aquila chrysaetos*	CSC, FP
White-Tailed Kite	*Elanus leucurus*	FSC, FP
San Joaquin Kit Fox	*Vulpes macrotis mutica*	FE, ST
Ringtail	*Bassariscus astutus*	FP
Columbian Black-Tailed Deer	*Odocoileus hemionus columbianus*	Harvest Species

Source: SCVWD 2003c.

Status Codes

FE=Listed as Endangered under ESA
FT= Listed as Threatened under ESA
PT=Proposed Threatened under ESA
FSC=Federal Species of Concern
SE=Listed as Endangered under CESA
ST=Listed as Threatened under CESA
SR=State-listed Rare
FP= State Fully Protected
CSC=California Species of Concern
CNPS 1B= Plants rare, threatened, or endangered in California or elsewhere

Table A-3. San Benito County Vegetation and Wildlife Species by Habitat Type

Common Name	Scientific Name	Habitat(s)	Status
Plants			
Wild oats	*Avena spp.*	D, G	-
Brome grasses	*Bromus spp.*	D	-
Mustards	*Brassica spp.*	D	-
Mallows	*Malva spp.*	D	-
Filarees	*Erodium spp.*	D, G	-
Ripgut Brome	*Bromus diandrus*	G	-
Softchess Brome	*Bromus hordeaceus*	G	-
Wild Barley	*Hordeum murinum*	G	-
Bur Clover	*Medicago polymorpha*	G	-
Popcorn-Flower	*Plagiobothyrys spp.*	G	-
California poppy	*Eschscholzia californica*	G	-
Tarweeds	*Hemizonia spp.*	G	-
Turkey mullein	*Eremocarpus setigerus*	G	-
Downingia	*Downingia spp.*	G	-
Coyote thistle	*Eryngium spp.*	G	-
Coast Live Oak	*Quercus agrifolia*	CO	-
Valley Oak	*Quercus lobata*	CO, VFR	-
Blue Oak	*Quercus douglassii*	CO	-
Foothill Pine	*Pinus sabiniana*	CO	-
California blackberry	*Rubus ursinus*	CO, VFR	-
Toyon	*Heteromeles arbutifolia*	CO	-
Miner's Lettuce	*Claytonia perfoliata*	CO	-
Brakenfern	*Pteridium aquilinum*	CO	-
Coyote brush	*Baccharis pilularis*	S	-
Lupines	*Lupinus spp.*	S	-
California lilac	*Ceanothus spp.*	S	-
California Sagebrush	*Artemisia californica*	S	-
Indian paintbrush	*Castilleja spp.*	S	-
Monkeyflower	*Mimulus aurantiacus*	S	-
Yerba buena	*Satureja douglasii*	S	-
Poison Oak	*Toxicodendron diversilobum*	VO	-
California coffeeberry	*Rhammus californica*	VO	-
Fremont Cottonwood	*Populus fremontii*	VFR	-
California Sycamore	*Platanus racemosa*	VFR	-
Boxelder	*Acer negundo*	VFR	-
Alder	*Ulnus sp.*	VFR	-
Willows	*Salix spp.*	VFR	-
Mulefat	*Baccharis salicifolia*	VFR	-
Poison Hemlock	*Conium maculatum*	VFR, FE	-
Cattail	*Typha spp.*	FE	-
Bulrush	*Scirpus spp.*	FE	-
Sedges	*Cyperus spp.*	FE	-
Rushes	*Juncus spp.*	FE	-
Smilo Grass	*Piptatherum miliaceum*	FE	-
Shining Peppergrass	*Lepidium latifolium*	FE	-
Saltgrass	*Distichlis spicata*	FE	-

Common Name	Scientific Name	Habitat(s)	Status
Canary Grass	*Phalaris spp.*	FE	-
Barnyard Grass	*Echinochloa crus-galli*	FE	-
Mammals			
Striped Skunks	*Mephitis mephitis*	D, FE	-
Raccoons	*Procyon lotor*	D, VFR, FE	-
Virginia opossums	*Didelphis virginiana*	D	-
Deer Mouse	*Peromyscus maniculatus*	G, S, VFR	-
California ground squirrel	*Spermophilus beecheyi*	G	-
Botta's Pocket Gophers	*Thomomys bottae*	G	-
Coyote	*Canis latrans*	G, S	-
Bobcat	*Lynx rufus*	G	-
San Joaquin kit fox	*Vulpes microti muitca*	G	FE, ST
Western Gray Squirrels	*Sciurus griseus*	CO	-
Dusky-footed woodrats	*Neotoma fuscipes*	CO, VFR	-
Mule deer	*Odocoileus hemionus*	CO	-
Black-tailed Jackrabbit	*Lepus californicus*	S	-
Brush Rabbit	*Sylvilagus bachmani*	S, VFR	-
California Vole	*Microtus californicus*	S	-
Birds			
House Finche	*Carpodacus mexicanus*	D	-
Northern Mockingbird	*Mimus polyglottos*	D	-
Mourning Dove	*Zenaida macroura*	D	-
European Starling	*Sturna vulgaris*	D	-
House Sparrow	*Passer domesticus*	D	-
Rock Dove	*Columba livia*	D	-
Red-tailed Hawk	*Buteo jamaicensis*	D, G	-
Savannah Sparrow	*Passerculus sandwichensis*	G	-
Horned Lark	*Eremophila alpestris*	G	-
Western Meadowlark	*Sturnella neglecta*	G	-
Lesser Goldfinch	*Carduelis psaltria*	G	-
Barn Swallow	*Hirundo rustica*	G	-
Northern Harrier	*Circus cyaneus*	G	CSC
Burrowing Owl	*Athene cunicularia*	G	CSC
Acorn Woodpecker	*Melanerpes formicivorous*	CO	-
Western Scrub-jay	*Aphelocoma californica*	CO, S	-
California Quail	*Callipepla californica*	CO	-
Chestnut-backed Chickadee	*Poecile rufescens*	CO	-
Oak Titmouse	*Baeolophus inornatus*	CO	-
Hutton's Vireo	*Vireo huttoni*	CO	-
Dark-eyed Junco	*Junco hyemalis*	CO	-
Ash-throated Flycatcher	*Myiarchus tuberculifer*	CO	-
Nuttall's Woodpecker	*Picoides nuttallii*	CO	-
Ana's Hummingbird	*Calypte anna*	S	-
Wrentit	*Chamaea fasciata*	S	-
Bushtit	*Psaltriparus minimus*	S	-
California Thrasher	*Toxostoma redivivum*	S	-
Bewick's Wren	*Thryomanes bewickii*	S	-
Song Sparrow	*Melospiza melodia*	S	-

Common Name	Scientific Name	Habitat(s)	Status
Western Bluebirds	*Sialia mexicana*	VO	-
Western Kingbirds	*Tyrannus verticalis*	VO	-
White-tailed Kites	*Elanus leucurus*	VO	SP
Ruby-crowned Kinglets	*Regulus calendula*	VFR	-
Yellow-rumped Warblers	*Dendroica coronata*	VFR	-
Warbling Vireos	*Vireo glivus*	VFR	-
Orange-crowned Warbler	*Vermivora celata*	VFR	-
Wilson's Warbler	*Wilsonia pusilla*	VFR	-
Downy Woodpecker	*Picoides pubescens*	VFR	-
Black Phoebe	*Sayornis nigricans*	VFR	-
Spotted Towhees	*Pipilo maculatus*	VFR	-
Black-headed Grosbeaks	*Pheuticus melanocephalus*	VFR	-
Snowy Egret	*Egretta thula*	FE	-
American White Pelican	*Pelecanus erythrorhynchos*	FE	CSC
Red-winged Blackbird	*Agelaius phoeniceus*	FE	-
Common Yellowthroat	*Geothlypis trichas*	FE	-
Amphibians			
California Tiger Salamander	*Ambystoma californiense*	G, FE	FC, CSC, SP
Arboreal salamander	*Aneides lugubris*	CO	-
California Red-legged Frog	*Rana aurora draytoni*	R, FE	FT, SP, CSC
Foothill yellow-legged Frog	*Rana boylii*	R	CSC
Pacific Treefrogs	*Hyla regilla*	FE	-
Reptiles			
Western Fence Lizard	*Sceloporus occidentalis*	G, S	-
Western Rattlesnake	*Crotalus viridis*	G, S	-
Ringneck Snake	*Diadophis punctatus*	CO	-
Western Skink	*Eumeces skiltonianus*	CO	-
Gopher Snake	*Pituophis melanoleucus*	S	-
Coast Horned Lizard	*Phrynosoma coronatum*	S	-
Garter Snake	*Thamnophis spp.*	VFR, FE	-
Western Pond Turtle	*Clemmys marmorata*	FE	CSC, SP
Fish			
Steelhead	*Onchorhynchus mykiss*	R	FT, CSC
Monterey roach	*Hysperculus symmetricus*	R	CSC
Speckled Dace	*Rhinichthys osculus*	R	-
Sacramento Sucker	*Cataostomus occidentalis*	R	-
Mosquitofish	*Gambusia affinis*	R	-
Invertebrates			
Vernal pool fairy shrimp	*Branchinecta lynchi*	FE	FT

Source: SBCWD 2003.

Habitat Codes:	**Status Codes**
D= Developed	FE = Listed as Endangered under ESA
G=Annual Grassland	FT = Listed as Threatened under ESA
CO=Coastal Oak Woodland	PT = Proposed for listing as Threatened under ESA

Habitat Codes:	**Status Codes**
S=Coastal Scrub	FSC = Federal species of management concern
VO=Valley Oak Woodland	PR = Protected under the Bald and Golden Eagle Protection Act
R=Riverine (Aquatic)	SE = Listed as Endangered under CESA
VFR=Valley Foothill Riparian	ST = Listed as Threatened under CESA
FE=Freshwater Emergent	FP = Fully protected under California Fish and Game Code
	CSC = California Species of Concern
	FC=Federal Candidate

Table A-4. Status and Potential Occurrence of Special-Status Plant and Animal Species in San Benito County

Common Name	Scientific Name	Habitat & Local Occurrence	Status
Federal or State Endangered or Threatened Species			
Invertebrates			
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	Freshwater vernal pools. Occurs in southern San Benito County; could occur in vernal pools in northern portion of county.	FT
Fish			
Steelhead south/central California ESU	*Ochorhynchus mykiss*	Free-flowing coastal rivers and streams. Distribution poorly known. Could occur in any tributary of Pajaro River.	FT, CSC
Amphibians			
California Red-legged Frog	*Rana aurora draytoni*	Streams, freshwater pools, ponds with overhanging vegetation. Found in various freshwater habitats in San Benito County.	FT, SP, CSC
Birds			
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Breeds in mature riparian forests, primarily in Sierra Nevada foothills. Not found in San Benito County since 1899.	FC, SC
California Condor	*Gymnogyps californianus*	Forages for carrion over open habitats. Foraging individuals could occur in south San Benito County.	FE, SE
American Peregrine Falcon	*Falco peregrinus*	Forages for other birds over a variety of habitats. Breeds on rocky cliffs. Could breed in southern portion of San Benito County.	FD, SE
Bald Eagle	*Haliaeetus leucocephalus*	Forages in rivers and lakes for large fish. Does not breed locally. Wintering birds forage at local reservoirs in San Benito County.	FD, SE
Southwestern Willow Flycatcher	*Empidonax trailii extimus*	Breeds in mature riparian habitat; now extirpated from coastal California. No recent sitings.	FE, SE

Common Name	Scientific Name	Habitat & Local Occurrence	Status
Least Bell's Vireo	*Vireo bellii pusillus*	Breeds in thick willow riparian groves. Range expanding. Historic record of a nesting pair at the Pajaro River and Highway 101. No recent records for Hollister area but could occur.	FE, SE
Bank Swallow	*Riparian riparia*	Nests in colonies in sandy banks along riparian habitat. No recent nest recordings. Could forage at site during migration.	ST
Mammals			
San Joauqin kit fox	*Vulpes macrotis mutica*	Occurs in grasslands and scrublands in San Joaquin Valley and coastal valleys in central California. Historic records around Hollister from 1972-1975. No recent records, but could occur.	FE, ST
Federal or State Candidate Species			
Mountain Plover	*Charadrius montanus*	Breeds in great plains, winters in Central Valley and other flat open habitats in California. Rare winter occurences in San Benito County. Could occur on agricultural fields and other open habitats.	FC, CSC
California Tiger Salamander	*Ambystoma californiense*	Occur in vernal or temporary pools in annual grasslands, or open areas of woodlands in San Benito County. Burrows in ground squirrel burrows.	FC, CSC, SP
State Species of Special Concern			
Fish			
Monterey Roach	*Lavinia symmetricus subditus*	Small, warm dispersed streams and isolated pools. Occurs in San Benito River and other tributaries of the Pajaro River.	CSC
Reptiles and Amphibians			
Western Pond Turtle	*Clemmys marmorata*	Occur in permanent or nearly permanent water habitats. Found in freshwater habitats within San Benito County.	CSC, SP

Common Name	Scientific Name	Habitat & Local Occurrence	Status
California Legless Lizard	*Anniella pulchra*	Occur in sandy or loose loamy soils, including stream terraces and coastal dunes. Could occur in San Benito River channel and similar habitats.	CSC
California Horned Lizard	*Phynosoma coronatum frontale*	Exposed gravely-sandy substrates usually containing scattered shrubs, clearings in riparian woodlands. Could occur in San Benito River channel and similar habitats.	CSC
San Joaquin Whipsnake	*Masticophis flagellum ruddocki*	Occurs in dry open environments. Sitings recorded from San Benito River channel near Hollister, and south of Hollister. Could occur elsewhere in similar habitats.	CSC
Western Spadefoot	*Scaphiopus hammondii*	Needs temporary rain pools for breeding. Burrows in loose soil, mostly in grasslands. Records from aquatic habitats south of Hollister.	CSC
Foothill Yellow-legged Frog	*Rana boylii*	Occurs in small to average sized streams and rivers with some cobble substrate. No local records but could occur in the southern San Benito River, Pacheco Creek, and similar habitats.	CSC
Coast Range Newt	*Taricha torosa*	Ponds, reservoirs, and slow-moving streams, and nearby terrestrial habitat. One record southwest of Hollister. Could occur in San Benito County.	CSC
Birds			
American White Pelican	*Pelecanus erythrorhynchos*	Breeds mainly in Great Basin, but found in Central Valley and coastal California during the summer. Found by local reservoirs and wetlands during summer.	CSC

Common Name	Scientific Name	Habitat & Local Occurrence	Status
Burrowing Owl	*Athene cunicularia*	Uses ground squirrel burrows in grassland habitat. Breeding records in Flint Hills and northern margiin of Flint Hills. Could occur elsewhere in suitable habitat.	CSC
Northern Harrier	*Circus cyaneus*	Forages in open and herbaceous areas. Breeds in marshes and prairies. Could breed in undisturbed grasslands. Likely to forage over diverse open habitats.	CSC
Cooper's Hawk	*Accipiter cooperii*	Breeds in riparian woodlands and wooded canyons. Could fortage throughout San Benito County.	CSC
Osprey	*Pandion haliaetus*	Forages and breeds near rivers and lakes. Could forage at local reservoirs.	CSC
Golden Eagle	*Aquila chrysaetos*	Breeds on cliffs or in large trees. Could breed in southern San Benito Countyand forage over entire county.	CSC
Ferruginous Hawk	*Buteo regalis*	Forages in grasslands and occasionally in other open habitats during migration and winter. Uncommon during the winter. Could occasionally forage throughout San Benito County.	CSC
Prairie Falcon	*Falco mexicanus*	Found in dry open country, more migrants in winter. Could breed in southern San Benito County, and forage over entire county.	CSC
Sharp-shinned Hawk	*Accipiter striatus*	Nests in woodlands, forages primarily over riparian and vegetated habitats.	CSC
Merlin	*Falco columbarius*	Uses many habitats in winter and migration. Could forage over many habitats throughout county.	CSC
Vaux's Swift	*Chaetura vauxi*	Nests in coastal coniferous forests and forages aerially. Likely occurrences during migration (spring and fall) only.	CSC

Common Name	Scientific Name	Habitat & Local Occurrence	Status
California Horned Lark	*Eremophila alpestris actia*	Occurs in annual grasslands. Nesting records in eastern and southern portions of Hollister. Could occur in other grassland habitats also.	CSC
Tricolored Blackbird	*Agelaius tricolor*	Breeds near freshwater in thick emergent vegetation. Nesting colonies could occur throughout San Benito County.	CSC
Black Swift	*Cypseloides niger*	Nests on wet cliffs, sometimes behind waterfalls. Forages aerially. Uncommon but may be present during migration (spring and fall).	CSC
California Gull	*Larus californicus*	Nests in the Great Basin and San Francisco area. Winters along the Pacific Coast and the Central Valley. Common in many habitats during winter season.	CSC
California Yellow Warbler	*Dendroica petechia brewsteri*	Breeds in riparian woodland and meadow edges. Uncommon breeder in mature riparian areas.	CSC
Yellow-breasted Chat	*Icteria virens*	Breeds throughout riparian woodland habitat. Uncommon breeder in mature riparian areas.	CSC
Loggerhead Shrike	*Lanius ludivicianus*	Resident in dry open grasslands. Common in San Benito County.	CSC
Mammals			
Big-eared Kangaroo Rat	*Dipodomys elephantinus*	Resident in chaparral habitat and dry oak woodland habitat. Nearly native to San Benito County.	CSC
California mastiff bat	*Eumops perotis californicus*	Forages over many habitats; needs tall cliffs or buildings for roosting sites. Likely to occur in southern San Benito County.	CSC

Common Name	Scientific Name	Habitat & Local Occurrence	Status
Townsend's big-eared bat	*Plecotus townsendii*	Roosts in caves and mine tunnels in various habitats. Likely to occur in southern San Benito County.	CSC
Pallid bat	*Antrozous pallidus*	Forages across many habitats. Likely occurrences in San Benito County.	CSC
State Protected Species or CNPS Species			
Plants			
alkali milk vetch	*Astragalus tener var. tener*	Alkaline soils in playas, vernal pools, and adobe clay areas in valley and foothill grassland.	CNPS 1B
San Joauqin saltbush	*Atriplex joaquiniana*	Common in areas with alkaline substrates. Occurs in chenopod scrub, meadow, playa, valley and foothill grassland habitats.	CNPS 1B
Congdon's tarplant	*Centromadia parryi ssp. congdonii*	Valley and foothill grassland habitat. Common with alakaline substrates and in disturbed areas where water collects.	CNPS 1B
round-leaved filaree	*Erodium macrophyllum*	Clay soils in cismontane woodland and valley and foothill grassland habitats.	CNPS 2
Indian Valley bush mallow	*Malacothamnus aboriginum*	Rocky areas in chaparral and cismontane woodland habitats; often occurs on burned areas.	CNPS 1B
hairless popcorn-flower	*Plagiobothrys glaber*	Wet, alkaline soils in meadows and coastal salt marshes and swamps.	CNPS 1A
Birds			
White-tailed Kite	*Elanus leucurus*	Resident of river valleys, riparian woodlands, and nearby fields.	SP
Mammals			
Ringtail	*Bassariscus astutus*	Prefers riparian and heavily wooded habitats adjacent to water.	SP

Source: SBCWD 2003.

Status Codes

FE = Listed as Endangered under ESA

FT=Listed as Threatened under ESA

FC=Federal Candidate

SE= Listed as Endangered under CESA

ST= Listed as Threatened under CESA

SR= Listed as Rare under CESA

Status Codes

CSC= California Species of Concern

CNPS 1A= Plants considered by the CNPS to be extinct in California

CNPS 1B= Plants rare, threatened, or endangered in California and elsewhere.

CNPS 2=Plants rare, threatened, or endangered in California, but more numerous elsewhere.

SP= State Protected Species

Table A-5. Wildlife, Including Special-Status Species, within Stanislaus, Merced, Fresno, and Kings Counties

Species	Scientific Name	Status
Birds		
Aleutian Canada Goose	*Branta canadensis leucoparia*	Delisted 2001
American Crow	*Corvus brachyrhynchos*	-
American Golden Plover	*Pluvialis dominica*	-
American Goldfinch	*Carduelis tristis*	-
American Kestrel	*Falco sparverius*	-
American Pipit	*Anthus rubescens*	-
Baird's Sandpiper	*Calidris bairdii*	-
Barn Owl	*Tyto alba*	-
Black-bellied Plover	*Pluvialis squatarola*	-
Blue Grosbeak	*Passerina caerulea*	-
Brewer's Blackbird	*Euphagus cyanocephalus*	-
Brown-headed Cowbird	*Molothrus ater*	-
California Gull	*Larus californicus*	CSC
California Horned Lark	*Eremophila alipestris actia*	CSC
California Quail	*Callipepla californica*	-
Chestnut-collared Longspur	*Calcarius ornatus*	-
European Starling	*Sturnus vulgaris*	-
Greater Sandhill Crane	*Grus Canadensis tabida*	ST, FP
House Finch	*Carpodacus mexicanus*	-
House Sparrow	*Passer domesticus*	-
Least Sandpiper	*Calidris minutilla*	-
Loggerhead Shrike	*Lanius ludovicianus*	CSC
Long-billed Curlew	*Numenius americanus*	CSC
Mallard	*Anas platyrhynchos*	-
Mountain Plover	*Charadrius montanus*	PT, FSC, CSC
Mourning Dove	*Zenaida macroura*	-
Northern Harrier	*Circus cyaneus*	CSC
Red-tailed Hawk	*Buteo jamaicensis*	-
Red-throated Pipit	*Anthus cervinus*	-
Red-winged Blackbird	*Agelaius phoeniceus*	-
Ring-necked Pheasant	*Phasianus colchicus*	-
Savannah Sparrow	*Passerculus sandwichensis*	-
Short-eared Owl	*Asio flammeus*	CSC
Snow Bunting	*Plectrophenax nivalis*	-
Swainson's Hawk	*Buteo swainsoni*	ST
Tricolored Blackbird	*Agelaius tricolor*	CSC
Tundra Swan	*Cygnus columbianus*	-
Vesper Sparrow	*Pooecetes gramineus*	-
Western Burrowing Owl	*Athene cunicularia*	CSC
Western Meadowlark	*Srurnella neglecta*	-
Western Snowy Plover	*Charadrius alexandrinus nivosus*	FT, CSC
White-faced Ibis	*Plegadis chihi*	CSC
White-tailed Kite	*Elanus leucurus*	FSC, FP
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	-

Species	Scientific Name	Status
Mammals		
California vole	*Microtus californicus*	-
Black-tailed jackrabbit	*Lepus californicus*	-
Western harvest mouse	*Reithrodontomys megalotis*	-
Botta's pocket gopher	*Thomomys bottae*	-
Raccoon	*Procyon lotor*	-
Striped skunk	*Mephitis mephitis*	-
Virginia opossum	*Didelphis virginiana*	-
Black-tailed Deer	*Odocoileus hemionus*	-

Source: Reclamation 2006.

Status Codes

FE = Listed as Endangered under ESA
FT = Listed as Threatened under ESA
PT = Proposed for listing as Threatened under ESA
FSC = Federal species of management concern
PR = Protected under the Bald and Golden Eagle Protection Act
SE = Listed as Endangered under CESA
ST = Listed as Threatened under CESA
FP = Fully protected under California Fish and Game Code
CSC = California Department of Fish and Game "species of special concern"

Appendix B
Surface Storage Level 1 Screening

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Appendix B
Surface Storage Level 1 Screening

The analysis of surface storage resource management measures considered a number of factors to determine technical and institutional viability. This appendix describes this process in more detail.

Surface Storage Technical Viability

Determining "technical viability" for a surface storage measure requires consideration of more than whether the measure can be adequately designed. Engineering advances mean that projects are generally able to be designed, but some facilities are much more difficult to design than others. For the measures that are surface storage projects, the technical viability criterion helps eliminate the measures that would be the most difficult to design and construct. The Level 1 screening considered factors for each storage facility as follows.

- Capacity: Reservoirs on the west side of San Luis Reservoir must be capable of storing all of the water that the San Felipe Division needs during the low point months (approximately 100 TAF). Existing reservoirs must be able to be expanded by at least 100 TAF, and new reservoirs must be at least 150 TAF to allow for some storage for existing uses, flood control, and dead storage. Reservoirs on the east side of San Luis Reservoir must be able to provide water during the months that San Luis Reservoir is held at 300 TAF to allow conveyance to the San Felipe Division. South-of-Delta users would not be able to access the last 221 TAF in storage; therefore, reservoirs east of San Luis Reservoir would need a capacity of at least 271 TAF to meet user needs plus existing uses, flood control, and dead storage.

- Elevation: Reservoirs that are higher than existing conveyance facilities would require pump stations to move water into them, and would increase pressure in the conveyance facilities when releasing water. West of San Luis Reservoir, the hydraulic gradeline of the San Felipe Division at normal operating levels varies from 632 feet msl at the Pacheco Regulating Tank to 460 feet msl at the inlet to the SCVWD Santa Teresa Water Treatment Plant and 499 feet msl at San Justo Reservoir in San Benito County. The surface water elevation of existing or new storage facilities should be between approximately 600 and 1,000 feet msl. The upper end of this elevation range would limit any pumping to a reasonable lift provided by a single pumping station and would limit pressure on existing facilities when water is released. On

the east side of San Luis Reservoir, pumping lifts would be similarly limited.

- Proximity to infrastructure: To minimize cost and operational complexity, existing or new reservoirs should be located within approximately 5 miles of existing conveyance facilities. For reservoirs on the west side of San Luis Reservoir, facilities upstream of the Hollister Conduit Bifurcation would be preferred. Sites downstream of the Hollister Conduit Bifurcation might be technically viable (depending upon site location) but would require backfeeding through the Santa Clara Conduit to reach users on the Hollister Conduit. Backfeeding would significantly increase operational complexity of the San Felipe Division facilities.

- Ratio of additional dam volume to additional reservoir storage capacity: This ratio provides a measure of the relative efficiency of a dam site for a given reservoir and reservoir storage volume. To minimize cost and the complexity of constructing a very large dam, the maximum efficiency ratio for expanded or new reservoir sites should be less than 175 cubic yards of dam volume per acre-foot of storage capacity. This ratio is consistent with existing dams within the SCVWD system.

- Geotechnical concerns: Most storage facilities are in mountainous areas in the vicinity of faults. More faults, particularly more active faults, can increase the complexity of the engineering design or render the facility infeasible. Additionally, reservoirs or conveyance facilities in areas with liquefiable soils could be technically difficult or infeasible. The Study Team eliminated dam sites from consideration if the dam or reservoir site is on an active fault, the dam or reservoir is on liquefiable soils, or if the area near the dam does not have suitable borrow material.

Table B-1 shows elevation, proximity to infrastructure, and ratio of dam volume to storage capacity for SCVWD's existing dams. This information helps illustrate that each factor has a point of elimination that is within the range of existing facilities.

Table B-1. SCVWD Existing Dam and Reservoir Information

Reservoir	Existing Water Surface Elevation (ft)	Existing proximity to infrastructure (mi)	Existing Reservoir Storage Capacity (ac-ft)	Existing Dam Volume (cy)	Ratio of Dam Volume to Reservoir Storage Capacity (cy/af)
Almaden	606	2.36	1,553	250,000	161
Anderson	623	0.73	89,073	3,320,000	37
Calero	486	0	10,050	550,000	55
Chesbro	525	2.68	8,952	467,000	52
Coyote	771	1.80	22,925	1,060,000	46
Guadalupe	614	2.66	3,228	520,000	161
Lexington	645	8.73	19,834	2,124,000	107
Pacheco	471	0.44	6,143	325,000	53
Stevens Creek	536	14.52	3,465	530,000	153
Uvas	463	6.30	9,935	337,000	38
Vasona	302	7.80	400	70,000	175
Average	550	4.4	16,000	872,000	95

Source: SCVWD 2003

Surface Storage Institutional Viability

Several factors helped further define the institutional viability of each potential storage facility measure:

- Ratio of additional reservoir storage capacity to additional reservoir area: Reservoirs with high ratios of storage volume to surface area have a relatively small "footprint" on the land, and are therefore likely to have fewer impacts to land uses or the environment.

- Inundated structures: Structures that may be inundated can be moved, but the public is often resistant to relocation. Relocations of major roads or portions of larger towns or cities would not be institutionally viable. Additionally, building a new dam, or substantially expanding an existing dam, a short distance upstream of a larger town or area with historical significance would not be institutionally viable.

- Inundated parks or open space: Inundating parks or open space could reduce recreational opportunities and affect environmental resources. Constructing a storage facility in Henry Coe State Park would require conversion from a State Park to a State Recreation Area. State Recreation Areas allow extensive recreational opportunities, some of which are not compatible with a drinking water storage facility.

SCVWD determined that a change in use and purpose of Henry Coe State Park would be incompatible with SCVWD interests, and has committed to not inundating the park.

- Table B-2 contains a list of all potential surface storage facility measures with the information needed for each factor related to technical and institutional viability. If a potential facility site has a value outside the acceptable range for that factor, that cell is highlighted in yellow. Less information was available for the east-side reservoirs; Table B-2 contains available information.

- As described in Section 4, the reasonable sizes for many of the new reservoirs would be less than 150 TAF, which is the required capacity for the SLLPIP. This analysis studied the local effects of building reservoirs of the necessary capacity, even if they required extensive saddle dams and inundated large areas.

Appendix C
Resource Management Measures Cost Information

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Appendix C
Resource Management Measures Cost Information

The Study Team used existing cost estimates to evaluate initial alternatives relative to the P&Gs effectiveness criterion. Development of the IAIR relies on existing information in past studies; therefore, the Study Team did not develop any new cost estimates. The Study Team recognizes that using old data does not present an accurate estimate of actual alternative costs because costs vary greatly year to year with changing market conditions and input prices. The cost estimates in this IAIR are only used to compare alternatives. Specifically, existing cost estimates were used to evaluate the alternatives in cost categories of high, medium high, medium, and low. These categories are adequate for the planning level of analysis included in the IAIR. The alternative cost estimates will be revised to reflect current market conditions and input prices during the plan formulation phase.

Table C-1 summarizes cost estimates for each resource management measure. The table lists the present value cost, the base year of the cost estimate, the data source, and any notes or assumptions made by the Study Team. Assumptions included the amount of water purchased and the number of years purchased over a 100-year planning period and were necessary for measures that only had a cost per acre foot value. Some of the measures did not have existing cost estimates. As stated above, the cost estimates in Table C-1 will be revised for further alternatives evaluation in the Plan Formulation Report.

Table C-1. Resource Management Measure Costs

Measures	Present Value Cost	Base Year	Source	Notes/Assumptions
Banking	$116 million	2006	Bureau of Reclamation Semitropic Stored Water Recovery Unit Final Special Study Report October 2006	50,000 shares at $2,323 per share, includes O&M and Share purchase, high priority shares
Exchanges	$370 million (institutional measure) $92 million (combination measure)	2006	Bureau of Reclamation Los Vaqueros Expansion Investigation July 2006	150 TAF, in 34 out of 100 years, $284 per AF for institutional measure; $80 per AF for exchanges combined in all alternatives

Measures	Present Value Cost	Base Year	Source	Notes/Assumptions
Operating Agreements and Procedures	-	-	-	No data available, assume low cost
Algae Harvesting	$617 million	2004	SLLPIP Economics Overview 2004	Found typo in 2004 report, fixed for this table
Algaecides/Herbicides (for algae or macrophytes)	$182 million	2004	SLLPIP Economics Overview 2004	Found typo in 2004 report, fixed for this table
Managed Stratification (Modify Gianelli Inlet/Outlet Works)	$250 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F	-
Raise San Luis Reservoir	$896 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Dissolved Air Flotation (DAF) near San Felipe Intake	$226 million $284 million	2002, 2004	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002 & SLLPIP Economics Overview 2004	-
DAF at Coyote Pumping Plant (plus San Benito and Pajaro)	$235 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
DAF at Santa Teresa and Rinconada (plus San Benito and Pajaro)	$208 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Extend/Lower San Felipe Intake to Gianelli Inlet/Outlet Level	pipeline - $281 million tunnel - $284 million	2004	SCVWD SLLPIP Economics Overview 2004	-

Measures	Present Value Cost	Base Year	Source	Notes/Assumptions
Holladay Aqueduct	$913 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Northerly Bypass Corridor	$906 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Southerly Bypass Corridor	$430 million $446 million	2002, 2004	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002 & SCVWD SLLPIP Economics Review 2004	-
Expand Anderson Reservoir	symmetrical - $378 million downstream - $357 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Expand Chesbro Reservoir	-	-	-	-
Expand Lower Pacheco (Pacheco Lake Reservoir)	$560 million $493 million	2002, 2004	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002 & SCVWD SLLPIP Economics Review 2004	-
Expand Pacheco A	-	-	-	Assume similar cost to Lower Pacheco expansion measure
Construct Ingram Canyon Reservoir	$1,038 million	1996	DWR Alternative South of Delta Off Stream Reservoir Reconnaissance Study 1996	-
Construct Quinto Creek Reservoir	$747.5 million	1996	DWR Alternative South of Delta Off Stream Reservoir Reconnaissance Study 1996	-

Measures	Present Value Cost	Base Year	Source	Notes/Assumptions
Desalination: Monterey Bay	$2,272 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Desalination: San Francisco Bay	$2,258 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Desalination: San Benito Groundwater Basin, San Francisco Bay, and Monterey Bay	$2,036 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	-
Desalination: San Benito Groundwater Basin	-	-	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	Report did not identify separate costs of the brackish desalination plant
Enlarged SBA/Los Vaqueros Expansion	$700 per AF	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	50 TAF in 25 years @ $150 per AF
Los Vaqueros Expansion	$500 per AF	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	50 TAF in 25 years @ $150 per AF
More Storage in SCVWD Groundwater Basin	$20 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	50 TAF in 25 years @ $150 per AF
Options from SBCWD Basin Management Plan	$17 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	50 TAF in 25 years @ $150 per AF

Measures	Present Value Cost	Base Year	Source	Notes/Assumptions
Options from PVWMA Basin Management Plan	$9 million	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	50 TAF in 25 years @ $150 per AF
Re-Operation of Anderson Reservoir	-	-	-	No data available, assume low cost
SFPUC Intertie	-	2002	SCVWD SLLPIP Summary Report D1 Conceptual Alternatives Screening Appendix E and F December 2002	Did not calculate total cost because no data on water availability, cost identified as $350 per AF

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