3 Program Description

CHAPTER 3
Program Description

Sections

Figures

Tables

3.1 Introduction

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement a Water System Improvement Program (WSIP or proposed program) to increase the reliability of the regional water system. The WSIP would establish program goals for improvements to the regional water system and level of service objectives for system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. These goals and objectives provide the basis for a proposed water supply option to serve increased water demand, proposed operations during drought and nondrought periods, and a series of facility improvement projects to be constructed and implemented under the WSIP.

The facility improvement projects and the proposed water supply option included in the WSIP are designed to: (1) ensure compliance with existing and anticipated future water quality standards under all operating conditions; (2) upgrade the seismic standards of critical facilities to improve seismic reliability and to reduce the system's vulnerability to earthquakes; (3) improve water delivery reliability under a variety of operating conditions by improving overall operations of the system; and (4) assure that the SFPUC has an adequate supply of water available to deliver to customers during both nondrought and drought periods through 2030.

As described below in Section 3.4, the SFPUC initially proposed the draft WSIP in early 2006 as the result of long-term planning and in response to legislative mandates, including a 2002 voter-approved bond measure (see discussion of Assembly Bill No. 1823 in Section 3.4, below). However, for budgeting and management purposes, the SFPUC categorizes as part of the WSIP all capital improvements and projects that will receive financing from the 2002 voter-approved bond measure. Some, but not all, of the activities and projects that the SFPUC has identified for financing purposes as part of the WSIP are analyzed as a program in this Program Environmental Impact Report (PEIR), as defined under the California Environmental Quality Act (CEQA). Other proposed WSIP activities that are not evaluated in this PEIR as part of the proposed program are undergoing CEQA review independent of the PEIR. For the purposes of this PEIR, the WSIP or proposed program refers only to the key regional program elements of the WSIP, essentially consisting of the proposed water supply option, key regional facility improvement projects, and the associated modified operations strategy.

This chapter describes the proposed program and is organized as follows: Section 3.2 presents the regional location of the SFPUC water system (the reader is referred to Chapter 2 for additional details regarding the facilities and operations of the existing system). Section 3.3 describes the need for the program and outlines the WSIP goals and objectives, and Section 3.4 provides information on the background and development of the WSIP. Section 3.5 expands on the WSIP goals and describes the proposed levels of service and system performance objectives. Sections 3.6 and 3.7 outline the proposed water supply and the proposed system operations strategy, respectively. Section 3.8 summarizes the key regional WSIP facility improvement projects analyzed in this PEIR, and Sections 3.9, 3.10, and 3.11 describe the general construction assumptions for these projects. Section 3.12 presents related WSIP activities and their relationship to program components addressed in this PEIR. Section 3.13 outlines actions and approvals that could be required for the WSIP and the relationship to required actions and approvals for individual facility improvement projects.

[Since publication of the Draft PEIR, the SFPUC determined that it would like the option to consider approval and implementation of a variation of the WSIP called the "Phased WSIP Variant," which the SFPUC ultimately adopted. Please refer to Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13), for a description of this variation compared to the proposed program described in this chapter.]

3.2 Regional Location

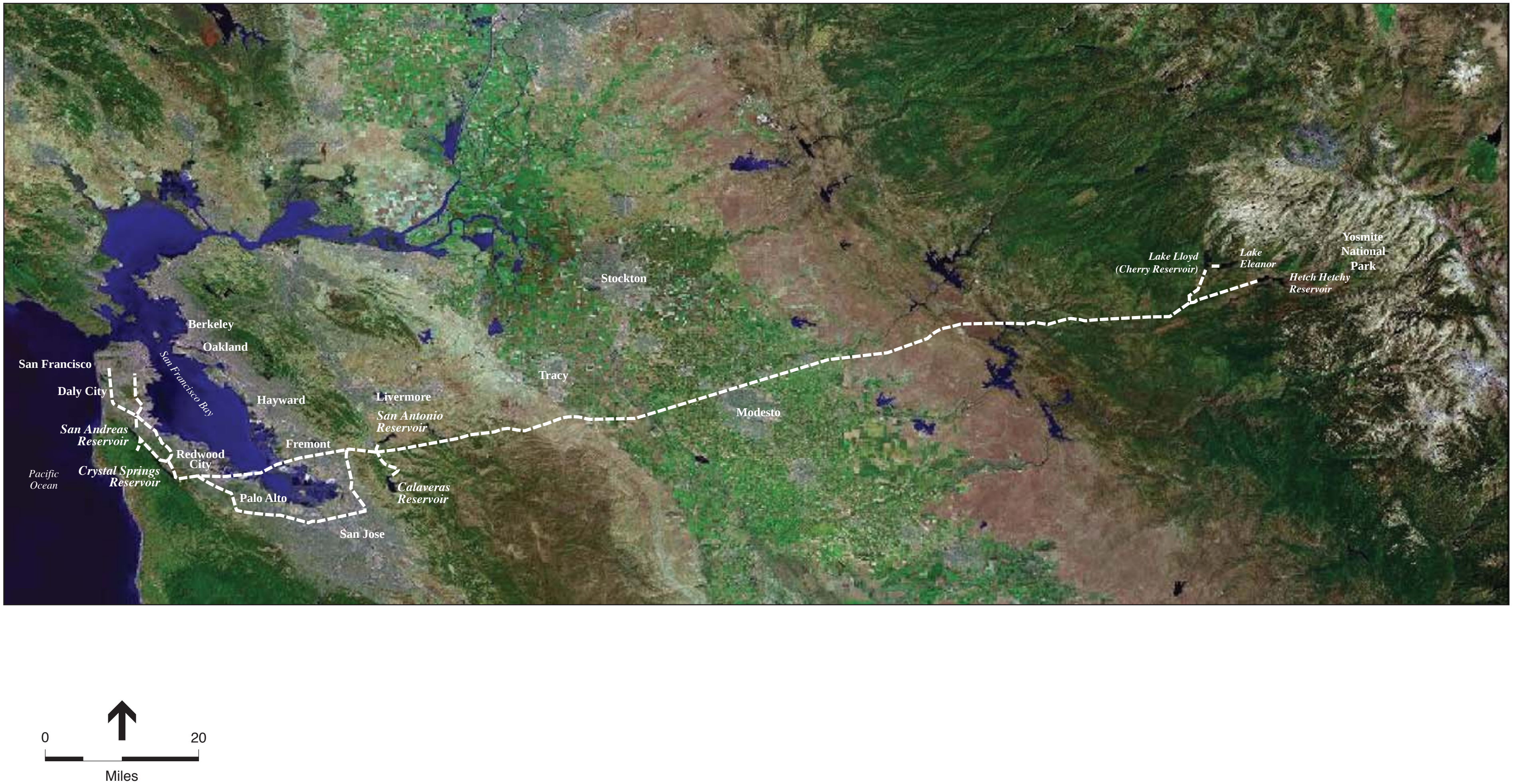
3.2.1 Facilities

The SFPUC regional water system consists of a complex network of facilities covering a geographic range of about 167 miles across Central California, from the Sierra Nevada on the east to San Francisco on the west, as shown in **Figure 3.1**. The regional water system crosses seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The existing facilities, location, and operations of the regional system are described in more detail in Chapter 2. The general location of the regional water system facilities, from east to west, is described below. A more detailed description of jurisdictions affected by proposed facility improvement projects is provided in Section 3.8, below.

The regional water system starts with three reservoirs and dams in Tuolumne County: Hetch Hetchy Reservoir/O'Shaughnessy Dam, Lake Eleanor/Eleanor Dam, and Lake Lloyd/Cherry Dam. Hetch Hetchy Reservoir and Lake Eleanor are located within Yosemite National Park. The system crosses into Stanislaus National Forest through about 30 miles of tunnels, regulating reservoirs, and hydropower facilities, passing south of the town of Groveland and through the town of Moccasin. The Hetch Hetchy Aqueduct continues in Foothill Tunnel to the San Joaquin Valley. At the western border of Tuolumne County, the 16-mile Foothill Tunnel connects to the three San Joaquin Pipelines at Oakdale Portal.

Starting in Tuolumne County for about the first mile, the San Joaquin Pipelines extend across Stanislaus County and end 47 miles later in San Joaquin County. These pipelines are almost entirely buried as they cross the San Joaquin Valley, passing south of the towns of Oakdale and Riverbank, through the city of Modesto, and under State Highway 99 and the San Joaquin River. South of the city of Tracy, the system crosses into San Joaquin County, over the Delta-Mendota Canal and California Aqueduct, and under Interstates 5 and 580. The San Joaquin Pipelines end at Tesla Portal, located just west of Interstate 580 in San Joaquin County. At Tesla Portal, the Hetch Hetchy system continues for 25 miles in the Coast Range Tunnel through the Diablo Range and crosses into Alameda County. The Coast Range Tunnel ends at Alameda East Portal in the Sunol Valley, where the Hetch Hetchy system connects to the Sunol Valley facilities.

The Sunol Valley facilities are located in Alameda and Santa Clara Counties. The Alameda East Portal connects the western end of the Coast Range Tunnel directly to the three buried Alameda Siphons. The Alameda Siphons traverse the valley about one-half mile, extending from the Alameda East Portal to the Alameda West Portal. In this valley, the Alameda Siphons also connect to pipelines that travel south to the Sunol Valley Water Treatment Plant (WTP) in Alameda County and continue south to Calaveras Reservoir, which lies in both Alameda and Santa Clara Counties. There are also pipelines traveling north from the Alameda Siphons to San Antonio Reservoir in Alameda County. The SFPUC has maintenance facilities farther north, just west of the town of Sunol, and isolated facilities serving customers in the Pleasanton and Niles Canyon areas. From the Alameda West Portal, the system connects to the 3.5-mile-long Irvington Tunnel, which passes through the Fremont Hills and ends at Irvington Portal in the city of Fremont in Alameda County, where it connects to the four Bay Division Pipelines.



SOURCE: ESA

SFPUC Water System Improvement Program . 203287

Figure 3.1
SFPUC Water System, Regional Location Map

The Bay Division Pipelines Nos. 1 and 2 extend about 22 miles through Fremont and Newark, continue across San Francisco Bay to San Mateo County, and pass through the cities of East Palo Alto, Redwood City, Menlo Park, and Atherton. Starting in Fremont, the Bay Division Pipelines Nos. 3 and 4 extend 34 miles around the bay, passing into Santa Clara County and through the cities of Milpitas, San Jose, Santa Clara, Sunnyvale, Mountain View, Los Altos, and Palo Alto; these two pipelines continue into San Mateo County and through the cities of Menlo Park, Atherton, Woodside, and Redwood City. With the exception of aboveground segments on the east and west side of the bay shoreline and on trestle bridges across the bay, the Bay Division Pipelines are almost entirely underground. The four Bay Division Pipelines connect again at the Pulgas Portal just west of Redwood City. From there, the system continues north up the Peninsula through San Mateo County via a network of tunnels, pipelines, pump stations, valve lots, reservoirs, and one treatment plant. The system crosses through the Peninsula towns of Belmont, San Mateo, Hillsborough, Burlingame, Millbrae, San Bruno, South San Francisco, Brisbane, and Daly City until it reaches San Francisco. The terminal reservoirs in the regional water system are located in San Francisco (SFPUC, 2004a).

3.2.2 Water Service Area

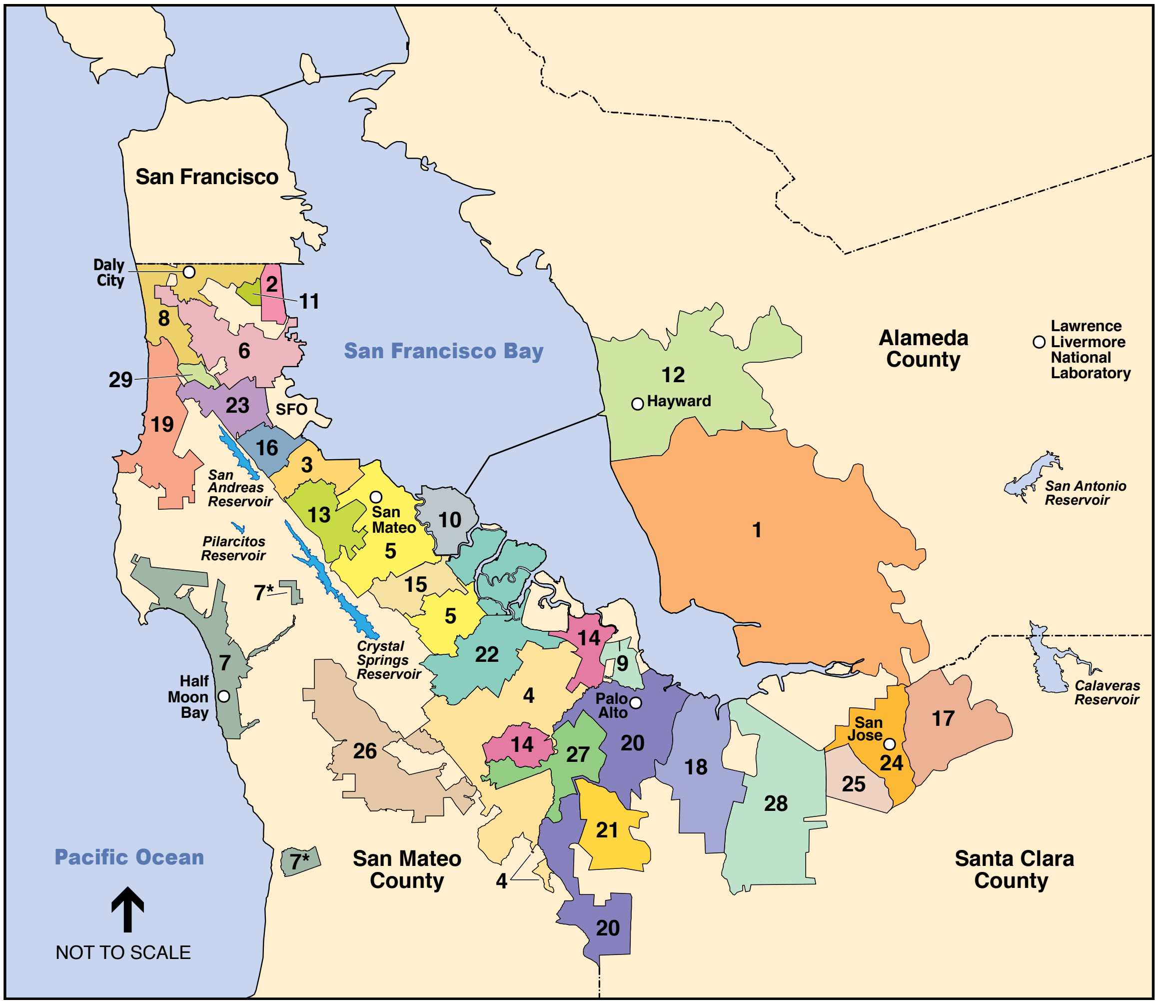
The SFPUC provides water delivery services to retail and wholesale customers, primarily in San Francisco, San Mateo, Santa Clara, and Alameda Counties, as shown in **Figure 3.2**. The SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco, and about two-thirds of its water supplies to wholesale customers by contractual agreement. The wholesale customers are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA) and consist of 27 total customers[11]: 25 cities and water districts plus Stanford University and one private utility. Some of these wholesale customers have other sources of water in addition to what they receive from the SFPUC regional system. The SFPUC also provides service to some isolated regional wholesale and retail customers along the water system, including customers in Tuolumne County. **Table 3.1** lists the major regional system customers and indicates the customers that receive water supplies from sources other than the SFPUC.

3.3 Need for and Objectives of the Program

The need for the WSIP is predicated on the basic mission of the SFPUC, which is in part:

> To serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care (SFPUC, 2002)

11 There are 28 wholesale customers identified in the 2004 SFPUC studies. Since the time of those studies, one of the wholesale customers, Los Trancos County Water District, was purchased by California Water Service Company, reducing the SFPUC wholesale customer count to 27.



Legend

(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4 CWS – Bear Gulch
5 CWS – Mid-Peninsula
6 CWS – South San Francisco
7 Coastside County Water District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley Municipal Improvement District
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this PEIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SOURCE: BAWSCA, 2006a

Figure 3.2 (Revised)
SFPUC Water Service Area -
San Francisco and SFPUC Wholesale Customers

TABLE 3.1
SFPUC REGIONAL WATER SYSTEM CUSTOMERS

Wholesale Regional Customers[a] (BAWSCA Members)		
Peninsula	**South Bay**	**Other Major Customers**
California Water Service Company (South San Francisco* and Mid-Peninsula)	Alameda County Water District*	City and County of San Francisco
City of Brisbane	Mid-Peninsula Water District	Presidio Trust*
Guadalupe Valley Municipal Improvement District	California Water Service Company (Bear Gulch)*	San Francisco County Jail (San Bruno)
City of Burlingame	City of Hayward	San Francisco International Airport (San Mateo County)
City of Daly City*	City of Menlo Park*[b]	Lawrence Livermore National Laboratory (Site 200/300)
City of Millbrae	City of Milpitas*	National Aeronautics and Space Administration (Santa Clara County)
City of San Bruno*	City of Mountain View*	Town of Sunol (Alameda County)
Coastside County Water District*	City of Palo Alto*	Groveland Community Services District (Tuolumne County)
Estero Municipal Improvement District (Foster City)	City Redwood City*	
North Coast County Water District	City of San Jose (North San Jose Service Area)*	
Town of Hillsborough	City of Sunnyvale*	
Westborough County Water District	City of Santa Clara*	
	City of East Palo Alto	
	Purissima Hills Water District	
	Skyline County Water District	
	Stanford University*	

* Indicates customers that currently receive additional water supplies from sources other than the SFPUC.

a Not shown on the table because they are not a BAWSCA member, the Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC. It is a small water association serving 18 single-family homes located in San Mateo County.

b Menlo Park receives all of its water supply from the SFPUC; however, a portion of the supply is obtained indirectly from the SFPUC through purchases from East Palo Alto (BAWSCA, 2006).

SOURCES: CDM, 2005; URS, 2004a.

While the SFPUC has historically met and is currently achieving its mission, there are numerous factors contributing to the need for a comprehensive, systemwide program such as the WSIP. In order to continue to reliably meet this mission in the future, the SFPUC must plan for future needs as well as address existing, known deficiencies. The proposed program would address these needs and deficiencies, including:

- *Aging Infrastructure*. The SFPUC regional water system is old. Many of its components were built in the 1800s and early 1900s; parts of the system were built using now-outdated construction materials and/or methods and are currently in need of major repair. As the system ages, its reliability decreases and the risk of failure increases.

- *Exposure to Seismic and Other Hazards*. The 167-mile-long system crosses five active earthquake faults. Many of the SFPUC system components are located on or in the immediate vicinity of major earthquake faults. Due to the age of the system, many facilities do not meet modern seismic standards. To protect public safety, the California Department of Water Resources, Division of Safety of Dams (DSOD) has imposed operating restrictions on Calaveras and Crystal Springs Reservoirs, reducing the local storage capacity and impairing normal system operations; this storage capacity needs to be restored (see Section 2.2 for discussion of the current operating restrictions on these dams).

- *Maintain Water Quality*. The regional system currently meets or exceeds existing water quality standards. However, system upgrades are needed to improve the SFPUC's ability to continue to maintain compliance with current water quality standards and to meet anticipated future water quality standards under a range of operating conditions, including such events as a major earthquake, without reducing system reliability (see Chapter 2, Section 2.4, for a discussion of water quality regulations that apply to the system).

- *Improve Asset Management and Delivery Reliability*. In order to implement a feasible asset management program in the future that will provide continuous maintenance and repairs to facilities, the system requires redundancy (i.e., backup) of some critical facilities necessary to meeting day-to-day customer water supply needs. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance.

- *Meet Customer Water Demands*. Water demand among SFPUC customers is predicted to increase over the next 25 years. Additional supplies are needed to satisfy current demand in drought years and projected 2030 demand in all years. The experience of the last 150 years of record as well as recent studies on California's climate show the region is susceptible to droughts. Two of the biggest droughts occurred during the past 30 years. The regional system currently has insufficient water supply to meet customer demand during a prolonged drought, and this situation will worsen in the future.

To address these challenges to the reliability of the water system, the SFPUC must replace or upgrade numerous components of the system and add some new components—thus the need for the WSIP and its associated facility improvement projects.

[Additional discussion on the need for the program was prepared in response to comments on the Draft PEIR. Please refer to Section 14.1, Master Response on WSIP Purpose and Need (Vol. 7, Chapter 14).]

3.3.1 Program Goals and Objectives

The WSIP goals and objectives were developed based on a planning horizon through 2030. The SFPUC selected the year 2030 because published population projections generally do not extend beyond 20 to 25 years, and the agency determined the 2030 forecasts to be the most reasonably foreseeable future condition. The goals and objectives are founded on two fundamental principles pertaining to the existing regional system: (1) maintaining a clean, unfiltered water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system.

The overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water and a gravity-driven system
- Reduce vulnerability to earthquakes

- Increase delivery reliability
- Meet customer water supply needs
- Enhance sustainability
- Achieve a cost-effective, fully operational system

To further these program goals, the WSIP includes objectives that address system performance. **Table 3.2** presents these objectives as they relate to the WSIP goals. The system performance objectives describe and, in many cases, more specifically quantify, what the regional water system proposes to achieve under the WSIP, and thereby guide the water supply actions, facility improvements, operations, and maintenance requirements included in the WSIP.

TABLE 3.2
WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 229 million gallons per day (mgd). The performance objective is to provide delivery to at least 70 percent of the turnouts (i.e., water diversion connecting points from the regional system to customers) in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively. • Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve the ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
Water Supply – *meet customer water needs in nondrought and drought periods*	• Meet average annual water purchase requests of 300 mgd from retail and wholesale customers during nondrought years for system demands through 2030. • Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. • Diversify water supply options during nondrought and drought periods. • Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

SOURCE: SFPUC, 2006a.

Therefore, as described in detail below, the SFPUC conducted extensive studies leading to the development of the proposed program to increase the reliability of the regional water system. For the purposes of this PEIR, the term “reliability” is used to encompass a host of system parameters affecting water delivery, including those related to both physical facilities and water supply sources. System parameters related to the reliability of physical facilities could include physical or hydraulic capacity, physical or operational redundancy (i.e., backup systems), operational flexibility, facility vulnerability, and likelihood of failure. System parameters related to the reliability of water supply sources could include water quality considerations, vulnerability to hydrologic and meteorological conditions, and regulatory/institutional considerations. While the numerous system parameters affecting reliability are not interchangeable, they are all interrelated, and an improvement in any of the parameters affecting reliability would result in an improvement in the overall reliability of the system. The SFPUC developed the WSIP to address the need to provide comprehensive improvements to all aspects of system reliability.

3.4 Background and Development of the WSIP

Public awareness of the need for major capital improvements became evident in 2002 with the passage of three related legislative actions. Propositions A and E, passed in November 2002 by San Francisco voters, approved financing for San Francisco’s portion of the multi-billion-dollar water system improvements. Assembly Bill No. 1823 (AB 1823), the Wholesale Regional Water System Security and Reliability Act, also approved in 2002, required the City and County of San Francisco (CCSF) to adopt a capital improvement program designed to restore and improve the regional water system and to review and update the program as necessary (see Chapter 2, Section 2.4, for further description of this act). The SFPUC developed the Long-Term Strategic Plan for Capital Improvements in May 2002 (SFPUC, 2002) to address these requirements and then proceeded with a series of planning and engineering studies that form the foundation of the WSIP as currently proposed.

The SFPUC began planning for major system improvements over a decade ago and has conducted numerous planning and engineering studies of the regional system with respect to its vulnerability, reliability, performance, operations, water supply, watershed management, and water quality. The SFPUC primarily used three models in the development of the scope of the WSIP facility improvement projects, including determining the appropriate performance objectives and level of service goals. The three models—reliability, hydraulic, and hydrologic models—are described below, followed by descriptions of the major planning studies utilizing these models in the development of the WSIP.

- *Reliability Model*. The SFPUC used this statistical model to evaluate the ability of the system to meet identified targets when subjected separately to earthquakes on the San Andreas, Hayward, and Calaveras faults, as well as to quantify system risk. The model is comprised of two parts: a probabilistic model used to assess the baseline conditions for the existing and improved systems, and a deterministic model used to evaluate system recovery. For the deterministic model, the following events were used: (1) magnitude 7.9 earthquake on the San Andreas fault, (2) magnitude 7.3 earthquake on the Hayward fault, and (3) magnitude 6.9 earthquake on the Calaveras fault. The model employs the most likely value for failure of system components when subjected to the earthquake hazard for the selected scenario. The SFPUC used this model to compare system facilities under both existing and improved conditions, each under a range of operating scenarios (Parsons-CH2MHILL, 2005; Parsons, 2006). Depending on the model run, the "improved conditions" represented various conceptual stages of improvement projects included in the WSIP.

- *Hydraulic Model*. The SFPUC used this model to determine transmission pipeline and tunnel capacities, which were then used as input to the hydrologic model (see description below) to analyze system operations under existing and potential alternative future conditions. This model uses a simulation software package to simulate and analyze water distribution systems, and has been refined, enhanced, calibrated, and validated on many parts of the regional system. The SFPUC used it to analyze the hydraulic characteristics of the existing water system and to assist in determining facility sizing, given assumptions about requirements for operations and maintenance (Parsons-CH2MHILL, 2005).

- *Hydrologic Model*. The SFPUC used this model (also referred to as the Hetch Hetchy/Local Simulation Model, HH/LSM, or the water supply model) to simulate the monthly operation of all major water transmission and storage facilities in the regional water system. It was used to depict system operation under existing conditions and predict various alternative future conditions using historical hydrology for the 82-year period from July 1920 to September 2002. The model was also used to evaluate drought periods to establish system firm yield[12] capabilities, levels of rationing required, water transfer needs, and reservoir storage requirements. The model can also be used to assess the effects on system reliability under different conditions, including water supply sources, levels of conservation, operational criteria, transmission and storage facilities, and hydrologic conditions (Parsons-CH2MHILL, 2005).

3.4.1 Water Supply Studies

In 2000, the SFPUC prepared the *Water Supply Master Plan* (SFPUC, 2000) as a guidance document to address the future water supply needs for the SFPUC service area. This study recommended a water resource strategy of demand management, facilities improvements, and development of additional water supplies. Building on the analysis conducted for the *Water Supply Master Plan*, the SFPUC expanded and updated the evaluation of water supply sources as part of development of the WSIP, including review of additional water supply opportunities that had developed since preparation of the master plan. The *Water Supply Options* report (SFPUC, 2007a) presents the most current evaluation of water supply options and describes the SFPUC's proposed water supply option for the WSIP, as described in Section 3.6.

Using information developed in the *Water Supply Master Plan*, the *Water Supply Options* report reviewed seven categories of potential sources of supply for addressing SFPUC system needs through 2030. The SFPUC evaluated various water supply alternatives formulated from these categories based on facilities requirements, costs, environmental effects, water quality impacts, and institutional and regulatory issues. The evaluation determined that system capacity improvements were required regardless of the alternative. The *Water Supply Master Plan* evaluated the following seven categories of potential sources:

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[12] System firm yield is the average annual water delivery that can be sustained throughout an extended drought.

- *Tuolumne River opportunities*—potential opportunities to increase the amount of Tuolumne River water diverted under existing water rights as well as through transfers from senior water-rights holders or increased storage under existing water rights.

- *Delta opportunities*—potential to acquire water from willing sellers located south of the Delta who possess water rights or contractual entitlements, including State Water Project contractors and Central Valley Project contractors. Alternatively, water could be purchased from willing sellers upstream of the Delta on the Sacramento, Feather, or Yuba Rivers, which would require an increase in Delta export pumping. However, this category of sources had many regulatory constraints.

- *Neighboring non-Delta, non-Tuolumne River opportunities*—potential to acquire water supplies through arrangements with neighboring agencies that are either near or adjacent to the SFPUC service areas or near major SFPUC storage or conveyance facilities. However, this category of sources had limited availability, since most of these agencies are projecting dry-year shortages similar to those expected for the SFPUC system.

- *Local opportunities*—potential to increase the yield of the Alameda and Peninsula system, including expansion of existing reservoirs, construction of new reservoirs, and implementation of groundwater banking programs.

- *Desalination opportunities*—potential to develop desalination facilities using San Francisco Bay water to produce potable water and connecting these facilities to the SFPUC system.

- *Recycled water opportunities*—potential to use recycled water for nonpotable uses to reduce SFPUC customer demands for deliveries from the SFPUC system.

- *Demand management*[13] *opportunities*—potential to reduce existing and future customer demand through conservation measures.

Additional water supply option analysis conducted by the SFPUC, and documented in the *Water Supply Options* report, confirmed the conclusion of the *Water Supply Master Plan* that the preferred strategy for meeting future SFPUC regional water system demand in normal and wet years is to implement additional Tuolumne River diversions under its existing water rights augmented by demand management activities, and to pursue water transfers on the Tuolumne River for meeting dry-year needs. However, the SFPUC determined that additional evaluation was required to identify the proposed water supply option for the WSIP. In particular, the SFPUC identified other options requiring further study to determine their feasibility to meet dry-year demand. These additional dry-year options included:

- Various regional water supply options through the Bay Area Blending Evaluation / Bay Area Water Quality and Supply Reliability Program (a program funded by CALFED that examined multiple regional water supply options involving seven Bay Area water agencies, including the SFPUC). The concepts that were considered to have potential dry-year benefits for the SFPUC system included: an enlarged Los Vaqueros Reservoir; an enlarged Calaveras Reservoir; a desalination plant in the East Bay that would produce potable water

[13] Demand management is the management of water supplies through activities that reduce the demand for water by altering water use practices, improving efficiency in water use, reducing losses of water, reducing waste of water, altering land management practices, and/or altering land uses. Demand management programs include water conservation, drought rationing and rate incentive programs.

from saline groundwater in the Newark Aquifer; a desalination project in Santa Clara County proposing up to three desalination plants to treat brackish groundwater for either potable or nonpotable uses; enhanced conservation implemented by individual agencies combined with additional regional conservation activities; and various recycled water projects and concepts.

- Storage in the Semitropic Water Storage District's groundwater bank near Bakersfield. Under this option, during wet years, the SFPUC would deliver Tuolumne River water to the Semitropic Groundwater Bank using the California Aqueduct, and in dry years, the SFPUC would receive water through the Semitropic Water Storage District's allocations of water from the State Water Project via the Delta and South Bay Aqueduct. The SFPUC also considered indirect participation in this program through current Bay Area partners, including the Santa Clara Valley Water District, Alameda County Flood Control and Water Conservation District Zone 7, and Alameda County Water District via Delta exchange.

- Westside Groundwater Basin conjunctive use, in which, during wet years, the SFPUC would provide regional system water to wholesale customers who would otherwise obtain water from the Westside Groundwater Basin in northern San Mateo County. This would allow the basin to naturally recharge during wet years, and, during dry years, those users would rely on groundwater and reduce their use of regional system water.

- Bay Area Regional Desalination Project involving four Bay area water agencies, including Contra Costa Water District, East Bay Municipal Utility District, Santa Clara Valley Water District, and the SFPUC, to explore the feasibility of developing a regional desalination plant to produce potable water for both drought and nondrought years.

The SFPUC analyzed and screened the above water supply options based on a combination of institutional, legal, technical, operational, environmental, and cost criteria. The screening analysis resulted in the retention of some options for further analysis and the elimination of others from further study. The following dry-year options were retained for further analysis: additional Tuolumne River supplies through transfers from the Turlock Irrigation District (TID) and/or Modesto Irrigation District (MID), demand management, recycled water and local groundwater programs, Westside Basin conjunctive use, and regional desalination(SFPUC, 2007a). These options are included either as part of the preferred WSIP water supply option described in this chapter or as part of the variants or alternatives discussed in Chapters 8 and 9 of this PEIR. The SFPUC eliminated the remaining options from further consideration due to institutional and technical feasibility issues. Further review of these options is provided in Chapter 9 of this PEIR to consider their potential as CEQA alternatives.

In addition to water supply sources, the water supply studies also examined drought-related strategies for meeting customer demand during extended periods of below-normal rainfall/snowmelt. As described in Chapter 2, Section 2.3.5, the regional system has experienced drought periods in the last 30 years, most notably the droughts from 1976 to 1977 and from 1987 to 1992. After the 1987–1992 drought, the SFPUC reevaluated and modified its operating procedures. As part of these modifications, the SFPUC developed a "design drought" to use in its system planning and adopted a Water First Policy to guide regional system operations (see Chapter 2, Section 2.3.4).

"Design drought" is a planning and operation tool that water supply agencies use to define a reasonable worst-case drought scenario based on known hydrology in order to establish design and operating parameters for the water system. Droughts more severe than the design drought would cause failure of supply within the water system. For purposes of regional water system planning, the SFPUC uses a design drought that anticipates and plans for a more severe drought than historical events and evaluates the system firm yield assuming the system is experiencing the design drought. Studies suggest a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought, which was the most extreme recorded drought event to affect the regional system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence (SFPUC, 2007a).

During a dry period, there is reduced inflow to the regional system's reservoirs, and maintaining water deliveries to customers is highly dependent on the amount water utilized from storage in the reservoirs. During a prolonged drought, the water delivered to customers exceeds inflow to the reservoirs, and the volume of water held in storage is continually depleted. In developing the water supply and drought-related goals for the WSIP, the SFPUC used the design drought along with customer demand projections to develop system firm yield requirements for 2030. (System firm yield is the average annual water delivery that can be sustained throughout an extended drought.) In addition to identifying options for acquiring additional water supply in dry years, the SFPUC also examined demand management and rationing as part of its drought planning strategy.

Current plans for drought response include a 20 percent rationing allocation, as established in the *Interim Water Shortage Allocation Plan* and the *Retail Water Shortage Allocation Plan* (described in Chapter 2, Section 2.3.5). In January 2005, the SFPUC staff presented two system rationing scenarios to the SFPUC commissioners for consideration: 10 and 20 percent maximum rationing during any given year of a drought. As described below, the Commission selected the 20 percent maximum systemwide[14] reduction in water service during drought periods for further study.

This systemwide level of 20 percent rationing translates into different percentages of allocation adjustments for each individual SFPUC customer. These percentages are dependent on the allocation plans mentioned above as well as further agreements among the wholesale customers. SFPUC wholesale customer allocation adjustments for a 20 percent systemwide rationing scenario could range from 12 to 40 percent for individual customers.

14 This rationing objective applies to the regional system as a whole, meaning overall system deliveries could be reduced by a maximum of 20 percent in any one year; this systemwide level of rationing could affect deliveries to specific sectors (turnouts) of the regional system differently, and individual customers could experience delivery reductions of more or less than 20 percent during a 20 percent systemwide reduction.

3.4.2 System Performance Studies

The SFPUC conducted extensive engineering analyses and studies regarding individual facilities and overall system performance to guide development of the facilities improvement program. A detailed assessment of regional system facilities was conducted from 1995 to 2006 to evaluate the vulnerability and reliability of the system. Using a statistical risk-based approach, the studies examined hazards and deficiencies at existing facilities, assessed their reliability, and determined the risk to the overall system (SFPUC, 1995; SFPUC, 2004b). The studies identified a range of conditions and deficiencies that could affect the reliability of critical system facilities, including hazards such as earthquakes, landslides, flood, fire, and general wear and tear. The SFPUC determined that the primary risks to its facilities are associated with seismic hazards as well as normal operating wear and tear. During this time, the SFPUC used the results of these studies to develop the capital improvement program in response to the AB 1823 requirements described above. The capital improvement program included numerous facility improvement projects that address the identified system deficiencies, particularly with respect to aging infrastructure and seismic hazards.

From 2004 through 2006, the SFPUC conducted system assessment and performance analyses of the WSIP (formerly known as the capital improvement program) with respect to the seismic and delivery reliability of the system over a range of operating conditions (SFPUC, 2004c; SFPUC, 2004d; Parsons, 2006). Using guidance from the SFPUC commissioners in January 2005, the system assessment developed level of service objectives for seismic and delivery reliability of the regional system on the basis of the following criteria:

- *Seismic Reliability*
  - Delivery after a major earthquake—how much can the system deliver after a major earthquake?
  - Percentage of turnouts that receive water—what percentage of the turnouts in each customer group will receive water after an earthquake?
  - Post-earthquake recovery—how much will the system be able to deliver 30 days after an earthquake?
- *Delivery Reliability*
  - Maintenance conditions—when key facilities are shut down for planned maintenance, how much can the system deliver without interrupting customer service?
  - Delivery during a Hetch Hetchy water quality event—how much can the system deliver when the quality of Hetch Hetchy water does not meet the requirements for unfiltered water sources[15] and filtration of all water sources is required prior to delivery to customers?
  - Delivery impacts due to unplanned outages—does the system have enough redundancy to allow for unplanned facility outages?

15 Water from Hetch Hetchy Reservoir can sometimes fail to meet the requirements for filtration avoidance, such as during storm events in the Sierra Nevada, which can lead to turbidity levels exceeding standards.

The seismic analyses were based on three earthquake scenarios: magnitude 7.9, 7.3, and 6.9 events on the San Andreas, Hayward, and Calaveras faults, respectively. For the seismic reliability assessment, delivery was evaluated on a customer group basis, and delivery to individual turnouts within a customer group could vary. The three customer groups in the service area consisted of the South Bay (Alameda/Santa Clara/southern San Mateo County), Peninsula (northern San Mateo County), and San Francisco.

The delivery analysis was used to evaluate the operational flexibility and redundancy within the system under reasonably foreseeable conditions, and evaluated three types of plausible scenarios. The planned maintenance scenarios assumed one planned shutdown of any one facility combined with an unplanned pipeline leak or break on either the San Joaquin or Bay Division Pipelines. Delivery during a Hetch Hetchy water quality event assumed that average-day demand could be met without the Hetch Hetchy source, or by treating part of the Hetch Hetchy source in addition to other supplies. In order to minimize risk of delivery due to unplanned outages under day-to-day conditions, the analysis evaluated the delivery capability with one source—Hetch Hetchy, Sunol Valley WTP, or Harry Tracy WTP—out of service.

Preliminary results indicated that the existing system would fail to meet seismic and delivery level of service objectives under most operating conditions, and that the performance of the system would decline in the future if no improvements were made. The studies also modeled how the regional system would perform with implementation of a program of facility improvement projects, and results demonstrated significant improvement in system performance under all operating conditions. The studies identified specific improvement projects and helped shape the scope of the facility improvement projects that are now proposed as part of the WSIP. Final results of the system assessment studies showing system performance with implementation of the proposed program are presented below in Section 3.5.

3.4.3 Operations Studies

Concurrent with the system performance studies, the SFPUC developed regional water system operations plans (CDM, 2005; URS, 2006a). These documents address operating goals, strategies, and constraints with respect to water supply and storage, water quality, and water delivery. Information from these studies was largely incorporated into the WSIP and is described further below in Section 3.7.

3.4.4 Water Demand Studies

From 2002 to 2006, the SFPUC, in collaboration with its wholesale customers and BAWSCA, conducted comprehensive planning studies to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in its retail and wholesale customer service areas. These studies, which provided a basis for 2030 water purchase estimates from the SFPUC regional water system, include the following:

- SFPUC Wholesale Customer Water Demand Projections (URS, 2004a)
- SFPUC Wholesale Customer Water Conservation Potential (URS, 2004b)

- SFPUC Wholesale Customer Recycled Water Potential (RMC, 2004)
- City and County of San Francisco Retail Water Demands and Conservation Potential (Hannaford and Hydroconsult, 2004)
- City and County of San Francisco Recycled Water Master Plan (RMC, 2006)
- SFPUC 2030 Purchase Estimates Technical Memorandum (URS, 2004c)

The studies indicate that total demand in 2000/2001 in the entire SFPUC service area from all water sources was about 366 million gallons per day (mgd). Of that total demand, about 261 mgd was purchased from the SFPUC regional water system. SFPUC wholesale customers met the balance of their supply needs from other water sources and conservation. The projected total service area demand in 2030 is approximately 417 mgd,[16] of which approximately 300 mgd would be purchased from the SFPUC system. The remaining 117 mgd would be met through other supply sources available to customers, primarily water purchases from other agencies, customers' local groundwater sources, additional water recycling, and conservation. Each customers' estimates of conservation savings and the use of recycled water, groundwater, and other supply sources as well as its 2030 purchase estimate is shown in **Table 3.3**. **Table 3.4** compares the 2030 estimated purchases to actual 2001 purchases of the wholesale and retail customers.

Demand Projection Methodology

This section summarizes the key steps involved in projecting 2030 water demand, upon which the estimates of 2030 purchases from the SFPUC regional water system are based. Following completion of the above studies, each wholesale customer submitted its estimate of 2030 purchases from the SFPUC regional system, taking into account water savings from ongoing and planned conservation programs and planned use of other water supply sources. The SFPUC also developed its estimate for the retail service area. These 2030 purchase estimates provide the basis for the WSIP water supply and delivery reliability objectives. A full description of the methodology used to forecast future water demand and assess conservation and recycled water potential is provided in the reports referenced above. Appendix E, Section E.2, of this PEIR also provides a detailed summary of the water demand forecasting methodology and results.

End-Use Demand Model

Future water demand projections for both retail and wholesale customers were developed using end-use demand models that break down total water use, by water service account, to specific end uses such as toilets, faucets, and irrigation. Projections for the wholesale service area were developed in close consultation with the wholesale customers, who provided critical inputs to the demand models and subsequently submitted statements concurring with the demand projections.

[16] Total 2030 demand (417 mgd) includes expected savings due to compliance with existing plumbing codes, which contain efficiency requirements. Total SFPUC service area demand without plumbing code savings is estimated at 453 mgd.

TABLE 3.3
SUMMARY OF WATER SUPPLY ASSUMPTIONS AND 2030 DEMAND PROJECTIONS

Customer	A 2030 Purchase Estimates (mgd[a])	B 2030 Projected Conservation Savings (mgd[a])	C 2030 Projected Use of Groundwater Sources (mgd[a])	D 2030 Projected Use of Other Surface Water Sources (mgd[a])	E 2030 Projected Use of Recycled Water (mgd[a])	TOTAL Total 2030 Supply (mgd[a])[b] (A+B+C+D+E)	2030 Projected Demand (with Plumbing Code Savings) (mgd[a])
Alameda County Water District	13.76	3.16	13.98	27.00	1.40	59.3	59.3
City of Brisbane	0.89	0.04				0.93	0.93
City of Burlingame	4.70	0.20				4.9	4.9
CWS–Bear Gulch District[c,d]	11.76	0.93		1.37		14.06	14.06
CWS–Mid-Peninsula District[c]	17.24	0.86				18.1	18.1
CWS–South San Francisco District[c]	7.97	0.56	1.37			9.9	9.9
Coastside County Water District[e]	2.24 – 3.02	0.18	0.0 – 0.30	0.0 – 0.48		3.2	3.2
City of Daly City[f]	4.90 – 7.32	0.44	1.34 - 3.76			9.1	9.1
City of East Palo Alto	4.64	0.16				4.8	4.8
Estero Municipal Improvement District	6.20 – 6.80	0.0 – 0.60				6.8	6.8
Guadalupe Valley Municipal Improvement District	0.71	0.10				0.81	0.81
City of Hayward	27.95	0.76				28.7	28.7
Town of Hillsborough	3.70	0.20				3.9	3.9
City of Menlo Park	4.54	0.16				4.7	4.7
Mid-Peninsula Water District	3.70	0.10				3.8	3.8
City of Millbrae[g]	3.19	0.08 – 0.11				3.3	3.3
City of Milpitas	8.20	0.61		7.13	1.77	17.7	17.7
City of Mountain View	13.20	0.24 – 1.21	0.05	1.30		14.8 – 15.8	14.8
North Coast County Water District	3.61 – 3.80	0.0 – 0.19				3.8	3.8
City of Palo Alto[n]	13.00	0.60			0.76	14.4	14.4
Purissima Hills Water District	3.22	0.08				3.3	3.3
City of Redwood City[i]	11.60 – 12.60	0.59 – 1.02			0 – 1.00	13.2 – 13.6	13.4
City of San Bruno	4.30	0.19				4.5	4.5
City of San Jose (North)[j]	6.34	0.16				6.5	6.5
City of Santa Clara	4.90	1.00	19.99	4.00	4.00	33.9	33.9
Skyline County Water District	0.30	0.01				0.31	0.31
Stanford University	4.20	0.70		1.90		6.8	6.8
City of Sunnyvale	12.10	0.70	2.60	9.90	1.50	26.8	26.8
Westborough Water District[k]	1.03	see note k				1.03	1.03
Total, Wholesale Service Area[l]	**204 – 209**	**13 – 15**	**39 – 42**	**53**	**9 – 10**	**323 – 325**	**324**
SFPUC Retail Service Area[l,m]	**80 – 91**	**0 – 4**	**3 – 5**	**0**	**0 – 4**	**93 – 94**	**93**
TOTAL[l,n]	**284 – 300**	**13 – 19**	**42 – 47**	**53**	**9 – 14**	**417**	**417**

NOTES: 1. Numbers may not sum due to rounding.
2. The SFPUC serves one additional Bay Area wholesale customer, Cordilleras Mutual Water Users Association, which did not participate in the study because it is a finite group (18 single-family homes) with minimal usage (4,600 gallons per day, or 0.0046 mgd). As indicated in Table 3.1, Cordilleras Mutual Water Users Association is not a member of BAWSCA.

a mgd = million gallons per day.
b Total assumes low-range purchase estimate plus high-range value of other supply sources, and high-range purchase estimate plus low-range value of other sources, where a range was provided.
c CWS = California Water Service Company.
d CWS–Bear Gulch District includes the former Los Trancos County Water District.
e The upper range purchase estimate assumes loss of all local water sources (surface water and groundwater) and the lower range estimate assumes continuation of local sources; both estimates assume Level B water conservation.
f The purchase estimate range reflects a range of potential groundwater usage, established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd) according to Daly City's best estimate of 2030 water purchases (SFPUC, 2004e).
g 2030 conservation savings is based on URS 2004b and the City's UWMP as confirmed by the City (Popp, 2007).
h 2030 demand and conservation savings are based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005).
i In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030(City of Redwood City, 2005). The high-range purchase estimate total of 300 mgd published in URS 2004c remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies. The purchase estimate range originally submitted apparently reflects the average of the City's estimated conservation range plus the originally estimated range of recycled water use.
j Portion of north San Jose only.
k Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the district in a letter to the SFPUC (Westborough Water District, 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to the demand and purchase estimate. The District's original estimate of water purchases indicated conservation savings of 0.020 mgd (SFPUC, 2004e).
l All totals have been rounded to the nearest 1 mgd.
m The low range of the SFPUC retail customer purchase estimate reflects the identified groundwater, recycled water, and conservation programs totaling 10 mgd in San Francisco that are included as part of the WSIP proposed water supply option.
n The single value for total supply assumes the low-range purchase estimate plus high-range value of other sources, and the high-range purchase estimate plus low-range value of other sources (i.e., both approaches round to 417 mgd).

SOURCES: URS, 2004a; URS, 2004c; URS, 2006b; SFPUC, 2004e; SFPUC, 2007a; City of Palo Alto, 2005; City of Redwood City, 2005; Westborough Water District, 2005 and 2007; Popp, 2007.

TABLE 3.4
SUMMARY OF SFPUC 2030 PURCHASE ESTIMATES

SFPUC Customer	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd)	2030 Purchase Estimates (mgd)	Change in Water Purchases from the SFPUC (mgd)
Wholesale Customers			
Alameda County Water District[a]	11.99	13.76	1.77
City of Brisbane	0.39	0.89	0.50
City of Burlingame	4.64	4.70	0.06
CWS–Bear Gulch District[a,b]	11.12	11.60	0.48
CWS–Mid-Peninsula District[b]	16.75	17.24	0.49
CWS–South San Francisco District[a,b]	7.56	7.97	0.41
Coastside County Water District[a,c]	1.80	2.24 – 3.02	0.44 – 1.22
City of Daly City[a]	5.08	4.90 – 7.32	-0.18 – 2.24
City of East Palo Alto	2.04	4.64	2.60
Estero Municipal Improvement District	5.62	6.20 – 6.80	0.58 – 1.18
Guadalupe Valley Municipal Improvement District	0.3	0.72	0.42
City of Hayward	17.61	27.95	10.34
Town of Hillsborough	3.56	3.70	0.14
Los Trancos County Water District[d]	0.11	0.16	0.05
City of Menlo Park[g]	3.57	4.54	0.97
Mid-Peninsula Water District	3.46	3.70	0.24
City of Millbrae	2.47	3.19	0.72
City of Milpitas[a]	6.83	8.20	1.37
City of Mountain View[a]	10.97	13.20	2.23
North Coast County Water District	3.45	3.61 – 3.80	0.16 – 0.35
City of Palo Alto[a]	13.19	13.00	-0.19
Purissima Hills Water District	2.2	3.22	1.02
City Redwood City[a,e]	11.64	11.60 – 12.60	-0.04 – 0.96
City of San Bruno[a,c]	2.7	4.30	1.60
City of San Jose (North)[a,c,f]	4.42	6.34	1.92
City of Santa Clara[a]	3.84	4.90	1.06
Skyline County Water District	0.17	0.30	0.13
Stanford University[a]	2.36	4.20	1.84
City of Sunnyvale[a]	9.69	12.10	2.41
Westborough Water District	1.02	1.03	0.01
Subtotal, Wholesale Customers	171	204 – 209	34 – 38
Retail Customers	90	80 – 91	-10 – 1
Total, SFPUC Regional Water System Customers	**261**	**284 – 300**	**24 – 39**

NOTES: 1. Numbers may not sum due to rounding.
2. One additional wholesale customer, Cordilleras Mutual Water Users Association, did not participate in the study because they are a finite group (18 single-family homes) with minimal usage (4,600 gallons per day).

[a] Wholesale customer that currently receives water supplies from sources other than the SFPUC, including local groundwater, local surface water, recycled water, and other sources of supply.
[b] CWS = California Water Service Company
[c] Wholesale customer that currently receive water supplies from other sources but projects receiving only SFPUC water by 2030 (assuming the high-range purchase estimate where a range is given).
[d] The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports (URS, 2004a; URS, 2004c).
[e] In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.60 mgd due to anticipated implementation of 1 mgd of recycled water in 2030. The high-range purchase estimate total of 300 mgd published in URS 2004b remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies.
[f] Portion of north San Jose only.
[g] Menlo Park purchased 96 percent of its 2001/2002 supply directly from the SFPUC; the balance of its 2001/2002 purchases also came from the SFPUC regional system, but was purchased from East Palo Alto. Menlo Park projects that it will purchase all of its 2030 supply directly from the SFPUC.

SOURCES: URS, 2004c; City of Redwood City, 2005; Westborough Water District, 2007.

To develop projections of future water demand in the wholesale customer service area, the SFPUC employed a model called the Decision Support System (DSS) model. The DSS model involves breaking down existing water use by customer type (residential or nonresidential) into detailed water end uses,[17] and then uses population and employment projections to develop residential and nonresidential account growth rates for projecting future water demand by end use. Water demand projections for the SFPUC retail service area were developed using a similar end-use model. The retail model, however, used composite employee water use rates (gallons per employee per day) with Association of Bay Area Governments (ABAG) industry-specific employment projections to project nonresidential water demand (rather than using employment forecasts to develop nonresidential account growth rates). The SFPUC selected the end-use models over other forecasting methods (e.g., forecasting water use by land use type in gallons per acre per day or on a simple per capita basis) because they allow for a more accurate representation of changing conditions, such as the future impact of plumbing and appliance codes and the effects of additional specific-use planned conservation (URS, 2004a).

Existing Water Demand

A key first step in water demand forecasting is developing accurate estimates of existing water demand (i.e., base-year conditions). Establishing base-year conditions for the end-use models entailed the following steps:

- Selecting the appropriate base year
- Developing water-use data
- Calibrating end uses for that year

The demand projection studies were initiated in the fall of 2002. The year 2001 was selected as a representative base year for the wholesale customer service area because water use data in 2001 showed less influence of the recession than did 2002 data, and because 2001 was a typical year in terms of rainfall. (Complete data were not available for 2003 since the wholesale customer demand study was undertaken that year.) The year 2000 was used as the base year for the SFPUC retail service area demand study because this year provided the best available data.

Customer billing data, along with published information on demographics and housing stock from sources such as the California Department of Finance and U.S. Census Bureau, were used to develop base-year water use, by end use, and plumbing fixture conditions. Base-year parameters, such as the average number of water users per household and per nonresidential account and the percentage of non-water-efficient toilets, were estimated for each service area.

[17] For example, for single-family and multifamily residential customers, water use was subdivided into indoor and outdoor use and then estimated for up to eight indoor end uses (e.g., toilets, showers, faucets, baths, clothes washers, etc.) and up to five outdoor end uses (e.g., irrigation, pools, etc.).

Projecting Future Demands

Once base-year conditions were estimated, the models were set up to project future water use through 2030. Account growth rates were developed for residential and nonresidential accounts using published population and employment projections, respectively. Each wholesale customer was asked to select the published population projection source to be used for its service area, and was asked to ensure that the employment and population projections were based on land use plans relevant to its service area. Most (19 of 30 wholesale customer entities[18]) selected *Projections 2002*, ABAG's current projections series at the time. Other wholesale customers selected from among the following sources: Annual Survey conducted by BAWSCA (known as the Bay Area Water Users Association [BAWUA] when the surveys cited were conducted) (3 customers); urban water management plans (3 customers); selected city planning sources (2 customers); another service area planning study (1 customer); a draft general plan (1 customer), and a water master plan (1 customer). Citywide planning estimates were used for the SFPUC retail service area population projections. *Projections 2002* was used as the source of employment projections for most of the SFPUC wholesale customers and was used in developing nonresidential demand for the retail service area.

Conservation Potential

As part of the modeling effort, the SFPUC also evaluated future water conservation potential in the wholesale and retail service areas (Hannaford and Hydroconsult, 2004; URS, 2004b). The evaluation considered the effects of implementation of existing plumbing code requirements for conservation practices on existing and future water users and continuation of existing conservation practices, as well as additional indoor and outdoor conservation measures for residential and non-residential customers that could feasibly be implemented. In the wholesale service area, the total water savings potential ranged from about 7.7 mgd to 19.6 mgd in 2030, not including the 25.4-mgd savings from effects of the plumbing codes. In the SFPUC retail service area, the total water savings potential ranged from about 0.64 mgd to 4.45 mgd in 2030, not including the 10.3-mgd savings from effects of the plumbing codes.

Although it is difficult to quantify water savings resulting from existing or historical conservation programs, substantial and sustained decreases in per-capita water demands were observed following the 1976–1977 and 1987–1992 droughts (of approximately 26 percent in the wholesale customer service area and over 22 percent in the retail service area) (RMC, 2003). The low range of conservation potential noted above represents the forecasted 2030 water savings associated with a continuation of the conservation measures currently being implemented. The high range of conservation potential presented above represents the outer range of feasible and cost-effective conservation programs.

[18] There are 27 wholesale customers that are members of BAWSCA; however, the background studies consider the three California Water Service Company districts and the former Los Trancos County Water District (now part of CWS–Bear Gulch District) as distinct entities.

Recycled Water Potential

The SFPUC evaluated recycled water potential by considering existing recycled water programs, plans to expand uses in the future, and the amount of potable water that could potentially be offset by future recycled water uses. The studies indicated that there is a range of about 47 to 53 mgd in potential for recycled water use in the wholesale and retail service areas, including current plus additional uses through 2020 (RMC, 2004). The *Recycled Water Master Plan* (RMC, 2006) assesses the technical feasibility of recycled water projects in the westside area of San Francisco; it identifies projects with the potential to provide approximately 6.2 mgd of recycled water to irrigate Golden Gate Park, Lincoln Park, Harding Park, the San Francisco Zoo, San Francisco State University, and other locations, as well as provide a supplemental water supply for Lake Merced. The first phase of projects identified in the report would provide 4.1 mgd of recycled water to this area (RMC, 2006). These San Francisco projects are included in the total SFPUC service area recycled water potential of 47 to 53 mgd in 2020 (RMC, 2004). It should be noted, however, that during the project planning and design phase of recycled water projects, the recycled water potential of specific users will be refined and could potentially be reduced. As such, it is assumed that 100 percent of these specific users' demand represents an offset in potable surface water supplies and that could be met by other appropriate sources of alternative water supply such as groundwater and/or stormwater if recycled water is deemed inappropriate for the specified use (SFPUC, 2008a).

[Additional discussion on the demand projections, conservation, and recycling assumptions was prepared in response to comments on the Draft PEIR. Please, refer to Section 14.2, Master Response on Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14) and to Section 15.4, Response SI_PacInst, responses to the letter from Pacific Institute (Vol. 7, Chapter 15).]

Purchase Estimates

Upon completion of the demand, conservation, and recycled water studies, the wholesale customers and the SFPUC (for the retail service area) submitted their best estimates of purchases from the SFPUC regional system in 2030. The purchase estimates incorporate the customers' expected 2030 conservation savings (shown in Table 3.3). As the table indicates, some customers provided an estimated range of purchases. The high-range estimate of 300 mgd was used for planning purposes to establish the delivery reliability and water supply objectives for the proposed program, as described below.

3.4.5 Draft Water System Improvement Program

From October 2004 to January 2005, the SFPUC held a series of public workshops to present the results of the planning and engineering studies conducted for the development of the proposed program. At the final workshop, the SFPUC Commission established guidance on the proposed performance standards and levels of service to serve as the basis for WSIP (described in Section 3.3). The SFPUC staff incorporated the performance standards and levels of service selected by the Commission into the proposed program and completed the *Water System*

Improvement Program in February 2005 (SFPUC, 2005a). This document was submitted to the San Francisco Planning Department for preparation of this PEIR, and a follow-up report documenting the proposed program in response to AB 1823 legislation was completed in March 2005 (SFPUC, 2005b). Following development of the level of service objectives published in the February 2005 report, the SFPUC continued to conduct technical and engineering assessments to evaluate and refine the program as needed. The Commission adopted refinements to the WSIP in November 2005, and the SFPUC completed a revised WSIP program description (SFPUC, 2006a) along with the required AB 1823 report (SFPUC, 2006b) in January 2006. These program description documents, together with supplemental information on the facility improvement projects and the proposed water supply option developed by the SFPUC (SFPUC, 2007a), provide the basis for the proposed program analyzed in this PEIR.

3.4.6 WSIP Project Refinement and Other WSIP Components

In addition to presenting the WSIP goals and objectives (described in Section 3.3), the draft WSIP program description issued in January 2006 included 34 facility improvement projects in five regions plus two systemwide projects; it focused on regional projects and did not include the San Francisco (local) projects to be funded through the WSIP bond measure. Since that time, the SFPUC has continued to develop and refine the WSIP projects identified in 2006. This refinement has resulted in the minor reclassification of some proposed facility improvement projects as well as identification by the San Francisco Planning Department of some regional projects that could proceed independently of projects and actions included in the PEIR. As explained earlier, for budgeting purposes, the SFPUC classifies as part of the WSIP all projects and actions that are or will be funded through the 2002 voter-approved bond measure, including projects analyzed in this PEIR as well as other projects and activities.

The SFPUC has identified the following projects for funding through the WSIP bond measure; these projects are listed below in six categories:

A. **Key Regional Projects** considered as part of a program pursuant to CEQA requirements and authorizations and analyzed as a program in this PEIR (the reference to WSIP and WSIP project or facilities in the PEIR refers to these projects and activities).

1. Advanced Disinfection
2. Tesla Portal Disinfection Station
3. Lawrence Livermore Supply Improvements
4. San Joaquin Pipeline System
5. Rehabilitation of Existing San Joaquin Pipelines
6. Alameda Creek Fishery Enhancement
7. Calaveras Dam Replacement
8. Additional 40-mgd Treated Water Supply
9. New Irvington Tunnel
10. Sunol Valley Water Treatment Plant (SVWTP) – Treated Water Reservoirs
11. San Antonio Backup Pipeline
12. Bay Division Pipeline Reliability Upgrade
13. Bay Division Pipelines Nos. 3 and 4 Crossovers
14. Seismic Upgrade of Bay Division Pipelines Nos. 3 and 4 at Hayward Fault
15. Baden and San Pedro Valve Lots Improvements
16. Crystal Springs/San Andreas Transmission Upgrade
17. Harry Tracy Water Treatment Plant (HTWTP) Long-Term Improvements
18. Lower Crystal Springs Dam Improvements
19. Pulgas Balancing Reservoir Rehabilitation
20. San Andreas Pipeline No. 3 Installation
21. Local and Regional Groundwater Projects
22. Recycled Water Projects

The PEIR evaluates the SFPUC's proposed water supply option to meet its identified water delivery needs and, at a programmatic level of detail, the key regional facility improvement projects listed above that the SFPUC proposes to construct to meet system performance goals and level of service objectives. These projects are described in Table 3.10 and

Appendix C. In addition, where necessary, project-level CEQA review will be conducted for the facility improvement projects evaluated in this PEIR.

In Sections 4.17 and 5.7, the PEIR analyzes whether the other projects funded through the 2002 voter-approved bond funds that are listed below have the potential to contribute to cumulative impacts in combination with impacts associated with the facility improvement projects evaluated in the PEIR and other reasonably foreseeable future projects.

B. **Regional Projects** that are determined to be independent of the Program for CEQA purposes and are not analyzed as part of the program in this PEIR:

1. Alameda Siphons
2. San Antonio Pump Station Upgrade
3. Pipeline Repair and Readiness Improvements
4. Standby Power Facilities
5. BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault
6. SFPUC/EBMUD Intertie
7. Installation of SCADA System – Phase 2 & System Security Upgrades
8. Adit Leak Repair – Crystal Springs/Calaveras
9. Capuchino Valve Lot Improvements
10. Cross Connection Controls
11. New Crystal Springs Bypass Tunnel
12. HTWTP Short-Term Improvements
13. Crystal Springs Pipeline No. 2 Replacement
14. Sunset Reservoir Upgrades – North Basin
15. University Mound Reservoir Upgrades – North Basin

In September 2005, the Notice of Preparation (NOP) on the WSIP PEIR identified most of the projects listed above as projects that might undergo environmental review independent of and possibly in advance of the PEIR (refer to the NOP in Appendix A of this PEIR for brief descriptions of these projects). As a result of reclassification of projects and program refinement since the issuance of the NOP, the San Francisco Planning Department has determined that three other projects not listed in the NOP as such are appropriate for environmental review separate from the PEIR: Alameda Siphons (previously classified as part of the Irvington Tunnel project), San Antonio Pump Station Upgrade and Capuchino Valve Lot Improvements. The Planning Department is preparing or has completed environmental review for all of the projects listed above separate from the PEIR, and the SFPUC has already implemented some of the projects. The Planning Department has determined that these projects may appropriately proceed with environmental review in advance of completion of the WSIP PEIR for several reasons: (1) these projects are necessary irrespective of whether the SFPUC approves the overall WSIP goals and objectives or any other WSIP facility project; (2) construction of the particular project will not increase the normal operating or delivery capacity of the SFPUC's regional system, change the manner in which water is dispersed, increase the storage capacity of the system, or increase or alter the nature of any treatment capacity of the system; (3) these projects do not commit the SFPUC to any other WSIP project; and (4) any cumulative impacts associated with the individual project can be and are adequately addressed by the analysis in the individual environmental review documents. Although the independent utility projects may contribute to the overall reliability of the regional water system, the primary purpose of these projects is to rehabilitate existing facilities and provide flexibility for maintenance and emergency response.

Subsequent to Draft PEIR publication in June 2007 and based on more detailed project information, the San Francisco Planning Department determined that five additional regional WSIP projects, previously identified as Key Regional Projects in category A above, could appropriately proceed with environmental review independent of the WSIP PEIR: Rehabilitation of Existing San Joaquin Pipelines, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, and Pulgas Balancing Reservoir Rehabilitation (all phases). Thus, these five additional projects have been determined to have independent utility from the overall program analyzed in the WSIP PEIR (SFPUC, 2008b) and can undergo environmental review independent of and possibly in advance of the PEIR.

C. **Local Projects** are located in San Francisco and would only affect the San Francisco component of the water system. These projects entail upgrades to pump stations, reservoir facilities, water transmission lines, and tanks in addition to other similar actions. Environmental review is complete for most of these projects, and many of the projects have been or are in the process of being implemented.

D. **WSIP-Related Activities**, including the Watershed Environmental Improvement Program, Habitat Reserve Program, and Regional Desalination Feasibility Project, which are described in Section 3.12 of this chapter, are in the preliminary planning phase and will be subject to separate CEQA review when they are further defined.

E. **Regional Recycled Water Projects** (note that these are different than the project #22, Recycled Water Projects, listed above under A). The SFPUC expects that some recycled water projects that would be located outside of San Francisco will be developed in coordination with other jurisdictions. As these projects are developed and designed, they will be reviewed to determine the appropriate lead agency and level of environmental review.

F. **Bay Division Pipeline No. 4 Slipline PCCP Sections – Condition Assessment** was identified in the draft 2006 WSIP and NOP as a pipeline rehabilitation project, but has since been redefined and is limited to the assessment of the condition of sections of Bay Division Pipeline No. 4 where vulnerable prestressed concrete cylinder pipe (PCCP) currently exists. No construction activities are proposed at this time. Physical work needed for the assessment, if any, is expected to be minimal and exempt from CEQA.

3.4.7 WSIP PEIR Components

As explained above, the program analyzed in this PEIR consists of the following: a proposed water supply option for both drought and nondrought periods; 22 key regional facility improvement projects, as listed above in Section 3.4.6; and a proposed system operations strategy that would incorporate the proposed facility improvement projects into the existing system and would allow the SFPUC to exercise the proposed water supply option as needed, either to serve dry-year needs or increases in customer purchase requests through 2030.

The proposed levels of service established to achieve the WSIP goals and service performance objectives are discussed below in Section 3.5. The proposed water supply option is presented in Section 3.6, followed by the proposed changes in system operations (Section 3.7). Sections 3.8 through 3.11 describe the key regional facility improvement projects analyzed in the PEIR for implementation under the WSIP, including the facility locations, components, and construction requirements.

3.5 Proposed Levels of Service to Achieve Program Objectives

The WSIP includes proposed levels of service for the regional water system, which are intended to further define the system performance objectives through 2030 and to provide design criteria for the facility improvement projects. The proposed levels of service address the following categories: water quality, seismic reliability, delivery reliability, and water supply. **Table 3.5** summarizes the proposed changes in levels of service with implementation of the WSIP as compared to existing conditions.

TABLE 3.5
EXISTING AND PROPOSED REGIONAL SYSTEM LEVELS OF SERVICE[a]

Operating Parameter	Existing Level of Service (2005)	Proposed Level of Service with WSIP (2030)
Water Quality	Meet all existing local, state, and federal water quality requirements	Meet all local, state, and federal water quality requirements in 2030
Seismic Response After Major Earthquake	Not defined	Provide basic service[b] of 229 mgd within 24 hours; average-day service of 300 mgd within 30 days
Delivery During System Maintenance	Not defined	Average-day demand of 300 mgd
Average Annual Water Supply	265 mgd	300 mgd[c]
Regional System Firm Yield[d]	219 mgd[d]	256 mgd
Drought-Year Rationing	No maximum limit to rationing	Up to 20 percent systemwide rationing

[a] Level of service flow rates are defined on a systemwide basis and are not specific to any customer turnout.
[b] Basic service is defined as winter-time delivery (estimated to be 229 mgd in 2030). The performance objective is to provide delivery to at least 70 percent of the turnouts in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively (Parsons, 2006).
[c] Includes 10 mgd from conservation, recycled water, and groundwater supply programs in San Francisco.
[d] System firm yield is defined as the average annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Currently, due to operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam in 2001, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

SOURCES: SFPUC, 2006a; Parsons, 2006.

3.5.1 Water Quality Level of Service

The purpose of the water quality level of service goals is to ensure compliance with all existing and anticipated federal, state, and local drinking water requirements as well as to provide systemwide watershed management. The regional system currently meets or exceeds existing water quality standards. Existing water quality requirements applicable to the regional system are summarized in Chapter 2, Section 2.4.

The WSIP includes provisions to enhance the SFPUC's ability to maintain compliance with water quality standards under a range of operating conditions, including catastrophic events such as a major earthquake. Projects are proposed to improve both of the regional treatment plants. In addition to supporting the objective of maintaining the filtration avoidance status for Hetch Hetchy water, ongoing/proposed system operations would include continued implementation of source water protection and systemwide watershed management and protection. The Watershed and Environmental Improvement Program (see Section 3.12 for further description) is a related WSIP activity that would further support these objectives.

In addition, implementation of the WSIP would allow the SFPUC to comply with the recently approved Long Term 2 Enhanced Surface Water Treatment Rule (approved in January 2006). The U.S. Environmental Protection Agency established this regulation to reduce disease incidence associated with *Cryptosporidium* and other pathogenic microorganisms in systems that use surface water. This rule includes requirements for all unfiltered systems to treat for *Cryptosporidium*, with the required degree of treatment depending on the source water contamination level. Dates for implementation of this rule depend on the size of the system as well as the source water conditions. The WSIP includes the Advanced Disinfection project (see Section 3.8 for further description) to address the requirements of this rule.

Proposed federal regulations that could affect the SFPUC in the future include the following (the date in parentheses indicates when the regulation was proposed):

- Proposed Ground Water Rule (August 9, 2000)
- Proposed Radon in Drinking Water Rule (November 2, 1999)

The SFPUC's current plans for developing groundwater supplies take into account the proposed Ground Water Rule (see Groundwater Projects, described in Section 3.8), and no significant modification of the WSIP groundwater projects would be needed in the event the rule is adopted. Specifically, the groundwater sources planned for development have been tested and are typically free of bacteria. Nonetheless, the SFPUC would disinfect (with chlorine) all groundwater prior to blending with regional system supplies and distribution to customers, thus adding an additional protective barrier. Furthermore, the SFPUC would conduct regular groundwater monitoring and implement a wellhead protection program to provide further protection. All of these activities would be consistent and ensure compliance with the proposed Ground Water Rule.

The proposed Radon in Drinking Water Rule applies only to systems using groundwater sources. Surface water systems are not affected. At this time, no significant modifications of the WSIP groundwater projects are expected in the event the rule is adopted. The SFPUC will coordinate closely with the U.S. Environmental Protection Agency and California Department of Health Services regarding the regulatory requirements associated with the Radon Rule, and their application to the WSIP groundwater projects, to ensure compliance.

Other water quality regulations of significance to the SFPUC could include the Stage 2 Disinfectants and Disinfection Byproducts Rule, Candidate Contaminant List, California Action Levels, and California Public Health Goals. The SFPUC will address these regulations as appropriate as part of its ongoing operations as well as to ensure consistency with the WSIP water quality levels of service.

3.5.2 Seismic Reliability Level of Service

The WSIP goal for seismic reliability is to reduce the regional system's vulnerability to earthquakes, thereby ensuring water service to customers within a defined period following a major earthquake. As described above in Section 3.4.2, the SFPUC conducted an extensive series of facility reliability and system performance studies, and presented the results to the SFPUC Commission during 2004 to 2005; in January 2005, the Commission selected the levels of service to be achieved under the WSIP.

To improve the seismic reliability of the regional system, critical facilities would be upgraded to meet current seismic standards, thereby improving their ability to withstand seismic damage and reducing the overall vulnerability of the system to earthquake damage. For planning purposes, the earthquake scenarios used to develop seismic upgrade criteria are the largest earthquakes likely to be generated on each of the three major faults—the San Andreas, Hayward, and Calaveras faults—as defined by the U.S. Geological Survey. The seismic upgrade criteria take into account how critical each facility is to the system in restoring customer service following an earthquake. The proposed program would establish seismic criteria appropriate to individual facilities to achieve the required level of seismic reliability in the most cost-effective manner (SFPUC, 2004a).

In addition to upgrading critical facilities to meet current seismic standards, the proposed level of service for seismic reliability addresses the ability of the SFPUC to restore disrupted service after an earthquake, as shown in Table 3.5. The WSIP would provide basic service to the service area within 24 hours after a major earthquake and average-day service within 30 days after a major earthquake. Basic service is defined as average, monthly winter usage, which is projected to be 229 mgd systemwide in 2030. This level of service was broken down for the three customer groups in the service area, with basic service levels of 104, 44, and 81 mgd established for the East/South Bay, Peninsula, and San Francisco regions, respectively. The system performance objective for this level of service is to provide delivery to at least 70 percent of the customer turnouts within each customer group. Assuming that resources, repair materials, and roadway access are available, this level of service would restore delivery of average-day demand to each customer group within 30 days after a major earthquake, which is estimated to be 300 mgd systemwide in 2030. To achieve this level of service, the proposed program includes provisions for redundant facilities, backup/standby power, and stockpiling of supplies/equipment to expedite emergency repairs.

Under the WSIP, the increased level of operational flexibility would also improve the system's overall ability to respond and restore service following an earthquake. As described below for water delivery reliability, the restored water storage capacity in the Bay Area reservoirs proposed under the WSIP would also provide increased seismic reliability for the system, since it would allow water service to resume more rapidly and reliably following a seismic event.

The SFPUC conducted a system assessment to evaluate and compare the performance of the existing system with that of the future system under the WSIP in terms of the system's ability to meet the level of service objectives for seismic reliability (Parsons, 2006). **Table 3.6** presents the results of the performance analysis. Although the model estimates have an estimated uncertainty of 10 percent, the results show a vast improvement in system performance with implementation of the WSIP in all categories. The model results indicate that a major earthquake on the San Andreas, Hayward, or Calaveras fault under existing conditions would result in a drastic disruption of service to all customer groups, and that the ability of the system to recover following an earthquake would be limited. A major earthquake on these faults would result in failure of critical facilities and prolonged outages; customers could be without service for more than 14 days and possibly more than 30 days. With construction and implementation of facility improvement projects under the WSIP, all level of service objectives for seismic reliability would be met or exceeded.

3.5.3 Delivery Reliability Level of Service

The water delivery reliability goal addresses the overall operations of the system with regard to its ability to deliver water to customers under a variety of operating conditions. The goal is to increase the reliability of the regional system to meet customer demand under a range of operating conditions, such as reservoir replenishment requirements during planned maintenance,

TABLE 3.6
SYSTEM ASSESSMENT FOR SEISMIC RELIABILITY LEVELS OF SERVICE[a]

Operating Parameter	WSIP Level of Service Objective[b]	Existing System Performance	Future System Performance with WSIP[c]
Delivery After a Major Earthquake, Total System			
San Andreas Fault	229 mgd	**<30 mgd**	267 mgd
Hayward Fault	229 mgd	**<30 mgd**	278 mgd
Calaveras Fault	229 mgd	**<30 mgd**	297 mgd
Percent of Turnouts Receiving Basic Service After a Major Earthquake, Total System			
San Andreas Fault	70%	**<10%**	79%
Hayward Fault	70%	**<10%**	92%
Calaveras Fault	70%	**<10%**	96%
Post-Earthquake Recovery, Delivery 30 Days After a Major Earthquake, Total System			
San Andreas Fault	300 mgd	**255 mgd**	463 mgd
Hayward Fault	300 mgd	**120 mgd**	463 mgd
Calaveras Fault	300 mgd	378 mgd	463 mgd

NOTE: Boldface type indicates scenarios that would fail to meet the level of service objective.

[a] The earthquake scenarios analyzed were: San Andreas fault—magnitude 7.9 event; Hayward fault—magnitude 7.3 event; Calaveras fault—magnitude 6.9 event.
[b] The level of service objective following a seismic event is defined as: (1) basic service equivalent to average winter-month demand, or 229 mgd, within 24 hours, and (2) average-day demand, or 300 mgd, within 30 days.
[c] Note that future performance indicates greater capacities under the WSIP than the level of service objective of 300 mgd. This is because facilities are sized to meet peak-day demand; 2030 peak-day demand is estimated to be 463 mgd.

SOURCE: Parsons, 2006.

unplanned outages, and loss of any one water source. As described above in Section 3.4.2, the SFPUC conducted an extensive series of facility reliability and system performance studies, and presented the results to the SFPUC Commission during 2004 to 2005; in January 2005, the SFPUC Commission selected the levels of service to be achieved under the WSIP, including measures of the reliability of the regional system to deliver water. As summarized in Table 3.5, the proposed system performance and level of service objective for delivery reliability is 300 mgd for 2030 under the following conditions:

- *Maintenance Conditions*. This scenario measures how much water the system can deliver when one key facility is shut down for planned maintenance at the same time that an unplanned outage occurs. SFPUC operations staff identified the following 12 key facilities affecting delivery reliability: the Harry Tracy and Sunol Valley WTPs; Coast Range, Irvington, Pulgas, and Stanford Tunnels; Crystal Springs Pump Station; Bay Division Pipeline No. 4; San Joaquin Pipeline No. 3; Crystal Springs Bypass Pipeline; San Andreas Pipeline No. 2; and the proposed Bay Division Pipeline No. 5 Tunnel. Although all facilities in the system require planned maintenance at some point, these 12 facilities were selected because they would have the most impact on deliveries during shutdown. Furthermore, it was determined that analyzing these 12 critical facility shutdowns would capture the most significant maintenance condition impacts (Parsons, 2006). The WSIP level of service objective was analyzed based on the shutdown of each of these 12 facilities for maintenance combined with one unplanned outage on one pipeline reach of the Bay Division or San Joaquin Pipelines.

- *Delivery During a Hetch Hetchy Water Quality Event*. This scenario measures how much water the system can deliver in the event of a Hetch Hetchy water quality event. During such an event, the system is required to supply up to 300 mgd of water for treatment at the Harry Tracy and Sunol Valley WTPs. The Harry Tracy WTP would treat a sustained capacity of 140 mgd from the Peninsula reservoirs, while the Sunol Valley WTP would treat a sustained capacity of 160 mgd from some combination of Hetch Hetchy and Alameda sources. System delivery during this type of event is not dependent on operating capacity in the San Joaquin Pipelines.

- *Delivery Impacts Due to Unplanned Outages*. This scenario measures the ability of the system to deliver water when one water source is unavailable. It examines the scenarios with either Hetch Hetchy water, Sunol Valley WTP, or Harry Tracy WTP out of service. The level of service objective is to achieve a systemwide delivery capacity of average-day demand with one water source unavailable.

The SFPUC conducted a system assessment to evaluate and compare the performance of the existing system with that of the future system under the WSIP in terms of the system's ability to meet the level of service objectives for delivery reliability (Parsons, 2006). **Table 3.7** presents the results of the performance analysis.

As indicated in Table 3.7, the regional system under existing conditions cannot meet comparable level of service targets for delivery under most scenarios analyzed. For planned maintenance conditions with one critical facility shutdown concurrently with one unplanned outage, the existing system could not meet average daily demand if any one of the following five critical facilities were shut down for maintenance: the Harry Tracy WTP, Sunol Valley WTP, Irvington Tunnel, Coast Range Tunnel, or Bay Division Pipeline No. 4. However, with implementation of the WSIP, the level of service objective of total system delivery of average-day demand (300 mgd) would be met for all of the critical maintenance conditions.

The system assessment also determined that the existing system would be unable to deliver the average annual demand to customers during a water quality event in the Hetch Hetchy supply for the full range of flow scenarios. Different flow rates were evaluated because system deficiencies vary depending on the flow rate. However, with implementation of the WSIP, the level of service objective of total system delivery of average-day demand (300 mgd) would be met or exceeded for all flow rates.

Delivery impacts due to unplanned outages were also evaluated as a measure of delivery reliability of the system. The system assessment showed that if there were an unplanned outage of the Hetch Hetchy supply under the existing system, the SFPUC could not meet customer demand, since the systemwide delivery capability would be limited to 243 mgd. With implementation of the WSIP projects, this delivery capability would increase to 313 mgd, surpassing the level of service objective.

TABLE 3.7
SYSTEM ASSESSMENT FOR DELIVERY RELIABILITY LEVELS OF SERVICE
(mgd)

Operating Parameter	WSIP Level of Service Objective[b]	Existing System Performance	Future System Performance with WSIP[c]
Delivery During Planned Maintenance with one critical facility shutdown and one unplanned outage[a]			
Harry Tracy WTP Shutdown	300	**273**	359
Sunol Valley WTP Shutdown		**273**	339
Irvington Tunnel Shutdown		**111**	463
Coast Range Tunnel Shutdown		**231**	313[e]
Pulgas Tunnel Shutdown		367	409
Bay Division Pipeline No. 4 Shutdown		**270**	405
San Joaquin Pipeline No. 3 Shutdown		313	421
Crystal Springs Pump Station Shutdown		350	436
Crystal Springs Bypass Pipeline Shutdown		379	463
San Andreas Pipeline No. 2 Shutdown		393	463
Stanford Tunnel Shutdown		344	463
Bay Division Pipeline No. 5 Shutdown[d]		N/A	409
Delivery During a Hetch Hetchy Water Quality Event			
Hetch Hetchy flow rate 70 mgd	300	**243**	313[e]
Hetch Hetchy flow rate 150 mgd		**213**	313[e]
Hetch Hetchy flow rate 230 mgd		**213**	313[e]
Hetch Hetchy flow rate 290 mgd		**213**	313[e]
Delivery Capacity Due to Unplanned Outages			
Hetch Hetchy outage	300	**243**	313[e]

NOTE: Boldface type indicates scenarios that would fail to meet the level of service objective.

a An unplanned outage is assumed to be the worst case of one reach of either the Bay Division or San Joaquin Pipeline out of service.
b The WSIP level of service objective for delivery reliability is defined as average-day demand, or 300 mgd.
c Note that future performance indicates greater capacities under the WSIP than the level of service objective of 300 mgd. This is because facilities are sized to meet peak-day demand; 2030 peak-day demand is estimated to be 463 mgd.
d One of the key regional facility improvement projects under the WSIP, the Bay Division Pipeline Reliability Upgrade.
e Based on completion of the Sunol Valley WTP, Harry Tracy WTP, groundwater/recycled water/conservation program, and partial delivery to Coastside County Water District from Crystal Springs Reservoir.

SOURCE: Parsons, 2006.

3.5.4 Water Supply Level of Service

The purpose of the SFPUC's water supply goal is to assure that the SFPUC has an adequate supply of water to deliver to customers during both nondrought and drought periods. For the purposes of this PEIR, the terms "nondrought period" and "drought period" are used as a simplified breakdown of the two basic hydrologic/meteorological conditions (a more detailed breakdown of hydrologic year types is provided in Chapter 5 of this PEIR). Most years are nondrought periods, which refers to typical years or sequences of years during which hydrologic/meteorological conditions can assure adequate SFPUC water supplies to fully meet customer purchase requests and to allow operation of the regional system in normal operating mode. Drought period refers to all other years or sequences of years, when hydrologic/meteorological conditions indicate that water supplies may not be adequate and the SFPUC needs to modify its operating procedures and implement drought response actions.

The WSIP level of service objectives for water supply are: (1) to fully meet customer purchase requests in nondrought years through the planning year 2030, estimated to be 300 mgd average annual delivery, and (2) to provide drought-year delivery with a maximum systemwide cutback of 20 percent in any one year of a drought. As described in Section 3.4.4, above, the SFPUC, in conjunction with its wholesale customers, conducted extensive studies to determine water demand projections, conservation and recycled water potential, and the extent to which customers receive water supplies from sources other than the SFPUC. The studies ultimately resulted in water purchase estimates from the regional system in 2030, with the wholesale customers projected to purchase 209 mgd and the retail customers projected to purchase 91 mgd, or a total estimated purchase request of 300 mgd. This formed the basis for the water supply level of service for nondrought years.

With respect to drought-year supply, the proposed level of service is to limit rationing to a maximum of 20 percent systemwide in any one year. This corresponds to a required system firm yield of 256 mgd in 2030. System firm yield is the average annual water delivery that can be sustained throughout an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes and for calculating system firm yield. The normal system firm yield is 226 mgd.[19] By 2030, with customer purchase requests of 300 mgd, the system firm yield needed to meet the WSIP goals and objectives to provide adequate water delivery in drought years is estimated to be 256 mgd—an increase of 30 mgd. (Under the current restricted operating condition that limits storage levels in Calaveras Reservoir, the system firm yield is 219 mgd, and an additional 37 mgd of system firm yield would be needed to meet the WSIP 2030 level of service objective of 256 mgd.) The proposed water supply option to meet the projected increase in water deliveries during nondrought and drought periods is described in Section 3.6, below.

3.5.5 Other Goals and Objectives

In addition to program goals in the areas of water quality, seismic reliability, delivery reliability, and water supply, Table 3.2 also lists program goals in the areas of sustainability and cost-effectiveness provided in the SFPUC's January 2006 WSIP description. The SFPUC has included these program goals as fundamental elements of the WSIP, although the WSIP does not establish quantitative levels of service for the sustainability and cost-effectiveness goals.

Enhancing sustainability is part of the SFPUC's ongoing watershed management and operational efforts and is not specifically or exclusively an element of the WSIP. The WSIP enhances sustainability by integrating and incorporating the sustainability objectives listed in Table 3.2 into each of the facility improvement projects. The SFPUC is also taking other actions indirectly related to the WSIP that support sustainability objectives, such as development of the Watershed and Environmental Improvement Program funded through WSIP bond financing (described further in Section 3.12, below, under WSIP Related Activities). The systemwide watershed management and enhancement activities are related to the water quality goals as well as to the overriding program principle of maintaining a clean, unfiltered water source from Hetch Hetchy

[19] Currently, due to operating restrictions imposed by the California Division of Safety of Dams in 2001 on the Calaveras Dam, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

Reservoir (see Chapter 2, Section 2.4, regarding the Surface Water Treatment Rule and Hetch Hetchy Reservoir) and maintaining a gravity-driven system.

Similarly, the WSIP integrates the cost-effectiveness goals listed in Table 3.2 in the planning, development, and design of facility improvement projects. The SFPUC has developed detailed preliminary cost information on the WSIP and its individual facility improvement projects, and the cost information is provided in the January 2006 program description (SFPUC, 2006a).

3.6 Proposed Water Supply Sources

To achieve the WSIP water supply level of service objectives to fully meet customer purchase requests in nondrought years through 2030 and to provide drought-year delivery with a maximum systemwide rationing of 20 percent, the WSIP's proposed water supply option specifies water sources during drought as well as nondrought periods. The proposed water supply option would serve the projected 35 mgd increase in average annual purchase requests through deliveries from the regional system and through conservation/recycled water/groundwater programs in San Francisco, while limiting customer rationing to a maximum of 20 percent systemwide in any one year.

SFPUC studies indicate that the SFPUC's existing water rights for the current water sources of the regional system in the Alameda, Peninsula, and Tuolumne River watersheds are sufficient to meet current and future water purchases in nondrought years, assuming restored storage capacity in the system's Bay Area reservoirs (SFPUC, 2007a). The SFPUC currently holds entitlements for sufficient water to meet 2030 purchase requests in nondrought years through increased Tuolumne River diversions that could supplement current Tuolumne River diversions and local watershed supplies. However, during drought periods, the SFPUC's existing water supply sources are insufficient to satisfy the WSIP water supply goal under 2005 purchase requests, and this shortage will become more severe by 2030 with the projected increase in purchase requests.

The facilities and facility improvement projects required to implement the proposed water supply option during both nondrought and drought periods are described in greater detail in Section 3.8 of this chapter. Key regional system facility improvements include: increasing SFPUC regional system transmission reliability and redundancy in the San Joaquin and Bay Division Pipelines; restoring full, historical storage capacity in the existing Crystal Springs and Calaveras Reservoirs; developing groundwater wells in San Francisco to supplement the regional water system as well as additional wells in northern San Mateo County to implement the regional groundwater conjunctive-use program; and constructing recycled water treatment facilities and associated distribution systems in San Francisco. Also needed is the implementation of a water recapture project on Alameda Creek, in accordance with the 1997 Memorandum of Understanding (MOU) between the SFPUC and the California Department of Fish and Game (CDFG), as described in Chapter 2, Section 2.3.4. The recapture project in itself would not increase the firm yield of the system; however, it is necessary to avoid the loss of yield since fishery releases from Calaveras Reservoir would be made as a part of the Calaveras Dam Replacement project and the recapture part would be conducted through the Alameda Creek Fishery Enhancement project (both are

WSIP facility improvement projects described in Section 3.8). In addition to these facility improvement projects, other WSIP facility improvement projects (also described in Section 3.8) would be needed to achieve the WSIP level of service performance objectives for water quality, seismic reliability, and delivery reliability the SFPUC has established for the regional system in nondrought and drought years.

3.6.1 Proposed Nondrought Water Supply

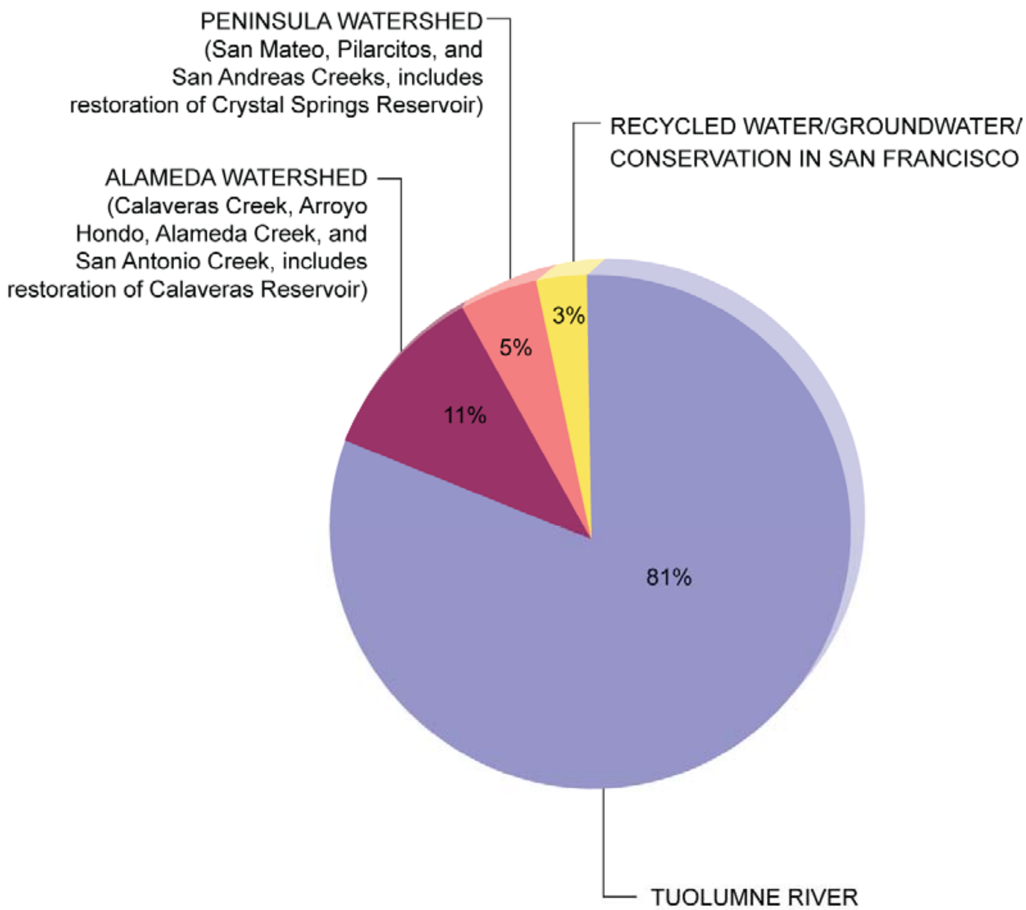
During years with nondrought conditions, the SFPUC proposes to meet the increased 35 mgd in purchase requests through a combination of conservation, water recycling, and groundwater supply programs in San Francisco and increased diversions from the Tuolumne River (SFPUC, 2007a).

Under the proposed WSIP water supply option, the SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply every year, including nondrought and drought periods. The SFPUC has determined that 10 mgd of additional supply (including demand management) could be met within San Francisco alone with projects that have already undergone completed preliminary planning phases. These projects would consist of about 2 mgd of local groundwater development, 4 mgd of recycled water projects, and 4 mgd of additional water conservation measures, as described below:

- *Local Groundwater Projects*. One of the WSIP facility improvement projects described in Section 3.8 involves installation of new groundwater production wells in the North Westside Groundwater Basin (located on the west side of San Francisco) to provide an average annual 2 mgd of potable water to augment the regional system water supply sources.
- *Recycled Water Projects*. One of the WSIP facility improvement projects described in Section 3.8 includes treatment, storage, and distribution facilities to provide about 4 mgd of recycled water to irrigation users on the west side of San Francisco based on preliminary estimates of recycled water demand. However, due to ongoing planning efforts and demand projection refinements, the project sizes may be reduced to match the refined demands (SFPUC, 2008a).
- *Additional Conservation Measures*. The SFPUC has identified additional conservation measures to provide about 4 mgd not already included in the 2030 San Francisco retail water demand projections, as summarized in the *2005 Urban Water Management Plan for the City and County of San Francisco* (SFPUC, 2005c). The additional measures were identified as Package C in the *Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004) and would be implemented using funding from the SFPUC operating budget.[20] These programs would be in addition to plumbing code savings of 10 mgd already accounted for in the 2030 purchase request for the retail service area (Hannaford and Hydroconsult, 2004).

[20] The study entitled *San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004) identified three conservation packages—Packages A, B, and C—based on the results of a benefit-cost analysis and identification of potential water conservation measures that either the SFPUC is currently implementing or other water agencies have considered or are currently implementing. Package A consists of the measures San Francisco is currently implementing, Package B includes all elements of Package A plus additional measures that reflect an expansion of the current conservation program, and Package C consists of Package B plus four additional measures. Package C represents an upper bound of conservation that is considered achievable and fundable. The reader is referred to that study for descriptions of specific conservation measures.

The SFPUC proposes to satisfy the remaining 25 mgd of increase in average annual purchase requests with increased use of Tuolumne River water under its existing water rights (see Chapter 2, Section 2.5.1, for discussion of CCSF water rights). The regional system would continue to maximize its use of local watershed water supplies. This increased level of diversions includes the additional deliveries needed to serve 2030 purchase requests as well as to maintain and maximize local storage for unplanned outages and drought needs. **Figure 3.3** depicts the various supply sources and their relative contributions of the proposed water supply option for typical years (nondrought).



Note: Water supply sources (average annual) based on 2030 conditions during nondrought conditions with 300 mgd in total customer deliveries and all WSIP facility improvement projects completed.

SFPUC Water System Improvement Program . 203287

Figure 3.3
WSIP Water Supply Sources, Nondrought Years

Although during nondrought years the SFPUC would be able to meet the increase in future purchase requests with its proposed conservation, water recycling, and groundwater supply programs and additional diversions from the Tuolumne River under existing entitlements, the nature of the proposed supplemental drought supplies would indirectly affect water supplies during nondrought years. For instance, implementation of a groundwater conjunctive-use program in the South Westside Groundwater Basin in San Mateo County would involve the use of regional system water in nondrought years to enable the storage of water from natural recharge for extraction during drought years. Also, the proposed water transfer agreement with TID and MID (described below) could be established to enable a transfer of water every year as an assurance, given the unpredictable nature of droughts in the region. These components of the proposed water supply option are further discussed in Section 3.6.2, below.

3.6.2 Proposed Drought Water Supply

Although the SFPUC can meet projected 2030 water purchases of 300 mgd from existing local supplies combined with existing and increased Tuolumne River diversions in nondrought years, these sources alone have not allowed for full water deliveries during past droughts and cannot be solely relied upon in the future for water deliveries during potential future droughts. During a drought, the SFPUC proposes to serve the 2030 purchase requests, while limiting customer rationing to a maximum of 20 percent systemwide in any one year, with a combination of: (1) existing local watersheds and Tuolumne River resources; (2) conservation, water recycling, and groundwater supply programs in San Francisco (implemented in all years, both drought and nondrought); (3) water transfers; (4) groundwater conjunctive-use programs; and (5) restoration of storage at Crystal Springs and Calaveras Reservoirs (SFPUC, 2007a). **Figure 3.4** depicts the proposed WSIP drought-period water supply described above. The proposed supplemental water sources and estimated amounts that would be developed under the WSIP for use during drought periods to increase the system firm yield from the current 219 mgd[21] to the proposed 2030 level of service of 256 mgd, are described below:

- *Water transfers*. Utilize up to an equivalent of 26 mgd (annual average over 8.5-year design drought) of supplemental Tuolumne River water through water transfer agreements with TID and MID.

  [Additional discussion on the proposed dry-year transfer was prepared in response to comments on the Draft PEIR. Please refer to Section 14.3, Master Response on Proposed Dry-Year Transfer (Vol. 7, Chapter 14).]

- *Restoration of Calaveras and Crystal Springs Reservoirs capacities*. Restore Calaveras and Crystal Springs Reservoirs to historical operational capacities. Restore the historical operating storage capacity at Crystal Springs Reservoir by an equivalent of 1 mgd of water (annual average over 8.5-year design drought) and restore Calaveras Reservoir capacity to provide a equivalent of 7 mgd of water (annual average over 8.5-year design drought).[22] The restoration of reservoir capacities would occur through two of the WSIP facility improvement projects, Lower Crystal Springs Dam Improvements and Calaveras Dam Replacement, as described in Section 3.8.

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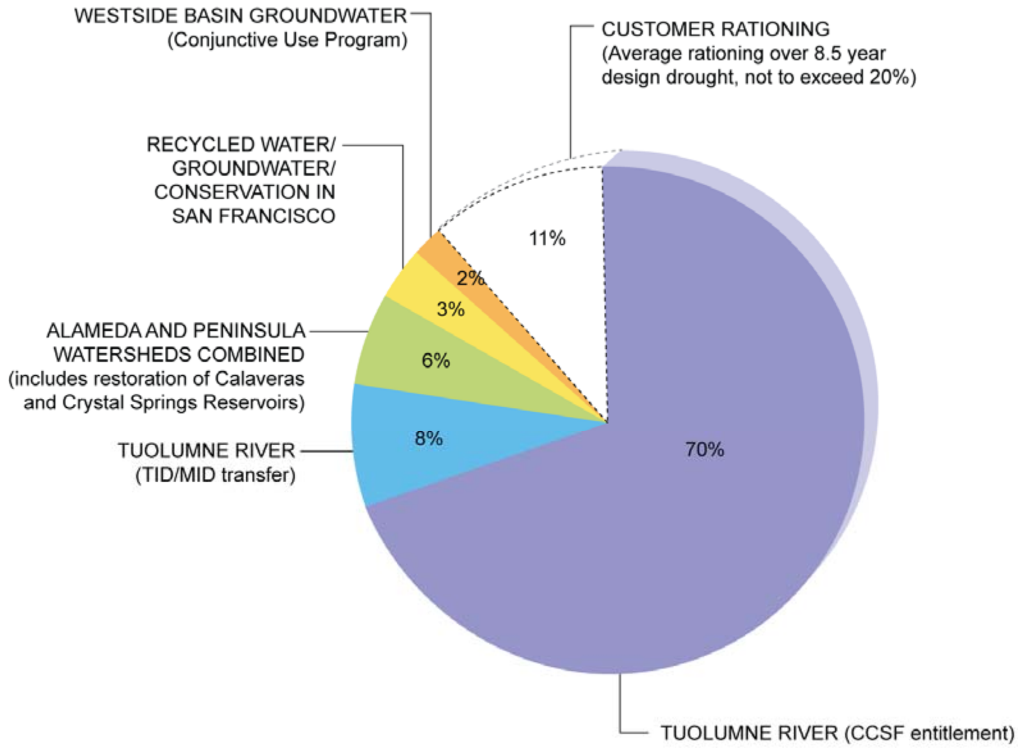
21 Currently, due to operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam in 2001, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

22 The 7 mgd of dry-year supply that would be provided by Calaveras Reservoir storage restoration has been considered in the normal system firm yield of 226 mgd.



Note: Water supply sources (average annual) over 8.5-year design based on 2030 conditions with 300 mgd in total customer deliveries and all WSIP facility improvement projects completed.

SFPUC Water System Improvement Program . 203287

Figure 3.4
WSIP Water Supply Sources, Drought Years

- *Groundwater conjunctive use*. Utilize the extraction component of a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County to provide the equivalent of approximately 6 mgd of water (annual average over 8.5-year design drought) through one of the WSIP facility improvement projects, Regional Groundwater Projects, as described in Section 3.8.

In drought years, the SFPUC would implement a multistep drought response program. Under this program, the initial response to a drought would be to initiate the extraction component of the above-described groundwater conjunctive-use program and to continue to fully deliver customer purchase requests during the initial response stage. If drought conditions were to persist, the groundwater extraction would be augmented with the water transfer, which might be sufficient to defer any additional response actions. If necessary, in combination with the supplemental water supplies and within the WSIP goals for drought periods, the SFPUC would then implement up to 20 percent systemwide rationing.

The water transfer program would entail agreements with TID and MID for a supplemental water supply for the SFPUC. Although there are no agreements currently in place, the SFPUC is pursuing this approach with TID and MID. For the purpose of developing the WSIP water supply option, SFPUC assumed that water in excess of TID and MID needs would be made available annually to the SFPUC. Since the SFPUC cannot directly divert water out of Don Pedro Reservoir, the transfer would be made through a mechanism that credits water to the SFPUC's "water bank account" in Don Pedro Reservoir (see Chapter 2, Section 2.5.2, for description of the water bank account). Such a credit would reduce the obligation of the SFPUC to release water from Hetch Hetchy facilities for downstream capture in Don Pedro Reservoir for TID and MID under the Raker Act (see Chapter 2, Section 2.5.1). This reduction in release obligation would lead to additional water being retained in Hetch Hetchy Reservoir, thus increasing the storage available for diversion to the Bay Area to serve drought-year demands. Due to the unpredictable nature of hydrologic conditions and the uncertainties in predicting the timing and duration of drought periods, a pragmatic assumption for the transfer agreement is that the water would be made available to the SFPUC every year regardless of hydrologic conditions, and the payment for the transfer could be structured accordingly. Therefore, the proposed water supply option assumes that the transfer would occur every year, and only during drought years, the SFPUC would be able to retain the additional water in Hetch Hetchy Reservoir so that it would be available to serve customer demands. The proposed water supply option assumes that the water transfer has been sized to provide 27,000 acre-feet as an annual credit to the water bank account of the SFPUC. This transfer would equate to 23 mgd of delivery yield during drought years (average over design drought).

The proposed program includes a facility improvement project to restore Crystal Springs Reservoir capacity; this project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection from the probable maximum flood as well as the maximum credible earthquake (as described in Section 3.8). Due to DSOD operational restrictions on the dam, the current capacity of the reservoir is limited to 58,400 acre-feet. The project would restore the historical reservoir capacity of 69,300 acre-feet. This additional storage capacity, once filled with local watershed runoff or Tuolumne River diversions during nondrought years, would be available for use during drought years. When delivered, the additional volume of stored water would equate to an additional 1 mgd of delivery yield during drought years (average over design drought).

Similarly, the WSIP includes a facility improvement project to restore the historical capacity of Calaveras Reservoir through the construction and operation of a replacement dam that meets seismic safety requirements (as described in Section 3.8). Due to DSOD operational restrictions on the dam, the current capacity of the reservoir is restricted to 37,800 acre-feet, and the project would restore the historical reservoir capacity of 96,800 acre-feet. This additional storage capacity, once filled with local watershed runoff, would be available for use during drought years, providing an additional 7 mgd of delivery yield during drought years (average over design drought).

The groundwater conjunctive-use program would provide up to 8,100 acre-feet per year[23] of drought supply to the SFPUC. In nondrought years, the SFPUC would deliver water to customers in northern San Mateo County in excess of their purchase requests. This water would be used by customers "in-lieu" of the groundwater they would normally have pumped to meet part of their demand. The substitution of this pumping with additional SFPUC deliveries would offset groundwater pumping and allow water to be "banked" in the Westside Groundwater Basin aquifer through natural recharge. During a drought, the initial drought response of the SFPUC would be to initiate the extraction of this banked water by these same customers coincident with a reduction in their purchase requests. The total volume of water to be banked during a succession of nondrought years is estimated to be approximately 61,000 acre-feet. This additional volume of water available (storage) would equate to an additional 6 mgd of delivery yield during drought years (average over 8.5-year design drought).

3.7 Proposed System Operations Strategy

Operation of the regional water system is affected by numerous factors, including fluctuations in customer demands; hydrologic and meteorological conditions; physical facilities and infrastructure capacity and maintenance requirements; and multiple institutional parameters. The WSIP addresses the condition of the physical facilities and infrastructure while also planning for and taking into account customer demand, hydrologic/meteorological conditions, and institutional parameters. Under the WSIP, general day-to day operation of the regional water system would essentially remain unchanged, but implementation of the program would allow refinements to the operations strategy to meet the WSIP goals and objectives, thereby increasing system reliability and providing additional flexibility for scheduling repairs and maintenance. The regional system operations would continue to comply with the conditions of all applicable institutional and planning requirements, including:

- Complying with all water quality, environmental, and public safety regulations
- Maximizing use of water from local watersheds
- Assigning a higher priority to water delivery over hydropower generation
- Meeting all downstream flow requirements

The WSIP goals and objectives have resulted in system operating goals and strategies for 2030 (SFPUC, 2007a; CDM, 2005; Parsons-CH2MHILL, 2006). Under the WSIP, the system would be operated to meet the following objectives:

- Optimize use of available supplies by maximizing: (a) use of local resources, (b) carryover storage, and (c) local storage to provide system reliability
- Provide drinking water that meets all regulatory standards

[23] The conjunctive use program has been designed to provide an extraction capacity of approximately 8,100 acre-feet during a dry year, equivalent to about 7 mgd, over 7.5 years. While the initiation of the extraction component of the conjunctive use program would occur as the first response to anticipated drought, the realization of a drought does not typically occur until the second year of a dry sequence. Thus, in the 8.5-year design drought, the extraction component of the conjunctive use program would only occur for 7.5 years. Groundwater pumping of about 7 mgd over 7.5 years is approximately equivalent in volume to 6 mgd over 8.5 years.

- Reliably deliver water to meet the demand of San Francisco, other retail customers, and wholesale customers
- Maintain the regional water system for the benefit of its retail and wholesale customers
- Maintain a gravity-fed system, unfiltered Hetch Hetchy source water, and local filtered water sources

The operations strategy addresses four components of system operation: water supply and storage, water quality, water delivery, and asset management.

3.7.1 Water Supply and Storage Operations Strategy

General Operations

Operation of the water supply and storage aspects of the regional system would continue to be based on the need to ensure reliable, high-quality water to meet customer demand year-round and under a variety of conditions, and implementation of the WSIP would increase reliability and system performance to meet these program goals and objectives. The SFPUC would continue to integrate operation of the local system with that of the Hetch Hetchy system. Local storage system operations would be consistent with applicable regulatory and institutional requirements (described in Chapter 2, Sections 2.4 and 2.5), while balancing maximum use of local water sources, maintaining prudent carryover storage for drought supply, and maximizing storage of local supplies in Bay Area reservoirs.

The SFPUC would continue to operate the Hetch Hetchy system to conserve water from the Tuolumne River watershed for the consumptive domestic and municipal uses of its customers and the production of hydroelectricity, as authorized by the Raker Act (see Chapter 2, Section 2.4). In addition to serving domestic, municipal, and hydropower uses, the Hetch Hetchy system is operated to meet instream flow requirements and to augment flows for whitewater rafting, as described in Chapter 2, Sections 2.5.3 and 2.5.4 and below. The Raker Act requires that the SFPUC recognize the prior rights of TID and MID (see Chapter 2, Section 2.5.1) as well as comply with conditions of the U.S. Department of the Interior (DOI) for the protection of public lands (Raker Act, Section 4); the DOI conditions require minimum instream flow releases for fish and wildlife habitat. The FERC settlement agreement for the New Don Pedro Project (described below under Other Operational Considerations) requires the CCSF "to continue to work cooperatively with the organized and permitted recreational river users (rafters and kayakers) to schedule flows and to communicate daily flow schedules" (FERC, 1996). With implementation of the WSIP, the SFPUC would continue to operate the Hetch Hetchy system in compliance with instream flow requirements and in cooperation with recreational interests on the Tuolumne River. As described in more detail in Chapter 5, Section 5.3.1, system operations under the WSIP would result in a reduction in average monthly storage in Hetch Hetchy Reservoir and a delay in releases from O'Shaughnessy Dam to the Tuolumne River compared to existing conditions.

Local reservoirs in the Alameda and Peninsula watersheds would continue to be operated to maximize the use of local resources for annual water deliveries, drought supply, and emergencies.

Calaveras Reservoir would be restored to its historical operating capacity, and the DSOD restrictions would no longer constrain operations and storage; the SFPUC would generally return to its normal operating procedures, diverting flow from upper Alameda Creek through the Alameda Creek Diversion Tunnel to Calaveras Reservoir. Crystal Springs Reservoir would also be restored to its historical capacity, providing increased local storage. These reservoirs would continue to be operated to avoid releases that could harm SFPUC facilities or otherwise present risks to public health and safety. In general, the local reservoirs would be maintained at a higher level under the WSIP than under current practices in order to maintain and maximize local storage for unplanned outages or drought needs.

Under the WSIP, operation of the Sunol Valley WTP would be modified to take advantage of system flexibility that is not currently available. Under current operations, the SFPUC can filter diversions from the Tuolumne River at Sunol Valley WTP in limited quantities for limited time periods; however, this operation is not typical, since water from Hetch Hetchy does not require filtration. Under normal system operations, raw water from Calaveras Reservoir flows to the Sunol Valley WTP for treatment, and this water source is also used to supply the minimum flows needed to maintain filtration process operations at the WTP. However, with implementation of the WSIP, it is assumed that diversions from the Tuolumne River could be used to meet the minimum flow requirements at the Sunol Valley WTP so that water in Calaveras Reservoir can be maintained at a higher level, thus maximizing local storage for unplanned outages or drought needs.

Under the WSIP, other system improvements that would affect operations include the additional conveyance capacity in system facilities, such as the San Joaquin and Bay Division Pipelines, which would allow for implementation of a regular, planned maintenance schedule for critical facilities. The maintenance schedule would allow for planned outages for critical facilities, during which time the SFPUC would utilize redundant facilities to maintain system deliveries. Depending on the facility subject to maintenance and inspection, the SFPUC would adjust the normal system operation as needed in order to avoid disruption of service to customers.

Additionally, restoration of the historical capacity at Crystal Springs Reservoir would allow the reservoir to be operated with additional storage. Typical operations would be to fill the reservoir whenever possible within the cyclic operational storage goals of the system for maximum local reservoir and system storage.

Nondrought-Year System Operations

In nondrought periods with average or above-average rainfall and snowmelt conditions, the SFPUC proposes to meet the increased purchase requests of 35 mgd through 2030 with increased Tuolumne River diversions and 10 mgd of recycled water, conservation, and groundwater programs in San Francisco. The amount of diversion from the Tuolumne River would vary from year to year, and in some years, particularly after a dry period, a portion of the Tuolumne River diversions would be used to replenish local reservoirs. Under the WSIP, the local reservoirs in the Alameda and Peninsula watersheds would provide an average of about 16 percent of the total water supply, with the Hetch Hetchy system providing about 81 percent and recycled water, conservation, and groundwater programs in San Francisco providing the remaining 3 percent. Seasonal operation of diversions and the reservoir system would essentially continue as currently practiced, although the local reservoirs would generally be maintained at a higher level than under current conditions in order to maintain and maximize local storage for unplanned outages or drought needs.

As part of the WSIP, the SFPUC would utilize a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County. Under this program, wholesale customers in this area (such as Daly City, California Water Service Company, and San Bruno, which currently pump groundwater to meet a portion of their potable demand) would receive additional supplies from the regional system during nondrought years to offset their groundwater pumping, and would cease pumping and allow the aquifer to recharge naturally. In exchange, those customers would increase groundwater pumping during drought periods, thereby reducing the amount of their purchase requests during a drought and making more water available for serving regional water system demand.

Drought-Year System Operations

As described above in Table 3.5, the proposed level of service objective for water supply during a drought is to limit rationing to a maximum of 20 percent systemwide reduction in water service in any one year. The proposed WSIP facilities and operations strategy are designed to meet this level of service. Under the WSIP, in response to reduced water supply conditions, the SFPUC would manage drought-year supplies and water deliveries through implementation of a four-stage response program to ensure that water is delivered to customers continuously through the duration of the drought.

The first stage of response would be to implement water supply options specific to drought-year water conditions, namely the conjunctive-use program within the Westside Groundwater Basin and the TID and MID water transfer. As described above in Section 3.6.2, the groundwater conjunctive-use program in the Westside Groundwater Basin would be put into the extraction mode, with the participating customers substituting groundwater for a portion of their otherwise requested system delivery. During this first stage of response and if still needed following implementation of groundwater pumping in the Westside Basin, the water transfer from TID and MID would also supplement the supply available for SFPUC deliveries. Then, as needed for a severe drought, the SFPUC would implement Stages 2 and 3 of the response program in combination with the supplemental dry-year supplies and would initiate water delivery reductions. A Stage 2 response would include up to 10 percent systemwide rationing, and a Stage 3 response would include up to 20 percent systemwide rationing. The procedures include customer notification, customer allocation if necessary, and evaluation of customer performance. Water use reduction programs would remain in place until total system storage is recovered and drought conditions appear to have ended.

During a drought that exceeds the 8.5-year design drought scenario, a fourth stage of response would be implemented. Stage 4 would increase rationing beyond the WSIP proposed level of service goal of 20 percent. However, with implementation of the WSIP facility improvement projects (see Section 3.8) and the proposed water supply option, the Stage 4 response would not be necessary for any drought sequence equal to or less severe than the 8.5-year design drought.

The SFPUC uses total system and local system reservoir storage levels as parameters to indicate response level in the four-stage dry-year response program. The specific storage levels that indicate a certain response are related to demand and water supply resources and are updated as demand and resources change. As part of operations, by April 15 of each year, the SFPUC can project what system storage will be on July 1 based on current storage, rainfall, and snowpack conditions (SFPUC, 2007a).

Other Operational Considerations

Instream Flow Releases

The SFPUC will meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat, as stated in Table 3.2 under the sustainability goal. Current requirements, as described in Chapter 2, Section 2.5.3, include releases from the following SFPUC regional facilities: Lake Lloyd, Lake Eleanor, Hetch Hetchy Reservoir, Moccasin Reservoir, and Calaveras Reservoir. In addition, the National Marine Fisheries Service has raised concerns regarding stream flows in Pilarcitos Creek below Stone Dam, and the SFPUC is currently making experimental releases and undertaking studies in an effort to address these concerns.

TID and MID own and operate Don Pedro Reservoir (built under the New Don Pedro Project) and are solely responsible as project licensees for meeting the Federal Energy Regulatory Commission (FERC) requirements for fishery releases. Nevertheless, under the Fourth Agreement with TID and MID (see Chapter 2, Section 2.5.3), the CCSF may be required to provide water for these FERC-imposed fishery releases from Don Pedro Reservoir if TID and MID demonstrate that their water entitlements are being adversely affected by providing the flows. The CCSF, TID, and MID entered into two funding agreements to implement the FERC Settlement Agreement; the CCSF now pays TID and MID to provide all of the additional water required under the 1996 FERC order amending the requirements for fishery releases from Don Pedro Reservoir.

The current FERC license expires in 2016, at which time TID and MID will be required to apply for a new license for hydroelectric operations on Don Pedro Reservoir. As part of the license renewal, FERC may modify the fishery release requirements. Although the fishery release requirements that FERC may impose in 2016 cannot be anticipated at this time, the SFPUC assumes, for purposes of the WSIP, that it will be able to continue its current agreement with TID and MID to pay them to provide all of the additional water, if any, required for the fishery releases.

There are no regulatory or contractual flood control restrictions on the local reservoirs. With the exception of Calaveras Dam, none of the local reservoirs or dams has requirements for downstream fishery releases. The SFPUC has not implemented the instream flow releases from Calaveras Reservoir that are stipulated under a 1997 MOU with the CDFG due to the DSOD restrictions on the reservoir water level (discussed in Chapter 2, Section 2.5.4). The SFPUC proposes to implement these releases after completion of the Calaveras Dam Replacement project, which is one of the WSIP facility improvement projects. The Calaveras Dam

Replacement project would include new outlet valve structures to provide for the instream flow releases. As part the MOU stipulations (CDFG, 1997), the WSIP facility improvement projects include a flow recapture project downstream of Calaveras Reservoir (referred to as the Alameda Creek Fishery Enhancement project and described in Section 3.8), which would divert water from Alameda Creek back to the SFPUC water supply system corresponding to the amount of any releases made.

Whitewater Rafting Flows

As described in Chapter 2, Section 2.5.4, although there is no regulatory obligation beyond working cooperatively with the rafters, each year, the SFPUC coordinates with the whitewater recreational interests regarding releases from the Hetch Hetchy system. Currently, subject to the availability of water and hydropower needs, the SFPUC attempts to accommodate whitewater recreation in the Tuolumne River below its reservoirs by adjusting the timing and volume of releases from Holm Powerhouse in order to augment river flows for whitewater rafting.

Under the WSIP's proposed water supply option, the SFPUC intends to continue its general practice regarding releases for whitewater rafting in the Tuolumne River and would continue to coordinate its release patterns with the whitewater recreational interests to provide rafting flow patterns similar to current conditions. During the height of the spring runoff, the rafting release would be met through unregulated flow and releases from Hetch Hetchy Reservoir, Lake Eleanor, and Lake Lloyd. Following the end of the runoff season from July through Labor Day weekend, in addition to the minimum instream flow releases, the SFPUC would augment river flows for whitewater rafting through releases at the Holm Powerhouse, subject to the availability of water and the CCSF's need for hydroelectric power generation. As described in Chapter 5, Section 5.3.8, system operations under the WSIP could result in a slight reduction in the number of days of higher flows compared to existing conditions.

3.7.2 Water Quality Operations Strategy

The SFPUC would continue to conduct all system operations to provide reliable, high-quality water year-round as a priority and to maintain a clean, unfiltered water source from the Hetch Hetchy system. The SFPUC's program to assure high-quality water is based on a multi-barrier approach, starting with source water protection, which would continue with implementation of the WSIP. As stated previously, watershed management and source water protection are included under the sustainability objectives for the WSIP, but these efforts are not specifically or exclusively an element of the WSIP.

After source protection, the next step in maintaining high-water quality involves the use of best management practices during operation of transmission system and water treatment facilities. Transmission facilities are operated at appropriate pressures, not only to meet demand but also to avoid possible entry of contaminants into the system and to avoid cross-connection with nonpotable water sources. Treatment facilities would continue to provide disinfection of all water sources, including Hetch Hetchy system water, and filtration of local watershed water sources. The Hetch Hetchy system would continue to be operated and maintained to meet filtration avoidance requirements, and Hetch Hetchy system water would continue to be treated for corrosion control and to reduce exposure to lead and copper from plumbing systems.

The overall water quality operations strategy would not change with implementation of the WSIP, although refinements to system operations would be developed as part of the new and improved treatment facilities. Under the WSIP, the SFPUC would construct a new advanced disinfection facility to provide a higher level of disinfection for the Hetch Hetchy supply, as required by the federal Long Term 2 Enhanced Surface Water Treatment Rule, and the specific operation of this facility would be incorporated into project planning and design. The WSIP also proposes construction of facilities to meet the same requirements for the Lawrence Livermore Laboratory supply. The program also includes funding to support conceptual engineering of improvements at the Sunol Valley and Harry Tracy WTPs; these improvements are not expected to be needed for compliance with this regulation, but could become necessary in the future if source water quality degrades or changes. Other WSIP system improvements to increase water quality reliability involve upgrades to the primary disinfection facilities currently located at Tesla Portal, process improvements to the Harry Tracy WTP, capacity expansions to meet sustainable production requirements at both water treatment plants, construction of the Sunol Valley Treated Water Reservoir to provide a barrier between the treatment plant and the distribution system, improvements to sanitary deficiencies at the Pulgas Balancing Reservoir, and upgrades of various valves and piping to eliminate cross connections. These proposed facility improvement projects are further described in Section 3.8, below.

3.7.3 Water Delivery Operations Strategy

The SFPUC operates the regional transmission system with the overarching goal to reliably deliver water to meet customer demands. While current system operating strategies would generally remain unchanged, implementation of the WSIP would rehabilitate and upgrade existing facilities as well as provide a wider range of operational flexibility, thereby increasing the reliability of the system to deliver water to all customers under a range of operating conditions. For example, proposed improvements to the Baden and San Pedro Valve Lots would increase the system’s capability to provide water from Peninsula sources to South Bay customers in the event of a catastrophic failure of water supplies from the Hetch Hetchy and Alameda watersheds.

The WSIP includes a maintenance program that would increase day-to-day reliability and would establish a schedule to allow for the planned shutdown of facilities for inspection and maintenance while continuing to meet customer demands. Currently, the SFPUC has limited ability to take certain facilities out of service for the extended period of time needed to conduct appropriate inspection and maintenance, but the WSIP would provide adequate redundancy of critical facilities to enable inspection and maintenance on a regular schedule. Redundant facilities would also increase the operational flexibility and thus the reliability of water service to customers in the event of an unplanned facility failure or system upset, natural disaster, or other emergency situation. As summarized in Table 3.2, the WSIP includes performance objectives that would maintain water delivery services during planned facility maintenance activities and unplanned outages of key facilities. As described in Section 3.8, the WSIP includes improvements that would provide varying levels of redundancy to the following facilities: Irvington Tunnel, Bay Division Pipelines, and San Joaquin Pipelines.

The proposed system upgrades would optimize local water storage to provide the SFPUC with a local supply in the event of an emergency. At present, depending on hydrologic conditions and the transmission capacity of pipelines, the replenishment of local reservoirs can take more than one year to complete. The addition of redundant facilities and hydraulic capacity upgrades would also increase the system's transmission capability so that local reservoirs in the Alameda and Peninsula watersheds can continue to be replenished during maintenance periods to maintain higher average annual storage levels, thus ensuring that water would be available for use during emergencies or droughts, while also continuing to meet ongoing customer demands.

3.7.4 Maintenance and Asset Management Strategy

As part of operations under the WSIP, the SFPUC would continue to maintain the regional water system. The SFPUC published the *Post-WSIP Preliminary Maintenance Plan for Regional Water Transmission Facilities* (Parsons-CH2MHILL, 2006), which outlines inspection as well as minor and major maintenance activities for the regional system following completion of the WSIP facility improvement projects. Maintenance activities are grouped in a cycle of regular maintenance, repair/replacement, and renewal and are coordinated under an overall asset management program. These activities are described below:

- <u>*Regular Maintenance*</u> – maximizing and extending the useful life of facilities, including:
  - *Predictive Maintenance* – inspecting and testing facilities to assess conditions, identify problems, and identify the need for repairs.
  - *Preventive Maintenance* – includes scheduled servicing, painting, cleaning, lubrication, and other work performed on a routine basis.
  - *Reactive Maintenance* – includes unscheduled remedial work to address unplanned component failures (e.g., repair of a pipeline leak).
- <u>*Repair and Replacement*</u> – repair or replacement of system components to extend the life of an asset until the renewal phase (e.g., replacement of a limited length of pipeline).
- <u>*Renewal*</u> – renewal or replacement of an asset near the end of its useful service life (e.g., renewal of pipeline through the insertion of steel liners).

The SFPUC's preliminary maintenance plan (Parsons-CH2MHILL, 2006) is based on a 20-year planning horizon. It is a "living document" that will be revised and adapted according to ongoing condition assessments. The plan focuses initially on the major transmission pipelines and tunnels of the regional system, as listed in **Table 3.8**, although the SFPUC has developed a preliminary list of 123 additional facilities requiring maintenance. The maintenance plan can be expanded to a more comprehensive maintenance program to cover the maintenance needs for other facilities in the regional system, including dams, powerhouses, chemical stations, pump stations, treatment plants, balancing reservoirs, valve lots, and other pipelines.

TABLE 3.8
MAJOR WATER TRANSMISSION FACILITIES INCLUDED IN THE INITIAL MAINTENANCE PROGRAM

San Joaquin Pipelines and Hetch Hetchy Tunnels	Bay Division Pipelines and Bay Area Tunnels
Canyon Tunnel	Alameda Siphon No. 1
Mountain Tunnel	Alameda Siphon No. 2
Moccasin Penstocks or Pipelines	Alameda Siphon No. 3
Foothill Tunnel	Alameda Siphon No. 4
San Joaquin Pipeline No. 1	Irvington Tunnel, 1 and 2
San Joaquin Pipeline No. 2	Bay Division Pipeline No. 1
San Joaquin Pipeline No. 3	Bay Division Pipeline No. 2
San Joaquin Pipeline New Segment	Bay Division Pipeline No. 3
Coast Range Tunnel	Bay Division Pipeline No. 4
	Bay Division Pipeline No. 5
	Bay Tunnel
	Stanford Tunnel
	Pulgas Tunnel

SOURCE: SFPUC, 2006c.

The WSIP maintenance goals are generalized, and specific maintenance requirements for individual facilities would depend on actual conditions and risk. The predictive and preventive maintenance goals for the major transmission facilities are shown in **Table 3.9**. The maintenance frequency for pipelines and tunnels varies based on the material composition of each facility. These regular maintenance goals, along with repair/replacement and renewal maintenance goals, have been incorporated into a 20-year timeline that identifies the maintenance schedule for each facility listed in Table 3.8. The maintenance timeline details the expected number of regular, repair/replacement, and renewal maintenance outages and the duration of each outage for specific months and years during the 20-year planning horizon.

TABLE 3.9
PREDICTIVE AND PREVENTIVE MAINTENANCE GOALS

Maintenance Activity	Expected Frequency Interval (years)	Approximate Outage Duration (months)
Pipelines		
Prestressed concrete cylinder pipelines (PCCP)	5	2 – 3
Concrete pipelines	10	2 – 3
Steel pipelines	20	2 – 3
Tunnels		
Rock – lined	20	2 – 3
Rock – unlined	10	2 – 3
Soft Ground – steel liner	20	2 – 3

SOURCE: Parsons-CH2MHILL, 2006.

Currently, the SFPUC attempts to meet maintenance goals to the extent possible; it is generally able to conduct adequate maintenance on treatment and pumping facilities, because these services can typically be performed without completely shutting them down. However, the SFPUC has limited ability to shut down some of the tunnels and pipelines while still meeting customer demand. The transmission system needs additional tunnels and/or pipelines to provide redundant capabilities to enable shutdown, inspection, and maintenance of some major components of the existing system.

Improvements to the transmission system under the WSIP would allow the SFPUC to meet its maintenance goals. The WSIP level of service objective for delivery reliability is to meet the average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown for maintenance concurrent with one unplanned facility outage due to a facility failure caused by a natural disaster or other emergency. Under the WSIP, the regional transmission system has been sized to allow for system demand to be met with a major reach of pipeline, such as one reach of the Bay Division Pipelines, out of service for major maintenance. System operations under the WSIP would allow planned facility inspection, repair, and maintenance without interrupting customer service, and the SFPUC could schedule planned facility shutdowns to accommodate ongoing system demand. Planned shutdowns of major pipeline reaches would occur during the lower demand months of November through March. The proposed program would enable the SFPUC to conduct deferred maintenance and repair work throughout the regional system, thereby extending the useful life of facilities and improving overall system reliability (SFPUC, 2005d).

3.8 Proposed Facility Improvement Projects

To achieve the system performance objectives of the WSIP, the SFPUC has proposed a series of facility improvement projects that would repair, improve, and in some cases expand the physical facilities in the regional system. This PEIR addresses the key regional system projects in the WSIP, as described in Section 3.4.6. **Table 3.10** describes the key regional facility improvement projects that have been identified as necessary to meet the goals and objectives of the WSIP and to support implementation of the proposed water supply option; more detailed information regarding project facilities, operations, locations, construction, and permits is included in Appendix C. **Figure 3.5** shows the locations of the WSIP's key regional facility improvement projects relative to the existing regional system. **Table 3.11** identifies the jurisdictions that would be affected by each of the projects.

The descriptions in Table 3.10 and Appendix C are based on the best available information at this time about each project; however, due to the complexity and extent of the overall program and the varying levels of individual project development, some of the projects have more detailed information than others. The project descriptions presented in this PEIR are of a level of detail appropriate to identify the overall magnitude of effects expected from implementation of the WSIP as a whole. Chapter 4 of this PEIR assesses the potential impacts of implementing the WSIP facility improvement projects listed in Table 3.10 at a program level (see Chapter 1 for a description of program-level impact analyses), including cumulative impacts. While each of these key regional projects is assessed in Chapter 4, the purpose of the analysis is to provide a comprehensive environmental review of the overall range of effects of implementing the WSIP

TABLE 3.10
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region				
SJ-1	Advanced Disinfection	Treatment / Water Quality	Tesla Portal	This project would provide for the planning, design, and construction of a new advanced disinfection facility for the Hetch Hetchy water supply to comply with the new federal drinking water regulatory requirements contained in the Long Term 2 Enhanced Surface Water Treatment Rule. This regulation is designed to provide treatment for the parasite *Cryptosporidium*. The project is in the planning phase and the SFPUC is evaluating applicable technologies and possible locations to identify the most technologically sound and cost-effective alternative. In addition, the project includes planning and conceptual engineering for providing advanced disinfection facilities at the Sunol Valley and Harry Tracy WTPs. This project may be combined with the Tesla Portal Disinfection project (SJ-5) along with portal modifications, and the need for the Lawrence Livermore project (SJ-2) may be affected by the location and technology selected for this project.
SJ-2	Lawrence Livermore Supply Improvements	Treatment / Water Quality	Thomas Shaft	This project includes design and construction of treatment upgrades for the water supplied to the Lawrence Livermore Laboratory. The project would construct water treatment facilities from the Thomas Shaft of the Coast Range Tunnel. An advanced disinfection facility planned at an upstream location under SJ-1 could affect project design.
SJ-3	San Joaquin Pipeline System	Pipeline / Water Supply, Delivery Reliability	Isolated locations along the existing San Joaquin pipeline corridor	The preferred project would generally be located within the existing San Joaquin Pipeline (SJPL) right-of-way and would include: • Construction of a new 6.4-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the east end of the pipelines, starting at Oakdale Portal, and associated portal modifications. • Construction of two additional crossover facilities between the San Joaquin Pipelines within the existing right-of-way, both located in Stanislaus County, with one about 20 miles east of Modesto and the other about 15 miles west of Modesto, and improvements at the existing Roselle Crossover. • Construction of a new 10-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the west end of the pipelines ending at Tesla Portal. This project would provide additional facilities to upgrade the hydraulic capacity of the San Joaquin Pipeline system to 314 mgd (and a 271-mgd average during system maintenance when a pipeline segment must be taken out of service) and to provide redundancy for prestressed concrete cylinder pipe for reliability. Note: While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed depending on the results of a conditions assessment of the existing pipelines.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Pipeline / Water Supply, Delivery Reliability	Rehabilitation could occur anywhere along the pipeline corridor, which extends from Oakdale Portal to Tesla Portal	Reconditioning/rehabilitation of the existing San Joaquin Pipelines. There are three existing pipelines, each 47.7 miles long, extending from Oakdale Portal to Tesla Portal: • SJPL-1, riveted steel pipe, 56- to 72-inch internal diameter • SJPL-2, reinforced concrete pipe and welded steel pipe, 61- to 62-inch internal diameter • SJPL3, prestressed concrete cylinder pipe and welded steel pipe, 78-inch internal diameter

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region (cont.)				
SJ-5	Tesla Portal Disinfection Station	Treatment / Water Quality, Seismic Reliability	Tesla Portal	This project includes the planning, design, and construction of new disinfection facilities for the Hetch Hetchy water supply. The project would replace and upgrade the existing disinfection facilities at the Tesla Portal Disinfection Facility to meet current seismic, safety/fire, and building code standards. The preferred project would include construction of: • New control building and storage room • Pump houses • Chemical storage tanks and feed equipment and sampling systems • Emergency generator, including primary and standby power supplies • Access road It should be noted that the design and location of the Advanced Disinfection project (SJ-1) would affect the design and location of this project.
Sunol Valley Region				
SV-1	Alameda Creek Fishery Enhancement	Other / Water Supply, Sustainability	Structural Alternatives: Alameda Creek in Sunol Valley, downstream of Calaveras Dam	This project would recapture the water released as part of the Calaveras Dam project (SV-2) and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration for this project, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.
SV-2	Calaveras Dam Replacement	Storage / Water Supply, Delivery and Seismic Reliability	Sunol Valley, immediately downstream of existing dam and at the Alameda Creek Diversion Dam	This project would provide for the planning, design, and construction of a replacement dam at Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earthfill dam • New intake tower and new outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir and the proposed bypass structure at the diversion dam would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
SV-3	Additional 40-mgd Treated Water Supply	Treatment / Water Quality, Delivery Reliability	Sunol Valley WTP and pipeline to connect to the Alameda Siphons or Irvington Tunnel	This project would provide for the planning, design, and construction of an additional 40 mgd of treatment capacity at the Sunol Valley WTP. The project would increase the sustainable capacity of the Sunol Valley WTP to 160 mgd. The planning-level study would evaluate treatment operations protocol and an alternative treatment process. The project would include either retrofitting the existing facilities with a membrane treatment process or expanding the existing facilities with: • New flocculation and sedimentation system • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-3 (cont.)				• New filtered water and backwash piping Additionally, the project would include: • New chemical feed and piping system • Upgrade of the electrical supply system • Miscellaneous piping, valves, and mechanical and electrical work • Approximately two miles of 78-inch-diameter pipe to connect to the Alameda Siphons or Irvington Tunnel
SV-4	New Irvington Tunnel	Tunnel / Delivery and Seismic Reliability	Sunol Valley to Fremont, parallel to and just south of the existing Irvington Tunnel	This project would construct a new tunnel parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. The preferred project would include construction of: • New 18,200-foot-long, 10-foot-diameter tunnel • New portal at the east end adjacent to the existing Alameda West Portal in the Sunol Valley with connections to the existing Alameda Siphons and proposed new siphon • New portal at the west end adjacent to the existing Irvington Portal in Fremont with connections to the existing Bay Division Pipelines and proposed new pipeline (BDPL Reliability Upgrade, BD-1) • Valves and equipment to control and monitor flows • Modifications to the existing Alameda West and Irvington Portals
SV-5	SVWTP – Treated Water Reservoirs	Storage and Treatment / Delivery Reliability	North of the Sunol Valley WTP	This project would provide for the planning, design, and construction of new treated water storage reservoirs at the Sunol Valley WTP to comply with requirements of the California Department of Health Services. The preferred project would include construction of: • One 5-million-gallon chlorine contact basin • Two 8.75-million-gallon storage basins • New inlet and outlet piping and reservoir drainage system • Pipe bridge over Alameda Creek • Chemical (ammonia and chlorine) storage and feed system • Backup filter washwater supply and filter washwater supply system • Instrumentation and controls and miscellaneous pumping appurtenances to integrate the reservoirs into the existing treatment plant • Expansion of the existing Sunol Valley WTP electrical substation • Two 750-kilowatt diesel-powered emergency generators

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-6	San Antonio Backup Pipeline	Pipeline / Delivery and Seismic Reliability	Sunol Valley between San Antonio Reservoir and San Antonio Pump Station	This project would consist of three proposed facilities: (1) San Antonio Backup Pipeline, a new pipeline (size undetermined) from San Antonio Reservoir to San Antonio Pump Station, about 2 miles long; (2) San Antonio Creek discharge facilities (improvements allowing for the discharge of Hetch Hetchy water and associated road improvements); and (3) Alameda East Portal vent overflow pipeline and portal modifications.
Bay Division Region				
BD-1	Bay Division Pipeline Reliability Upgrade	Pipeline and Tunnel / Water Supply, Delivery and Seismic Reliability	Along existing Bay Division Pipelines Nos. 1 and 2 easement from Fremont to Redwood City	This project would construct a new Bay Division Pipeline No. 5 (BDPL No. 5) from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City, consisting of 16 miles of new pipeline and 5 miles of tunnel under San Francisco Bay. Portions of the section of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed (approximately 1.4 miles), and existing aboveground and submarine sections of BDPL Nos. 1 and 2 over the five-mile-long section from Newark Valve House to Ravenswood Valve House would be decommissioned (decommissioning is not part of this project). The redundancy provided by the project would increase the overall transmission capacity of the Bay Division pipeline system. The preferred project would include construction of: • New welded-steel pipeline, approximately 72 inches in diameter, extending along the seven-mile reach from Irvington Portal to Newark Valve Lot, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New "Bay Tunnel" segment of BDPL No. 5, approximately 120 inches in diameter, extending five miles from Newark Valve Lot to Ravenswood Valve Lot, crossing under San Francisco Bay and adjacent marshlands; BDPL Nos. 1 and 2 would tie into the tunnel at both ends and would be decommissioned between Newark and Ravenswood Valve Lots • New welded-steel pipeline, approximately 60 inches in diameter extending along the nine-mile reach from Ravenswood Valve Lot to Pulgas Portal, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New facilities at eight valve vault lots along the alignment, containing new concrete vaults and control structures that house electrical control panels, isolation valves, mechanical equipment, and cross-connections between BDPL No. 5 and the existing Bay Division Pipelines • Two flow metering vaults at or near Mission Boulevard (in Fremont) and Pulgas Portal areas • New Isolation valves and piping for connecting BDPL No. 5 to Irvington and Pulgas Portals

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Bay Division Region (cont.)				
BD-2	BDPL Nos. 3 and 4 Crossovers	Valve House / Delivery and Seismic Reliability	Three locations adjacent to where BDPL Nos. 3 and 4 traverse Guadalupe River, Barron Creek, Bear Gulch Reservoir	This project would construct three additional crossover facilities along BDPL Nos. 3 and 4 to provide operational flexibility for maintenance or during emergencies. The new crossover facilities would reduce the length of pipe to be removed from service, either for maintenance or for emergencies, and would reduce the duration of outages. Each crossover facility would include construction of: • Four mainline valves and one cross-connect valve • Automatic controlled actuators • Discharge facilities to enable release of water that meets water quality discharge requirements within discrete pipeline segments to surface waters, either for maintenance or emergencies
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Pipeline / Seismic Reliability	Along existing BDPL Nos. 3 and 4 in Fremont	This project would provide for the planning, design, and construction of upgraded, seismically resistant sections of the BDPL Nos. 3 and 4 where they cross the Hayward fault. The replacement pipelines would be located between the two new crossover/isolation valves that would be built as part of BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault project (a WSIP project determined to be independent of the PEIR). In addition to the replacement pipelines, a new bypass pipeline between the two new crossover/isolation valve vaults could also be built as part of one of the several alternatives being considered for this project.
Peninsula Region				
PN-1	Baden and San Pedro Valve Lots Improvements	Valve House / Delivery and Seismic Reliability	Baden Valve Lot, South San Francisco, San Pedro Valve Lot, Daly City	This project would upgrade valve vaults, valves, and piping at the existing Baden and San Pedro Valve Lots to meet current seismic standards. Work could also be performed at the Pulgas Pump Station and Pulgas Valve Lot as part of transmission reliability. The project would include a new pressure-reducing valve at one of the locations to allow transfer of water between high and low pressure zones from the Harry Tracy WTP to the Peninsula under an emergency scenario.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Pipeline / Delivery and Seismic Reliability	Lower Crystal Springs Reservoir to San Andreas Reservoir, including Crystal Springs Pump Station	This project would consist of seismic improvements of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP. This project would increase the transmission capacity of the existing raw water pipeline from Crystal Springs Reservoir to San Andreas Reservoir in order to reliably supply 140 mgd of raw water for treatment at the Harry Tracy WTP. The project would include: • Repair of Upper Crystal Springs Dam discharge culverts • Upgrade and repair of Lower Crystal Springs Dam outlet structures and tunnels conveying water to Crystal Springs Pump Station • Replacement or refurbishment of Crystal Springs Pump Station • Upgrade and repair of the chemical system and Crystal Springs chlorine emergency feed • Improvements to the Crystal Springs/San Andreas Pipeline, including replacement of approximately 1,350 feet of 66-inch-diameter pipeline, general renewal of the remaining pipeline, and addition of new manholes, blowoff valves, and isolation valves; or construction of a new redundant pipeline along a new alignment.

**TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS**

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-2 (cont.)				• Seismic and hydraulic upgrade and repair of San Andreas outlet facilities • Addition of fish screens on the outlet structures for both Crystal Springs and San Andreas Reservoirs • Repair of two pipelines that convey raw water from San Andreas Reservoir to the Harry Tracy WTP raw water pump station
PN-3	HTWTP Long-Term Improvements	Treatment / Water Quality, Delivery and Seismic Reliability	Harry Tracy WTP	This project would be a seismic retrofit and rehabilitation of the existing building and facility to provide long-term reliability and process improvements. The project would increase the sustained treatment capacity of the plant from 120 to 140 mgd for 60 days. The proposed improvements would include: • Replacement and upgrade of the ozone generation system for primary disinfection • Replacement or upgrade of the existing sedimentation basins at the same location • Improvements to sludge handling facilities • New, redundant pipeline from the treatment works to the finished water storage reservoir • Raw water pump station improvements • Upgrade and replacement of electrical and instrumentation components, including improvements to process and plant security facilities
PN-4	Lower Crystal Springs Dam Improvements	Storage / Water Supply and Delivery Reliability	Lower Crystal Springs Dam	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection of the dam and downstream areas from the probable maximum flood, as defined by the DSOD. DSOD has placed operational restrictions on the dam, and the capacity of the reservoir is limited to 56,800 acre-feet. The project would restore the historical reservoir capacity of 68,000 acre-feet. The project would be coordinated with San Mateo County, which is concurrently planning the replacement of the existing county bridge built above the crest of the dam. Project elements would include: • Lowering the existing parapet wall on either side of the existing spillway to lengthen the overflow weir (central spillway) from the reservoir • Raising the remaining parapet walls and adding two new spillway bays, one on each side of the existing central spillway • Enlarging the spillway stilling basin to accommodated the probable maximum flood • Installing four gates (with control building) or installing a fixed weir within the spillway to restore the historical storage capacity

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

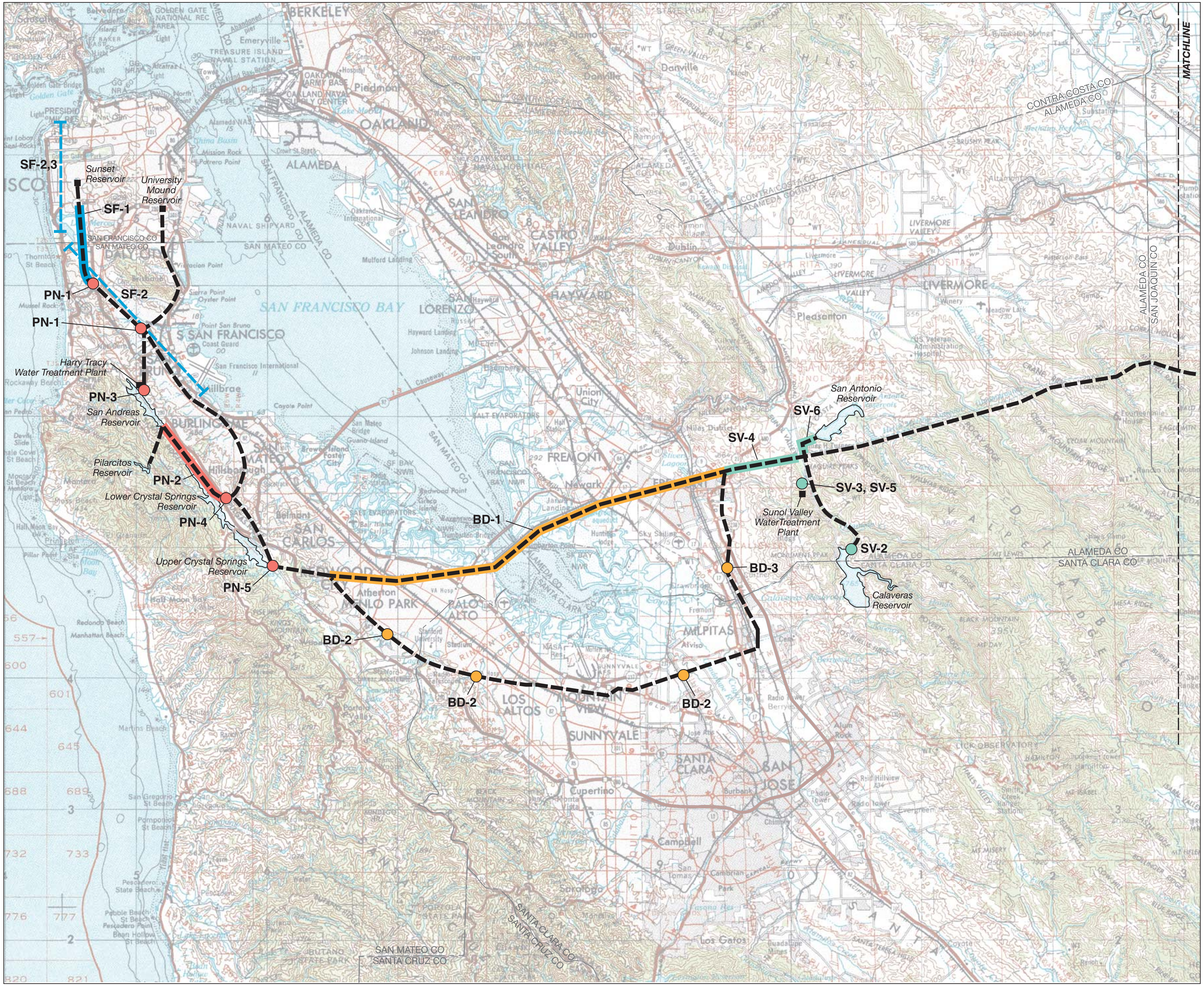
No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-5	Pulgas Balancing Reservoir Rehabilitation	Storage / Water Quality, Delivery and Seismic Reliability	Pulgas Balancing Reservoir and mouth of Laguna Creek at south end of Upper Crystal Springs Reservoir	This project would provide for the planning, design, and construction of improvements to the existing Pulgas Balancing Reservoir and associated facilities. The project would include: • Modifications to the inlet/outlet piping (Phase 1, currently under construction) • Design and construction to rehabilitate and/or expand the discharge channel to Crystal Springs Reservoir (or to install a parallel channel) (Phase 2) • Geotechnical investigations, design, and construction of recommended seismic improvements, including repair/replacement of the reservoir walls, floor, and roof (Phase 3) • Restoration of a six- to eight-acre sediment catchment basin in Laguna Creek to also serve as sustainable habitat for San Francisco garter snake and California red-legged frog, including culvert replacement, sediment removal, revegetation, and protective measures to avoid impacts on sensitive species (Phase 4) • Modification of the existing dechlorination process, including modifications to the chemical feed system to enable pH adjustment and dechlorination system to operate reliably (Phase 5)
San Francisco Region				
SF-1	San Andreas Pipeline No. 3 Installation	Pipeline / Delivery and Seismic Reliability	Daly City to San Francisco	This project would replace the out-of-service Baden-Merced Pipeline, which is beyond repair, and would construct a new pipeline extension of the existing San Andreas Pipeline No. 3 from San Pedro Valve Lot in Daly City to Merced Manor Reservoir in San Francisco. It would also connect the existing San Andreas Pipeline No. 2 at Sloat Boulevard in San Francisco and install an additional pipeline to serve the water turnouts along San Andreas Pipeline No. 2. The project would provide seismic reliability and system redundancy for Peninsula and San Francisco customers. The project would include: • New 3.8-mile-long, 36-inch-diameter pipeline • Approximately 0.27 mile of 36-inchdiameter pipeline for three connections between San Andreas Pipelines Nos. 2 and 3 • Removal of the Baden-Merced Pipeline where the new San Andreas Pipeline No. 3 alignment matches the Baden-Merced alignment • Less than 0.1 mile of 12- to 16-inch-diameter new pipeline for five branch connections to user turnouts (three turnouts to Daly City, two turnouts to San Francisco distribution lines) • Installation of line valves and vaults, manholes, cathodic protection and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances
SF-2	Groundwater Projects	Other / Water Supply	West side of San Francisco and northern San Mateo County	This project includes three groundwater projects: Lake Merced, Local Groundwater, and Regional Groundwater. • The Lake Merced project would address raising the level of Lake Merced in San Francisco using a supplemental source of water, such as treated stormwater, recycled water, groundwater, or SFPUC system water.

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Francisco Region (cont.)				
SF-2 (cont.)				• The Local Groundwater Projects would include development of 2 mgd of new local groundwater for blending with water in the potable water system in San Francisco. An estimated four wells and well stations would be constructed to develop this new local groundwater. This project would also include the use of an additional 2 mgd of groundwater through replacement of existing irrigation wells at the San Francisco Zoo, Golden Gate Park, and/or other locations, once recycled water were available for irrigation (to be developed under the Recycled Water Projects, SF-3). Two existing wells would be modified to enable emergency supply to local residents in the event of a major earthquake or other disaster. This project would include the pipelines, water treatment equipment, and controls needed to add the groundwater to the municipal supply. The additional water supply developed under this project would be used during both nondrought and drought years. • As part of a regional conjunctive-use project, the SFPUC would construct about 10 new groundwater production wells in San Mateo County to develop about 6 mgd of potable groundwater for use as a supplemental drought-year supply. In nondrought years under this project, the SFPUC would provide potable water from the regional system to customers in Daly City, San Bruno, and South San Francisco to substitute for groundwater currently used for municipal purposes, thereby reducing groundwater pumping and allowing the groundwater basin to recharge naturally. In drought years, the groundwater would be available for local use to supplement the regional system water. This project would require agreements with the affected agencies see (Section 3.13).
SF-3	Recycled Water Projects	Other / Water Supply, Sustainability	Various locations on west side of San Francisco	This project includes recycled water projects in San Francisco and other locations. Projects include Westside Baseline and Harding Park/Lake Merced. This project would provide treatment, storage, and distribution facilities for about 4 mgd of recycled water to users on the west side of San Francisco. Primary users would include Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, Harding Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University. As described under Groundwater Projects (SF-2), the SFPUC is also investigating appropriate sources of supply for increasing and maintaining Lake Merced lake levels, including recycled water that has undergone advanced treatment.

[a] The numbering system is consistent to the extent possible with the system presented in the NOP. However, due to regrouping of the projects after publication of the NOP, some projects have been renumbered.
[b] General types of facilities. Objectives refer to the WSIP objectives met by each project; see Table 3.2 for a complete description of WSIP goals and objectives.
[c] See Figure 3.5 for the approximate locations of preferred projects; many of the projects are still in development and the SFPUC may ultimately consider other design options.

SOURCE: SFPUC, 2006a.



SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS

SUNOL VALLEY REGION

SV-1 Alameda Creek Fishery Enhancement (not shown)
SV-2 Calaveras Dam Replacement
SV-3 Additional 40-mgd Treated Water Supply
SV-4 New Irvington Tunnel
SV-5 SVWTP – Treated Water Reservoirs
SV-6 San Antonio Backup Pipeline

BAY DIVISION REGION

BD-1 Bay Division Pipeline Reliability Upgrade
BD-2 BDPL Nos. 3 and 4 Crossovers (3 locations)
BD-3 Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault

PENINSULA REGION

PN-1 Baden and San Pedro Valve Lots Improvements (2 locations)
PN-2 Crystal Springs / San Andreas Transmission Upgrade
PN-3 HTWTP Long-Term Improvements
PN-4 Lower Crystal Springs Dam Improvements
PN-5 Pulgas Balancing Reservoir Rehabilitation

SAN FRANCISCO REGION

SF-1 San Andreas Pipeline No. 3 Installation
SF-2 Groundwater Projects (general geographic area indicated)
SF-3 Recycled Water Projects (general geographic area indicated)

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

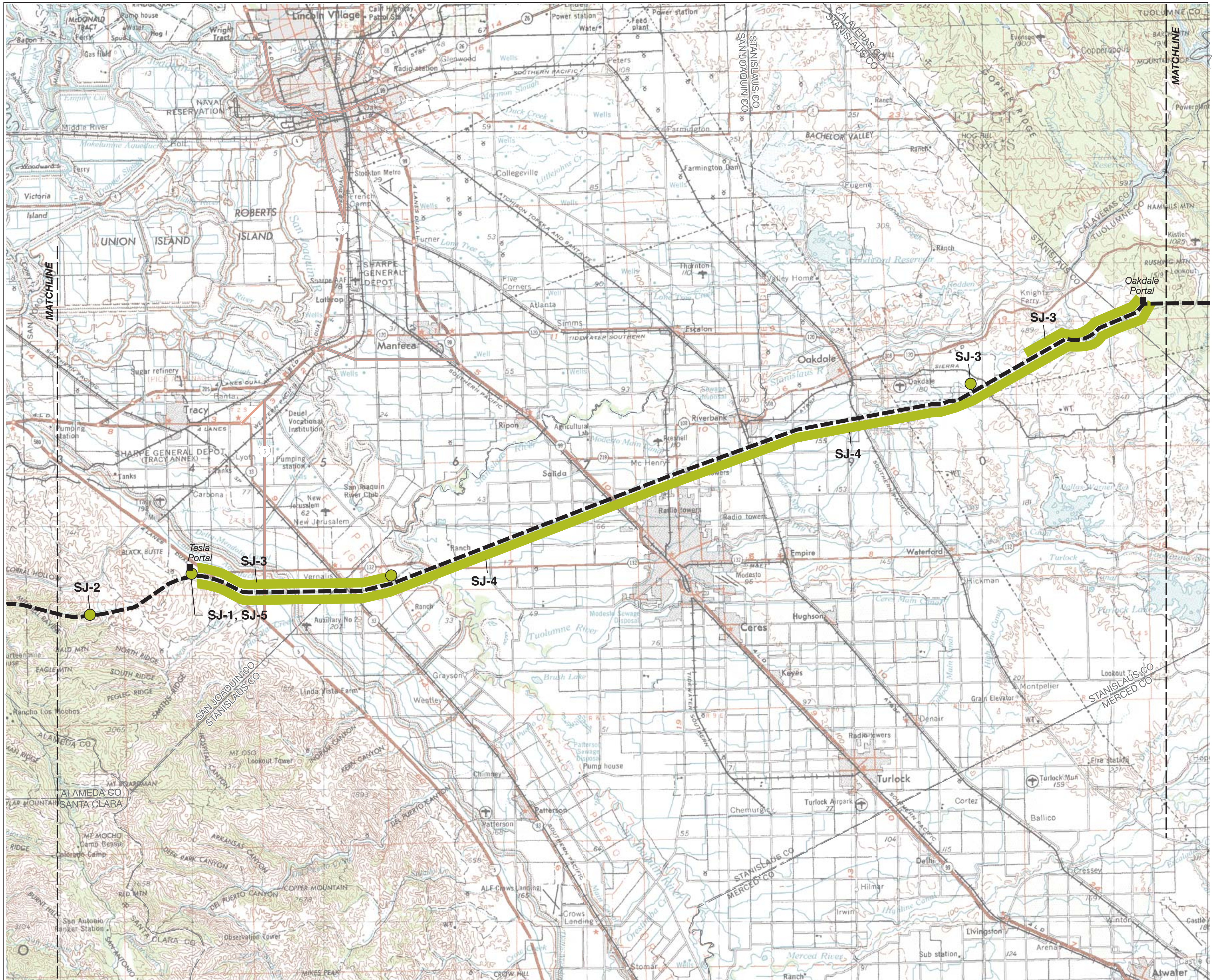
0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure 3.5a
Location of WSIP Facility Improvement Projects-
Sunol Valley, Bay Division, Peninsula,
and San Francisco Regions

SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS



SAN JOAQUIN REGION

- **SJ-1** Advanced Disinfection
- **SJ-2** Lawrence Livermore Supply Improvements
- **SJ-3** San Joaquin Pipeline System
- **SJ-4** Rehabilitation of Existing San Joaquin Pipelines
- **SJ-5** Tesla Portal Disinfection Station

- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

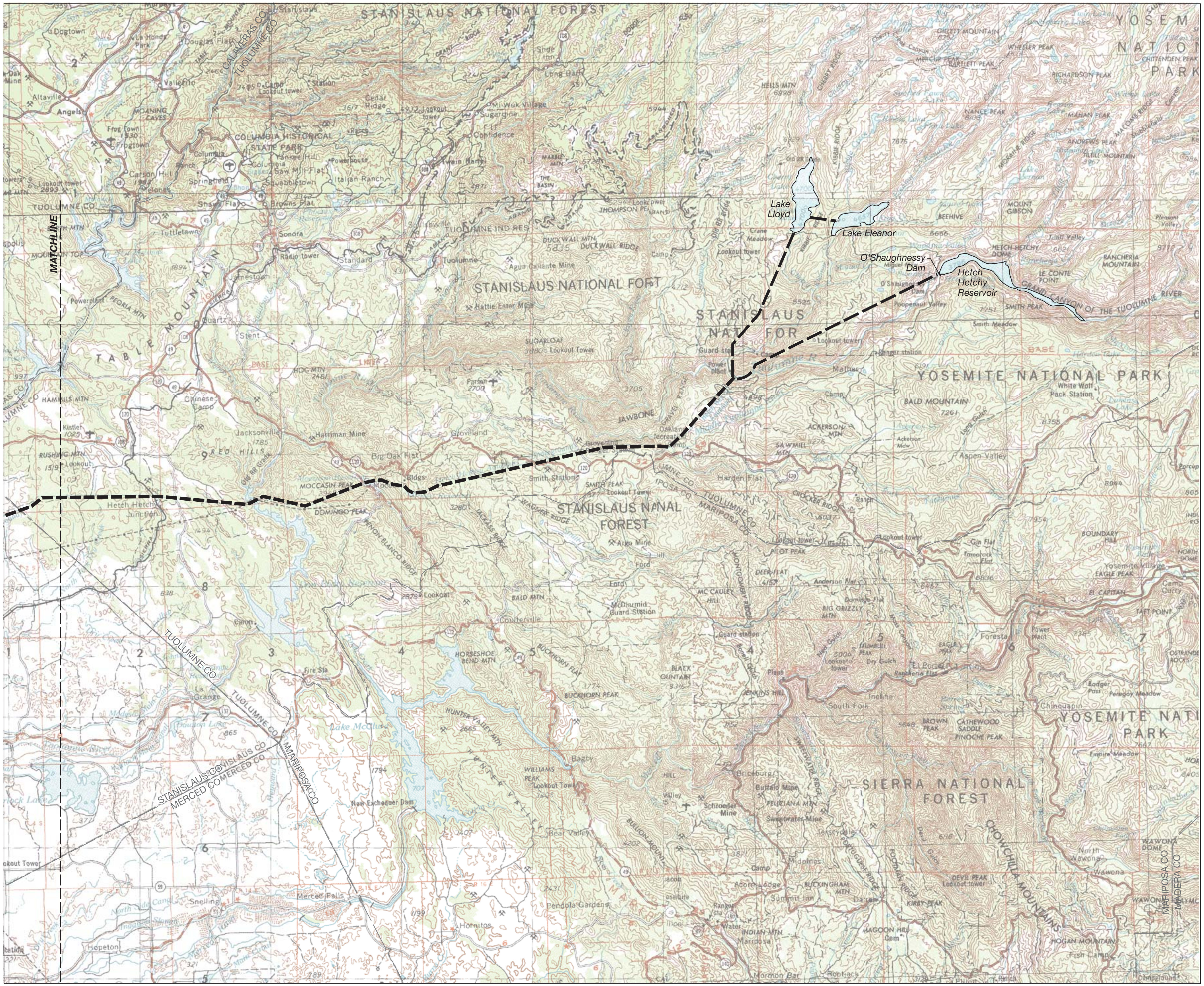
0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 3.5b
Location of WSIP Facility Improvement Projects-
San Joaquin Region

SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS



- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

NOTE: *No WSIP facilities are proposed in this region.*

0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure 3.5c
Location of WSIP Facility Improvement Projects-
Hetch Hetchy Region

TABLE 3.11
WSIP IMPROVEMENT PROJECTS – AFFECTED JURISDICTIONS

Affected County and City Jurisdictions	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs/San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Tuolumne County																						
Unincorporated Areas			X	X																		
Stanislaus County																						
Unincorporated Areas			X	X																		
Riverbank				X																		
Modesto				X																		
San Joaquin County																						
Unincorporated Areas	X	X	X	X	X																	
Alameda County																						
Unincorporated Areas (including Sunol and Castro Valley)						X	X	X	X	X	X											
Newark												X										
Fremont									X			X		X								
Santa Clara County																						
Unincorporated Areas							X															
Milpitas							A						A									
San Jose													X									
Santa Clara													X									
Sunnyvale													A									
Mountain View													A									
Los Altos													A									
Palo Alto													X									
San Mateo County																						
Unincorporated Areas												X				X	X	X	X		X	
East Palo Alto												X										
Menlo Park												X										
Atherton													X									
Redwood City												X	A									
Woodside													A									
San Mateo																						
Hillsborough																C						
Burlingame																C					X	
Millbrae																C	C				X	
San Bruno																C	C				X	
South San Francisco															X						X	
Colma																					X	
Brisbane																						
Daly City															X					X	X	X
City and County San Francisco																				X	X	X

NOTES: X = Indicates a preferred project location, but an alternative site may also be present in this jurisdiction.
A = Alternative sites under consideration.
C = Not located in the city, but very close to the city limits.

facility improvement projects as a whole and to identify programmatic mitigation measures. As further project details and site-specific information are developed, it is possible that individual project effects identified in this document may not occur or additional project effects not identified in this document may occur. Such changes in project details would be addressed during subsequent project-specific environmental review.

[Since publication of the Draft PEIR, the SFPUC modified the project descriptions of two of the facility improvement projects, as reflected in the revisions to Table 3.10. Please refer to Section 13.2, Program Description Changes Affecting System Operations (Vol. 7, Chapter 13, for further discussion).]

As described in Chapter 2, for the purposes of this PEIR, the regional water system is divided geographically into regions (see Chapter 2, Figure 2.1). The WSIP facility improvement projects are located in the following five regions: San Joaquin (SJ), Sunol Valley (SV), Bay Division (BD), Peninsula (PN), and San Francisco (SF). There are no WSIP facility improvement projects in the Hetch Hetchy Region. The San Joaquin Region, covering the system from the Oakdale Portal to the Coast Range Tunnel, includes five improvement projects, three of which are treatment projects and two of which are pipeline projects. The Sunol Valley Region, with six improvement projects, covers a wide variety of facilities, including storage, treatment, tunnel, pipeline, and other facilities. The Bay Division Region, encompassing the south Bay Area, has three improvement projects, primarily related to pipeline, tunnel, and other transmission facilities. There are five improvement projects in the Peninsula Region, including valve houses, pipelines, and treatment and storage facilities. Overlapping with the Peninsula Region, the San Francisco Region includes three projects in northern San Mateo County and San Francisco, with one pipeline project and two water supply projects. For the most part, individual project activities are confined within the region, although two projects in the San Francisco Region have facilities that are also located in the Peninsula Region. This PEIR analyzes 22 key WSIP facility improvement projects, which are located along the regional system from Oakdale Portal on the east to San Francisco on the west. For the purposes of this PEIR, the projects are coded and numbered by region, as shown in Table 3.10 and Figure 3.5; these project numbers are used throughout this PEIR.[24]

Table 3.12 summarizes the preliminary construction and operational assumptions that the SFPUC has developed for the key regional facility improvement projects; **Figure 3.6** presents the preliminary construction schedule. The information presented in Table 3.12 is based on detailed project information tables, which are included in Appendix C of this PEIR; these tables provide additional project information such as site ownership, land acquisition requirements, existing uses, alternative designs, access routes, construction schedule, proximity to waterways, key environmental issues, construction scenario assumptions, and expected permits/approvals. However, all project information presented in this program-level evaluation is considered preliminary and will be subject to further study, design, and refinement during site-specific analyses. For this PEIR, the facility improvement projects are grouped by regional location and are discussed by region below.

24 The numbering system for the facility improvement projects is consistent, to the extent possible, with the system presented in the Notice of Preparation (NOP). However, due to regrouping of the projects after publication of the NOP, some projects have been renumbered.

Region	No.	Project Title	2006	2007	2008	2009	2010	2011	2012	2013	2014
SAN JOAQUIN REGION	SJ-1	Advanced Disinfection				■	■				
	SJ-2	Lawrence Livermore Supply Improvements					■				
	SJ-3	San Joaquin Pipeline System						■	■	■	
	SJ-4	Rehabilitation of Exisitng San Joaquin Pipelines			■	■	■	■	■	■	■
	SJ-5	Tesla Portal Disinfection Station				■	■				
SUNOL VALLEY REGION	SV-1	Alameda Creek Fishery Enhancement						■			
	SV-2	Calaveras Dam Replacement				■	■	■			
	SV-3	Additional 40-mgd Treated Water Supply					■	■	■		
	SV-4	New Irvington Tunnel				■	■	■	■		
	SV-5	SVWTP – Treated Water Reservoirs			■	■					
	SV-6	San Antonio Backup Pipeline				■	■				
BAY DIVISION REGION	BD-1	Bay Division Pipeline Reliability Upgrade				■	■	■	■		
	BD-2	BDPL Nos. 3 and 4 Crossovers					■	■			
	BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault					■	■			
PENINSULA REGION	PN-1	Baden and San Pedro Valve Lots Improvements				■	■				
	PN-2	Crystal Springs/San Andreas Transmission Upgrade						■	■	■	
	PN-3	HTWTP Long-Term Improvements						■	■	■	
	PN-4	Lower Crystal Springs Dam Improvements					■				
	PN-5	Pulgas Balancing Reservoir Rehabilitation					■	■	■		
SAN FRANCISCO REGION	SF-1	San Andreas Pipeline No. 3 Installation				■	■				
	SF-2	Groundwater Projects - Local and Lake Merced				■	■	■			
	SF-2	Groundwater Projects - Regional					■	■	■	■	
	SF-3	Recycled Water Projects					■	■	■		

SOURCE: SFPUC, 2006

Figure 3.6
Preliminary WSIP Construction Schedule

TABLE 3.12
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

No.	Project Title	Preferred Location	Existing Land Use	Project Facilities: Pipeline (miles)	Tunnel (miles)	Storage/ Basin (sq. ft.)	Treatment (sq. ft.)	Vaults/ Valve Houses (no. of structures)	Pump Station (no. of structures)	Other Facilities	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Operational Changes
San Joaquin Region													
SJ-1	Advanced Disinfection	Tesla Portal in San Joaquin County.	Existing SFPUC facility site developed with a caretaker's residence, two valve houses, and chlorination facility.	0.2	0	0	20,000	4	0	None	2	TBD	TBD, may require increased manpower.
SJ-2	Lawrence Livermore Supply Improvements	Thomas Shaft in San Joaquin County.	Undeveloped at Thomas Shaft site.	0	0	0	TBD	TBD	TBD	TBD	TBD	TBD	None. This unmanned facility is monitored by a SCADA system 24/7.
SJ-3	San Joaquin Pipeline System	Construction of a new eastern 6.4-mile pipeline (starting at Oakdale Portal) and a new western 10-mile fourth pipeline (ending at Tesla Portal), traversing Tuolumne, Stanislaus, and San Joaquin Counties. Construction of two additional crossover facilities, one about 20 miles east of Modesto and the other about 15 miles west of Modesto.	Alignment traverses areas developed with agricultural, residential, and golf course uses.	16.4[a]	TBD	0	0	2	0	• New valve houses and improvements at Tesla Portal • Two new crossover facilities	100 to 575 (plus up to 70 acres for staging)	424,000	Increased manpower during flow rate changes.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Across the Central Valley from Oakdale Portal to Tesla Portal.	Pipelines are routed through open grasslands (sometimes used for grazing), City of Modesto (including linear parks with walking and bike paths), orchards, Tracy Golf Course.	47.7 (each pipeline)	0	0	0	Throttling Stations Nos. 1 & 2; Roselle Crossover; San Joaquin River Valve House	0	None	All work would be within the existing right-of-way.	Conservatively, about 100,000	None
SJ-5	Tesla Portal Disinfection Station	Tesla Portal in San Joaquin County.	Existing SFPUC facility site developed with a caretaker's residence, two valve houses, and chlorination facility.	0	0	0	6,000	0	0	• Administration building (control room and offices) • Pump houses • Chemical storage tanks and feed equipment and sampling systems • Emergency generator, including primary and standby power supplies • Access road	2	TBD	None. This unmanned facility is monitored by a SCADA system 24/7.
			Subtotal (Rounded)	**64+**	**0**	**0**	**26,000**	**6+**	**0**		**±104 to 650**	**±524,000**	
Sunol Valley Region													
SV-1	Alameda Creek Fishery Enhancement	Alameda Creek in Alameda County.	Alternatives would be located in or near Alameda Creek downstream of Sunol Valley WTP.	TBD	0	0	0	0	TBD	A number of structural and non-structural recovery alternatives are under consideration, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed.	TBD	TBD	TBD, depending on alternative selected
SV-2	Calaveras Dam Replacement	Immediately downstream of Calaveras Dam at the south end of the Sunol Valley in Alameda and Santa Clara Counties.	Existing Calaveras Dam.	0	0	62.5 million	0	2	0	• Zoned earthfill dam with open-chute spillway • New intake tower and outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • Various instrumentation • Calaveras Road upgrades – TBD	666 (includes borrow areas)	6,300,000 cy total excavation and 4,000,000 cy spoil	Increased maintenance; Calaveras Reservoir would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek to support fisheries.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Sunol Valley Region (cont.)													
SV-3	Additional 40-mgd Treated Water Supply	Sunol Valley WTP in Sunol Valley, Alameda County.	Undeveloped land immediately adjacent to Sunol Valley WTP facilities.	1.5 to 2	0	42,000	0	0	0	• New flocculation and sedimentation system • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber • New filtered water and backwash piping • New chemical feed and piping system • Upgrade of the electrical supply system • Miscellaneous piping, valves, and mechanical and electrical work • Approximately two miles of 78-inch-diameter pipe to connect to the Alameda Siphons or Irvington Tunnel	1.5	100,000	25% increase in maintenance activities.
SV-4	New Irvington Tunnel	New east tunnel portal would be about 75 feet north or south of Alameda West Portal in the Sunol Valley. New west tunnel portal would be about 175 feet south of existing Irvington Portal within the Fremont city boundary.	Tunnel portals would be located on undeveloped lands near existing SFPUC facilities: Alameda West Portal and Irvington Portal. Lands immediately adjacent to existing portals are undeveloped, except for caretaker's home and water facilities at Irvington Portal and water facilities at Alameda West Portal. There is one residence located south of Alameda West Portal, and residential uses located west of Irvington Portal.	0	3.4	0	0	9 to 12	0	• New Alameda West Portal 2 and Overflow Shaft • New access road to Irvington Portal and Alameda West Portal • New Irvington Portal 2 and air release pipe • Demolition and rebuilding of existing Irvington Portal manifold • Valves and equipment to control and monitor flows • Two new permanent bridges across Alameda Creek. (Note that a total of two bridges are necessary to construct and operate both the New Irvington Tunnel and Alameda Siphons Upgrade projects; the determination of when to build the bridges would depend on which project would be constructed first. Since this determination has not been made to date, the bridges are evaluated under both projects.)	120 (additional area for staging could be required)	190,000	NA
SV-5	SVWTP – Treated Water Reservoirs	Site is within the boundary of the existing Sunol Valley WTP in Sunol Valley, Alameda County.	Site is within boundary of existing Sunol Valley WTP. Site is currently used for temporary equipment or supply storage on an as-needed basis. The Calaveras Nursery is located to the north, and open space is located to the west.	0.3	0	138,200	0	1	0	• Chemical storage and feed system • Pumping system for filter backwashing and other miscellaneous pumping appurtenances • Backup filter backwash system • Washwater supply system • Reservoir drainage system, controls, and instrumentation • Expansion of the existing Sunol Valley WTP electrical substation • Modification of existing valves • Upgrade of existing dechlorination station and miscellaneous piping	10.5	300,000	No
SV-6	San Antonio Backup Pipeline	Pipeline would extend between San Antonio Reservoir and San Antonio Pump Station.	Undeveloped SFPUC lands.	2.3	0	0	0	2	0	• New discharge facilities at San Antonio Creek (at end of the new pipeline) • New pipeline from the existing overflow outlet near Alameda East Portal, passing adjacent to the San Antonio Pump Station, and continuing to the discharge point on Alameda Creek	TBD	51,000 cy total excavation and 37,000 cy spoil	Second pipeline would allow discharge of dechlorinated water to San Antonio Creek during emergency outages. Pipeline would serve as a water supply alternative if the existing San Antonio Pipeline is out of service due to maintenance or emergency.
			Subtotal (Rounded)	**4 to 5**	**3+**	**63 million**	**0**	**14 to 17**	**TBD**		**±800**	**±7 million**	

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Bay Division Region													
BD-1	Bay Division Pipeline Reliability Upgrade	Within existing easement for the BDPL Nos. 1 and 2, which extends approximately 21 miles from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City. Pipeline right-of-way traverses urbanized areas of Fremont, Newark, East Palo Alto, Menlo Park, and Redwood City in Alameda and San Mateo Counties. The five-mile-long tunnel portion extends from Newark to East Palo Alto, running beneath San Francisco Bay and surrounding marshlands. A subsurface easement would be required for this portion.	Pipeline right-of-way traverses commercial, residential, school, and park uses. The pipeline would cross various highways, major roads, minor roads, and railroads. The Bay Tunnel would be underground and would not affect surface land uses, except at the tunnel shafts on either side of the bay. The Newark tunnel shaft site is developed with an existing SFPUC valve house and is surrounded by industrial uses. The Ravenswood tunnel shaft site is bordered by Bay Division Pipeline right-of-way to the south, marshland to the east, Cargill Salt Ponds to the north, and University Avenue and residential uses to the west. Approximately 15 acres of this site is being used for soil remediation and might eventually be used as a maintenance yard.	16	5	0	0	8 valve vaults, with up to 15 vaults total	0	Isolation valves and piping for connection to new Irvington extension and Pulgas Tunnels. One flow meter at each end of the alignment (2 total). Control buildings for electrical and mechanical equipment at each of the valve lots (8 total). New tunnel shafts at Ravenswood and Newark. Final decision on which shaft would be the drive shaft and which would be the receiving shaft is still to be determined. For the drive shaft, the excavated diameter would be approximately 50 feet, with parking for up to 40 construction work vehicles. Staging area would accommodate mucking out materials handling area, on- site power generation (as needed), or a transformer station, ventilation fans and mufflers, water supply, compressed air supply, and miscellaneous temporary construction facilities totaling approximately 30,000 s.f. The receiving shaft would require a demobilization area for disassembly and removal of a tunnel boring machine, materials handling area, onsite power generation (as needed), or a transformer station, ventilation fans and mufflers, water supply, compressed air supply, and miscellaneous temporary construction facilities totaling approximately 11,000 s.f.	165 to 175	Pipeline: 434,000 Tunnel: 260,000 to 355,000	Would increase system capacity to meet 2030 demand, improve drought delivery through increased replenishment of Peninsula reservoirs, and allow more frequent maintenance of the existing Bay Division Pipelines than is now possible. Following construction of the project, the aboveground and submarine sections of BDPL Nos. 1 and 2 from Newark Valve House to Ravenswood Valve House would be decommissioned. The westernmost reach of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be decommissioned.
BD-2	BDPL Nos. 3 and 4 Crossovers	Preferred locations and sites include: (1) Guadalupe River (Site B) in San Jose, Santa Clara County; (2) Barron Creek (Site C) in Palo Alto, Santa Clara County; and (3) Bear Gulch Reservoir (Site C) in Atherton, San Mateo County.	Sites would be located in undeveloped areas on Veterans Administration Medical Center and Gunn High School lands (Barron Creek), Ulistac Natural Area (Guadalupe Creek), and reservoir lands (Bear Gulch).	0	0	0	0	3 valve vaults	0	Valve vaults would be 3,750 sq. ft. each. The discharge location of drainage outfalls would vary depending on site conditions. Piping to connect facility to outfalls. Control buildings for electrical and mechanical equipment at each valve vault (3 total).	0.4 (minimum) at each site	43,500	Would reduce the length of pipe out of service at any one time and reduce the impact of maintenance or unplanned outages of BDPL Nos. 3 or 4 on system flows. Could allow more frequent maintenance than is now possible.
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Spans the I-680/Mission Boulevard interchange in Fremont (Alameda County) between Tissiack Place, Cayuga Place, and Indian Hills Road on the north side and Crawford Street on the south side.	Site spans the I-680/Mission Boulevard freeway interchange.	3	0	0	0	0 to 2 (TBD)	0	None	TBD	Phase B: 55,300	Would improve the seismic resistance of BDPL Nos. 3 and 4 across the Hayward fault.
			Subtotal (Rounded)	**19**	**5**	**0**	**0**	**11 to 20**	**0**		**±170 to 180**	**±800,000 to 900,000**	

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Peninsula Region													
PN-1	Baden and San Pedro Valve Lots Improvements	Baden site: W. Orange Avenue at El Camino Real in South San Francisco, San Mateo County. San Pedro site: San Pedro Road and Junipero Serra Boulevard in Daly City. Pulgas Pump Station: West of Cañada Road adjacent to Pulgas Water Temple in San Mateo County. Pulgas Valve Lot: Edgewood Road near I-280 in San Mateo County.	All work would occur within existing valve lots.	<1	0	0	0	2 at San Pedro; 6 at Baden	2	• Install new valves, pressure and flow meters, motor operators, SCADA valve controls • Modify valves/pumps/sump/vent shaft • Either enlarge existing vault or add new vault at Baden and/or San Pedro Valve Lots	Approximately 2 acres	5,000+	Operation of new PRV at Baden Valve Lot would occur during emergencies only but would be run for maintenance purposes approximately 2 times per year.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Facility locations in San Mateo County: • Upper Crystal Springs Dam culverts under Highway 92. • Crystal Springs Outlet Tower Nos. 1 and 2 and Crystal Springs Pump Station located west of I-280 near Skyline Boulevard/Crystal Springs Road intersection, near Hillsborough. • Crystal Springs/San Andreas Pipeline, San Andreas Inlet Structure, San Andreas Outlet Towers Nos. 2 and 3 located west of I-280, generally between Millbrae Avenue and Crystal Springs Road (adjacent to Hillsborough, Burlingame, and Millbrae). • Harry Tracy WTP located east of I-280 and south of Crystal Springs Road in San Mateo County, adjacent to San Bruno.	Project involves repair or replacement of existing SFPUC water facilities. If a new parallel pipeline is needed and an alternative alignment is chosen, an easement may be necessary. The most likely alignments would be within the watershed on lands currently owned by the CCSF.	4.5	0.5**	0	Emergency chemical injection systems at Crystal Springs and San Andreas Reservoirs.	32 existing vaults (number of vaults would most likely be reduced), and new vaults are limited to Crystal Springs Pump Station and outlet of four tunnels.	Renovation of existing pump station or 1 new pump station	• Repair lower culvert linking Upper and Lower Crystal Springs Reservoirs • Upgrade/repair Crystal Springs Outlet Structure Nos. 1 and 2 • Upgrade or replace Crystal Springs Pump Station (including increasing the capacity to transfer water between reservoirs from 80 to approximately 120 mgd, depending on the future modeling (maximum rate would be 140 mgd to match Harry Tracy WTP output), and build new substation (chemical injection equipment is new, only minor strengthening of pipe required) • Renew pipeline sections that are not replaced at San Andreas Reservoir • Depending on alternatives analysis, a new redundant pipeline may be required • Upgrade/repair San Andreas Outlet Structure Nos. 2 and 3 (significant retrofit of San Andreas No. 2 Tunnel may be required) • Repair San Andreas Pipelines Nos. 2 and 3 • Pump station capacity upgrades as required to meet Harry Tracy WTP raw water supply requirements **There are four existing tunnels that would require strengthening and/or retrofit.	TBD	Not specified (estimate up to 9,000 cy)	Increased operations and maintenance due to increased pumping/ transmission capacity.
PN-3	HTWTP Long-Term Improvements	Harry Tracy WTP is located south of Crystal Springs Road in San Mateo County, adjacent to San Bruno and Millbrae.	Harry Tracy WTP site is currently developed with water treatment facilities.	1 to 2	0	2	Project is a treatment facility.	TBD	1	Some of the 16 identified structures would require upgrades. Mechanical, structural, electrical, and process upgrades are expected to be necessary, with known upgrades occurring within existing development footprints. However, structures could be added within the Harry Tracy WTP property. Improvements include disinfection treatment upgrades, raw water pumping upgrades, replacement/upgrade of sedimentation basins at same location, sludge facilities, and power and instrumentation upgrades.	TBD	Not specified	Potential increase in operations and maintenance due to increased sustainable treatment capacity.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Peninsula Region (cont.)													
PN-4	Lower Crystal Springs Dam Improvements	Dam is located west of I-280 and Skyline Boulevard, and south of Crystal Springs Road in San Mateo County.	Lower Crystal Springs Dam is an existing dam, and the Lower Crystal Springs Reservoir level is currently restricted by the CA Division of Safety of Dams (DSOD). The zone around the reservoir that would be inundated under the WSIP is currently undeveloped; however, with implementation of the proposed project, including improvements to the dam and spillway, the reservoir levels would be restored to inundation zone levels that were permissible by DSOD prior to 1983.	0	0	0	0	0	0	• Raise dam parapet wall to provide required freeboard during probable maximum flood (PMF), which could also require strengthening abutments • Lengthen spillway crest to increase discharge capacity • Install new mechanical gates to replace the antiquated stop-log system • Enlarge the stilling basin to accommodate the probable maximum flood discharge. Project cannot be completed until San Mateo County completes the Skyline Boulevard (Highway 35) bridge project.	6 acres	21,000 cy	Increased maintenance (although project would restore historical storage capacity).
PN-5	Pulgas Balancing Reservoir Rehabilitation	Located on the east side of Cañada Road, southeast of the Pulgas Water Temple in San Mateo County.	This project would be located within the areas of the existing Pulgas Balancing Reservoir Pulgas Channel, and Pulgas dechloramination facility as well as near the mouth of Laguna Creek.	0	0	0	0	0	0	Five phases: • New inlet/outlet piping to ensure optimal mixing in reservoir • Replace Pulgas Channel with an enlarged channel to accommodate estimated maximum flow of 250 mgd • Structural rehabilitation and roof replacement • Restore the existing sedimentation basin for the enhancement of habitat as a mitigation • Modify existing dechlorination process – increase capacity of carbon dioxide system and chemical feed systems	TBD	TBD	No
			Subtotal (Rounded)	**±7 to 9**	**0.5+**	**2**	**0**	**8+**	**3+**		**±8**	**±35,000**	
San Francisco Projects													
SF-1	San Andreas Pipeline No. 3 Installation	This pipeline alignment extends from the San Pedro Valve Lot in Daly City (San Pedro Road at Junipero Serra Boulevard) to Merced Manor Reservoir in San Francisco (at Ocean Avenue and 22nd Avenue).	Most of the pipeline would be located within existing roadways, parking lots, and other paved areas, with the remainder crossing through open space corridors in Lake Merced Golf and Country Club and San Francisco Golf Club. Adjacent uses include residential, commercial, school, church, and park uses.	4.17	0	0	0	2	0	• 4.07 miles of 36-inch-diameter and 0.1 mile of 12- to 16-inch-diameter steel pipeline • Removal and/or slurry fill of the existing Baden-Merced Pipeline • Installation of line valves, vaults, and manholes • Installation of cathodic protection systems and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances	23	44,170	No
SF-2	Groundwater Projects	Local Projects in San Francisco: Lake Merced Pump Station, South Sunset Playground (40th Avenue/Wawona Street), West Sunset Playground (41st Avenue/Quintara Street), Golden Gate Park (Lincoln/42nd Avenue), or alternative locations; North Lake (north side of North Lake in Golden Gate Park, near Fulton Street/43rd Avenue intersection); San Francisco Zoo; Central Pump Station; Pine Lake (Stern Grove), other Golden Gate Park locations. Regional Projects in San Mateo County: up to 10 sites in Daly City and San Bruno and the California Water Service	San Francisco sites already developed with municipal water supply, playground, school parking lot, park, and zoo uses. Regional well sites have not yet been identified.	4.0	0	0	500	0	0	• San Francisco: Install new wells, well stations, and associated pipelines, water treatment equipment, and controls at Lake Merced Pump Station, South Sunset Playground, West Sunset Playground, and Golden Gate Park (or alternate location at Central Pump Station or Francis Scott Key Annex). Modify wells at San Francisco Zoo and North Lake (Golden Gate Park) for emergency supply. Replace wells at San Francisco Zoo, Pine Lake (Stern Grove), Golden Gate Park, and/or other locations (TBD); 2,500 sq. ft. per site. • Regional: Up to 10 new wells and well stations in San Mateo County, Daly City, San Bruno, South San Francisco, and Colma. Wells are estimated to be 600 feet deep.	0.04 acre per site plus pipeline alignments (or 0.7 acre for 18 sites)	TBD	Increased chlorination or chloramination supplies during drought years only, operation inspections, lubrication, calibration of monitoring equipment.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
San Francisco Projects (cont.)													
SF-2 (cont.)	Groundwater Projects (cont.)	Company's South San Francisco service area (including South San Francisco, Colma, and unincorporated areas of northern San Mateo County). Wells could possibly be located in San Francisco, Burlingame, or Millbrae.											
SF-3	Recycled Water Projects	Treatment site location is TBD; options include the Oceanside Water Pollution Control Plant, San Francisco Zoo overflow parking lot, the site of the old Richmond-Sunset Treatment Plant, and the site of the old McQueen Plant. Treated water storage would be provided at the treatment site as well as offsite; offsite locations include new storage in Lincoln Park (golf course), and the conversion of existing storage in Golden Gate Park. Pipeline alignments would be within city streets.	The Oceanside Water Pollution Control Plant has limited space in an existing room that houses odor control scrubbers; the zoo overflow parking lot is unpaved and in use by the zoo; the Richmond-Sunset site is used for construction spoils storage; and the McQueen site is being used by the Recreation & Park Department as an Urban Forestry Center. Lincoln Park is a golf course, and the Golden Gate Park storage tank is an existing storage facility.	20	0	TBD	Approx. 50,000	0	1 or 2	Utilize existing 2-million-gallon Golden Gate Park Reservoir. Additional storage in the Lincoln Park area. Other potential small booster pumping station(s) have not been identified.	5 to 7	47,200	Increased deliveries and maintenance.
			Subtotal (Rounded)	**28+**	**0**	**0**	**50,500**	**2**	**1 or 2**		**±29 to 31**	**±91,400**	

mgd = million gallons per day
NA = not applicable
SCADA = Supervisory Control and Data Acquisition
sq. ft. = square feet
cy = cubic yards
TBD = to be determined during project design and as part of separate, project-level CEQA review

[a] While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed (depending on the results of a condition assessment of the existing pipelines), as well as a new valve house at Oakdale Portal (in addition to Tesla Portal).

3.8.1 San Joaquin Region

Of the five key regional WSIP projects in the San Joaquin Region, most project facilities would be constructed along the San Joaquin Pipelines alignment or at Tesla Portal. As summarized in Table 3.12, implementation of the WSIP in the San Joaquin Region would be expected to result in construction of approximately:

- 16 miles of pipeline between Oakdale Portal and Tesla Portal (SJPL System, SJ-3, and Advanced Disinfection, SJ-1)[25]
- Rehabilitation of the existing San Joaquin Pipelines Nos. 1, 2, and 3 (SJPL Rehabilitation, SJ-4) at locations to be determined, potentially anywhere along its 48-mile length
- 26,000 square feet of treatment facilities at Tesla Portal (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5)

In addition, a small treatment facility could be developed at Thomas Shaft, west of Tesla Portal (under the Lawrence Livermore project, SJ-2), although the design and locations of treatment facilities associated with the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects are all interrelated and subject to change. In general, program implementation would not alter existing operation and maintenance activities in this region, although there could an increase in chemical usage, truck traffic, and energy usage, all related primarily to the Advanced Disinfection project.

Based on the preliminary WSIP schedule, program-related construction activities in this region are scheduled to occur between 2008 and 2014 and would be expected to result in surface disturbance of as much as 650 acres (99 percent attributable to the SJPL System project, SJ-3). Such disturbance would generate approximately 424,000 cubic yards of excavated material/trench spoils (100 percent attributable to the SJPL System project, SJ-3), though an additional approximately 100,000 cubic yards could result from SJPL Rehabilitation, SJ-4.

3.8.2 Sunol Valley Region

Of the six key regional WSIP projects in the Sunol Valley Region, the largest projects (as defined by the construction duration and extent of earthwork required) would be the Calaveras Dam (SV-2) and New Irvington Tunnel (SV-4) projects. As summarized in Table 3.12, WSIP implementation in the Sunol Valley Region would be expected to result in construction of approximately:

- 4 to 5 miles of pipeline within the Sunol Valley (40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; and SABUP, SV-6)
- Over 3 miles of tunnel between the Sunol Valley and Fremont (New Irvington Tunnel, SV-4)

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[25] While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed depending on the results of a condition assessment of the existing pipelines.

- Replacement of the existing earthen dam at Calaveras Reservoir (Calaveras Dam, SV-2)
- 180,200 square feet of storage and treatment facilities at the Sunol Valley WTP (40-mgd Treated Water, SV-3, and Treated Water Reservoirs, SV-5)
- 14 to 17 vaults or valve houses at Calaveras Reservoir (SV-2), near Turner Dam and San Antonio Pump Station (SABUP, SV-6), Alameda West Portal and Irvington Portal (New Irvington Tunnel, SV-4), and Sunol Valley WTP (Treated Water Reservoirs, SV-5)
- Pump stations in the Sunol Valley could be developed along Alameda Creek, depending on the alternative implemented (Alameda Creek Fishery, SV-1)

In addition, various other water facilities (piping, pumping, chemical feed, valve, manifold, electrical substation facilities, portable propane- or diesel-powered generators, and propane fuel tanks at some sites) would be constructed in the Sunol Valley (SV-2 through SV-6). Facilities associated with the Alameda Creek Fishery project (SV-1), other than the possible pump stations, have not yet been identified. In general, WSIP implementation would result in a long-term increase in operation, maintenance, and monitoring activities associated with the instream fishery releases and the facilities for recapturing the released water downstream in Alameda Creek and returning it to the regional water supply. There would also be operations and maintenance needs associated with periodic instrumentation calibration, valve cleaning, and increased use of treatment chemicals associated with expanded treatment capacity (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; and Treated Water Reservoirs, SV-5) in Sunol Valley.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2008 and 2013, with most work performed in 2009 to 2011. Construction would be expected to result in surface disturbance of approximately 800 acres (98 percent attributable to the Calaveras Dam, SV-2, and New Irvington Tunnel, SV-4, projects) and would generate approximately 7 million cubic yards of excavated material/spoils that would require permanent disposal (90 percent attributable to the Calaveras Dam project).

3.8.3 Bay Division Region

Of the three key regional WSIP projects in this region, most project facilities would be associated with the BDPL Reliability Upgrade project (BD-1). As summarized in Table 3.12, program implementation in the Bay Division Region would be expected to result in construction of approximately:

- 19 miles of pipeline in the East Bay, South Bay, and Peninsula (BDPL Reliability Upgrade, BD-1, and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3)
- 5 miles of tunnel extending across San Francisco Bay between Newark and East Palo Alto (BDPL Reliability Upgrade, BD-1)
- 11 to 20 valve lots or vaults along the existing rights-of-way of Bay Division Pipelines Nos. 1, 2, 3, and 4 (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3)

In addition, various other appurtenant facilities (isolation valves, piping, drainage outfalls, control rooms, transformers, emergency generators, and electronic equipment) would be constructed in various cities under all three projects in the region. In general, program implementation would not alter existing operation and maintenance activities (e.g., no change chemical deliveries, storage, and use) in this region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2009 and 2013. Construction in the Bay Division Region would be expected to result in surface disturbance of approximately 170 to 180 acres (99 percent attributable to BDPL Reliability Upgrade project, BD-1) and would generate approximately 800,000 to 900,000 cubic yards of excavated material/spoils that would require permanent disposal (most attributable to the BDPL Reliability Upgrade project).

3.8.4 Peninsula Region

There are five key regional WSIP projects in this region, and most facilities are attributable to the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects. As summarized in Table 3.12, program implementation in the Peninsula Region would be expected to result in construction of approximately:

- 7 to 9 miles of pipeline in San Mateo County, including segments between Lower Crystal Springs Reservoir and San Andreas Reservoir (CS/SA Transmission, PN-2), at Harry Tracy WTP (HTWTP Long-Term, PN-3), and at various valve lots (Baden and San Pedro Valve Lots, PN-1)
- 0.5 mile of tunnel in San Mateo County (CS/SA Transmission, PN-2)
- Raising the Lower Crystal Springs Dam (Lower Crystal Springs Dam, PN-4)
- 2 storage basins at Harry Tracy WTP (HTWTP Long-Term, PN-3)
- About 8 vaults/valves lot in or near South San Francisco and Daly City (Baden and San Pedro Valve Lots, PN-1, and CS/SA Transmission, PN-2)
- 3 to 4 pump stations, new or upgrades (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; and HTWTP Long-Term, PN-3)
- Replacement and enlargement of discharge channel (Pulgas Balancing Reservoir, PN-5)

Except for the pipeline facilities, most of the projects in this region would generally involve modifying or expanding existing water facilities and would be located in developed areas in San Mateo County or within the cities of Daly City and South San Francisco (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; and HTWTP Long-Term, PN-3). These projects include installing new valves, pressure and flow meters, or motor operators; modifying, repairing, upgrading, or seismic retrofitting vaults, valves, vent shafts, piping, pumps, sumps, chemical feeds, filters, or other treatment facilities; and rehabilitating or adding structures. Larger projects also include pump station upgrades (CS/SA Transmission, PN-2), reservoir outlet upgrades/repairs (CS/SA Transmission, PN-2), raising the dam parapet at Lower Crystal Springs

Reservoir (Lower Crystal Springs Dam, PN-4), and replacing/enlarging Pulgas Channel at Upper Crystal Springs Reservoir (Pulgas Balancing Reservoir, PN-5).

Program implementation in the Peninsula Region would increase pumping and transmission capacity between Lower Crystal Springs Reservoir and San Andreas Reservoir (CS/SA Transmission, PN-2) as well as increase the sustained treatment capacity at the Harry Tracy WTP (HTWTP Long-Term, PN-3). In addition, raising the parapet at Lower Crystal Springs Reservoir would restore the historical storage capacity (Lower Crystal Springs Dam, PN-4). However, the other WSIP projects in this region would not alter existing operation and maintenance activities in the region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2008 and 2013. The extent of surface disturbance associated with projects in this region cannot be estimated at this time because many of the projects are still in the preliminary planning stage. Projects with the potential for extensive surface disturbance include the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects. Surface disturbance for some projects (Baden and San Pedro Valve Lots, PN-1, HTWTP Long-Term, PN-3, and part of Pulgas Balancing Reservoir, PN-5) would be limited to expanded facilities and staging areas, since these projects would primarily be located within existing development footprints. Program-related construction activities in the Peninsula Region would generate approximately 35,000 cubic yards of excavated material/spoils, attributable mostly to the CS/SA Transmission Upgrade (PN-2) and Lower Crystal Springs Dam (PN-4) projects, with the potential for additional excavation under the Baden and San Pedro Valve Lots, HTWTP Long-Term, and Pulgas Balancing Reservoir projects.

3.8.5 San Francisco Region

Of the three key regional WSIP projects in this region, most of the project facilities would be associated with the San Andreas Pipeline No. 3 Installation project (SF-1) and Recycled Water Projects (SF-3). As summarized in Table 3.12, program implementation in the San Francisco Region would be expected to result in construction of:

- Approximately 28 miles of pipeline in Daly City and San Francisco (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3)
- An estimated 14 new groundwater wells in San Francisco, Daly City, San Bruno, and South San Francisco (Groundwater Projects, SF-2)
- Approximately 50,000 square feet of treatment facilities for recycled water (Recycled Water Projects, SF-3)

In addition, various other water facilities (line valves, vaults, manholes, cathodic protection systems and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances) would be constructed in Daly City and San Francisco under the SAPL 3 Installation project (SF-1). Approximately 14 new well stations (which could include new buildings and booster pumps) and associated piping could be installed, and some existing wells in San Francisco could be upgraded under the Groundwater Projects (SF-2).

Program implementation in the San Francisco Region could modify or add treatment facilities for the Groundwater and Recycled Water Projects in San Francisco (SF-2 and SF-3). The other WSIP project in this region (SAPL 3 Installation, SF-1) would not alter existing operation and maintenance activities in the region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2009 and 2014. Approximately 30 acres of surface disturbance is estimated for this region. Program-related construction activities in the San Francisco Region would generate approximately 91,000 cubic yards of excavated material/spoils (nearly all attributable to the SAPL 3 Installation, SF-1, and Recycled Water Projects, SF-3).

3.9 Construction Scenarios for Facility Types

Typical construction scenarios for the different types of facilities proposed under the WSIP are described below. These descriptions address the nature, extent, and duration of anticipated construction activities and are used in the programmatic analysis of construction impacts in Chapter 4 of this PEIR. Actual construction activities could vary and would be determined during subsequent, project-specific review of the individual WSIP projects.

3.9.1 Pipelines

Construction of the WSIP facility improvement projects related to water transmission and distribution pipelines would be accomplished using standard pipeline installation methods, generally the open-cut trench method (also referred to as the cut-and-cover construction method) where feasible. In general, cut-and-cover pipeline construction would progress at a rate of approximately 120 to 160 feet per day depending on conditions (e.g., whether the pipeline is located in an urbanized or undeveloped area), the length and size of the pipe segment, number of utility crossings, traffic congestion, and any restrictions on work schedules. However, in areas where there are no obstructions and construction occurs entirely within the SFPUC right-of-way (e.g., where there are no road crossings), the pipeline construction could progress at a rate of up to 300 feet per day. Periodically, staging areas could be required for equipment laydown and for stockpiling backfill and spoils from the trench, but construction disruption associated with pipeline installation would generally be limited to one section at a time rather than the entire length of the alignment.

The key steps in the cut-and-cover construction process would be as follows: (1) surface preparation, (2) trench excavation and shoring, (3) pipe installation, (4) trench backfilling and compacting, and (5) surface restoration. Surface preparation could involve removing structures (such as fences), saw-cutting and removing pavement, or removing vegetation from the surface of the trench area. Equipment used for this activity could include jackhammers, pavement saws, mowers, graders, and loaders. Trench excavation would be done using a backhoe or excavator, and excavated soil of suitable quality would be stockpiled along the trench for later reuse as backfill; where excavated soil is not of suitable quality, engineered fill could be trucked to the site for backfilling. Excess soil would be hauled offsite for disposal.

The depth and width of the trench would depend on the size of the pipeline to be installed. For pipe diameters ranging from 12 to 36 inches, the depth of the trench would range from 5 to 8 feet and the width of the trench from 2 to 5 feet. For larger pipelines (54 to 78 inches in diameter), the depth of the trench would range from 10 to 15 feet and the width of the trench from 8 to 12 feet. There would be a minimum of 3 feet of cover over the pipelines. To protect workers from trench failure, shoring would be required for trenches over 5 feet deep. Depending on the geotechnical characteristics, soil conditions, and the depth of excavation, various methods of shoring could be employed, including use of a shield or trench box, steel plates, sheet piling and beams, or solder piles and lagging, which would be installed with a pile driver or excavator. Typically, sheet-piling would be required for trenches over 10 feet deep in unstable soils, such as sand or heavy clay. If groundwater is encountered during trench excavation, dewatering would typically be required so that the pipe could be installed in dry conditions. Any groundwater produced during dewatering would likely be discharged to the local sewer system, the storm sewer, or a nearby waterway, in compliance with appropriate regulations.

Pipe-bedding materials would then be placed in the stabilized trench, followed by the new segment of pipeline. Pipe segments would be connected, typically with welded joints (for steel pipe) or bell and spigot joints (for ductile iron pipe). Flexible couplings are typically used when the pipe needs special protection from damage due to earthquakes or other soil movement. Depending on the soil conditions, imported pipe-bedding materials could be used to backfill the pipe up to its approximate centerline. The trench would then be backfilled with native soil, to the extent possible, in order to meet applicable compaction requirements. Imported backfill could be necessary for compactibility and stability. For pipelines located within paved roadways, surface restoration would involve repaving the area with new asphalt or concrete pavement. For undeveloped areas, the disturbed area would be graded and revegetated with approved plant materials. Finally, construction debris would be hauled from the site for disposal.

Open-cut construction would not be appropriate for some pipeline crossings of major roadways (including freeways and highways), railroads, environmentally sensitive areas, perennial creeks,[26] or aqueducts/canals. In these cases, several alternative "trenchless" pipeline construction techniques that avoid trenching along the entire length of the pipeline could be utilized as appropriate, including the following:

- Where an aboveground crossing would be appropriate (considering security and access issues), a pipeline could be elevated above ground and either hung beneath an overpass with brackets or supported by footings from below.
- Where an underground crossing is required, the pipeline crossing could be constructed using trenchless methods, such as jack-and-bore or microtunneling, as appropriate.

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26 For seasonal creeks, trenched crossings could be accomplished during the dry season, to protect environmentally sensitive habitat (such as riparian habitat).

Jack-and-bore construction requires excavation of a jacking pit at the jacking end and a receiving pit at the other end of each pipeline crossing segment, through which the piping installation equipment is respectively inserted and retrieved. Jacking pits for larger pipelines would be approximately 12 to 20 feet deep, 15 to 20 feet wide, and 30 feet long. Jack-and-bore construction would typically be used for pipeline crossings that are 80 to 300 feet long and for pipe diameters of 30 to 78 inches. Similarly, microtunneling could be used for pipeline segments that are 100 to 1,000 feet long and would be appropriate for areas with coarse soils and rocks and where precise alignment is needed. Microtunneling requires excavation of a shaft at each end of the pipeline crossing, and surface disturbance is limited to either end of the pipeline segment.

- In some cases, where pipeline installation or replacement is not required, it might be possible to slipline some sections of an existing pipeline. This method, which could be employed where the pipeline is straight, would require excavation of access pits at all angle points and on either side of the segment to be sliplined, rather than trenching along the length of the entire segment. Sliplining would involve disturbance of less surface area than cut-and-cover construction. However, as with cut-and-cover construction, periodic staging locations might be needed for equipment laydown and for stockpiling backfill and spoils from the access pits.

3.9.2 Tunnels

Whereas pipeline construction would generally occur during daytime working hours and would affect adjacent uses for a short period of time as construction progresses along the alignment, tunnel construction would typically occur 24 hours per day, seven days a week, and construction activities would be focused at two locations (the entrance and exit tunnel portals) for the duration of tunnel construction.

Tunneling is typically accomplished by mechanical means, with the use of a tunneling machine (such as a tunnel boring machine, or roadheader, or an earth-pressure-balancing tunnel machine) that excavates the tunnel, removes the spoils (or “muck”), and lines the tunnel with concrete segments. Within the tunnel, a narrow-gage railway or tunnel train is built on the concrete segments for delivering supplies into the tunnel, and a conveyor belt is installed to remove tunnel spoils. Spoils from tunnel excavations are typically removed from the tunnel face and deposited outside the portal using various methods, such as a conveyor belt, front-end loader, hoppers, or tunnel train (also known as a muck train). Excavated material stockpiled outside the portal is then loaded onto trucks or barges (if applicable) and transported offsite. Other related tunneling equipment includes a tunnel ventilation fan, muck removal equipment, dewatering and groundwater treatment system, etc. Depending on the tunnel design, vent shafts could be required at certain locations along the tunnel alignment, with associated surface disturbance occurring outside of the tunnel portal areas.

Depending on the subsurface conditions encountered, drilling and controlled detonations might be needed as part of tunnel construction. Controlled detonation is performed by drilling holes in a specified pattern in the rock face of the tunnel excavation, packing the holes with small amounts of explosive and primer, and detonating the explosives using a time delay between successive detonations.

Tunnel construction would start at the entry portal, which would serve as the primary staging area for tunnel construction and require a large construction staging area for the duration of tunneling activities. Removal and transport of tunnel spoils would generally occur at the entry portal, as would equipment storage and deliveries. Depending on the construction specifications, activities at the exit portal could be limited; in some cases, this portal would primarily be used to remove the tunneling equipment upon completion of tunneling. Tunnel portal construction could require grading and construction of an access road and staging areas for construction office trailers, equipment and materials storage, and temporary stockpiling. Tunnel construction would include excavation and construction of a tunnel portal entry or launch shaft, which would serve as the main access for installation of equipment as well as for removal of tunnel spoils. Depending on the depth, size, and location of the tunnel, the portal entry could require shoring and associated supports and/or dewatering systems.

Tunneling operations typically take place 24 hours a day to maximize construction efficiency, since most activities occur underground and cause limited surface disturbance. However, surface activities at the tunnel portals could be suspended during nighttime shifts, depending on the location. Upon completion of tunnel construction, portal areas would generally include construction of permanent tunnel access and maintenance facilities, and construction staging areas would be restored to their original conditions.

3.9.3 Vaults, Valve Lots, and Crossover Facilities

Vaults, valve lots, and crossover facilities are located at discrete sites along the regional system and house a variety of electrical and mechanical equipment used for system operation and maintenance. The design of vaults, valve lots, and crossover facilities varies from project to project and site to site. These structures are generally partially or entirely buried, have a building footprint of about 4,000 square feet (50 feet by 75 feet), and range in depth from 6 to 15 feet below grade. Partially buried vaults can extend up to 30 inches above the ground surface, whereas access doors to completely buried vaults are at grade. Whether or not a vault can be completely buried depends on site-specific conditions, such as depth to groundwater or adjacent uses. Vaults are used to house valves, and control buildings are often associated with them. Control buildings house instrumentation and electrical facilities. Control buildings can be buried, but are more frequently above grade; they are typically small, one-story structures (minimum height of 8 feet) and have power requirements. Some facilities, such as crossover structures, could require permanent discharge facilities to local creeks or other water bodies so that transmission pipelines can be drained prior to maintenance or if needed to conduct emergency repairs.

Construction activities for vaults or valve lots are assumed to be restricted to the immediate vicinity of the site (either existing sites proposed for repair or new sites) and to continue at the same location for the full duration of construction. Construction activities could include excavation and shoring, concrete construction, equipment installation, startup, and testing. Staging areas for equipment storage and temporary stockpiling could also be required. The extent and duration of construction would depend on the specific project.

3.9.4 Pump Stations

As with valve lots, existing or proposed pumping facilities are located at discrete sites along the regional system, but generally require a much larger area and larger equipment than valve lots. The WSIP improvements for this category of facility involve upgrades to pump stations, although there is a possibility that one station would be abandoned and a new station constructed on adjacent developed land. The proposed pumping facility modifications include replacing pumping, electrical, power, and valving systems to allow them to reliably operate at their original capacity. Pump stations typically include a series of pumps, the largest being about 1,000 horsepower. The proposed improvements would include the use of electrically driven pumps, so there would be no additional onsite emissions from internal combustion engines. One pump station has three existing diesel-driven pumps that would remain available for use. All of the new facilities would be designed to comply with current noise abatement ordinances.

Pump station upgrades generally involve replacing existing pumps with new pumps. The buildings that house the pumps would typically remain unchanged.

In general, construction associated with pumping facilities can be phased so that system operations are not interrupted during construction. Construction of new pump stations or rehabilitation of existing stations would generally include the following types of construction activities: partial demolition of existing facilities, removal and replacement of pumps and valves, structural modifications, electrical modifications, power system modifications (which could include backup power), and modifications to the instrumentation and controls.

3.9.5 Treatment Facilities

The WSIP treatment facility projects include constructing a new secondary disinfection facility, upgrading the system's existing primary disinfection facility at Tesla Portal, and expanding/upgrading treatment facilities at both the Sunol Valley and Harry Tracy WTPs. For all of these projects, construction activities would be confined to the proposed site location and immediate vicinity for the duration of construction.

For projects proposed at existing treatment facility locations, all construction activities would be limited to the area within the property boundaries, and changes in operations would involve minor modifications over existing procedures. The general types of proposed modifications to treatment facilities include:

- Process improvements and additions
- Hydraulic system improvements
- Structural/seismic improvements
- Instrumentation and control improvements
- Electrical and power system improvements
- Site grading, paving, and drainage

In general, construction associated with treatment facilities would be phased so that system operations would not be interrupted during construction. Construction of both new and modified treatment facilities would generally include the following types of construction activities: a relatively minor amount of excavation, relocation of existing utilities, demolition, site grading, structural work, mechanical/process system work, electrical work, and instrumentation and controls.

3.9.6 Storage Facilities

The WSIP includes construction or improvement of two types of storage facilities: reservoirs and dams. For both types of facilities, construction activities would occur at the project site and vicinity throughout the duration of construction. There would be about 30 to 40 workers per crew (with one or more crews, depending on the project).

Storage reservoirs can be associated with water treatment facilities or can be an isolated end point in the distribution system. In the SFPUC system, existing storage reservoirs are entirely or partially below grade; construction of new storage reservoirs under the WSIP would involve extensive excavation to accommodate the basin(s), with excavations extending up to approximately 25 feet below grade. Excavated soils would be reused or would be hauled offsite for disposal. A dewatering system could be required if the excavation extends below groundwater elevations. The excavated area would have vertical side walls, which would require shoring by tieback walls, sheet piles, and/or solder piles in select areas; these are typically installed through pile driving or drilling, depending on the type of shoring used. The next phase of construction would involve the placement of steel-reinforced concrete. Following excavation, shoring, and concrete placement, equipment would be delivered and installed. Equipment could include pumping systems, filters, chemical feed equipment, piping, valves, and electrical and instrumentation facilities. Storage basins would require extensive seismic support and strengthening for public safety as well as for compliance with applicable requirements of the DSOD.

Dam improvements associated with the WSIP facilities range from replacing of the earthen dam at Calaveras Reservoir to raising the dam parapet at Lower Crystal Springs Dam. Replacement of Calaveras Dam would involve extensive earthmoving activities, not only to construct the new earthen dam but also to remove a portion of the existing dam. Dam replacement would also require the development of borrow and disposal areas as well as associated access roads between the borrow and fill areas and the dam site. In contrast, the Lower Crystal Springs Dam improvements would require much less earthmoving activities. Raising the dam parapet would primarily involve strengthening dam abutments and upgrading the spillway crest, tilt-weir gates, and stilling basin (below the dam).

3.10 Standard Construction Measures and GHG Reduction Actions

The SFPUC has established standard construction measures and greenhouse gas (GHG) reduction actions that would be implemented as part of all SFPUC projects, including the WSIP projects listed in Table 3.10. The main objective of the standard construction measures is to minimize potential disruption of surrounding neighborhoods during construction and to reduce impacts on existing resources to the extent feasible. The construction measures will be implemented individually for the different facility improvement projects; some measures might not be applicable to individual maintenance or repair projects, and some projects will require the development of more detailed implementation steps as the individual projects are designed and implemented. Each SFPUC project manager, environmental project manager, and contract manager would ensure that every project involving construction work contains uniform provisions to address the issues addressed in the standard construction measures. To that end, each construction contract or project must include the following standard construction measures in either the contract or project implementation procedures, as appropriate. The measures would apply to any project subject to environmental review under CEQA and would be implemented by SFPUC staff or by outside contractors under contract to the SFPUC. Although some of the SFPUC standard construction measures might not be appropriate for certain projects, each measure must be addressed through one of the following: undertaking the activities listed, undertaking further investigation and developing a more detailed work plan to address the issue, or explaining why the measure is not applicable to the particular site.

The standard construction measures to be included in WSIP construction contracts consist of the following ten provisions (SFPUC, 2007b):

1. *Neighborhood Notice*: The SFPUC will provide reasonable advance notification to the businesses, owners and residents of adjacent areas potentially affected by the Water System Improvement Program (WSIP) projects about the nature, extent and duration of construction activities. Interim updates should be provided to such neighbors to inform them of the status of the construction.

   Where schools would be affected, the SFPUC will coordinate with school facility managers to schedule construction for time periods with the least impact on school activities and facilities to ensure student safety and to minimize disruption to educational and recreational uses of the school property.

2. *Seismic and Geotechnical Studies*: Projects will incorporate review of existing information and, if necessary, new engineering investigations to provide relevant geotechnical information about the particular site and project, including a characterization of the soils at the site, and the potential for subsidence and other ground failure. Construction will address any recommendations by such geotechnical reports to ensure seismic stability and reliability of the proposed project. All SFPUC projects must be designed for seismic reliability and minimum potential water loss and property damage. All components of the water system improvement program must be designed to continue water service during a major earthquake.

3. *On-Site Air and Water Quality Measures during Construction*: All construction contractors must take measures to minimize fugitive dust and dirt emissions resulting from the construction, and implement measures to minimize any construction effects on local air and water quality, including a local storm drain system or watercourse. These measures could include preparation of a stormwater pollution prevention plan (SWPPP), if required by the California Regional Water Quality Control Board. At a minimum, construction contractors should undertake the following measures, as applicable, to minimize any adverse effects:

   - Erosion and sedimentation controls tailored to the site and project
   - Dust control plan
   - Placement of straw rolls around each of the nearby stormwater inlets
   - Preservation of existing vegetation
   - Installation of silt fences
   - Use of wind erosion control (e.g. – geotextile or plastic covers on stockpiled soil)
   - Sweeping of nearby streets at least once a day
   - Stabilization of site ingress/egress locations to minimize erosion
   - Spraying the disturbed areas of the site, or any stockpiled soil, with water to minimize fugitive dust emissions

4. *Groundwater*: If groundwater is encountered during any excavation activities, the construction contractor shall prepare a dewatering plan so that water is discharged to the stormwater system in compliance with the local standards and discharge permit requirements.

5. *Traffic*: Each contractor shall prepare a traffic control plan which will minimize the impacts on traffic and on-street parking on any streets affected by construction of the proposed project. As appropriate, SFPUC or the contractor will consult with local traffic and transit agencies.

6. *Noise*: The contractor will comply with local noise ordinances regulating construction noise to the extent feasible, and will undertake efforts to minimize any noise disruption to nearby neighbors and sensitive receptors during construction.

7. *Hazardous Materials*: Appropriate measures will be implemented to characterize and dispose of hazardous materials should they be encountered during excavation and construction. Contract specifications will mandate full compliance will all applicable local, state and federal regulations related to the identification, transportation and disposal of hazardous materials/soils. As necessary, a spill prevention and countermeasure plan will be prepared.

   A qualified environmental professional will conduct any necessary site assessment. The site assessment would include a regulatory database review to identify permitted hazardous materials and environmental cases in the vicinity of each project no more than three months before construction, and a review of appropriate standard information sources to determine the potential for soil or groundwater contamination to occur. Follow-up sampling would be conducted as necessary to characterize soil and groundwater quality prior to construction and, if needed, site investigations or remedial activities would e performed in accordance with applicable laws. The environmental professional would prepare a report documenting the activities performed, summarize the results and make recommendations for appropriate handling of any contaminated materials during construction. A contingency plan would also be prepared identifying measures to be taken should unanticipated contamination be identified during construction. Construction contractors will conduct asbestos and lead abatement in accordance with established regulations.

8. *Biological Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether biological resources may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of biological resources. A qualified biologist must conduct any required biological screening survey. The biologist will review standard information sources to determine special status species with the potential to occur on the project site. The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special-status species is present. The biologist would then document the survey with a brief letter report or memo, setting forth the date of the visit, whether habitat for special-status species is present, providing a map or description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.

9. *Cultural Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether cultural resources, including archaeological and other historical resources, may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of cultural resources.

   CEQA considers paleontological resources to be "cultural resources." Any screening for cultural resources would include screening for archaeological, paleontological and historic resources. For projects requiring excavation, deep grading, well drilling or tunneling into geologic material at sites identified as having high potential for encountering paleontological resources, a state-registered professional geologist or qualified professional paleontologist will conduct a site-specific evaluation of the paleontological sensitivity. The assessment will include a report of findings for the SFPUC.

   A qualified archaeologist, historian or paleontologist will conduct all cultural resources survey and screening work. Screening surveys for cultural resources would include a cultural resources records search to be conducted at the appropriate office member of the California Historical Resources Information System. A field survey will be conducted if determined necessary after the cultural resources records search. Any impacts on identified cultural resources will be avoided to the extent feasible.

   Any initial historic resource screening will identify historic resources on the project site as well as adjacent to the project site.

   It is possible that project work may affect accidentally discovered buried or submerged cultural resources. Any contractor must distribute the Planning Department archaeological resource "ALERT" sheet to any person involved in soil-disturbing activities. If there is any indication of an archaeological or a paleontological resource during the soils disturbing activity of the project, the contractor shall immediately suspend any soils disturbing activities in the area and notify the SFPUC of such discovery. The SFPUC will then work with the Planning Department's Environmental Review Officer to determine what additional measures should be implemented, based on reports from a qualified archaeological or paleontological consultant.

10. *Project Site*: The SFPUC will conduct construction activities on SFPUC-owned lands to the extent feasible and minimize the need for use of non-SFPUC-owned land during construction. In cases where construction easement or staging areas are needed on non-SFPUC land, the SFPUC will restore these areas to their prior condition so that the owner may return them to their prior use, unless otherwise arranged with the property owner. The site will be maintained to be clean and orderly. Construction staging areas will be sited away from public view where possible. Nighttime lighting will be directed away from residential areas.

    Upon project completion, the construction contractor will return the SFPUC project site to its general condition before construction, including re-grading of the site and re-vegetation of disturbed areas.

In addition, the SFPUC is committed to the following GHG reduction actions as part of the WSIP program. The SFPUC will include the first two measures in all WSIP contractor specifications and implement the third measure during project planning and design, which in addition to having other environmental benefits, would also help reduce GHG emissions.

1. The SFPUC will require that all contractors maintain tire inflation to the manufacturers' inflation specifications.

2. The SFPUC will implement a construction worker education program for all WSIP projects.

3. WSIP projects that include construction of new buildings will consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures into the project design. Projects with buildings components will attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent. Projects with buildings components will attempt to meet or exceed LEED Silver certification as required by the City's Green Building Ordinance.

3.11 Proposed Construction Schedule

Figure 3.6 presents a preliminary master schedule of the construction phases for the key regional WSIP facility improvement projects. The SFPUC developed the preliminary schedule to assure that water delivery service is maintained throughout construction of the numerous projects, but is preparing schedule refinements and adjustments as the projects are further developed and more information is known about construction requirements. As the preliminary schedule indicates, construction of projects is expected to be completed by the end of 2014; there would be an intense period of construction from 2009 to 2010, when 18 of the 22 projects would be under construction concurrently. All WSIP projects would be completed by the end of 2014. The acquisition of supplemental water supplies during droughts would be implemented as needed to match the water delivery needs of the systemwide customers (see Chapter 5, Section 5.1) and is not included on the construction schedule.

3.12 WSIP-Related Activities

As discussed in Section 3.4, above, the SFPUC has included several components under the funding umbrella of the WSIP that are not analyzed in this PEIR. Three of these components—the Watershed Environmental Improvement Program, Regional Desalination Feasibility Study, and Habitat Reserve Program—are indirectly related to the proposed program analyzed in this PEIR and are described below.

3.12.1 Watershed Environmental Improvement Program

The purpose of the Watershed Environmental Improvement Program (WEIP) is to identify, prioritize, protect, and restore lands and natural resources in the vicinity of the SFPUC's regional water system. The WEIP encompasses the entire geographic range of areas that affect or are affected by water system operations, including the Tuolumne River watershed, Alameda Creek watershed, Peninsula watershed, and other SFPUC lands and rights-of-way. The program could include ecosystem and habitat protection, improvements, and restoration projects, addressing such issues as fish passage, riparian habitat degradation, and sensitive species recovery. This program is currently under development, and preliminary WEIP activities have focused on the development of studies and monitoring programs as well as coordination with other projects and work groups with similar goals. Many of the WEIP projects and activities identified at this time consist of the implementation of activities previously identified in the SFPUC's adopted Alameda and Peninsula Watershed Management Plans. CEQA documents have been certified for both plans, so programmatic environmental review of these activities has already been completed. Additional environmental review will be conducted as appropriate as the WEIP projects and activities become further defined.

Although the SFPUC is funding the WEIP through the WSIP bond funds, the WEIP is considered separate from and in addition to the mitigation measures identified in this PEIR. However, the SFPUC is coordinating the projects and activities of the WEIP with the WSIP facility improvement projects and water supply and system operations described in this PEIR, and the general scope of the WEIP is considered in the cumulative impact analyses presented in Chapter 4, Section 4.17, and in Chapter 5, Section 5.7.

3.12.2 Bay Area Regional Desalination Project

This activity consists of the SFPUC's participation with the East Bay Municipal Utility District, Santa Clara Valley Water District, and Contra Costa Water District to study the feasibility of a Bay Area Regional Desalination Plant (BARDP). These regional water agencies have formed a partnership to investigate the feasibility of jointly implementing a desalination project in the Bay Area to improve water supply reliability for the over 5 million people served by the four agencies. The project would produce potable water from seawater or brackish water to meet some of the water supply needs in the agencies' combined service areas (URS, 2003).

The participating agencies are currently preparing a feasibility study for the project and planning for construction of a pilot plant. The feasibility study includes analysis of institutional issues related to implementing the full-scale BARDP and assessment of site and infrastructure options for three potential sites. The possible sites are located along the eastern Contra Costa County shoreline, near the east end of the Bay Bridge in Oakland, and near the Oceanside Water Pollution Control Plant in San Francisco. The pilot plant and related studies are scheduled to be implemented from 2007 to 2008. Assuming a positive outcome from the feasibility study and the pilot plant, it is expected that environmental review of the BARDP would occur in 2009, design in 2010, and construction of the full-scale BARDP in 2012.

The regional desalination project is considered in this PEIR as a potential alternative water supply source. The project is analyzed in Chapter 8 as a component of one of the WSIP variants and is considered in Chapter 9 as part of the CEQA alternatives analysis.

3.12.3 Habitat Reserve Program

The SFPUC is proposing the Habitat Reserve Program (HRP) with the objective of developing and enhancing wetlands and other habitats to be applied toward mitigation of impacts on biological resources resulting from implementation of the WSIP. The program would enhance, restore, create, and preserve habitats on existing SFPUC property and/or on other land to be covered by conservation easements. The HRP would serve as compensation for both temporary and permanent impacts on potentially affected sensitive habitats, including habitats of special-status species, due to construction and operation of the WSIP facility improvement projects as well as implementation of the proposed water supply option (SFPUC, 2006c).

The HRP would provide a comprehensive, coordinated approach to implementing mitigation measures for impacts on biological resources from WSIP actions identified in this PEIR and in project-level CEQA documents for the individual WSIP projects. The SFPUC would coordinate the implementation and management of the HRP with the implementation and management of mitigation measures presented in this PEIR and in project-level CEQA documents. In most cases, the HRP would augment the project-specific mitigation measures, focusing on habitat compensation requirements. The HRP could provide a vehicle for the SFPUC to comply with regulatory permit requirements related to biological resources affected by the WSIP.

The HRP would consolidate habitat enhancement, restoration, creation, and preservation at a select number of mitigation sites located throughout the WSIP program area on CCSF-owned lands or on county, nonprofit, or private lands that are appropriate for conservation easements, if necessary. The HRP would establish performance criteria for habitat enhancement, restoration, creation, and preservation and would include monitoring to ensure that the criteria are satisfied. In addition to enhancing, restoring, creating, or protecting habitat, the HRP could also involve funding research or local projects, purchase of mitigation credits from existing mitigation banks, or participation in regional habitat restoration efforts. Where appropriate, the HRP actions would be coordinated with other ongoing SFPUC activities, including implementation of the Alameda and Peninsula Watershed Management Plans, the Alameda and Peninsula Habitat Conservation Plans (in development), and the WEIP (described above).

As part of the HRP, a preliminary identification has been conducted to determine the types of habitats that could be created as well as potentially suitable mitigation sites. The types of actions being considered under the HRP include: altering existing agricultural uses to enhance or restore habitat; fencing and managing grazing lands; grading, planting, and monitoring vegetation; excavating, grading, and constructing stock ponds and installing water control structures to provide appropriate hydraulic conditions; harvesting local seed stock; and fencing to protect habitats and control non-native species. **Table 3.13** provides a preliminary list of habitat types and possible mitigation sites for each region.

TABLE 3.13
HABITAT RESERVE PROGRAM – PRELIMINARY LIST OF HABITAT TYPES AND MITIGATION SITES

Region	Habitat Type	Potential Location of Mitigation Sites
San Joaquin Region		
	Vernal Pools and Wetland	Stanislaus County, Tuolumne County
	Grassland	San Joaquin County, Stanislaus County
Sunol Valley Region		
	Oak Woodland	Within the Alameda watershed
	Riparian	Along Alameda Creek or its tributaries
	Wetland	Along tributaries to Calaveras and San Antonio Reservoirs
	Serpentine	Within the Alameda watershed
	Grassland	Within the Alameda watershed
Bay Division Region		
	Oak Woodland	Within the Alameda and Peninsula watersheds
	Riparian	Within the Alameda and Peninsula watersheds, or in tributaries to San Francisco Bay
	Freshwater Wetland	Within the Alameda and Peninsula watersheds, or other watersheds draining to San Francisco Bay
	Grassland	Within the Alameda and Peninsula watersheds
	Saline Wetland	Along the San Francisco Bay shoreline
	Tidal Marsh	Along the San Francisco Bay shoreline
Peninsula and San Francisco Regions		
	Oak Woodland	Within the Peninsula watershed
	Riparian	Within the Peninsula watershed or other parts of San Mateo County and San Francisco
	Freshwater Wetland	Within the Peninsula watershed or other parts of San Mateo County and San Francisco
	Grassland	Within the Peninsula watershed or other parts of San Mateo County and San Francisco

SOURCE: SFPUC, 2006c.

The San Francisco Planning Department recently began environmental review of the HRP, and the SFPUC is currently designing the program with the intent of initiating habitat enhancement, restoration, creation, and preservation before or concurrent with the WSIP project activities, and in advance of impacts where possible. The HRP schedule includes environmental review from 2007 to 2008, habitat creation and/or enhancement and negotiation of conservation easements between 2008 and 2010, and monitoring extending from 2009 to 2010 and longer.

Chapter 6 of this PEIR describes mitigation measures for WSIP impacts on biological resources, and the HRP is identified as a potential approach to mitigating WSIP impacts on biological resources. However, CEQA environmental review of the HRP must be completed before the SFPUC can approve and implement the HRP. Once the HRP is approved, the SFPUC can then implement it and apply any habitat creation and/or enhancement towards habitat compensation requirements of WSIP-related mitigation measures as approved by the appropriate regulatory agencies. Otherwise, in the absence or delayed approval of the HRP, where necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects.

3.13 Required Actions and Approvals

The following list sets forth the approvals necessary for overall adoption and approval of the WSIP as described in this chapter, including adoption of the proposed levels of service and water supply option, and general approval of the facility improvement projects.

Each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and CEQA documents developed through those reviews will identify needed approvals by local, state, and federal agencies for individual projects. Table C.6 of Appendix C presents the specific permits and approvals that could be required for individual projects as well as interested agencies that have requested early consultation and coordination with the SFPUC. Several projects are expected to require U.S. Department of the Army permits to comply with the Clean Water Act, which, in turn, will require compliance with the Federal Endangered Species Act, the Clean Water Act Section 401, and the National Historic Preservation Act. Several projects are expected to require Streambed Alteration Agreements from the California Department of Fish and Game and compliance with the California Endangered Species Act. When individual projects undergo CEQA review, the project's environmental documentation will provide more detailed and up-to-date information on the required approvals and need for consultation with interested agencies. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

Approvals and actions applicable to the overall WSIP include:

- *San Francisco Planning Commission*
  - Certifies Final PEIR on the WSIP

- *San Francisco Public Utilities Commission*
  - Reviews Final PEIR and adopts CEQA findings and mitigation monitoring and reporting program
  - Approves and adopts WSIP
- *San Francisco Board of Supervisors*
  - Hears and decides any appeals of the Planning Commission's certification of the Final PEIR

Local, state and federal agency approvals for individual facility improvement projects are listed in Appendix C, Table C.6. Implementation of the WSIP could involve the following additional discussion and actions by the agencies listed below:

- *San Francisco Public Utilities Commission*
  - Approves any water transfer agreements with the Turlock and Modesto Irrigation Districts or other agencies
  - Approves contracts for construction of WSIP facility improvement projects
  - Approves operating agreements for the Westside Basin conjunction-use program
  - Reviews its cost of utility service annually and revises its rate schedules applicable to retail water sales as required[27]
  - Approves any water sales agreements with SFPUC wholesale and retail customers
- *San Francisco Planning Department/Planning Commission*
  - Conducts ongoing environmental review of individual facility improvement projects as well as compliance with mitigation and monitoring reporting program during WSIP implementation
  - Makes determinations of consistency with the San Francisco General Plan, if needed, for projects requiring certain approvals by the Board of Supervisors
- *San Francisco Board of Supervisors*
  - Appropriates funding for implementation of the WSIP projects, including general obligation bond monies and annual budget appropriations
  - May reject rates and charges that the SFPUC establishes for water customers by resolution within 30 days of adoption by the SFPUC
  - Considers appeals of EIR certifications and negative declaration approvals by the San Francisco Planning Department
- *State Water Resources Control Board*
  - Reviews and authorizes any transfer under a post-1914 water right that may be necessary to implement long-term water transfers with the Turlock or Modesto Irrigation Districts

[27] Retail water sales include sales to Lawrence Livermore National Laboratory, the Town of Sunol, and approximately 190 other retail customers (see list of major water customers in Table 3.1). The SFPUC sells water to Groveland Community Services District under the terms of a 1984 contract that allows the water rate to be adjusted every four years.

- *Turlock and Modesto Irrigation Districts*
  - Review and approve water transfer agreements with the SFPUC and/or amendments to the SFPUC's water bank account in Don Pedro Reservoir
- *SFPUC wholesale and retail water customers*
  - Approves any agreements between SFPUC and individual wholesale and retail customers
- *Daly City, California Water Service Company's South San Francisco service area, and San Bruno*
  - Approves operating agreement(s) for the Westside Basin conjunctive-use program (Regional Groundwater Projects, part of SF-2), including approval of new system wells

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