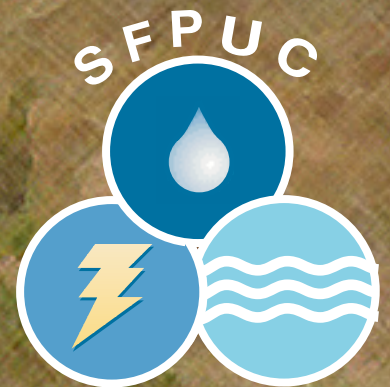


Watershed Sanitary Survey Update for the Alameda and Peninsula Watersheds and the Sunol Filter Galleries

April 2006

Final Report



WATER
HETCH HETCHY
WATER & POWER
CLEAN WATER

San Francisco
Public Utilities Commission

Watershed Sanitary Survey Update for the
Alameda and Peninsula Watersheds and the
Sunol Filter Galleries

April 2006

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and
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Appendices

Appendix A – Pictures of the Watersheds

Appendix B – 2001 – 2005 Annual Source Water Monitoring Data

Abbreviations

| | |
|---------------------|------------------------------------------------------------------|
| µg/L | Micrograms per liter |
| AADT | Annual average daily traffic |
| abs/cm | Absorbance per centimeter |
| AC | <i>Cryptosporidium</i> with amorphous internal structure |
| AG | <i>Giardia</i> with amorphous internal structure |
| AMSL | Above mean sea level |
| BARTC | Bay Area Ridge Trail Council |
| BERM | Bureau of Environmental and Regulatory Management |
| BMP | Best Management Practices |
| CalTrans | California Department of Transportation |
| CCR | California Code of Regulations |
| CCWD | Coastside County Water District |
| CDF | California Department of Forestry and Fire Protection |
| CPUC | California Public Utilities Commission |
| CTAP | Calaveras Technical Advisory Panel |
| CW1S | <i>Cryptosporidium</i> oocyst counts with one internal structure |
| DBP | Disinfection by-products |
| DCS | Distribution Control System |
| DCS HMI | Distribution Control System human-machine interface |
| D/DBPR | Disinfectants / Disinfection By-products Rule |
| DHS | Department of Health Services |
| DIC | Differential interface contrast |
| DSOD | California Division of Safety of Dams |
| EBRPD | East Bay Regional Park District |
| EC | <i>Cryptosporidium</i> oocyst counts with empty oocysts |
| EG | <i>Giardia</i> cyst counts with empty cysts |
| EIR | Environmental Impact Report |
| EPA | Environmental Protection Agency |
| gpm/ft ² | Gallons per minute per square foot of filter |
| GIS | Geographical Information System |
| GW1S | <i>Giardia</i> cyst counts with one internal structure |
| GW2S | <i>Giardia</i> cyst counts with more than one internal structure |

| | |
|----------|---------------------------------------------------|
| HHWWP | Hetch Hetchy Water and Wholesale Power |
| HTWTP | Harry Tracy Water Treatment Plant |
| IESWTR | Interim Enhanced Surface Water Treatment Rule |
| IPM | Integrated Pest Management |
| LT2ESWTR | Long-Term 2 Enhanced Surface Water Treatment Rule |
| MCLG | Maximum Contaminant Level Goals |
| MCLs | Maximum Contaminant Levels |
| MG | Million gallons |
| mg/L | Milligrams per liter |
| mgd | Million gallons per day |
| NMWS | Normal maximum water surface |
| NPDES | National Pollutant Discharge Elimination System |
| NRD | Natural Resources Division |
| OEHHA | Office of Environmental Health Hazard Assessment |
| PHGs | Public Health Goals |
| PLC | Programmable Logic Controller. |
| ROW | Right-of-way |
| RWPS | Raw water pump station |
| SCADA | Supervisory Control and Data Acquisition |
| SCVWD | Santa Clara Valley Water District |
| SDWA | Safe Drinking Water Act |
| SFPUC | San Francisco Public Utilities Commission |
| SMCL | Secondary Maximum Contaminant Levels |
| SMP-32 | Alameda County Surface Mining Permit 32 |
| SUVA | Specific ultraviolet absorbance |
| SVCF | Sunol Valley Chloramination System |
| SVWTP | Sunol Valley Water Treatment Plant |
| SWPPP | Stormwater pollution prevention plan |
| SWTR | Surface water treatment rule |
| TC | Total <i>Cryptosporidium</i> oocyst count |
| TG | Total <i>Giardia</i> cyst count |
| TOC | Total organic carbon |
| TRE | Toxicity reduction evaluation |
| UV254 | Ultraviolet absorption at 254 nanometers |
| UPS | Un-interrupted power source |
| WQB | Water Quality Bureau |

| | |
|------|----------------------------------|
| WSIP | Water System Improvement Program |
| WTP | Water Treatment Plant |
| WWD | Wholesale Water Division |

Section 1

Introduction

The Surface Water Treatment Rule (SWTR) approved by Congress in 1989 included a recommendation for all surface water systems to prepare watershed control plans. As the primary agency for the implementation of the SWTR, the California Department of Health Services (DHS) specified that all surface water systems conduct a watershed sanitary survey of their water supply watersheds by January 1, 1996 and update it every five years. Subsequent regulations for surface water treatment (i.e., the Interim Enhanced Surface Water Treatment Rule) have expanded the scope of watershed analyses. Previous watershed sanitary surveys were produced in 1995 (1995 Sanitary Survey; Montgomery Watson, 1995) and 2000 (2000 Sanitary Survey; CDM, 2000).

1.1 Study Context

The San Francisco Public Utilities Commission (SFPUC) serves a total of 2.4 million people in the San Francisco Bay Area with high quality drinking water. The Hetch Hetchy watershed provides approximately 85 percent of SFPUC's total water needs. The Alameda watershed, located in the East Bay Alameda and Santa Clara Counties, has two reservoirs: Calaveras and San Antonio. The Sunol Filter Galleries are also located in the East Bay near the Sunol Valley Water Treatment Plant (SVWTP). The Peninsula watershed, located in San Mateo County, has three reservoirs: Crystal Springs (Upper and Lower), San Andreas, and Pilarcitos. Runoff from the Alameda and Peninsula watersheds represent about 15 percent of the total water supply.

SFPUC owns approximately 33 percent of the land in the Alameda and Santa Clara watersheds and 99 percent of Peninsula San Mateo County watersheds. Non-SFPUC lands include the East Bay Regional Park District's (EBRPD) Sunol and Ohlone Regional Wildernesses. Thus, a large degree of protection is afforded these watersheds, helping to assure maintenance of a high quality drinking water supply.

1.2 Study Purpose

The Alameda and Peninsula Watershed Sanitary Survey Update presents a description of watershed activities, discusses watershed concerns, and summarizes data and observations in the Alameda and Peninsula watersheds for the period of January 1, 2001 through December 31, 2005. The City and County of San Francisco (San Francisco) owns 21,708 acres of the 22,533-acre Peninsula hydrologic watershed, located entirely in San Mateo County, and 34,104 acres of the 128,424-acre Alameda watershed, located in Alameda and Santa Clara counties. These lands collect, store, and provide water to San Francisco, as well as portions of San Mateo, Santa Clara, and Alameda counties. The sanitary survey has been prepared in compliance with Title 22 Section 64665 of the California Code of Regulations (CCR) and is an update to the sanitary survey completed in 2000 (CDM, 2000). Information that has not changed since that report was issued is generally not reiterated here.

1.3 Report Organization

This report is organized into seven sections:

- Section 1 – Introduction.
- Section 2 – Description of Watersheds and Water Supply Systems. This section updates the descriptions of the watersheds and water supply systems from the 1995 and 2000 Sanitary Surveys. This section also describes improvements, including maintenance activities, to the water supply system that occurred during the period January 1, 2001 through December 31, 2005.
- Section 3 – Potential Contaminant Sources and Events. This section provides updates on potential contaminant sources, describes changed conditions, and describes watershed events that occurred from 2001 through 2005.
- Section 4 – Watershed Control and Management. This section describes SFPUC watershed management activities and watershed involvement by other agencies during the period January 1, 2001 through December 31, 2005.
- Section 5 – Water Quality. This section presents a summary of water quality monitoring and analysis conducted from January 1, 2001 through December 31, 2005.
- Section 6 – Recommendations. This section presents the implementation status of corrective actions recommended in the 2000 Sanitary Survey and makes additional recommendations for preserving water quality and controlling potential contaminant sources.
- Section 7 – References.

Section 2

Description of Watersheds and Water Supply Systems

2.1 Watershed Descriptions

The SFPUC owns 34,104 acres of the 128,424-acre Alameda hydrologic watershed. The non-SFPUC-owned portion of the watershed extends from the upper reaches of Arroyo Hondo to Mt. Hamilton in Santa Clara County and includes the upper reaches of La Costa, San Antonio, and Alameda creeks in Alameda County. Three hundred forty-five parcels in Santa Clara County are either directly adjacent to or at least partially within the contributing watersheds. Fifty-one parcels in Alameda County are adjacent or within the headwaters of the above named creeks. A map of the Alameda Watershed is shown in Figure 2-1.

The Sunol Filter Galleries are tunnels built in the gravel aquifer located along Calaveras Road near Alameda Creek downstream of the Sunol Valley Water Treatment Plant (SVWTP). This groundwater source is under the influence of surface water from Alameda Creek. Water from the Sunol Filter galleries flows through the Sunol Water Temple then through the Niles-Sunol Aqueduct to Brightside where it is diverted back into Alameda Creek. Some of this water is diverted to irrigate the Sunol Golf Course. The water from the Sunol Filter Galleries is periodically pumped at the Sunol Pump Station to San Antonio Reservoir or the Sunol Valley Water Treatment Plant. The locations of the Sunol Filter Galleries are shown in Figure 2-1.

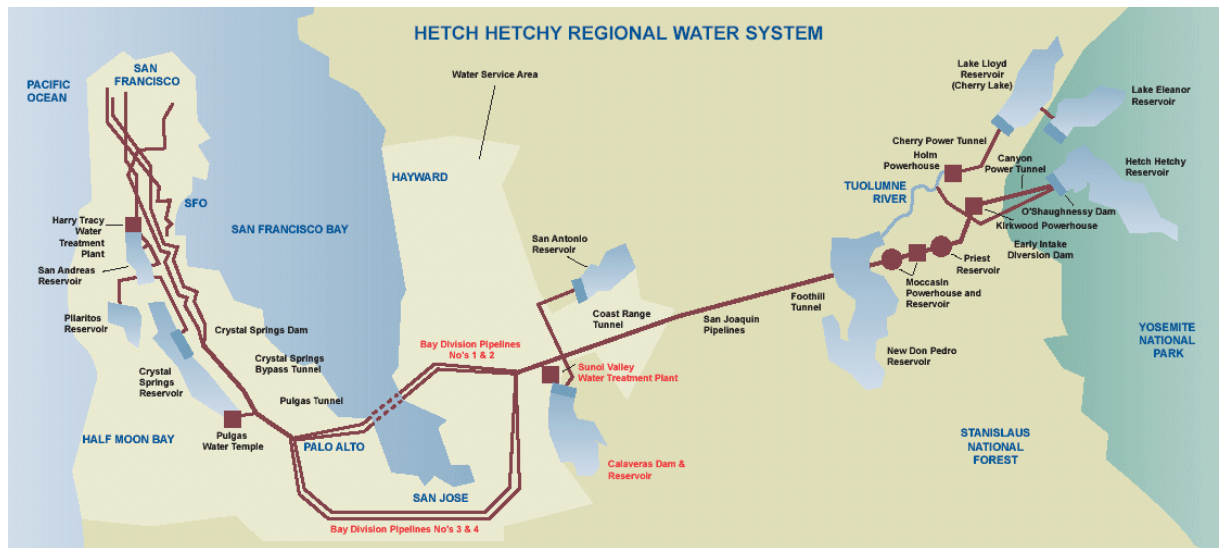
The SFPUC owns 21,708 acres of the 22,533-acre Peninsula hydrologic watershed, which is located entirely in San Mateo County. The non-SFPUC owned portion of the watershed is primarily the Filoli Estate (657 acres). The SFPUC also owns 1,292 acres of the Peninsula Watershed area that are outside of the hydrologic watershed. A map of the Peninsula Watershed is shown in Figure 2-2.

Detailed descriptions of the Alameda and Peninsula watersheds are found in Sections 3 and 4 (pages 3-1 to 3-10 and 4-1 to 4-5) of the 1995 Watershed Sanitary Survey for Alameda and Peninsula Watersheds (Montgomery Watson, 1995).

Usage note: In most SFPUC documents such as the Watershed Management Plans, the terms Alameda Watershed and Peninsula Watershed refers to the portion of the hydrologic watersheds owned by SFPUC.

2.2 Water Supply System Improvements

A schematic overview of the water supply system is provided in Figure 2-3. For detailed descriptions of the water supply systems, please see Section 2 (pages 2-1 to 2-16) of the 1995 Sanitary Survey (Montgomery Watson, 1995).



Source: http://sfwater.org/main.cfm/MSC_ID/16

Figure 2-3
Schematic Overview of the SFPUC Water Supply System

2.2.1 Alameda Watershed, Sunol Filter Galleries, and East Bay

This section describes improvements and upgrades made to the water supply system in the Alameda Watershed and East Bay facilities. 2.2.1.1 Sunol Valley Chloramination Facility

The Sunol Valley Chloramination Facility (SVCF), completed in the Fall of 2003, is one of the main facilities built under the SFPUC Chloramine Conversion Project. It is located between Calaveras and San Antonio Reservoirs near the SVWTP. It includes storage and feed systems for the application of disinfectant and corrosion control. The SVCF injects sodium hypochlorite to boost the chlorine residual to approximately 2.0 to 3.0 milligrams per liter (mg/L) prior to ammonia addition. Aqueous ammonia is then added to reach a chlorine to ammonia-nitrogen ratio of 4.5:1 to 5:1 by weight. This facility feeds sodium hypochlorite, aqueous ammonia, and caustic soda to one or more of the three Alameda Siphons that deliver treated water from both Hetch Hetchy and the SVWTP. An auxiliary purpose is to chloramine water delivered to the Town of Sunol. The chloramination facility began operation in February 2004. The facility also includes an extension that contains a fluoride feed system with a caustic soda feed to adjust pH. The

fluoridation facility began operation in September 2005. A complete description of the SVCF is contained in *SFPUC Chloramine Startup Plan – Final Report* (CDM, 2004).

2.2.1.2 Sunol Improvement Project

Major upgrades and refits of SVWTP plant were made, including: the addition of an alkalinity adjustment system for treating Hetch Hetchy water, a new flash mix system, a new raw-water distribution facility, new flocculators, new plate settlers, residuals removal system, new filter to waste system, replacement of all filter valves, new chemical feed facility, additional chemical storage tanks, effluent mixer system, new wash water recovery basins and system, new plant process laboratory and a new pipeline for drains to evaporation Lagoon #8 (receives and evaporates washdown water). These upgrades were completed in March 2004. In addition, numerous small upgrades were made to the Distribution Control System (DCS) in the SVWTP including a new computer in July 2004

2.2.1.3 Tesla Portal

Major upgrades were made to Tesla Portal including: addition of new chemical (chlorine for disinfection) injection points; moving the injection points from the side of pipeline to the top of pipeline (completed in January 2004); four (4) indoor chemical feed tanks which were cracking were replaced along with the piping (completed in December 2004); and a new instrument building including a small lab was constructed (January 2004). This upgrade moved instruments, which analyzed residual chlorine, pH, and other chemical constituents, from the chlorine building to next to tunnel.

2.2.1.4 Town of Sunol System

A new programmable logic controller (PLC) for at Town of Sunol was installed in the July 2005. The meters for the Town of Sunol take off were replaced. The new meters improve blending of water from the two Alameda siphons and were done as part of the chloramination upgrade in February 2005.

2.2.1.5 Castlewood System

Castlewood Terminal Reservoir provides the town of Castlewood and the Castlewood Country Club with drinking water. A new Castlewood Reservoir was built in October 2002 to replace the old one that was in disrepair. The Castlewood Reservoir is fed by the Pleasanton Wells. Pleasanton Wells A and B were replaced in March 2003. In addition, the Pleasanton Wells were upgraded to change how the pump reset works in August 2004. When a loss of power occurs the pumps now automatically reset. This prevents low water levels in Castlewood Reservoir. A new PLC was installed for Pleasanton Wells in 2005.

2.2.1.6 Other Alameda Watershed/East Bay Improvements

Other improvements and upgrades were made in the Alameda Watershed and East Bay including:

- The SCADA (Supervisory Control and Data Acquisition) system underwent system-wide improvements. Remote sites previously had SCADA, but this upgrade added SCADA widely throughout the system. SCADA now integrates data such as reservoir levels, pipe pressures and flows, and water quality parameters into one system. The SCADA system can be accessed at each of the treatment plants and Lake Merced Pump Station for the City (San Francisco) distribution system. This upgrade was completed in August 2001.
- In February 2002 an intertie between SFPUC and SCVWD (Santa Clara Valley Water District) was completed. This intertie allows SFPUC and SCVWD to share water with each other for emergency and planned maintenance uses.
- A new potassium permanganate facility was built near Calaveras Reservoir. Potassium permanganate is an oxidizer used to treat taste and odor problems. The old chlorination facility was removed prior to construction of the new facility. The potassium permanganate facility was completed in April 2002.
- Siphon valves were replaced in Alameda East and Alameda West on siphon #1 and siphon #3 in January 2005.
- A hypolimnetic oxygenation system was installed Calaveras Reservoir that can deliver a daily maximum of 6,290 pounds of oxygen during peak periods during the summer/fall. The system has been in service since September 2005.

2.2.2 Peninsula Watershed

This section describes improvements and upgrades made to the water supply system in the Peninsula Watershed and other Peninsula facilities.

2.2.2.1 Harry Tracy Water Treatment Plant Chloramination

After filtration at the Harry Tracy Water Treatment Plant (HTWTP), water passes through two treated water reservoirs located at the plant site. The two reservoirs (capacities of 6.5 and 8.0 million gallons [MG], respectively) were originally designed to operate as parallel units with the ability to take either of the reservoirs out of service for maintenance or emergencies. The SFPUC recently modified the two reservoirs to operate in series or to bypass the 6.5 MG reservoir. The hydraulic modifications to the reservoir and new hypochlorite and aqueous ammonia systems are designed to primarily trim the chlorine residual after filtration, achieve CT, when needed, through the 6.5 MG reservoir, then add ammonia as the treated water flows from the 6.5 MG reservoir to the 8.0 MG reservoir. The design allows flexibility for varying the chlorine contact time for achieving disinfection while minimizing disinfection by-products. A complete description of the HTWTP Chloramination Facility is contained in *SFPUC Chloramine Startup Plan – Final Report* (CDM, 2004). This upgrade began operation in February 2004.

Other upgrades to the HTWTP and the dates of completion include:

- Raw water pump station (RWPS) switchgear un-interrupted power source (UPS) battery upgrade (June 2001)
- Re-roofed plant buildings (December 2001)
- Replaced 1 raw, 3 effluent, and 10 filter turbidity analyzers (March 2001)
- PLC upgrades including main PLC UPS upgrade (June 2001), RWPS PLC ups backup (June 2004), and main PLC memory upgrade (April 2005)
- Plant seismic retrofit including seismic anchorage (November 2001) and other seismic upgrades (March 2003)
- Upgraded facility phone system (May 2002)
- Upgraded n-51 valve operation with electric actuator (May 2002)
- Replaced and upgraded facility DCS human-machine interface (HMI) to Wonderware in-touch (May 2002)
- New residuals thickening/clarifier station to handle backwash water (July 2002)
- Caustic system feed pump upgrade (February. 2003)
- Power monitoring project (March 2003)
- Ozone cooling water system improvements (May 2003)
- Installed natural gas vehicle feed station (March 2004)
- Upgraded chemical tank level monitors to Milltronics (March 2004)
- Prechlorination system upgrade (June 2004)
- Streaming current monitor installation (June 2004)
- Upgraded and re-configured stand-by power system (April 2005)
- Wash water pump control panel upgrade (April 2005)
- Recloser operation improvements (April 2005)
- Installed Limitorque actuators on 6 flocculation basin gate valves (August 2005)

2.2.2.2 Pulgas Dechloramination

Dechloramination – removal of both chlorine and ammonia – occurs at the system located near the Pulgas Temple. Dechloramination consists of three processes: pH

adjustment to enhance chemical kinetics and meet discharge requirements, breakpoint chlorination to remove the ammonia, and dechlorination with calcium thiosulfate to remove the chlorine. Currently, the intermittent flow by-passes the Temple and flows through a 10-foot diameter pipeline where the de-chloramination process occurs. Up to 200 mgd can be diverted to the treatment facility, though flows above 100 million gallons per day (mgd) will only receive partial ammonia treatment. Flows exceeding 200 mgd are directed through the existing 10-foot Pulgas channel. A complete description of the Pulgas Dechloramination Facility is contained in *SFPUC Chloramine Startup Plan – Final Report* (CDM, 2004).

2.2.3 Terminal Regional Water System Reservoirs

The City of San Francisco contains three potable water terminal storage reservoirs: University Mound, Sunset, and Merced Manor. The following upgrades have been made to these systems:

2.2.3.1 University Mound South

Repairs and upgrades, completed July 2003, include cleaning of the reservoir, concrete repairs and roof repairs (it was recoated and a new hatch was installed). SolarBee mixers, solar powered water circulators that help improve water quality, were installed in the reservoir in May 2005. The chlorine station for University Mound (North and South) was completely rebuilt in 2003.

2.2.3.2 University Mound North

Repairs and upgrades, completed in June 2005, include cleaning the reservoir prior to emptying, and installing a new inlet pipeline. Solarbee installation occurred in September 2005.

2.2.3.3 Sunset North

SolarBee installation occurred in the Sunset North reservoir in May 2005. The chlorine station for Sunset (North and South) was completely rebuilt in 2003.

2.2.3.4 Sunset South

Repairs and upgrades, completed September 2001, included concrete repairs and roof repairs (it was recoated and a new hatch was installed). SolarBee installation occurred in May 2005.

2.2.3.5 Merced Manor

Seismic upgrades (including new shear walls and collector beams) and roof recoating were completed in December 2005.

Section 3

Potential Contaminant Sources and Events

Much of the information on potential contaminant sources in the Alameda and Peninsula Watersheds was described in the 2000 Watershed Sanitary Survey (2000 Sanitary Survey) and is still valid at this time. Only changes/updates since the 2000 Sanitary Survey are provided in this section.

Numerous routine and focused field investigations were conducted in the Alameda and Peninsula Watersheds from 2001 through 2005. These observations allowed identification and evaluation of the potential contaminant sources in each watershed. Presented below are events that had the potential to affect water quality or changes to the watershed that occurred during that period, along with the control approach where applicable.

3.1 Alameda Watershed and Sunol Filter Galleries

The land uses and activities occurring within the watershed that have the potential for impacting water quality are both natural elements (e.g. fires, erosion, animals) and human-induced activities (e.g. roads, recreation). The following activities and land uses were described in the 2000 Sanitary Survey and are updated in this section:

- Transportation Corridors
- Utility Corridors
- Recreation
- Sunol Valley Golf Course
- Research
- Sanitary Facilities
- Residential Areas
- Livestock and Wildlife
- Nurseries
- Quarries
- Industrial Uses
- Natural Resource Management

- Calaveras Dam Replacement Project
- Other SFPUC Operations
- Other Activities and Land Uses

The subsections below provide the updated information. An additional section has been added in this report to describe the activities related to the Calaveras Dam Replacement Project. Potential contaminant sources that can be displayed on a map are shown in Figure 3-1. Photographs of the Alameda Watershed are provided in Appendix A.

3.1.1 Transportation Corridors

The general description of the transportation corridors is unchanged since the 2000 Sanitary Survey.

Concerns related to transportation corridors include: 1) stormwater runoff; 2) hazardous waste releases from general automobile usage and accidents; 3) erosion; 4) illegal dumping and trespassing; and 5) herbicides applied during roadside maintenance. An additional concern, not addressed in the 2000 Sanitary Survey is potential waste from bicycle users.

3.1.1.1 Stormwater Runoff

Stormwater runoff from the Pigeon Pass portion of Highway 84 described in the 2000 Sanitary Survey remains a potential source of contamination.

A low-water crossing in Sunol Regional Park is a potential source of contamination from vehicles use. Temporary bridge repair work is in process. The EBRPD has purchased deck replacement materials and the SFPUC will be responsible for installation. This temporary bridge will alleviate the need for low water crossing by light- and medium-duty vehicles. However, since heavy vehicles will need to continue to use the low water crossing, the long-term solution is to replace the bridge. SFPUC obtained an engineering evaluation and a proposal for new bridge construction and is now considering purchase of a Bailey bridge (military-type bolt together on site). The cost of bridge replacement will be split evenly between SFPUC and EBRPD.

3.1.1.2 Accidental Spills

As stated in the 2000 Sanitary Survey, accidents involving truck traffic are the greatest concern for the portion of Highway 84 that does not have a stormwater drainage system, and for Calaveras Road. The California Department of Transportation (CalTrans) data on annual average daily traffic (AADT) and truck AADT along Highway 84 for 2001 through 2004 are presented below in Table 3-1. Counts for 2005 were not available.

| Table 3-1 | | | | | | |
|----------------------------------------------------------|-------------|-------------------|----------------|----------------|------------------------|--------------|
| 2001-2004 AADT Traffic Counts – Alameda Watershed | | | | | | |
| Location | AADT | Truck AADT | | | | |
| | | 2 Axles | 3 Axles | 4 Axles | 5 or more axles | Total |
| 2001 | | | | | | |
| Highway 84 and I-680, west of intersection | 8,900 | 47 | 21 | 4 | 133 | 205 |
| Highway 84 and I-680, east of intersection | 24,000 | 315 | 29 | 14 | 2 | 360 |
| 2002 | | | | | | |
| Highway 84 and I-680, west of intersection | 8,900 | 47 | 21 | 4 | 133 | 205 |
| Highway 84 and I-680, east of intersection | 24,000 | 336 | 31 | 15 | 2 | 384 |
| 2003 | | | | | | |
| Highway 84 and I-680, west of intersection | 9,100 | 48 | 21 | 4 | 136 | 209 |
| Highway 84 and I-680, east of intersection | 26,000 | 364 | 34 | 17 | 2 | 417 |
| 2004 | | | | | | |
| Highway 84 and I-680, west of intersection | 9,200 | 48 | 22 | 4 | 138 | 212 |
| Highway 84 and I-680, east of intersection | 26,500 | 371 | 34 | 17 | 2 | 424 |

Source: CalTrans, 2005 <http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm>

3.1.1.3 Erosion

Excessive erosion remains one of the main concerns of the SFPUC. The improved road maintenance practices that were described in the 2000 Watershed Sanitary Survey Update are still in place to minimize erosion. Santa Clara County has not ceded maintenance of the Marsh Road to the SFPUC as reported in 2000. However, the SFPUC is currently in the process of having Santa Clara County vacate both Marsh and Mt. Day roads, which would make SFPUC the road manager. This will lead to improved maintenance practices and improved water quality.

Periodically, the State Water Project de-waters their line where it crosses the watershed (see Figure 3-1 for location). Water released from this activity flows down a natural drainage, causing channel and stream bank erosion. Although this happens infrequently, the SFPUC has implemented structural measures to reduce the potential erosion.

A five-acre natural landslide is located approximately one-quarter mile upstream from the Alameda Diversion Dam. It appears that the landslide is a chronic, long-term situation due to natural geologic instability in the area. This may be the single largest erosion/sediment source on SFPUC lands within the Alameda Creek Watershed. However, because of the instability of the area, no attempts have been made to resolve the problem since any attempts would likely be unsuccessful.

3.1.1.4 Illegal Dumping

Dumping of trash and other debris still occurs along Marsh Road, Calaveras Road, and Ranch Road. The SFPUC removes the trash and debris but makes no estimate of the volume removed. Illegal dumping also occurs along Highway 84, but Alameda County usually cleans it up within a week.

3.1.1.5 Herbicides

Highway maintenance along the main corridors includes herbicide spraying to control vegetation. Herbicide application is done to: 1) maintain the integrity of the pavement; 2) maintain sight distance around curves; 3) allow safety devices to remain visible; and 4) provide fire breaks. Herbicide application data are only available for 2001 (SFPUC, 2001). CalTrans performed herbicide application along Highway 680 from Andrade Road to Calaveras Road. Approximate amounts used by CalTrans were 2,432 ounces of Roundup Pro (glyphosate) and 2,448 ounces of Predict (norflurazon). These total amounts include some applications that were outside the hydrologic watershed areas. Alameda County Department of Public Works applied 38 gallons of Roundup Pro and 20 ounces of 41A along six different roads including Calaveras Road. SFPUC did not perform herbicide application in the Alameda Watersheds during 2001, the only year for which information are available.

3.1.1.6 Waste from Bicyclists

Calaveras road bicycle traffic had increased considerably since the 2000 Sanitary Survey. Since no sanitary facilities are available, improper disposal of human waste can occur.

3.1.2 Utility Corridors

As discussed in the 2000 Sanitary Survey, there are several pipeline utility corridors that traverse the watershed. These utility corridors are a potential source of contamination because of the potential for leakage from pipes carrying hazardous material. The potential causes of failure for this type of pipe are: 1) damage caused by excavation; 2) corrosion; 3) external loading; 4) operations; and 5) landslides or earthquakes.

During the winter of 2003-2004, overflow from the Sunol Valley Golf Course pond spillway channel exposed the Kinder-Morgan liquid fuel line. The spillway overflow

channel is temporarily being protected by a fabric cover and large rock placement, pending design and permit approval by regulatory agencies for a permanent repair that will include relocation of the spillway.

Improvements were made to the Chevron high-pressure petroleum pipeline. Chevron Pipeline Company added SCADA to detect problems along their pipeline since the last Watershed Sanitary Survey. They also added additional spaces in their line to give the pipeline more flexibility and added more valves and detection and isolation equipment. Pipeline safety upgrades were installed to this 8-inch line by Chevron in 2002-2003. The SFPUC remains concerned about the reach of pipeline located upstream from San Antonio Reservoir should a proposed project to widen Highway 84 be carried out. Relocation permits for the pipeline along the Highway 84 right-of-way were obtained but the timeline for Highway 84 widening and pipeline relocation is unknown.

The Chevron pipeline was ruptured by a motor grader on August 14, 2005. Pipeline depth below the roadway surface at the contact point was 6 to 9 inches. The grader operator was an employee of an SFPUC lessee. The pipeline rupture occurred as the lessee was performing routine fire road maintenance and involved a spill of approximately 700 barrels of gasoline. Chevron was not able to recover any of the spilled gasoline and it was concluded that a portion of the spill evaporated. Various agencies responded to the spill including the California Department of Fish and Game. The Fish and Game inspector evaluated the stream closest to the spill and concluded that it had not been impacted.

In 2001 in the Calaveras Watershed, Pacific Gas & Electric Company (PG&E) applied a mixture of herbicides to bases of power poles. The mixture totaled 16 ounces of Oust, 6 ounces of Telar (chlorsulfuron), 5 gallons of Direx 4L (diuron), and 6 quarts of Accord (glyphosate, isopropylamine salt) (SFPUC, 2001).

The descriptions in the 2000 Sanitary Survey regarding PG&E gas lines and the Hetch Hetchy power lines are still valid.

3.1.3 Recreation

Recreation within the Alameda Watershed remains as described in the 2000 Sanitary Survey with some exceptions as follows.

The Sunol Water Temple is now open by permit only for weddings or other public ceremonies. It is not expected that these activities will contribute to any source water contamination.

Extensive hunting occurs on the non-SFPUC-owned watershed lands. This type of recreation can result in erosion and contaminants from the use off-road vehicles.

As described in the 2000 Sanitary Survey, EBRPD contracts with Alameda County Agricultural Commission to control the star thistle population on EBRPD lands, primarily

at Camp Ohlone. The herbicide Roundup (glyphosate) was used although the quantity is unknown.

3.1.4 Sunol Valley Golf Course

The lessee of the Sunol Valley Golf Course remains the same as in the 2000 Sanitary Survey. However, in 2004 the lease was extended for 25 years until 2029.

In 2004, Sunol Valley Golf Course used the following pesticides (SFPUC, 2005a):

- 11.5 gallons Roundup Pro (glyphosate);
- 10 gallons, 40 ounces Chipco 26 GT fungicide (iprodisone);
- 132 pounds Chemical Protect T/O fungicide (mancozeb);
- 110 pounds PCNB Granular fungicide;
- 6 gallons Banner Maxx (propiconazole);
- 21 gallons, 192 ounces (90 pounds) Confront herbicide (clopyralid, triethylamine salt and triclopyr, triethylamine salt);
- 49 pounds Eagle WSP (myclobutanil); and
- 18 quarts Delta Gard SC Insecticide (deltamethrin).

Information on pesticide use in Sunol Valley Golf Course was not available for other years.

3.1.5 Research

As described in the 2000 Sanitary Survey, access to SFPUC lands outside of that leased by EBRPD is limited to government agencies, universities, California Native Plant Society, and Audubon Society for conducting research and natural resource study and data collection.

The Environmental Research Laboratory is located on Calaveras Road across from one of the nurseries. This lab discharges its waste to a septic tank.

On non-SFPUC land, the University of California (UC) Lick Observatory is located in the southern portion of the watershed, near the top of Mt Hamilton. The Observatory owns about two square miles roughly surrounding the peak, off of Highway 130. It is used for research and public education purposes. The facilities and activities are unchanged from the 2000 Sanitary Survey (UC Lick Observatory, 2005).

3.1.6 Sanitary Facilities

The sanitary facilities on SFPUC and EBRPD property were described in the 2000 Sanitary Survey. The septic systems that were being installed during the last reporting period have now been completed. Two additional active septic\leach field systems that were not reported in the 2000 Sanitary Survey include an old occupied residence on Andrade Road (Parcel LA 8.4) and an old residence, presently unoccupied, on parcel LA-5.

Alameda County only inspects septic systems when they are installed. After installation, nothing is done unless complaints are made. The SFPUC cannot control the presence of septic systems on non-owned lands. Alameda County should be informed that septic systems can be an important source of contamination and be encouraged to perform regular inspections to prevent failing septic systems.

3.1.7 Residential Areas

The residential areas in the Alameda Watershed are unchanged from the 2000 Sanitary Survey.

3.1.8 Livestock and Wildlife

In addition to the natural wildlife that exists within the watershed, the Alameda Watershed also has extensive amounts of land utilized for cattle grazing. Wildlife and livestock have the potential to generate nutrients, pass along microorganisms, and increase erosion. In general, the information provided in the 2000 Sanitary Survey is still valid. Updates from the 2000 Sanitary Survey are provided below.

3.1.8.1 Livestock

Domestic livestock grazing continues to be utilized as a vegetation management tool on approximately 32,000 acres. Rangeland leases are administered based upon sound application of best management practices (BMPs). An SFPUC employee licensed as a Certified Rangeland Manager by the State Board of Forestry supervises the range management activities

SFPUC lessees are actively participating in the U.S. Department of Agriculture Natural Resource Conservation Service's Environmental Quality Incentive Program for shared grant funding for stock pond development and repair, as well as upland water development projects. Enclosure fences were repaired around Calaveras Reservoir, but they have not been as effective as hoped to keep cattle away from the water. There are still major sections of San Antonio that have not been fenced.

3.1.8.2 Wildlife

The feral pig control program implemented in 1998 has continued. Since inception, over 950 feral pigs have been removed from the SFPUC watershed lands. Other wildlife populations remain fairly static, with a slight increase in the Tule Elk herd (to approximately 150) and a noticeable decline in the Black-Tailed Deer population possibly due to increased predation by mountain lions.

3.1.9 Nurseries

Approximately 170 acres remain under intensive container cropping; however, the names of the nurseries have changed. The nurseries are: Anhorn, Calaveras Nurseries, Naka, and Valley Crest Tree Company. Also, a nursery owned by Lisa Arnold is not on SFPUC land but is in the Sunol Filter Gallery Watershed. Approximately 32 acres on the west side of Calaveras Road at Welch Creek Road, previously leased to Color Spot, Inc., are under permit to Jeff Anhorn Nurseries. Approximately 20 acres, leased to John Ura, Inc., continue to be utilized for “in-ground” peony seed production.

Pesticide usage for John Ura, Inc., and Valley Crest Tree Company nurseries were available for 2004 (SFPUC, 2005a) as follows:

John Ura, Inc.

- 10 gallons Roundup Pro (glyphosate)
- 30 pounds Dow Ethanol Gallery 75DF (isoxaben)
- 40 gallons Pendulum (pendimethalin)
- 26.25 gallons Kleenup Pro (glyphosate, isopropylamine salt)

Valley Crest Tree Co.

- 1,573 ounces, 1.25 gallons Daconil W.S. (chlorothalonil)
- 342 ounces, 78 pounds Pendulum W.D.G (pendimethalin)
- 21 ounces Subdue GR (mefenoxam)
- 154 ounces Subdue Maxx (mefenoxam)
- 4,756.5 ounces, 64.25 gallons Roundup Pro (glyphosate)
- 512 ounces, 5.4 gallons Camelot (copper salts of fatty and rosin acids)
- 280 ounces, 0.5 gallons Diazinon 4:E (diazinon)
- 15 gallons Ultra Fine Oil (paraffinic oil)
- 296 ounces, 0.75 gallons Fungo Flo (thiophanate-methyl)
- 192 ounces, 7.5 gallons Touchdown (glyphosate, diammonium salt)
- 68 ounces, 2 pints Talstar FL (bifenthrin)
- 222 ounces Orthene T.O.(acephate)

- 32 ounces Dursban Pro (chlorpyrifos)
- 330 ounces Phyton 27 (copper sulfate (pentahydrate))
- 74 pounds Aliette WDG (fosetyl-al)
- 3.55 gallons, 60 ounces Champ (copper hydroxide)
- 392 ounces Cleary's 3336 W.P. (dimethyl-4-4'-o-phenylenebis-3-thioallophanate)
- 234 ounces Banner Maxx (propiconazole)
- 5 ounces Medallion (fludioxonil)
- 19.5 pounds Agri-Mycin (streptomycin sulfate)
- 80 ounces, 16.5 quarts Astro (permethrin)

3.1.10 Quarries

The quarry operation planned for the farm field adjacent to the SFPUC Sunol corporation yard is proceeding. Protests and litigation brought by the activist organizations (Save our Sunol and the Alameda Creek Alliance) have run their course. A final appellate court decision based upon an alleged violation of Alameda County Measure D was dismissed in the spring of 2005. The proposed developer/operator of this quarry will be Hansen Aggregates, as Mission Valley Rock Company was sold to Hansen.

A new quarry (called Apperson Quarry) on SFPUC property has been proposed. Some minor fence relocation, tree trimming, and grading was started in 2004 on the "haul" road; however, since the Hansen Quarry development has already overcome all legal hurdles, it is possible the Apperson Quarry project will not be able to compete. Therefore, there is some speculation that development of the Apperson Quarry may be years away.

3.1.11 Industrial Uses

The information contained in the 2000 Sanitary Survey concerning Calaveras Test Site and Prestige Gunitite is still valid. Quarterly groundwater monitoring is still conducted for trichloroethylene (TCE) contamination from the Quantec site (Calaveras Test site) near the Calaveras Reservoir. This site is now approximately one mile from the reservoir due to lowered water levels in Calaveras Reservoir. Contrary to what was stated in the 2000 Sanitary Survey, three buildings remain on the Quantec site: two wood frame structures in a condition of major disrepair, and a concrete walled bunker type Quonset structure. A septic/leach field system served this site for many years.

3.1.12 Natural Resource Management

As described in the 2000 Sanitary Survey, the SFPUC actively manages the Alameda Watershed lands to reduce the fire hazard. During the last five years there were four fires

in the watershed. Three fires were in the primary watershed and one fire was in the secondary watershed. The largest burn was approximately 200 acres. However, none of the fires caused any increase in turbidity in the reservoirs. The sites of these fires are shown on Figure 3-1.

3.1.13 Calaveras Dam Replacement Project

Calaveras Reservoir is the SFPUC's largest local reservoir, providing about 40 percent of the SFPUC's local water storage. As such, Calaveras Dam represents a high priority and the Calaveras Dam Replacement Project is one of the most important projects of the SFPUC Water System Improvement Program (WSIP).

Since the winter of 2001, in response to safety concerns about the seismic stability of the dam and mandates from the California Division of Safety of Dams (DSOD), the SFPUC has lowered water levels in Calaveras Reservoir to elevation 706 Above Mean Seal Level (AMSL), or approximately 39 percent of its maximum capacity. The reduction in storage capacity has impacted the overall SFPUC system operations and reliability. SFPUC will continue to have water supply, water quality, and reliability issues until a suitable solution is identified and implemented for Calaveras Dam.

3.1.13.1 Conceptual Engineering Studies

Conceptual Engineering studies to repair or replace Calaveras Dam have been carried out by an SFPUC and URS Corporation project team since October 2003. As different study tasks were completed, the results were reviewed by the Calaveras Technical Advisory Panel, DSOD and SFPUC's Management Steering Committee. The following are some highlights of the studies that relate to potential disturbances in the watershed:

- A geotechnical investigation program including field explorations and laboratory testing was conducted to investigate foundation conditions at the dam and availability of materials in borrow areas. A site downstream of the existing dam is found to be suitable for construction of an earthfill dam and sufficient materials are available on site for the main zones of the dam.
- A detailed investigation and assessment of the activity of faults near Calaveras Dam was also completed. The Quarry and Spillway faults, which are within the dam site, were concluded to be inactive, and provided the basis to develop appropriate design parameters for the project.

Although these studies involved trenching activity and moving borrow material, the work was conducted using BMPs. No significant disturbances to the watershed resulted from these studies.

The Conceptual Engineering studies identified a number of biological and cultural resources considerations related to the replacement dam. They have been avoided or minimized to the extent that was practical. Formal evaluations of impacts associated with construction will have to be completed, and mitigation measures that would satisfy regulatory requirements will have to be developed and included in the project.

3.1.13.2 Preferred Project

During the Conceptual Engineering studies phase, an Alternatives Analysis Report was prepared which identified and screened a number of alternatives. These alternatives were evaluated based on the five following criteria:

- Environmental impacts;
- Operational flexibility, maintainability, and reliability;
- Implementability;
- Cost; and
- Dam safety approval.

The results of the Alternative Analysis indicate that regardless of the size of the reservoir, or single versus staged construction (i.e., future enlargement), the preferred alternative is to replace the existing dam with a new earthfill dam equipped with an open-chute spillway located downstream of the existing site. The existing dam will function as a cofferdam for construction of the replacement dam.

The recommended Calaveras Dam Replacement Project will include the following:

- Replacement of the existing dam with a new dam located downstream of the existing dam;
- Nominal reservoir storage capacity of 96,850 acre-feet (normal maximum water surface [NMWS] elevation = 756 feet AMSL). This storage is the same as the storage capacity of the reservoir when first constructed in 1925;
- Enlargement capability up to 386,000 acre-feet (NMWS elevation = 890 feet AMSL); and
- A new outlet tower for seismic safety, improved operations and maintenance, and accommodations for releases for environmental purposes.

3.1.13.3 Future Work

Final design work will need to include geotechnical investigations of the dam and spillway foundation, new inlet tower, and borrow areas. Also, final design engineering will further refine and optimize layouts of the foundation and spillway excavations and dam design; spillway hydraulic modeling; materials handling evaluations; foundation seepage control system; and stability and seismic deformation analyses.

The work plan and schedule for the second phase of the geotechnical investigations have been developed. Test grouting and test fill investigations began in October 2005 and are expected to end in fall of 2006. These and other “Phase Two” geotechnical studies could result in ground disturbance. However, part of the work plan for the Phase Two geotechnical studies included development of a Stormwater Pollution Prevention Plan

(SWPPP) that identified BMPs to prevent watershed degradation. No significant impact on the watershed is expected.

SFPUC is pursuing an aggressive, accelerated schedule for the Environmental Review and Design phases of this project. Construction would commence in early 2009 with project completion at the end of 2011. From an engineering and construction standpoint, this project completion date could be accelerated. However, this may be limited by the environmental documentation and review process.

3.1.14 Other SFPUC Operations

SFPUC operations in the Alameda Watershed as well as activities in Sunol Yard remain much as described in 2000 Sanitary Survey. Improvements to the SVWTP, described in Section 2 of this report, have mitigated the potential sources from that site described in the 2000 Sanitary Survey.

During 2001, herbicide applications on lessee lands were conducted by Alameda County Agricultural Commission under contract with SFPUC. Three ounces of Rodeo (glyphosate) and 293 ounces of Banvel (dicamba) were applied on 22 sites in the hydrologic watersheds (SFPUC, 2001). No applications were performed by SFPUC staff on the Alameda Watershed. Herbicide application for other years (except application in nurseries in 2004) was not available.

3.1.15 Other Activities and Land Uses

The southern part of the Alameda Watershed contains large areas of privately-owned land. Table 3-2 of the 2000 Sanitary Survey presents information on the parcels in the watershed that are not owned by SFPUC. For the 2000 Sanitary Survey, contaminant sources in these lands areas were evaluated using aerial photography. The following activities in non-SFPUC owned land in the Alameda Watershed were identified in the 2000 Sanitary Survey:

- Ranches with structures (including apparent human habitation) and water impoundments;
- Numerous unpaved roads;
- A reservoir in Isabel Valley with indications of aquatic recreation (boat docks and buildings);
- Possible off-road vehicle recreation in Isabel Valley near the reservoir;
- Possible orchard or vineyard agriculture in Isabel Valley approximately one mile from the reservoir; and
- Several creeks with unusual erosion – possible signs of disturbance.

In addition to the activities noted above from the 2000 Sanitary Survey, the Hodges property, on the south side of Highway 84, in the secondary watershed (below the San Antonio Dam) and adjacent to SFPUC lands is currently on the market as three 100-acre vineyard estates. A 5-acre vineyard is located on the secondary watershed to Calaveras Reservoir near Goldfish Pond.

Incident reports for the Alameda Watershed have been compiled for 2003 through 2005 and are presented in Table 3-2.

| Table 3-2 | |
|------------------------------------------------------|-------------------------------------|
| Summary of Alameda Watershed Incident Reports | |
| Incident Category | Number of Reported Responses |
| Trespassing | 772 |
| Fire ⁽¹⁾ | 14 |
| Hazmat ⁽²⁾ | 1 |
| Vehicle Accident ⁽³⁾ | several |
| Security Breach ⁽⁴⁾ | 3 |
| Suicide ⁽⁵⁾ | 1 |
| Marijuana Growing Operations ⁽⁶⁾ | 3 |

⁽¹⁾ Watershed Keepers responded to 14 fires on SFPUC-owned lands.

⁽²⁾ The Chevron pipeline ruptured on City property.

⁽³⁾ SFPUC responded to several vehicle accidents where the cars were over the bank and through SFPUC-owned fencing.

⁽⁴⁾ SFPUC-owned gates and locks were broken

⁽⁵⁾ Involved a driver driving onto City property after shooting himself

⁽⁶⁾ The Watershed Keepers worked with law enforcement on three different growing areas (1,000 plants) on City-owned lands.

3.2 Peninsula Watershed

The land uses and activities occurring within the Peninsula Watershed that have the potential for impacting water quality are both natural elements (e.g. fires, sedimentation, animals) and human-induced activities (e.g. roads, recreation). The following activities and land uses were described in the 2000 Sanitary Survey and are updated in this section:

- Transportation Corridors
- Utility Corridors
- Recreation
- Crystal Springs Golf Course
- Research
- Filoli Estate
- Sanitary Facilities
- Livestock and Wildlife
- Natural Resource Management
- Lucky Cypress Fire
- SFPUC Operations
- Other Activities and Land Uses

The subsections below provide the updated information. An additional section has been added to this report to describe the Lucky Cypress fire. Potential contaminant sources that can be mapped are shown in Figure 3-2. Photographs of the Peninsula Watershed are provided in Appendix A.

3.2.1 Transportation Corridors

For a description of the roads within the Peninsula Watershed see the 2000 Sanitary Survey. In addition to the description in the 2000 Sanitary Survey, Highway 35 is also in the watershed from just south of Crystal Springs Golf Course to where it meets Highway 92 and crosses the Crystal Springs reservoirs. A small section of it also enters the watershed northwest of Filoli Estate. Use of all roads has increased since the 2000 Sanitary Survey.

Concerns related to these transportation corridors include: 1) road surface runoff from leaks, spills, brake pads, and other general automobile usage; 2) accidental spills; 3) erosion; and 4) herbicides applied during roadside maintenance.

3.2.1.1 Stormwater Runoff

In the 2000 Sanitary Survey, I-280 was identified as source of potential runoff from stormwater. This remains a concern. Some portions of the highway have stormwater drains in place but it is not known by SFPUC if they are maintained and working as designed. SFPUC has contacted CalTrans and is working to improve communications on this issue and identify current operational and maintenance procedures.

CalTrans continues to use areas located along I-280 south of Edgewood Road as staging areas as described in the 2000 Sanitary Survey.

3.2.1.2 Accidental Spills

Several small spills occurred in the watershed and the potential exists for large ones. Trucks are more likely to be carrying hazardous materials, and in large quantities, than regular automobile traffic. Along I-280, CalTrans has five count locations for AADT within the watershed. These locations, the AADTs, and the truck AADTs are presented below in Table 3-3 for 2001 through 2004 data. Counts for traffic in 2005 were not available.

| Table 3-3 | | | | | | |
|------------------------------------------------------------|-------------|--------------------|--------------------|--------------------|----------------------------|--------------|
| 2001-2004 AADT Traffic Counts – Peninsula Watershed | | | | | | |
| <i>Location</i> | <i>AADT</i> | <i>Truck AADT</i> | | | | <i>Total</i> |
| | | <i>2 Axles</i> | <i>3 Axles</i> | <i>4 Axles</i> | <i>5 or More Axles</i> | |
| 2001 | | | | | | |
| I-280 at Highway 35, north of intersection | 106000 | 1083 | 224 | 38 | 692 | 2037 |
| I-280 at Highway 35, south of intersection | 122000 | 1347 | 292 | 46 | 1049 | 2733 |
| I-280 at Highway 92, north of intersection | 109000 | 1243 | 193 | 37 | 435 | 1908 |

Section 3
Potential Contaminant Sources and Events

| Table 3-3 | | | | | | |
|------------------------------------------------------------|-------------|--------------------|--------------------|--------------------|----------------------------|--------------|
| 2001-2004 AADT Traffic Counts – Peninsula Watershed | | | | | | |
| Location | AADT | Truck AADT | | | | Total |
| | | 2 Axles | 3 Axles | 4 Axles | 5 or More Axles | |
| I-280 at Highway 92, south of intersection | 111000 | 1455 | 192 | 89 | 511 | 2247 |
| I-280 at Canada Road | 110000 | 1149 | 317 | 54 | 691 | 2211 |
| 2002 | | | | | | |
| I-280 at Highway 35, north of intersection | 105000 | 1072 | 222 | 38 | 685 | 2016 |
| I-280 at Highway 35, south of intersection | 121000 | 1335 | 289 | 46 | 1040 | 2710 |
| I-280 at Highway 92, north of intersection | 108000 | 1231 | 191 | 37 | 431 | 1890 |
| I-280 at Highway 92, south of intersection | 111000 | 1452 | 191 | 89 | 510 | 2242 |
| I-280 at Canada Road | 105000 | 1414 | 251 | 47 | 608 | 2321 |
| 2003 | | | | | | |
| I-280 at Highway 35, north of intersection | 105000 | 1072 | 222 | 38 | 685 | 2016 |
| I-280 at Highway 35, south of intersection | 121000 | 1335 | 289 | 46 | 1040 | 2710 |
| I-280 at Highway 92, north of intersection | 108000 | 1231 | 191 | 37 | 431 | 1890 |
| I-280 at Highway 92, south of intersection | 111000 | 1452 | 191 | 89 | 510 | 2242 |
| I-280 at Canada Road | 105000 | 1415 | 251 | 47 | 608 | 2321 |
| 2004 | | | | | | |
| I-280 at Highway 35, north of intersection | 107000 | 1092 | 226 | 38 | 698 | 2054 |
| I-280 at Highway 35, south of intersection | 123000 | 1357 | 294 | 46 | 1057 | 2755 |
| I-280 at Highway 92, north of intersection | 110000 | 1254 | 195 | 37 | 439 | 1925 |
| I-280 at Highway 92, south of intersection | 113000 | 1478 | 195 | 90 | 519 | 2283 |
| I-280 at Canada Road | 105000 | 1414 | 251 | 47 | 608 | 2321 |

Source: CalTrans 2005 <http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm>

3.2.1.3 Erosion

There is a concern that shoreline erosion on the east side of San Andreas Reservoir has increased in recent years. A report was prepared by the SFPUC in May 2002 (*San Andreas Reservoir Shoreline Erosion Assessment*, SFPUC, 2002a) to evaluate the problem and present recommendations. The report stated that approximately 80 percent of the eastern shoreline was in an eroded condition. A monitoring study's results indicated that at the four monitoring locations on the east shoreline up to 1.3 to 8.6 feet of shoreline loss occurred between May 2003 and April 2004. The report concluded that the monitoring shows excessive erosion that, if continued, poses significant risk to SFPUC facilities, water quality, reservoir storage capacity and watershed natural resources. The report makes the following recommendations to correct the problem:

- Protection of high-risk facilities should occur prior to any planned increases in reservoir operating level to maximum capacity or near spillway level;
- An evaluation of reservoir operations should be conducted to determine if recent changes in operating regime could be adjusted to reduce erosion;
- A shoreline management strategy consistent with the Peninsula Watershed Management Plan should be developed and implemented; and
- New project funding should be requested for the development of the shoreline management strategy and for implementation and monitoring of the recommended protective measures.

Several other erosion problems occurred during the reporting period.

- The SFPUC road maintenance described in the 2000 Sanitary Survey is still not complete and is ongoing;
- The Sawyer Camp Trail in San Mateo Parks is subject to erosion. The County is evaluating the need to install culverts to correct erosion problems;
- The "Ingoing" road was damaged by a landslide in 2002. Repairs are complete and erosion control materials are in place;
- The fill over a culvert was lost on the Laguna Creek Road stream crossing (see Figure 3-2 for location) when the culvert was washed out in 2002. This stream crossing is part of Laguna Creek habitat management area. When repaired this area will function as a sediment basin and also habitat for California Red-Legged Frog and San Francisco Garter Snake. Work on this project is scheduled for the summer of 2006;
- There was an erosion problem on the road below the Cypress Field Office due to cracks in the road. An overlay of pavement to repair the road prevented further erosion;

- Adobe Gulch (see Figure 3-2) is a site of active stream channel erosion with poor riparian and aquatic habitat conditions. It is a proposed mitigation site for riparian and aquatic habitat restoration associated with another project but is still in the early planning stages;
- The San Mateo College Cross Country Trail had erosion problems but they have been corrected by improving trail alignment and drainage features. Work for this project was completed in 2005. New culverts were installed and drainage features were substantially improved through the efforts of volunteer workers; and
- The top of the Davis Tunnel Outlet collapsed in January 1998 and is eroding. The SFPUC has stopped using it as a diversion, thus greatly reducing erosion. However, it is still a potential source of erosion.

3.2.1.4 Herbicides

CalTrans and San Mateo County apply herbicides along the watershed roadways to control vegetation. In 2001, along I-280 between Highway 92 and Edgewood Road, along 280 north of Highway 92 and along Highway 35, CalTrans applied 6497 ounces of Roundup Pro (glyphosate), 340 ounces of Gallery (isoxaben), 680 ounces of Endurance (prodiamine), and 1608 ounces of Direx 4L (diuron) (SFPUC, 2001). These amounts include application for areas on those roadways that are outside of the watershed lands. Information on the dates of application and data for other years was not available for this Sanitary Survey.

In 2001, San Mateo County applied herbicides to Crystal Springs Road and Canada Road totaling 1920 ounces of Roundup Pro (glyphosate) and 2560 ounces of Pendulum (pendimethalin) (SFPUC, 2001). Information on other years was not available for this Sanitary Survey.

3.2.2 Utility Corridors

During the 1960s through 1970s, it was standard practice to blow out PG&E gas lines (discharge the contents for maintenance and other activities). This resulted in an accumulation of pollutants in soil in two areas in the Peninsula Watershed along the 24-inch gas main located within dry watercourses leading to Upper Crystal Springs. The soil was removed by PG&E between 2002 and 2003, and both areas were restored (see Figure 3-2 for locations).

Both PG&E and the North Coast Water District perform routine pipeline repair and maintenance on their lines. Both utilities have procedures in place to prevent watershed contamination.

PG&E is constructing a new 230 kilovolt (kV) electrical transmission line. The Jefferson-Martin 230 kV Transmission Project is needed to meet projected electric demand in the peninsula region including San Francisco. It involves rebuilding PG&E's existing 60 kV double circuit power line. The project starts from PG&E's Jefferson Substation in San Mateo County and terminates at PG&E's Martin Substation in the City of Brisbane.

Much of the route lies within the Peninsula Watershed. The new 60 kV/230 kV lines will be underground in the southern section adjacent to Upper and Lower Crystal Springs Reservoirs. In the section adjacent to San Andreas Reservoir, the lines will be above ground. An Environmental Impact Report (EIR) evaluated potential impacts to water quality in the watershed (Aspen Environmental Group, 2003). This EIR can be accessed online at the following website: http://www.cpuc.ca.gov/Environment/info/aspen/jefferson_martin/feir.htm. A number of mitigation measures have been developed to prevent impacts on the Peninsula Watershed. These measures, reviewed by SFPUC and the California Public Utilities Commission (CPUC), include a Hazardous Substances Control and Emergency Response Plan, a Spill Prevention, Countermeasure and Control Plan, an Erosion Control and Sediment Transport Plan, a SWPPP, and a Revegetation Plan. Further information can be found on the web at http://www.cpuc.ca.gov/Environment/info/aspen/jefferson_martin/jeffmartin.htm (CPUC, 2005).

During 2001, PG&E applied 64 ounces of Roundup Pro (glyphosate) in the watershed near Canada road. Information for other years was not available.

3.2.3 Recreation

With the important exception of the Fifield-Cahill Ridge Trail described below, recreation within the Peninsula Watershed remains as described in the 2000 Sanitary Survey.

The Bay Area Ridge Trail Council (BARTC) proposed a 400-mile Bay Area Ridge Trail. In August 1991, the Board of Supervisors of the City of San Francisco urged the SFPUC to defer any decisions regarding the use of watershed lands until a comprehensive watershed management plan was prepared and adopted by the commission. The SFPUC subsequently authorized the preparation of the management plans, which were completed in draft form in April 1998. Through a number of resolutions, the SFPUC stated its preference that the trail not provide unsupervised public access to interior areas of the watershed. The Board of Supervisors also issued resolutions, urging the SFPUC to allow watershed access. In 1997, the SFPUC amended the preferred alternative to consider public access to the Fifield/Cahill Ridge Service Road.

The 10-mile Fifield-Cahill Ridge trail starts at Skyline Quarry at Highway 92 and extends northward to the watershed boundary at the Portola Ridge gate. There it connects with the Golden Gate National Recreation Area's trail system and the Sweeney Ridge section of the Bay Area Ridge Trail, which is open to the public. Trail users can then access the Sneath Lane Gate Trailhead by following the Sweeney Ridge Trail to Army Road, which leads to the trailhead approximately 3.7 miles north of the Portola Ridge gate. Access can also be gained at the Portola Ridge gate (access via Army Road from the terminus of Sneath Lane), the Cemetery Gate (access via Skylawn Cemetery), and Skyline Quarry Gate (0.7 miles west of the intersection of lower Skyline Boulevard and Highway 92). See Figures 3-2 and 3-3 for trail and gate locations.

Because of the potential for erosion, contamination, and resource damage in the Peninsula Watershed from public use of the Fifield/Cahile Ridge trail, access is allowed to guided groups only. Small groups of hikers, bicyclists, or equestrians can now make reservations for guided excursions along the Fifield-Cahill Ridge trail. Groups must be accompanied by a volunteer trail leader and are limited to approximately 20 people (fewer on horseback), scheduled no more than three times a day on Wednesdays, Saturdays, and Sundays only. Toilets are located at approximately 2-mile intervals along the trail, starting at Skyline Quarry.

3.2.4 Crystal Springs Golf Course

The Crystal Springs Golf Course management leases 70 acres of SFPUC land near the community of Hillsborough on the eastern edge of the Peninsula Watershed. The primary concern of the SFPUC is the pesticides that are used on golf courses to control weeds, disease, and insects that may affect the color, uniformity, and density of turf grasses. Pesticide usage is described below. Additional activities since the 2000 Sanitary Survey include the re-paving of the golf cart paths, completed in Fall 2005.

Information available on the pesticide usage at the golf course for 2001 and 2004 is presented below in Table 3-4. Information on the dates of application and data for other years was not available for this Sanitary Survey.

| Table 3-4 | | | |
|-----------------------------------------------------|-----------------------------------|---------------------------|--------------------|
| Pesticide Use at Crystal Springs Golf Course | | | |
| Pesticide | | Application Amount | |
| Brand Name | Active Ingredient | 2001 | 2004 |
| Cleary's 3336 | Thiophanate methyl | 300 pounds | 26 pounds |
| Scott's Fungicide X | Iprodione | 1410 pounds | 900 pounds |
| Triplet | 2,4-D, MCP, Banvel | 26.5 gallons | 5 gallons |
| Fumitoxin | Aluminum phosphide | 36.9 pounds | - |
| Vanquish | Banvel | 7.3 gallons | 10.75 gallons |
| Heritage | Azoxystrobin | 160 ounces | 4 pounds |
| Roundup Pro | Glyphosate | 0.25 gallons | 2 gallons., 4 oz.. |
| Sweep | Glyphosate | 2 gallons | - |
| Fungicide VIII | Iprodione, Thiophanate-Methyl | - | 550 pounds |
| Medallion | Fludioxonil | - | 160 ounces |
| Daconil Ultrex | Chlorothalonil | - | 100 pounds |
| Chipco 26 GT fungicide | Iprodione | - | 10 gallons |
| Lontrel | Clopyralid, monoethanolamine salt | - | 228 ounces |

| Table 3-4 | | | |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------|-------------|
| Pesticide Use at Crystal Springs Golf Course | | | |
| Pesticide | | Application Amount | |
| Brand Name | Active Ingredient | 2001 | 2004 |
| Trimec Plus | Dicamba -Dimethylamine Salt, Mcpp-P - Dimethylamine Salt, 2,4-D - Dimethylamine Salt, MSMA | - | 10 ounces |
| Confront | Clopyralid, triethylamine salt and triclopyr, triethylamine salt | - | 14 gallons |
| Banner Maxx | Propiconazole | - | 3 gallons |
| Insecticide III | Chlorpyrifos | - | 150 pounds |
| Bayleton | Triadimefon | - | 5.5 pounds |
| ProStar 70WP | Flutolanil | - | 10 pounds |

Source: SFPUC, 2001; SFPUC, 2005a.

Sampling for pesticides downstream of the golf course was conducted on March 26, 2002, three days following a rainstorm of approximately one-third of an inch of water (California Irrigation Management Information System, 2005 – <http://www.cimis.water.ca.gov/>). Samples were collected from a tributary flowing from the golf course to Lower Crystal Springs Reservoir and from an inlet in Lower Crystal Springs near the tributary. Samples were analyzed for 57 pesticides including Safe Drinking Water Act pesticides. No pesticides were found in detectable concentrations in either sample.

3.2.5 Research

Research use in the watershed is unchanged from the 2000 Sanitary Survey.

3.2.6 Filoli Estate

The Filoli Estate, a 657-acre parcel owned and operated by a private foundation, is located south of Crystal Springs Reservoir. The potential contaminants associated with the Filoli Estate were identified in the 2000 Sanitary Survey.

The pesticides used in 2001 at Filoli Estate are presented in Table 3-5. Information on the dates of application and data for other years was not available for this Sanitary Survey.

| Table 3-5 | | |
|---------------------------------------|--------------------------|---------------------------|
| Pesticide Use at Filoli Estate | | |
| Brand Name | Active Ingredient | Application Amount |
| Ultrafine SunSpray Oil | Paraffinic oil | 577 ounces |
| Enstar II | Kinoprene | 14.7 ounces |
| Roundup | Glyphosate | 256 ounces |
| Roundup Pro | Glyphosate | 1007 ounces |
| Safer Insecticidal Soap | Potash Soap | 4.0 ounces |
| Merit | Imidacloprid | 10.84 ounces |
| Sluggo | Iron Phosphate | 60.8 pounds |
| Ortho Hornet Spray | Diazinon | 5 cans |
| Pro Control Plus Fogger | Pyrethrin and cyfluthrin | 2 cans |
| Astro | Permethrin | 3 ounces |

Source: SFPUC, 2001

3.2.7 Sanitary Facilities

In addition to the facilities described in the 2000 Sanitary Survey, there are six new vault toilets to serve the new trail. Six 1,000-gallon vault toilets were installed at 2-mile intervals on the Ridge Trail in the spring of 2003. The toilets installed are considered very efficient. The design of the toilet is such that a center drain was installed to help clean out and avoid wash water from entering the watershed lands. The most frequently used toilets were first pumped in fall 2005. Prior to the installation of vault toilets, portable toilets were used. In spring of 2003, a windstorm blew one over and there was a spill. There was only a recovery of the toilet with no clean up due to the dense brush and poor ground conditions.

3.2.8 Livestock and Wildlife

In general, there have been no changes to wildlife and livestock contaminant sources since the 2000 Sanitary Survey. However, unlike the case for the 2000 Sanitary Survey, no stray cattle have been observed on the watershed during the reporting period. There were, however, some goats observed on one occasion.

3.2.9 Natural Resource Management

Fire management practices can increase the amount of erosion in the Peninsula Watershed through the improper placement and management of fire roads and fire breaks. However, fire management generally decreases the potential for contamination

by minimizing the likelihood and intensity of wildfires. Fire management practices implemented over the past five years include brush clearing for fuel breaks on 240 acres in the Peninsula and removal and/or thinning of Eucalyptus trees at five locations over about 120 acres in total. Re-cutting of sprouts and some herbicide application was also performed to prevent re-growth. Habitat improvement at these sites included replanting native species and chipping and spreading of removed vegetation on site to prevent erosion. These projects are described in detail in Section 4.4.

3.2.10 Lucky Cypress Fire

On September 11, 2003, the Lucky Cypress Fire occurred in the Peninsula Watershed near the Cypress Field Office (SFPUC, 2003). It burned 17 acres on primary watershed lands. Storm runoff from the burned area is tributary to San Andreas Creek about two-thirds of a mile upstream of Tracy Lake, which is at the northern end of Lower Crystal Springs Reservoir.

Land and Resources Management Section (now in the Natural Resources Division, formerly in Water Supply and Treatment Division) staff performed a field survey and Geographical Information System (GIS) mapping of the burned area, with the intention of evaluating and documenting the effects of wildfire and fire suppression activities on watershed natural resources. This is consistent with goals described in the Peninsula Watershed Management Plan. The survey determined that ninety-two percent of the area (about 16 acres) within the Lucky Cypress Fire burned at low severity, 6 percent at moderate severity, and less than 2 percent burned at high severity.

The *Lucky Cypress Fire Burned Area Survey Report* (SFPUC, 2003) concluded that the Lucky Cypress Fire was not a risk to natural resources or to domestic water supply. A number of factors contributed to this:

- The 17-acre fire affected only 0.001 percent of the Crystal Springs Reservoir Watershed.
- Any local increase in sedimentation will be very small and of short duration due to the quick recovery potential of low severity burns.
- Recovery of vegetation and groundcover is likely to be substantial within two years thus reducing the fire effects of erosion and sedimentation.
- Most sediment from the one ephemeral spring channel draining the burn is deposited in lower gradient reaches and dense riparian vegetation prior to entry to San Andreas Creek.

3.2.11 SFPUC Operations

Since the 2000 Sanitary Survey, SFPUC made operational changes designed to reduce potential sources of contamination, including:

- All SFPUC boats are now equipped with 4-stroke motors.

- In the 2000 Sanitary Survey, it was noted that the material stored at the Skyline Quarry could be a source of contamination as the metals and other materials break down. Skyline Quarry is still used as a storage area but it has been cleaned up and organized and there is much less material stored than in the past.
- On July 5, 2005, some of the excess ordnance stored by law enforcement was stolen. San Mateo County Sheriff's office disposed of the remaining ordnance by blowing it up on site. As recommended in the 2000 Sanitary Survey, SFPUC policy now prohibits storage of explosives on watershed lands for security reasons and protection of water quality.
- The 2000 Sanitary Survey described potential problems from filter backwash discharge into San Andreas Reservoir. As described in Section 2, a new residuals thickening/clarifier station at the HTWTP was completed in July 2002 to handle backwash water.

Herbicides and pesticides are applied by SFPUC staff at watershed supply system facilities and rights-of-way. Applications in 2001 included 136 ounces of Roundup (glyphosate), 3.7 gallons of Garlon 4 (triclopyr, butoxyethyl ester), 58 ounces Whitmire PT 515 (allethrin), 44 ounces of Transline herbicide, and 1.2 ounces of Pendulum (pendimethalin) (SFPUC, 2001). Applications in 2004 included 36 ounces of Roundup Pro (glyphosate) and 7.7 ounces Turflon (triclopyr) in Millbrae Yard, 54 ounces of Roundup Pro at the HTWTP, 8 ounces of Rodeo (glyphosate) at the Crystal Springs pumps, 6 ounces of Roundup Pro in the Cypress Work Center, 32 ounces of Roundup Pro on Cypress Road, 28 ounces Wasp Freeze and 22 ounces of Roundup Pro in the Pulgas Temple grounds, and 18 ounces of Roundup Pro in the Crystal Springs Watershed (SFPUC, 2005a). Pesticide information for other years was not available.

3.2.12 Other Activities and Land Uses

Incident reports for the Peninsula Watershed have been compiled for 2003 through 2005 and are presented in Table 3-6.

| Table 3-6 | |
|--------------------------------------------------------|-------------------------------------|
| Summary of Peninsula Watershed Incident Reports | |
| Incident Category | Number of Reported Responses |
| Trespassing | 71 |
| Fire | 19 |
| Hazmat | 3 |
| Camping/Swimming | 3 |

| Table 3-6 | |
|--------------------------------------------------------|-------------------------------------|
| Summary of Peninsula Watershed Incident Reports | |
| Incident Category | Number of Reported Responses |
| Vehicle Accident | 4 |
| Medical Aid | 10 |
| Security Breach | 103 |
| Infrastructure Check | 14 |
| Illegal Dumping | 8 |
| Law Enforcement | 32 |
| Marijuana Growing Operations | 10 |

During the 2003 through 2005 period for which incident reports are available, Watershed Keepers reported 19 fire related incident responses. Most were either unable to be located or did not involve SFPUC watershed property. Not including the Lucky Cypress Fire incident, less than one acre was reported to have burned. Watershed Keepers responded to several incidents of reported hazardous materials, most of which involved unknown substances in containers. Containers and substances were removed. A portable toilet was blown over and its contents spilled (see section 3.2.7, above) which is included in the Hazmat incidents in Table 3-6. Four incidents involving vehicle accidents on the watershed were reported. Many more likely occurred.

The category Law Enforcement in Table 3-6 includes reported destruction of chemicals used for methamphetamine production stored in explosives bunker at Skyline Quarry. Chemicals were blown up in the quarry. A small fire (approximately 200 square feet) occurred as a result. Explosives are no longer stored in Skyline Quarry.

Several large marijuana growing operations were located and destroyed on the Peninsula Watershed during the reporting period. At least 5 acres were under cultivation in one garden alone. Besides denuding the vegetation in order to cultivate, the operations were large enough to require several live-on-site growers/armed guards. The camps of these growers were well established (and well hidden) and included kitchen areas, large living areas, and bathroom areas. The growers' methods were not organic and they used large quantities (hundreds of pounds) of chemical fertilizers and pesticides in their gardens. After the growing season, Watershed Keepers increased patrols, destroyed the camps and irrigation systems. The growers appear to have moved their operations, as no new large scale gardens were found (and the previously located gardens remained abandoned) during the 2005 season.

Section 4

Watershed Control and Management

The management of the watersheds is primarily controlled by the SFPUC, though other agencies also have jurisdiction over the types of development and activities that can occur within the watersheds. The SFPUC entities most involved in watershed activities are the Wholesale Water Division (WWD), the Natural Resources Division (NRD), and the Water Quality Bureau (WQB). Descriptions of each organization are presented in this section.

4.1 SFPUC Organization and Practices

The organization of the SFPUC has changed substantially since the 2000 Sanitary Survey. In February 2005, a comprehensive, agency-wide reorganization of the SFPUC was announced. Under the SFPUC General Manager there are now five entities – Water Enterprise, Wastewater Enterprise, Power Enterprise, Business Services, and External Affairs. An assistant general Manager heads each of these.

In order to manage and support the Water System Infrastructure Program (WSIP), a Deputy General Manager of Capital Programs was appointed to coordinate all capital improvement projects and programs across the Water, Wastewater and Power enterprises. In addition, the Deputy General Manager oversees the Infrastructure Division.

Within Water Enterprise, there are five divisions as follows:

- Hetch Hetchy Water and Wholesale Power (HHWWP, formerly Hetch Hetchy Water and Power);
- Wholesale Water Division (formerly Water Supply and Treatment or WS&T);
- Retail Water (formerly City Distribution Division); and
- Water Quality.

Natural Resources Division (consisting of the former WS&T Land and Resources Management Section and WQB Environmental Services Staff).

This section provides a brief description of the organizational structure and function of the SFPUC. The divisions within the SFPUC with authority over activities related to watershed management are described in greater detail.

4.1.1 Natural Resources Division

NRD was created during the SFPUC agency-wide reorganization in February 2005 by reassigning Land and Resources Management Section staff from WS&T and

Environmental Services staff from WQB to this new unit. NRD oversees fisheries, water flows, land and natural resources.

As mandated by the Alameda and Peninsula Watershed Management Plans, NRD staff will continue to implement key Plan provisions to protect water quality, reduce the risk of fire, protect reservoir storage capacity, create ecological reserves, monitor fisheries and implement actions beneficial to fisheries, maintain wildlife preserves, monitor wildlife, and conduct flood and erosion control. In addition, NRD staff provides marine biology and limnology, services support. With respect to the Alameda and Peninsula Watersheds, all activities and projects (including new leases and lease renewals) on these watershed lands are reviewed by both NRD staff and an interdepartmental review team as required by the Alameda and Peninsula Watershed Management Plans. This *Watershed Project Review* process insures that all activities and projects on the Alameda and Peninsula Watersheds are consistent with the Watershed Management Plans and comply with environmental regulations. NRD has the authority to identify specific lease requirements related to water usage, sanitary facilities, runoff control, grazing locations, pesticide and herbicide applications, changes in land uses, emergency responses, and water quality monitoring. NRD also oversees SFPUC lands leased to EBRPD and SFPUC lands managed (under an easement) by San Mateo County Parks and Recreation, as well as a watershed access permit system for consultants, contractors, scientists and other visitors. NRD also manages the Fifield/Cahill Ridge Trail through the Peninsula Watershed.

NRD staff are primarily natural resources professionals, including a land and resources manager, an environmental services manager, a licensed forester, and four area foresters (including a certified rangeland manager), two watershed keeper supervisors and numerous watershed keepers, as well as a planner, regulatory specialist, Geographical Information Systems (GIS) manager, Integrated Pest Management (IPM) Coordinator/Spray Operator, Arboricultural Technician supervisor and crew, an operating engineer, supervising biologists, , biologists, water quality technicians, a hydrologist, community liaison and support staff. NRD offices are located at 1657 Rollins Road in Burlingame.

4.1.2 Wholesale Water Division

WWD is headquartered at the Millbrae office and is responsible for the operation and maintenance of the storage, treatment, transmission, and distribution facilities from the Tesla Portal downstream to the San Francisco County line where the Retail Water Division takes over. WWD is further divided into the Operations and Maintenance, Maintenance Engineering, System Operations, and Millbrae Administration sections.

4.1.2.1 Operations and Maintenance

This section is responsible for daily operations and maintenance of the system, except for the pump stations and the water treatment plants. This includes pipeline inspection and maintenance and right of way, watershed, automotive, and building and grounds maintenance. All customer meters outside of the City are maintained by the Customer Services section of this group.

4.1.2.2 Maintenance Engineering

The Maintenance Engineering Section is responsible for dam inspections, land engineering, surveys, and corrosion protection for the water supply system.

4.1.2.3 System Operations

The System Operations Section is responsible for the operation of the West Bay and East Bay facilities, including the water treatment plants. Water supply system planning is also coordinated through this section.

4.1.2.4 Millbrae Administration

This section oversees the administrative duties of WWD, including supply requisition and payroll.

4.1.3 Water Quality Bureau

WQB provides operational support in a service area extending from Yosemite National Park to the Pacific Ocean. The WQB Engineering Section provides process engineering support, conducts applied research, reviews data and new regulations, prepares regulatory reports, and oversees disinfection of facilities and dechlorination of water discharges to the environment. Process engineers and chemists are assigned to all major treatment facilities. The WQB Laboratory Section provides full analytical support (chemical, physical, and microbiological analyses) to SFPUC operating units (water and wastewater treatment), source control (pre-treatment) and engineering units, and other City departments, public agencies, and wholesale water customers. Over 375,000 analytical tests are conducted each year.

4.1.4 Hetch Hetchy Water and Wholesale Power

HHWWP manages the Sierra Nevada watersheds and reservoirs and water conveyance facilities as far west as the Tesla Portal. This department also manages the power production and transmission facilities from the Sierra's to the Newark Substation where PG&E then wheels the power for the City. HHWWP supplies the prearranged flow of water from the Hetch Hetchy system to the SFPUC system at the Alameda East Portal. The flow rate is set by the SFPUC and is limited to the capacity of the three San Joaquin Pipelines. Depending on the seasonal demand and the water levels at the primary storage reservoirs, the SFPUC may request changes of flow rate four to five times a year.

4.1.5 Infrastructure Division

The Infrastructure Division is responsible for designing and constructing major capital improvement projects including the WSIP, a comprehensive rebuilding of the SFPUC's water system. This division is staffed with design engineers who conduct or contract for specific engineering, environmental, construction management, and related services for the SFPUC to implement components of the SFPUC's major capital improvement plans.

4.1.6 Bureau of Environmental and Regulatory Management (BERM)

BERM’s mission is to protect the environment, SFPUC employees, and facilities by regulating industrial waste discharges to the sewerage system; to implement the City's Sewer User Charge program; to assist the SFPUC in complying with environmental protection and industrial health and safety laws and regulations; to plan for the continued service of reliable, high quality water to San Francisco and its customers, in compliance with current and anticipated laws and regulations, and in quantities sufficient to meet reasonable needs; and to monitor and provide accountability for the SFPUC's various regulatory compliance efforts.

4.1.7 Other Divisions

The Retail Water Division operates the drinking water distribution system within San Francisco. The Water Pollution Control Division operates the City’s three water pollution control plants and associated facilities. These two divisions have little influence on watershed issues.

4.2 Other Agencies with Watershed Control Authority

There are numerous local, State, and Federal agencies which have either authority over or responsibilities for land uses and activities within the Alameda and Peninsula watersheds. Table 4-1 identifies the primary relevant agencies and responsibilities related to watershed land uses and activities which may impact water quality. Some agencies are regulatory and permit driven; others have cooperative agreements or protection authority.

| Table 4-1 | |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary Agencies with Watershed Water Quality Control Authority | |
| Agencies | Area of Responsibility |
| Alameda County Fire Department | Fire protection Storage of hazardous materials Emergency response |
| Santa Clara County Fire Marshall | Fire protection with California Department of Forestry and Fire Protection (CDF) Emergency response with CDF Storage of hazardous materials |
| San Mateo County Fire Department | Storage of hazardous materials Emergency response with CDF Fire protection with CDF |
| San Mateo County Parks Department | Manages some public trails and facilities on Peninsula Watershed |
| EBRPD | Recreation lands and facilities |

| Table 4-1 | |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary Agencies with Watershed Water Quality Control Authority | |
| Agencies | Area of Responsibility |
| CalTrans | Highway runoff collection Highway maintenance |
| California Department of Fish and Game | Wildlife management within refuge Responsible for State listed species Water quality for aquatic species 1600 permits |
| California Department of Forestry and Fire Protection (CDF) | Fire prevention, protection, and emergency response Timber harvesting practices Hazardous material emergency response |
| California Department of Health Services (DHS) | Drinking water quality Treatment and system changes |
| Regional Water Quality Control Board (RWQCB) | Discharge of waste into waterbodies (soil, nonpoint runoff, point discharges, construction over five acres) Hazardous waste surface impoundment Mines and quarries |
| U.S. Fish and Wildlife Service | Water quality impacts to federally listed species |

The various County agencies with responsibilities for construction and maintenance activities do not always have policies, which are focused on water quality protection. Several of the State and Federal agencies have permitting authority over construction activities and do have a vested interest in water quality protection, but they are typically only involved with watershed lands if there is construction proposed or occurring. The DHS and RWQCB have the most involvement in the watersheds on an on-going basis. DHS regulates drinking water quality, which is influenced by watershed conditions, and the RWQCB has policies and regulations pertaining to discharges to waterbodies impacting water quality. In addition, several agencies listed in Table 4-1 have emergency response authority and are critically important to the protection of water quality in the watersheds.

The General Plans for Alameda and Santa Clara Counties have assigned land use designations for the Alameda Watershed lands. The Alameda East County Area encompasses 418 square miles and includes the cities of Livermore, Pleasanton, Dublin, the town of Sunol, and a portion of Hayward, as well as surrounding unincorporated areas. SFPUC-owned lands within Alameda Watershed are zoned as Resource Management/Watershed Protection under the Alameda East County Area Plan. The East County Area Plan has not been revised since the 2000 Sanitary Survey. Alameda County also identified portions of the Sunol Valley as an agricultural

enhancement zone. The proposed agricultural enhancement zone is designed to amend current county zoning from A-100 (100 acres per residential dwelling) to A-20 restricted/intensified agricultural zoning with a 2-acre building envelope. If adopted, this designation may allow for subdivision of large parcels into 20-acre homesites each with an agricultural component. However, this proposal has not been approved and is not currently under consideration. As described in the 2000 Sanitary Survey, SFPUC-owned watershed lands within Santa Clara County are classified as Resource Conservation Area/Other Public Open Land in the Santa Clara County General Plan. With the exception of an amendment dealing with mineral resources, the Santa Clara County General Plan has not been revised since the 2000 Sanitary Survey.

The Peninsula watershed is located completely within San Mateo County. The SFPUC owns 21,708 acres of the 22,533-acre Peninsula hydrologic watershed. The non-SFPUC-owned portion of the watershed is primarily the Filoli Estate (657 acres). The San Mateo County General Plan has not been updated since the 2000 Sanitary Survey.

4.3 Watershed Management Plans

The Alameda and Peninsula Watershed Management Plans were adopted by the SFPUC in 2000 and 2001, respectively. These plans provide a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on SFPUC watershed lands. The watershed management issues discussed in these plans include water quality, water supply, ecological and cultural resources, fire and safety, watershed activities, fiscal management, and public awareness and agency participation.

To aid the SFPUC in decision-making, these plans provide a comprehensive set of goals, policies, and management actions that integrate all watershed resources and reflect the unique qualities of the watersheds. The primary goal for the watersheds is to maintain and improve source water quality to protect public health and safety. The secondary goals include:

- Maximize water supply;
- Preserve and enhance the ecological and cultural resources of the watersheds;
- Protect the watersheds, adjacent urban areas, and the public from fire and other hazards;
- Continue existing compatible uses and provide opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses;
- Provide a fiscal framework that balances financial resources, revenue-generating activities, and overall benefits, and an administrative framework that allows implementation of the Watershed Management Plans; and

- Enhance public awareness of water quality, water supply, conservation, and watershed protection issues.

Several key policies and management actions related to the review of all watershed activities and projects for consistency with the Alameda and Peninsula Watershed Management Plans and compliance with environmental regulations have been implemented during the 2001 through 2005 reporting period. This *Watershed Project Review* process insures the consistent application of best management practices and other Plan provisions designed to reduce erosion and runoff, avoid or minimize contaminants, and otherwise protect and/or improve water quality. In addition, all persons accessing the SFPUC's watershed lands (including contractors, consultants, lessees and employees) are issued the *Alameda and Peninsula Watershed Field Manual*, which contains the watershed regulations and procedures.

Many of the Watershed Management Plan recommendations have been implemented and are described in the following sections.

4.3.1 Alameda Watershed Management Plan Implemented Activities

The following recommendations for the Alameda Watershed have been completed or are ongoing.

- Assign an NRD staff member to be the Proposed Projects Review Coordinator to oversee the Review Process for Proposed Plans and Projects. *Completed*
- Prepare a conceptual landscape and recreation plan as required by Alameda Surface Mining Permit 32 (SMP-32) for the restoration and public use of the Sunol Water Temple, its environs and historic entry. *Completed*
- Implement a set of lease requirements and terms. *Completed*
- Maintain a network of hazardous materials clean-up storage lockers at accessible locations on each reservoir and at areas where spill potential is high. *Completed.*
- Implement specific criteria for lessee selection. *Completed.*
- Identify high-risk spill potential areas and implement measures to reduce the risk of hazardous spills. *Ongoing*
- Train staff members, as appropriate, in spill response and containment measures for SFPUC vehicles as well as for other types of spills on the watershed. *Annual training is being conducted.*
- Modify the grading and drainage of existing high use roads/road segments to reduce the potential for erosion and sedimentation. *Ongoing*

- Prior to authorizing the use of any vehicle or equipment on the watershed, require that SFPUC vehicle/equipment comply with the fire prevention regulations established by CDF for use in the watershed. *Ongoing*
- Prepare and provide to affected agencies and organizations maps and information showing water quality protection requirements, safe zones, turnout locations, helispots/heliports, fuel break locations, natural barriers, evacuation routes, and areas of limited suppression. *Ongoing*
- Regularly inspect and maintain the facilities and areas used by the public and assign responsibilities for maintenance of these facilities to the appropriate agency. *Inspection and maintenance completed quarterly.*
- Develop and implement an IPM Program for the NRD, specific to the watershed and watershed resources. *Ongoing program that includes monitoring and adaptive management.*
- Identify and adopt alternative non-toxic management practices to protect aquatic resources. SFPUC is in process of installing hypolimnetic oxygenation systems to reduce algal blooms in water storage reservoirs. This allows for the substantial reduction in the use of copper sulfate for treatment of algae. *Ongoing*
- Provide additional training for watershed keepers and NRD staff in enforcement and safety procedures and identification of activities that could degrade water quality. *Ongoing*
- Establish an employee-training program for safety and emergency response procedures. *Ongoing*
- Implement grazing management controls to reduce the risk of viable pathogen discharges and maintain and improve ecological resources. *Controls are established in Alameda Creek Watershed Grazing Resources Management Plan. Riparian fencing projects have been completed. Additional fencing to exclude cattle from riparian areas is funded, with implementation scheduled for 2006 and beyond.*
- Implement structural protection measures to reduce the risk of viable pathogen discharges and maintain and improve ecological resources. *Ongoing*
- Identify improvements to be accomplished by the tenants through a work-credit provision in the individual leases. *Done as needed per lease parcel.*
- Prohibit or regulate the timing or intensity of land use activities in high-risk shoreline areas consistent with other management actions in this Plan. *This is accomplished through monthly project review meetings.*

- Meet with proponents of new plans and projects prior to detailed design or development to identify requirements of the Watershed Management Plan, which must be met. *Accomplished at monthly project review meetings.*
- In coordination with Chevron, conduct ongoing monitoring of the pipeline for potential hazards and assure that spill response measures are adequate. *Monitoring and coordination are accomplished on an annual basis.*
- Maintain fire roads to minimize sediment generation through effective installation of waterbars, avoidance of unnecessary grading, and paving short lengths of road. *Ongoing*
- Periodically and systematically inspect watershed perimeter fencing, access gates, and locks and repair/replace as required to minimize trespassing, straying cattle, etc. *Accomplished on annual basis by tenants and periodically by Watershed Keepers.*
- Develop written agreements with public and private landowners outside of SFPUC-owned watershed lands to institute voluntary restrictions on land uses and activities that will protect water quality. *Yet to be developed.*
- Evaluate all watershed operations and maintenance activities and establish standards for staff and time allocations for each activity. *In development.*

4.3.2 Peninsula Watershed Management Plan Implemented Activities

The following recommendations for the Peninsula Watershed have been completed or are ongoing.

- Evaluate and rank all lands within the hydrologic watershed outside of SFPUC's landholdings for potential purchase or establishment of easements. *Completed.*
- Maintain a network of hazardous materials clean-up storage lockers at accessible locations on each reservoir and at areas where spill potential is high. *Completed*
- Install two 10,000-gallon metal water tanks at specified locations. *Completed*
- Assign GIS database operations maintenance duties to an NRD staff member. *Completed*
- Maintain four NRD patrol boats for ongoing patrols and emergencies. *Completed*
- Require CalTrans to include spill containment and diversion facilities in new and upgraded facilities along I-280 and Highway 92. *Completed*
- Identify key locations for, and install, barriers or fencing to prevent access to reservoir edges and dams. *Fencing program upgrades are accomplished on an as needed basis.*

- Conduct regular servicing for the SFPUC vehicle fleet and equipment so that leaks/drips/spills of contaminants are minimized. *Accomplished by SFPUC auto shop during routine scheduled preventive maintenance.*
- As part of the Highway 92 widening project, assure that a stormwater collection and filtration system is included. *The conceptual phase of the widening project includes a stormwater collection system.*
- Develop spill response and containment measures for SFPUC vehicles as well as for other types of spills on the watershed. *Ongoing*
- Modify the grading and drainage of existing high use roads/road segments to reduce the potential for erosion and sedimentation. *Ongoing*
- Conduct water quality and ecological resources training for NRD staff, operations supervisors and crews, SFPUC Utility Engineering Bureau engineers, and project managers. *Ongoing*
- Prior to authorizing the use of any vehicle or equipment on the watershed require that SFPUC equipment comply with fire prevention regulations. *Ongoing*
- Prohibit or regulate the timing or intensity of land use activities in high-risk shoreline areas consistent with other management actions in the Management Plan. *Ongoing*
- Maintain fire roads to minimize sediment generation through effective installation of waterbars, avoidance of unnecessary grading, and paving short lengths of road. *Ongoing*
- Conduct regular, on-site risk assessment inspections of SFPUC facilities in conjunction with the safety and security program and other maintenance activities. *Ongoing*
- Periodically and systematically inspect watershed perimeter fencing, access gates, and locks and repair as required to minimize trespassing, illegal dumping, etc. *This task is part of routine duties of the watershed keepers.*
- Identify and prioritize for removal from SFPUC lands, dump sites that pose a hazard to water quality and watershed resources. *Ongoing*
- Inspect all SFPUC facilities to assess conditions of vault, chemical, and composting toilets; repair/replace as necessary to minimize risk of contamination of water supplies. *Ongoing*
- Inspect and manage unpaved roads, stormwater collection systems, unlined stormwater conveyance systems, and other stormwater facilities according to the California Forest Practices Act Rules. *Ongoing*

- Conduct appropriate levels of review prior to undertaking activities involving surface disturbance and/or excavation to avoid damage to buried cultural resources. *Ongoing*
- Provide comments on environmental documents for projects within the larger watershed boundaries to ensure that potential adverse effects on SFPUC lands are mitigated. *NRD staff reviews and comments on all environmental documents and provides project proponents with this information at monthly project review.*
- Prior to approval of leases and permits requiring the use of pesticides, review the Chemical Application Management Program (CHAMP) prepared by the lessee or permittee. *Ongoing*

4.3.3 SFPUC Project Review Application

All projects and activities on the Alameda and Peninsula Watersheds, as well as the SFPUC Rights-of-Way (ROW) lands in Alameda, Santa Clara, and San Mateo Counties must be reviewed for conformity with the Watershed Management Plans and compliance with environmental codes and regulations. This will ensure that all future land management decisions and uses remain consistent with the goals and policies set forth in the Watershed Management Plans. This review process must be completed prior to a project being approved or denied. To expedite this review, the SFPUC has established a project review team consisting of NRD, Environmental Planning, Real Estate Services, Water Supply and Treatment, Water Quality and the City Attorney's Office. This multidisciplinary team reviews projects and activities for consistency with SFPUC policies and plans, and compliance with environmental regulations. In reviewing the proposed project, the team may indicate that modifications or mitigation are necessary so that the project is in keeping with the Watershed Management Plans, other SFPUC policies and plans, and to ensure compliance with environmental regulations.

4.4 Peninsula Watershed Fuel Hazard Reduction Projects

This section describes projects have been completed in the Peninsula Watershed designed to reduce fuel (brush and trees) that were deemed a potential fire hazard.

4.4.1 North San Andreas Fuel Break Modification

The North San Andreas Fuel Break Modification project was completed in spring 2002. This work was conducted near the northeast property line next to San Bruno easement for PG&E and was designed to 1) reduce the large and small fuels that can send cinders into adjacent urban areas and 2) enhance existing fuel breaks at two locations. Approximately 60 to 70 eucalyptus trees of various sizes were removed from the site. The stumps were treated to prevent re-growth. Brush cutting was done to enhance the boundaries of the existing fuel breaks by sculpting the edges and by creating vegetation islands for wildlife. Brush was chipped and spread on the area. In addition, the adjacent existing fuel break was re-mowed to provide even further protection for potential spread of wild fire. The site was later replanted with Hollyleaf

Cherry, Toyon, and Redbud. Figure 3-2 of Section 3 (Potential Contaminant Sources and Events) shows the location of this project.

4.4.2. North San Andreas Access Road Fuel Removal

The North San Andreas Access Road Fuel Removal project was conducted in fall 2003 on the road to North San Andreas Cottage. This project reduced the large and small fuels that can send cinders into adjacent urban areas and to restore the area to a natural landscape. Approximately 60 to 70 eucalyptus trees of various sizes were removed from the site. The stumps were treated to prevent re-growth, the brush was chipped and the chips were spread on the area for erosion control. As part of on-going maintenance, the adjacent existing road will be mowed annually to provide even further protection for potential spread of wild fire. Restoration of the area was conducted by grinding some of the larger stumps and re-planting the area with Hollyleaf Cherry, Toyon and Redbud. Prior to commencement of the project the site was surveyed by a SFPUC biologist on two occasions. Figure 3-2 shows the location of this project.

4.4.3. Maple Way Hazardous Tree Removal

The Maple Way Hazardous Tree Removal project was conducted in summer 2002 on Maple Way near Woodside and east of the Canada Quarry cottage site. The area is near the boundary of SFPUC land and Maple Way. This project removed from SFPUC property large fuels that can cast cinders for great distances into adjacent neighborhoods, thus reducing liability. Existing trees along the edge of Maple Way and on SFPUC property were removed. Brush left within the felling area was also removed. As part of the project, a crossing of a seasonal watercourse needed to be constructed. This crossing was removed when the project was completed. Figure 3-2 shows the location of this project.

4.4.4. Runnymede/Raymundo Property Line Fuel Break

Runnymede/Raymundo Property Line Fuel Break project was conducted in summer 2002 in the southern end of Watershed Property in Woodside starting at the intersection of Runnymead and Raymundo roads and going west along the SFPUC property line. The purpose of this project was to reduce ladder fuels by thinning existing trees to a fire safe spacing, limbing lower branches on remaining trees and removing brush species to create a shaded fuel break. A 300-foot shaded fuel break was created and enhanced by removing trees and brush species within that area from the eastern most point near the entrance to Crystal Springs Trail traveling westward to the property line at the top of a small knoll. All brush was cut and chipped, trees were removed as necessary to open up the dense cover and create a spacing of approximately 75 feet by 75 feet between mature oaks. The remaining trees were limbed up to a height of 6 or 7 feet above the ground surface. Figure 3-2 shows the location of this project.

4.4.5. Hillcrest to Trousdale Thinning/Edge Tree Removal

The Hillcrest to Trousdale Thinning/Edge Tree Removal project was conducted in summer 2002 between the Burlingame Water Tanks in Hillcrest to the watershed entrance by Trousdale gate along Buri Buri Ridge. The purpose of this project was to reduce fuel loading, minimize ladder fuels, and reduce edge trees from establishing new reproductive populations. Fuel was reduced by thinning out the stand of Eucalyptus trees leaving only stems larger than 12 inches, pruning the bottom branches of trees to 6 feet, and cutting brush. In addition, all pioneer and edge trees were eliminated extending beyond the main stand boundaries. Figure 3-2 shows the location of this project.

4.4.6. Portola/Sawyer Ridge Fuel Break

The Portola/Sawyer Ridge Fuel Break project was conducted from January to March 2004 on Portola and Sawyer Ridges from the northern gate to the Sawyer-Outgoing Road intersection. This project reduced the large and small fuels that can send cinders into the reservoir and spread a wild fire. A new fuel break was developed and mowed to provide even further protection for potential spread of wild fire next to the existing access road. Brush cutting was conducted and blended with the existing fuel breaks by sculpting the edges and by creating vegetation islands for wildlife. Prior to commencement of work, a SFPUC biologist surveyed the area for rare and endangered species with negative results. A population of Durka was discovered and was identified to the operator to avoid damage. Durka is not endangered but on the watch list for plants. Figure 3-2 shows the location of this project.

4.4.7. Hazardous Tree Removal Project

The Hazardous Tree Removal project was conducted in 2004 through 2005 to remove non-native and native trees from watershed lands consistent with the Watershed Master Plan and specifically to reduce flashy and long-term fuels. Reducing fire hazards on watershed lands is essential to reducing the liability from wild fire. The contractor removed both native and non-native trees, and chipped brush and limbs. The chips were spread on site or removed from watershed lands as directed by SFPUC staff, thereby reducing fuel loading. Four separate areas on the Peninsula Watershed were treated. Figure 3-2 shows the location of this project.

Cypress Unit H7. In this area, fuel was removed by clear-cutting of non-native pine trees. All brush was chipped and scattered for erosion control purposes. Hardwoods were also removed and chipped and scattered. Still to be completed is the scattering of the chips. Figure 3-2 shows the location of this project.

Cahill Unit I12. This unit is along Cahill Ridge and necessitated the removal of both standing and downed native trees and thinning of some non-native eucalyptus. One area in the unit had trees that were dead or dying and the other unit had trees that needed be thinned for fire protection purposes as stated in the Watershed Master Plan. All material was chipped and evenly spread at the site. Thinning in Douglas fir was done on an approximate spacing of 25 by 25 feet. All Eucalyptus under 24-inches

diameter were removed and larger Eucalyptus thinned to 40 by 40 feet. Figure 3-2 shows the location of this project.

San Andreas Unit G5. This unit has two sections: one is adjacent to the City of Burlingame water tanks and the other is near a cellular antenna site. The entire unit is on land owned by SFPUC next to Highway 280. The work conducted included the removal of non-native eucalyptus trees. Other designated trees were thinned in approximately 20 by 20-foot spacing. Logs were removed in log form and tops and limbs were chipped and evenly spread at each site for erosion control. The water tank site (area 1) had primarily understory removal and some thinning of larger trees. The communications site (area 2) required everything under 18-inches diameter removed and the larger trees were thinned to 20 by 20-foot spacing. Where eucalyptus were removed, the stumps were ground and earth back-filled after grinding. In addition, stumps in area 2 were ground and back-filled.

A SFPUC biologist surveyed the area for rare and endangered species with negative results. Area 1 does contain a special status plant population that was identified on the ground and avoided. Figure 3-2 shows the location of this project.

Burlingame Tree Thinning. A small stand of non-native eucalyptus trees, approximately 2.5 acres, adjacent to Hwy. 280 were thinned by 20% of the stems over 4 inches in diameter. Stumps were ground, brush was chipped and high hazard trees next to adjacent houses were removed. The area will be ultimately restored to native species, including oaks some conifers and native shrubs.

4.5 Reservoir Water Quality Management Plans

The *SFPUC Reservoir Water Quality Management Plans* (SFPUC, 2002b) were developed to address potential taste and odor in SFPUC reservoirs for four reasons as follows:

- Increased System Demand.
- Increasing Potential for Taste and Odor Problems.
- Consumer Confidence.
- Cost and Effectiveness of Alternative Control Strategies.

The objective of the reservoir water quality management plans was to avoid taste and odor production in SFPUC reservoirs. The plans described problems within each reservoir and identified potential water quality management options to address these problems. The problems and potential solutions are identified for each reservoir below. A phased approach is planned for implementing water quality management options. The option or options with the best cost benefit ratio will be implemented first and the results evaluated prior to implementing other options (SFPUC, 2005c).

A plan was not prepared for Calaveras Reservoir because reservoir operations in the future are uncertain due to the status of the dam. Although Calaveras Reservoir was not addressed in this report, a hypolimnetic oxygenation system was installed in

Calaveras in September 2005. It is anticipated that this system will greatly improve water quality in Calaveras Reservoir.

4.5.1 Alameda Watershed

4.5.1.1 San Antonio Reservoir

- *Problem* - Anoxic conditions allow nutrients in the sediments to be released into the water column

Potential management strategies. In January 2006, installation of a hypolimnetic oxygenation system in San Antonio Reservoir was approved. It is anticipated that installation will begin in summer of 2006

- Hypolimnetic oxygenation;
 - Fall destratification;
 - Hypolimnetic oxygenation with fall destratification;
 - Extended winter mixing;
 - Selective withdrawal (currently used at San Antonio reservoir); and
 - Dilution flow of 90 mgd for 3 of 6 months.
- *Problem* - Certain species of algae, in sufficient numbers may cause taste and odor and filter clogging problems

Potential management strategies

- Copper treatment (copper sulfate is applied as needed – last applied in San Antonio in 2005 [see Section 5, Table 5-18]); and
 - Solutions listed above for anoxic conditions.
- *Problem* – Additional external nutrient loading from imported water can accelerate eutrophication

Potential management strategies

- Limit importation of low quality water (State Water Project water that is of lower quality, is only purchased during periods of drought – no purchases were made during the reporting period of this Sanitary Survey); and
- Solutions listed above for anoxic conditions.

4.5.2 Peninsula Watershed

4.5.2.1 Upper Crystal Springs

- *Problem* – Infrequent anoxia provide the potential for internal nutrient loading

Potential management strategies

- Flow monitoring – Pulgas inflow (a program to monitor water in tributaries has begun to help assess impacts on water quality from local inflow);
 - Minimum storage – summer, fall;
 - Minimum flow – summer, fall; and
 - Intermittent destratification.
- *Problem* - Certain species of algae, in sufficient numbers may cause taste and odor and filter clogging problems

Potential management strategies

- Copper treatment (copper treatment is applied as needed – no applications were made during the 2001 through 2005 period [see Section 5, Table 5-18]); and
- Solutions listed above for anoxic conditions.

4.5.2.2 Lower Crystal Springs

- *Problem* – Anoxic conditions allow nutrients in the sediments to be released into the water column

Potential management strategies

- Quantifying local inflow with gaging (a program to monitor water in tributaries has begun to help assess impacts on water quality from local inflow);
- Hypolimnetic oxygenation;
- Fall destratification;
- Hypolimnetic oxygenation w/fall destratification;
- Extended winter mixing; and
- Selective withdrawal (Plans are underway to implement selective withdrawal. Currently the middle and bottom of the three adits are open or partially open at all times. Divers will inspect the adits when

turbidity improves sufficiently to allow an inspection. This will facilitate an evaluation of what needs to be done to be able to shut the bottom adit during periods of anoxia.).

- *Problem* - Certain species of algae, in sufficient numbers may cause taste and odor and filter clogging problems

Potential management strategies

- Copper treatment (copper treatment is applied as needed – no applications were made during the 2001 through 2005 period [see Section 5, Table 5-18]); and
- Solutions listed above for anoxic conditions.

4.5.2.3 San Andreas

- *Problem* – Low dissolved oxygen provides the potential for internal nutrient loading

Potential management strategies

- Quantifying local inflow with gaging (A program to monitor water in tributaries has begun to help assess impacts on water quality from local inflow.); and
 - Intermittent destratification.
- *Problem* - Certain species of algae, in sufficient numbers may cause taste and odor and filter clogging problems

Potential management strategies

- Copper treatment (copper treatment is applied as needed – no applications were made during the 2001 through 2005 period [see Section 5, Table 5-18]); and
- Solutions listed above for anoxic conditions.

4.5.2.4 Pilarcitos

- *Problem* – Anoxic conditions allow nutrients in the sediments to be released into the water column

Potential management strategies

- Quantifying local inflow with gaging;
- Fall destratification; and

- Extended winter mixing.
- *Problem* - Certain species of algae, in sufficient numbers may cause taste and odor and filter clogging problems

Potential management strategies

- Copper treatment (copper treatment is applied as needed – no applications were made during the 2001 through 2005 period [see Section 5, Table 5-18]); and
- Solutions listed above for anoxic conditions.