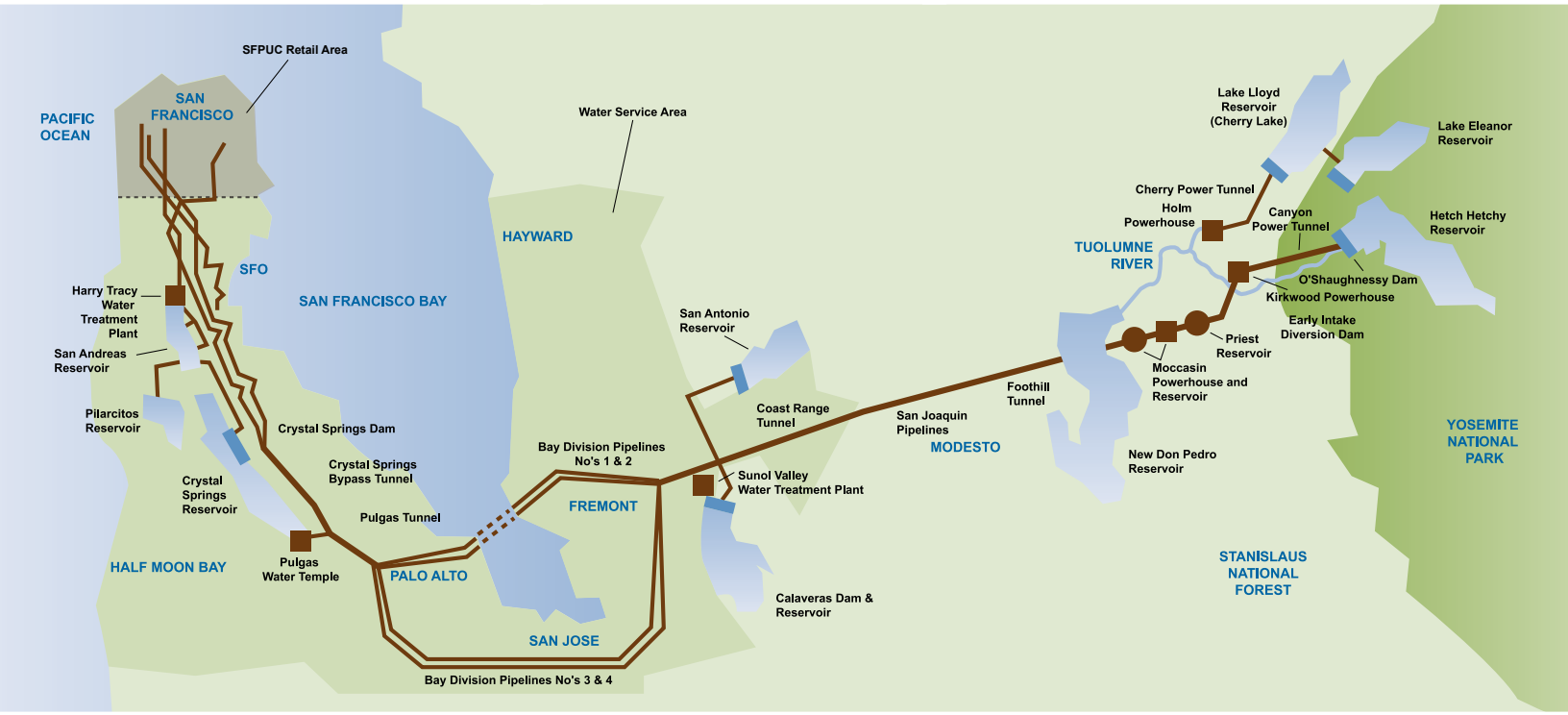
2010 Urban Water Management Plan
for the City and County of San Francisco

Prepared by: The San Francisco Public Utilities Commission

June 2011



San Francisco Water Power Sewer

Services of the San Francisco Public Utilities Commission

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San Francisco
Water
Power
Sewer

Services of the San Francisco Public Utilities Commission

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CONTACT SHEET

San Francisco Water Power Sewer

Services of the San Francisco Public Utilities Commission

2010 Urban Water Management Plan
For the City and County of San Francisco

San Francisco Public Utilities Commission (SFPUC)

Date plan submitted to the Department of Water Resources: June 22, 2011

Name of person preparing this plan: Steven R. Ritchie, Assistant General Manager, Water

Phone: (415) 934-5736

Fax: (415) 934-5750

E-mail address: SRitchie@sfwater.org

The Water supplier is: San Francisco Public Utilities Commission

The Water supplier is a: Wholesale and retail supplier

Utility services provided by the water supplier include:
Surface Water, Groundwater, and Recycled Water

Is This Agency a Bureau of Reclamation Contractor? No

Is This Agency a State Water Project Contractor? No

ABBREVIATIONS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
Act	California Urban Water Management Planning Act
ACWD	Alameda County Water District
AMI	Area Median Income
BACWA	Bay Area Clean Water Agencies
BAWSCA	Bay Area Water Supply and Conservation Agency
BDPL	Bay Division Pipeline
bg	billion gallons
BMP	Best Management Practice
CAP	Community Assistance Program
CCF	hundred cubic feet (volume of water, equivalent to 748 gallons)
CCWD	Contra Costa Water District
CEQA	California Environmental Quality Act
CII	commercial, industrial, and institutional
City	City and County of San Francisco
CUWCC	California Urban Water Conservation Council
DHS	State of California Department of Health Services
DMMs	demand management measures
DSOD	Division of Safety of Dams
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District
EIR	Environmental Impact Report
EOP	Emergency Operations Plan
ERRP	Emergency Response and Recovery Plan
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FY	fiscal year
GED	gallons per employee-day
gpcd	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
HECW	high-efficiency clothes washing
HET	high-efficiency toilet
HTWTP	Harry Tracy Water Treatment Plant

IRWMP	Bay Area Integrated Regional Water Management Plan
ISA	interim supply allocation
ISG	individual supply guarantee
IWSAP	Interim Water Shortage Allocation Plan
mgd	million gallons per day (flow or usage rate of water)
MID	Modesto Irrigation District
MOU	Memorandum of Understanding
NSMCSD	North San Mateo County Sanitation District
PEIR	Program Environmental Impact Report
PG&E	Pacific Gas and Electric Company
PUMA	Piloting Utility Modeling Applications for Climate Change
RISA	Regional Integrated Sciences and Assessment
RWMP	Recycled Water Master Plan
RWS	Regional Water System
RWSAP	Retail Water Shortage Allocation Plan
SB	Senate Bill
SCS	Sustainable Communities Strategy
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SFUSD	San Francisco Unified School District
SIC	Standard Industrial Classification
SVWTP	Sunol Valley Water Treatment Plant
SWRCB	State Water Resources Control Board
TID	Turlock Irrigation District
ULFT	ultra-low-flush toilet
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
UWMP	Urban Water Management Plan
WPCP	water pollution control plant
WSA	Water Supply Agreement between SFPUC and its Wholesale Customers
WSAP	Water Shortage Allocation Plan
WSIP	Water System Improvement Program
WSMP	Water Supply Master Plan
Zone 7	Zone 7 Water Agency
°C.	degrees Celsius

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PREFACE

Nearly 2.5 million people rely on water supplied by the San Francisco Public Utilities Commission (SFPUC) water system to meet their daily water needs. The Hetch Hetchy Regional Water System draws approximately 85% of its water from Hetch Hetchy Reservoir in the Upper Tuolumne River Watershed delivering water 167 miles by gravity through an aqueduct system to Bay Area reservoirs and customers. The remaining water supply is drawn from local surface waters in the Alameda and Peninsula watersheds.

The SFPUC has prepared this 2010 Urban Water Management Plan (UWMP) for the City and County of San Francisco in accordance with the requirements of the 1983 California Urban Water Management Planning Act (Act), California Water Code Division 6, Part 2.6, Sections 10610 through 10656, as amended. **Appendix A** contains a copy of the Act. The purpose of the Act is to assure that water suppliers plan for long-term reliability, conservation and efficient use of California's water supplies to meet existing and future demands.

The Act requires all urban water suppliers to prepare an UWMP every 5 years. The 2010 UWMPs are due to the California Department of Water Resources by July 1, 2011. As defined by Section 10617, an urban water supplier is a supplier (either publicly or privately owned) that provides water for municipal purposes to more than 3,000 customers (either directly or indirectly) or that supplies more than 3,000 acre-feet of water annually.

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SECTION 1: PLAN PREPARATION

This section summarizes the actions taken by the San Francisco Public Utilities Commission (SFPUC) to assure agency coordination and public participation throughout the development of this 2010 Urban Water Management Plan (UWMP) for the City and County of San Francisco (City).

1.1 AGENCY COORDINATION

Coordination with City Agencies: The SFPUC coordinated with City agencies in developing elements of this 2010 UWMP and the documents referenced herein. The SFPUC consulted with the San Francisco Planning Department in developing growth projections. City agencies were notified regarding the SFPUC's intent to review the 2005 UWMP and prepare an updated 2010 UWMP. These City agencies received a copy of the draft 2010 UWMP and notification of the date and time of the public hearing, and comments received from the agencies on the proposed 2010 UWMP were reviewed and addressed, as appropriate. Documentation relating to these efforts and communications is provided in **Appendix B**.

Regional Interagency Coordination: The SFPUC coordinated with the Bay Area Water Supply and Conservation Agency (BAWSCA) on the development of this 2010 UWMP. BAWSCA is a public agency representing the wholesale agencies served by the SFPUC–i.e., Wholesale Customers of the SFPUC Regional Water System (RWS). Enabled by Assembly Bill (AB) 2058, BAWSCA was established on May 27, 2003 to represent the interests of 24 cities and water districts, as well as 2 private utilities in Alameda, Santa Clara and San Mateo counties that purchase water on a wholesale basis from the RWS.

At BAWSCA's request, the SFPUC provided water supply reliability information for distribution to all BAWSCA members. In addition, the SFPUC provided water supply reliability information directly to Cordilleras Mutual Water Company.

The SFPUC also worked with BAWSCA and the Wholesale Customers to obtain purchase projections through the year 2035. These projections are presented in **Table 17**.

In addition to coordinating with BAWSCA and its member agencies, the SFPUC also communicated with other Bay Area water agencies, including East Bay Municipal Utility District (EBMUD), Santa Clara Valley Water District (SCVWD), Contra Costa Water District (CCWD), and Zone 7 Water Agency (Zone 7).

All Wholesale Customers and other Bay Area water agencies also received mailings regarding the SFPUC's intent to review the 2005 UWMP and prepare a 2010 UWMP. The agencies also received instructions to download the draft 2010 UWMP and notification of the date and time of the public hearing on the draft document. Comments received were reviewed and addressed, as appropriate. Documentation of related communications and coordination efforts is on file with the SFPUC.

1.2 PUBLIC PARTICIPATION

The SFPUC has always actively encouraged public participation in its urban water management planning efforts. For the 2010 UWMP update, the following measures were taken:

- Notification of Intent to update the UWMP was mailed on March 11, 2011 to all cities and counties within which the SFPUC provides water, as well as to other interested parties. A list is provided in **Appendix B**.

- A public hearing was held on May 24, 2011 during an SFPUC Commission Meeting. A notice of the hearing was advertised as specified in California Government Code 6066. Additional noticing was printed in local community papers on May 9, 2011 and May 16, 2011 to reach a more diverse local population. Public comment on the draft 2010 UWMP was taken at the public hearing, as well as for a period prior to and after the hearing.

- Comments on the draft UWMP were also taken at the May 16, 2011 meeting of the Citizens Advisory Committee, which was publicly noticed on the SFPUC website.

- The draft 2010 UWMP was made available for review prior to the public hearing at the San Francisco Main Public Library and the main offices of the SFPUC. A copy was also posted online at **www.sfwater.org**.

- In addition to notification of the general public (i.e., general City Retail and Wholesale Customers), other measures were taken to inform large SFPUC Retail Customers, such as the San Francisco Jail, Lawrence Livermore National Laboratory, Treasure Island, Hunters Point Shipyard, and Groveland Community Services District. These large Retail Customers received mailings regarding the SFPUC's intent to review the 2005 UWMP and prepare an updated 2010 UWMP. They also received a copy of the draft 2010 UWMP and notification of the date and time of the public hearing on the draft document.

- An adoption hearing was held on June 14, 2011 during an SFPUC Commission meeting.

Documentation of the notification and outreach actions identified above is included in **Appendix B**.

1.3 PLAN ADOPTION, SUBMITTAL AND IMPLEMENTATION

The SFPUC prepared this 2010 UWMP update and presented it to the SFPUC Commission for adoption on June 14, 2011. Please refer to **Appendix C** for a copy of the SFPUC Resolution adopting this 2010 UWMP update.

Within 30 days of SFPUC Commission approval, the adopted 2010 UWMP was submitted to the California Department of Water Resources (DWR), and a copy was provided to the California State Library and to any city or county within which the SFPUC provides water. In addition, throughout this 30-day period, the SFPUC made this adopted 2010 UWMP available for public review during normal business hours. The SFPUC will implement this adopted 2010 UWMP in accordance with the California Urban Water Management Planning Act.

Following adoption of the 2005 UWMP, the SFPUC implemented water supply planning programs, such as recycled water and groundwater, identified in the UWMP. These programs were ultimately reflected in the adopted Water System Improvement Program (WSIP), which details project implementation schedules and budgets.

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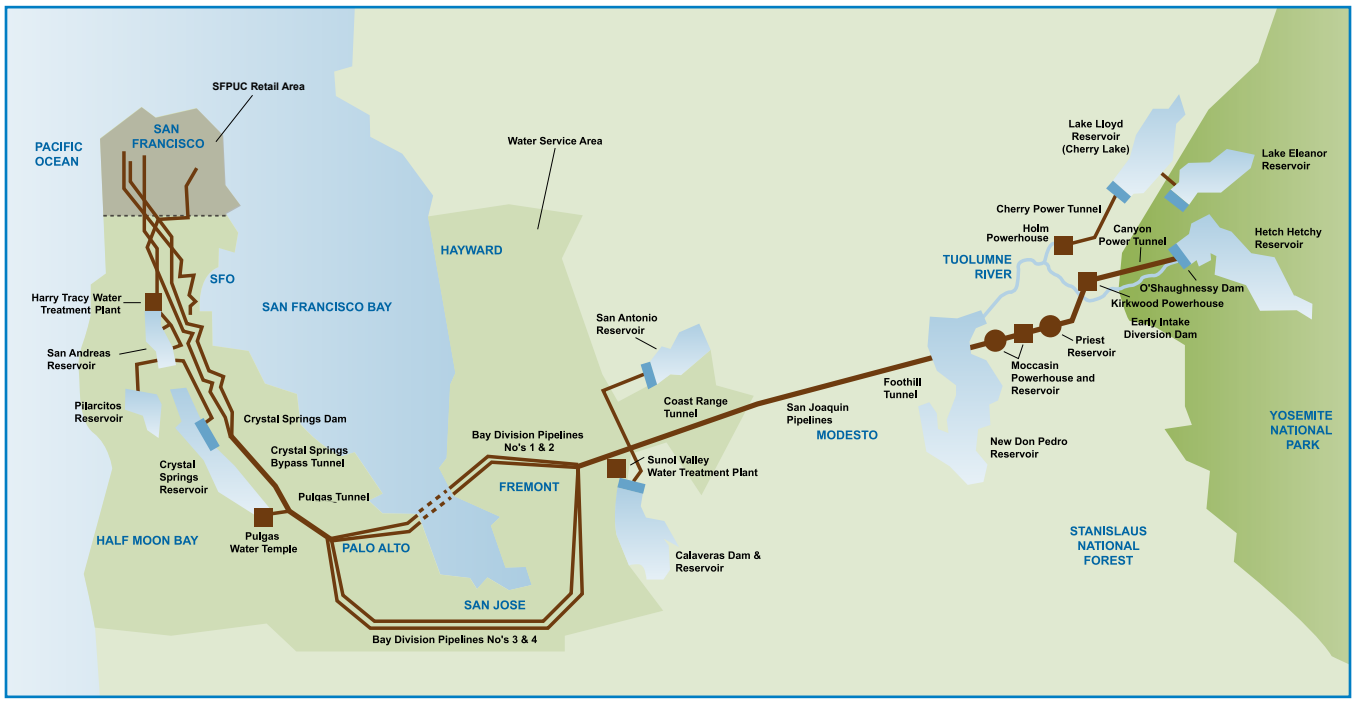
This section describes the SFPUC's water system (including the RWS and in-City distribution system), service area, climate, and demographic features.

2.1 SFPUC WATER SYSTEM OVERVIEW

Nearly 2.5 million people rely on water supplied by the SFPUC water system to meet their daily water needs. This water system **(Figure 1)** consists of over 280 miles of pipeline, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants located outside the City (the RWS) and over 1,250 miles of pipeline, 12 reservoirs, 9 storage tanks, and 17 pump stations[1] located within the city limits (the in-City distribution system).

The RWS draws approximately 85% of its water from the Upper Tuolumne River Watershed, collected in Hetch Hetchy Reservoir in Yosemite National Park, feeding an aqueduct system, delivering water 167 miles by gravity to Bay Area reservoirs and customers. The remaining water supply is drawn from local surface waters in the Alameda and Peninsula watersheds.

Figure 1: SFPUC Water System



1 Does not include 3 pump stations on Treasure Island.

2.1.1. Historical Development of the RWS

The RWS evolved through the development of two separate water systems: the Spring Valley Water Company and the Hetch Hetchy Project. The Springs Valley Water Company was established in 1858, developing a spring and several creeks into a local water system. It expanded over the years with the construction of Pilarcitos, San Andreas, and Upper and Lower Crystal Springs Dams on the Peninsula, and later with the development of the Pleasanton Well Field, the Sunol Filtration Galleries, and Calaveras Dam in Southern Alameda County.

Very early in San Francisco's development, it was recognized that the local water resources would be inadequate to support a burgeoning metropolis; thus, plans for importing water from the Sierra Nevada were born. In the late 1800s, the City's decision to develop its own water supply system culminated in the planning, financing, and construction of the Hetch Hetchy Project. Because many of the Hetch Hetchy Project facilities were to be located within Yosemite National Park, Congressional approval of the project was required. That approval was granted by the Raker Act of 1913.

The construction of the Hetch Hetchy Project began in earnest in 1914. After almost 20 years of construction (including building of Hetch Hetchy Reservoir and the 1930 acquisition of the Spring Valley Water Company by San Francisco), Tuolumne River water began flowing into the local distribution system. Through the operation of the two systems, the SFPUC has been able to provide the residents of the City and its neighboring communities with a supply of high-quality potable water from protected sources.

Since the 1930s, the major additions to the SFPUC's water system have included the raising of O'Shaughnessy Dam and the development of Lake Lloyd (Cherry Reservoir); the construction of additional pipelines across the San Joaquin Valley; and the local construction of San Antonio Reservoir in Alameda County and the Bay Division Pipelines 2, 3, and 4. Other local projects have included Crystal Springs Pipeline No. 3, Sunol Valley and San Andreas (now Harry Tracy) Filtration Plants, and the Crystal Springs Bypass Tunnel and Balancing Reservoir.

The RWS is geographically delineated between the Hetch Hetchy Project and the Bay Area water system facilities. The Hetch Hetchy Project is generally composed of the reservoirs, hydroelectric generation and transmission facilities, and water transmission facilities from the Hetch Hetchy Valley west to the Alameda East Portal of the Coast Range Tunnel in Sunol Valley. The local Bay Area water system generally consists of the facilities west of Alameda East Portal, and includes the Alameda and Peninsula watershed reservoirs, two water treatment plants and the distribution system that delivers water to the SFPUC's Retail and Wholesale Customers.

2.1.2. Water Distribution

The subsections below provide details of the water distribution system of both the SFPUC RWS and the in-City distribution system.

Regional Water System: The RWS consists of more than 280 miles of pipeline and 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants, and comprises three regional water supply and conveyance systems: the Hetch Hetchy System, the Alameda System, and the Peninsula System.

- **Hetch Hetchy System.** In the Hetch Hetchy System, water is diverted from Hetch Hetchy Reservoir into a series of tunnels and aqueducts from the Sierra Nevada to the San Joaquin Pipelines that cross the San Joaquin Valley to the Coast Range Tunnel, which connects to the Alameda system at the Alameda East Portal.

- **The Alameda System.** The Alameda System includes two reservoirs, San Antonio Reservoir and Calaveras Reservoir, which collect water from the upper Alameda and San Antonio Creek watersheds in Alameda County plus conveyance facilities connecting the Hetch Hetchy System and Alameda water sources to the Peninsula System. These conveyance facilities include pipelines known as the Alameda Creek Siphons that connect the Coast Range Tunnel to the Irvington Tunnel.

  The Irvington Tunnel supplies the four Bay Division Pipelines (BDPLs) that cross the South Bay Area to the Peninsula System. BDPLs 1 and 2 cross the Bay near the Dumbarton Bridge; BDPLs 3 and 4 traverse the southerly edge of the Bay delivering water to SFPUC customers along the pipeline route. All four pipelines reconnect near the inlet to the Pulgas Tunnel on the Peninsula.

  The Sunol Valley Water Treatment Plant (SVWTP) filters and disinfects water supplied from San Antonio and Calaveras Reservoirs.

  Two turnouts from the South Bay Aqueduct (SBA) of the California State Water Project (SWP) can supply limited supplemental water to the SVWTP or San Antonio Reservoir. The SFPUC, however, currently does not possess entitlements to water from the State Water Project.

- **Peninsula System.** The Peninsula System includes conveyance facilities connecting the BDPLs to the in-City distribution system and to other SFPUC customers on the Peninsula. Two reservoirs, Crystal Springs and San Andreas, collect runoff from the San Mateo Creek watershed. Water from Pilarcitos Reservoir, on Pilarcitos Creek, directly serves one of the Wholesale Customers, the Coastside County Water District (which includes the City of Half Moon Bay), and can also deliver water to Crystal Springs and San Andreas Reservoirs. Water delivered from the BDPLs in excess of the Peninsula System and in-City demands spills into Crystal Springs and San Andreas Reservoirs. The Harry Tracy Water Treatment Plant (HTWTP) filters and disinfects water supplied from Crystal Springs and San Andreas Reservoirs before it is delivered to the Peninsula customers and the in-City distribution system.

In-City Distribution System: San Francisco's water system, the in-City distribution system, was originally developed during the 100-year period between 1860 and 1960, reflecting the patterns and rates of growth in the City. San Francisco's retail water supply is delivered to the City via several major pipelines. Two pipelines provide water to the eastern portion (eastside) of the in-City distribution system and three pipelines serve the western portion (westside) of the in-City distribution system.

As shown in **Figure 2**, San Francisco's water system includes 10 reservoirs and 8 water tanks that store the water delivered by the Hetch Hetchy Project and the local Bay Area water system. The 17 pump stations[2] and approximately 1,250 miles of pipelines move water throughout the system and deliver water to homes and businesses in the City. Several major pipelines convey water from the Peninsula System to San Francisco. Water to the eastside of the City distribution system is fed by two pipelines that terminate at University Mound. Water to the westside distribution system is fed by two pipelines that terminate at Sunset Reservoir and one that terminates at Merced Manor Reservoir.

Figure 2: San Francisco Retail Water System Facilities

2 Does not include 3 pump stations on Treasure Island.

2.1.3. Water Treatment

The Hetch Hetchy Reservoir is the largest unfiltered water supply on the West Coast, and one of only a few large unfiltered municipal water supplies in the nation. The water originates from spring snow melt flowing down the Tuolumne River to Hetch Hetchy Reservoir, where it is stored. This pristine water source is located in the well-protected Yosemite National Park and meets or exceeds all federal and State criteria for watershed protection. The water originating from Hetch Hetchy Reservoir is protected in pipes and tunnels as it is conveyed to the Bay Area, and requires pH adjustment to control pipeline corrosion and disinfection for bacteria control. Based on the SFPUC's disinfection treatment practice, extensive bacteriological quality monitoring, and high operational standards, the U.S. Environmental Protection Agency (USEPA) and the State of California Department of Public Health (DPH) have determined that the Hetch Hetchy water source meets federal and State drinking water quality requirements without filtration, and thus the SFPUC is not required to filter water from Hetch Hetchy Reservoir.

All water derived from sources other than Hetch Hetchy Reservoir is treated at one of two treatment plants: (1) the SVWTP, which primarily treats water from the Alameda System reservoirs and has a peak capacity of 160 million gallons per day (mgd) and a sustainable capacity of 120 mgd; and (2) the HTWTP, which treats water from the Peninsula System reservoirs and has a peak capacity of 140 mgd and a sustainable capacity of 120 mgd.

Treatment processes at the SVWTP include coagulation, flocculation, sedimentation, filtration, and disinfection. Fluoridation, chloramination and corrosion control treatment are provided for the combined Hetch Hetchy Project and SVWTP water at the Sunol chloramination and fluoridation facilities. Treatment processes at the HTWTP include ozonation, coagulation, flocculation, filtration, disinfection, fluoridation, corrosion control treatment and chloramination.

A new ultraviolet (UV) treatment facility planned for the Hetch Hetchy System that enhances high water quality is a key component of the WSIP. The SFPUC's Advanced Disinfection Project will use UV light to disinfect Hetch Hetchy water to meet new federal requirements to control the waterborne parasite cryptosporidium. The Advanced Disinfection Project combines the construction of a new UV treatment facility with a new chemical water treatment building, an operations building, tanks, and other support structures. With a capacity of 315 mgd, the new UV water treatment facility will be the third largest in the United States. The new chemical storage and water treatment facilities will replace the existing 75-year-old structures, which do not meet current earthquake standards. Other major upgrades of the SVWTP and the HTWTP are also in progress. Construction is scheduled for completion of all of these projects in June 2012.

2.1.4. Water Storage

The majority of the water delivered by the SFPUC is supplied by runoff from the upper Tuolumne River watershed on the western slope of the central Sierra Nevada. Three major reservoirs collect runoff: Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor **(Table 1)**. A water bank in New Don Pedro Reservoir is integrated into system operations. New Don Pedro Reservoir is jointly owned and operated by Modesto Irrigation District and Turlock Irrigation District (the Districts), and is located on the Tuolumne River downstream of the Hetch Hetchy System.

Table 1: Regional Water System Storage Capacity

RESERVOIR	STORAGE (Acre-feet)	STORAGE (Billions of Gallons)
Up-Country		
Hetch Hetchy	360,360	117.4
Lake Lloyd [1]	273,300	89.1
Lake Eleanor	27,100	8.8
Subtotal Up-Country	**660,760**	**215.3**
Local		
Calaveras (East Bay) [2]	96,800	31.5
San Antonio (East Bay)	50,500	16.5
Crystal Springs (Peninsula) [3]	67,800	22.1
San Andreas (Peninsula)	19,000	6.2
Pilarcitos (Peninsula)	3,100	1
Subtotal Local [4]	**237,200**	**77.3**
Total Regional Water System [5]	**897,960**	**292.6**

1. Storage capacity shown includes flashboards, which are boards or structures of boards extending above a dam to increase its capacity.
2. Calaveras Reservoir was constructed with a storage capacity of 96,800 acre-feet. Since December 2001, in response to safety concerns about the seismic stability of the dam and a directive from DSOD, the SFPUC has held the maximum water level at approximately 37,800 acre-feet (roughly 40% of its maximum capacity), pending construction of a new comparably sized replacement dam downstream, scheduled for completion in 2015.
3. Crystal Springs Reservoir has a maximum storage capacity of 22.1 billion gallons (at 291.8 feet). When the Lower Crystal Springs Dam Improvement is complete, the reservoir will be operated normally at 287.8 feet (4 feet below capacity) based on permit conditions.
4. Two in-City reservoirs (Sunset and University Mound) are terminal storage for the RWS.
5. This includes 63,700 acre-feet in dead storage (i.e., the volume in a reservoir below the lowest controllable level). In addition, the SFPUC may draw against a credit of up to 570,000 acre-feet in storage in a water bank account with Don Pedro Reservoir, for total storage for planning purposes of 1,469,460 acre-feet.

Water stored in Hetch Hetchy Reservoir is also used for hydroelectric generation and released downstream to satisfy instream flow requirements. Normally, only Hetch Hetchy Reservoir water supplies are exported to the Bay Area for municipal and industrial uses, and releases from Lake Eleanor and Lake Lloyd are used to satisfy instream flow requirements, satisfy Raker Act entitlements to the Districts downstream, and produce hydroelectric power. Water stored in New Don Pedro Reservoir is credited to the City's water bank account, which allows the City to meet its Raker Act water obligations to the Districts.

On the San Francisco Peninsula, the SFPUC utilizes Crystal Springs, San Andreas, and Pilarcitos Reservoirs located in San Mateo County to capture local watershed runoff. In the Alameda Creek watershed (in Alameda County), the SFPUC has operates Calaveras and San Antonio Reservoirs. In addition to using these facilities to capture runoff, San Andreas, San Antonio, and Crystal Springs Reservoirs also provide storage for Hetch Hetchy Project diversions, and, along with Calaveras, serve as an emergency water supply in the event of an interruption to Hetch Hetchy Project deliveries.

The SFPUC's Crystal Springs and Calaveras Reservoirs are currently operating under restrictions imposed by the Division of Safety of Dams (DSOD).

The in-City reservoirs and tanks have the capacity to hold approximately 413 million gallons of water. The SFPUC estimates this capacity to be a 5-day supply at the current average water consumption rate for the City. In addition, there is an emergency supply of existing non-potable water immediately available within the City at Lake Merced. Lake Merced currently holds approximately 1.5 billion gallons of water. **Table 2** summarizes the storage capacity of in-City reservoirs and storage tanks.

Table 2: In-City System Potable Water Storage Capacity

RESERVOIR	MILLIONS OF GALLONS
Sunset	176.7
University Mound	140.9
Sutro	31.4
Summit	14
College Hill	13.5
Stanford Heights	12.9
Merced Manor	9.5
Lombard	2.7
Potrero	1
Hunters Point	1.1
Storage Tanks	9.3
Total	**413**

2.2 SERVICE AREA

The SFPUC provides water to both Retail and Wholesale Customers. A population of nearly 2.5 million people within the counties of San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne rely entirely or in part on the water supplied by the SFPUC. Approximately 68% of the SFPUC's water supply is delivered to Wholesale Customers, and the remaining 32% is delivered to Retail Customers.

Retail Customers: The SFPUC's Retail Customers include the residents, businesses and industries located within the corporate boundaries of the City. Water service is also provided to customers located outside the City, such as the Town of Sunol, San Francisco International Airport, Lawrence Livermore National Laboratory, Castlewood, and Groveland Community Services District.[3]

Wholesale Customers: The SFPUC sells water to 27 Wholesale Customers **(Figure 3)** under terms of the *2009 Water Supply Agreement between the City and County of San Francisco and the Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County*, together with individual water supply contracts. Since 1970, the SFPUC has supplied approximately 65% of the total Wholesale Customers' water demand. Some of the Wholesale Customers are entirely reliant on the SFPUC for their water supply.

2.3 CLIMATE

San Francisco has a Mediterranean climate. Summers are cool and winters are mild with infrequent rainfall. Temperatures in the San Francisco area average 58 degrees Fahrenheit annually, ranging from the mid-40s in winter to the mid-70s in late summer. Strong onshore flow of wind in summer keeps the air cool, generating fog through September. The warmest temperatures generally occur in September and October. Rainfall in the San Francisco area averages about 20 inches[4] per year and is generally confined to the "wet" season from late October to early May. Except for occasional light drizzles from thick marine stratus clouds, summers are nearly completely dry.

The Wholesale Customers experience a climate similar to San Francisco, except for customers located in the southern and inland regions that tend to experience warmer temperatures in the summer months with less incidence of fog.

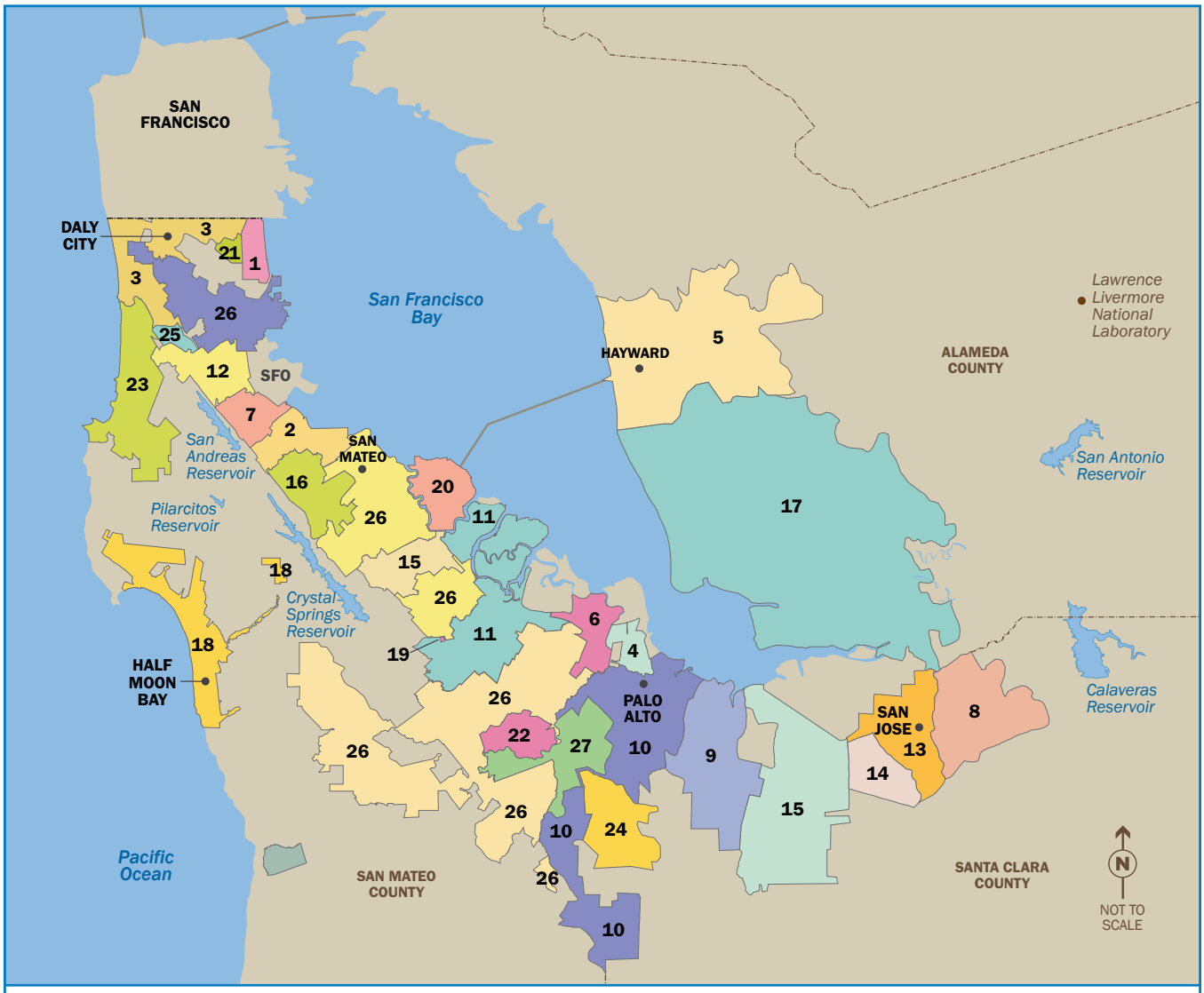
2.4 RETAIL CUSTOMER DEMOGRAPHIC AND ECONOMIC TRENDS

The retail water demand projections presented in this report are based on population and business trends forecast by the Association of Bay Area Governments (ABAG), the California Department of Finance, and the San Francisco Planning Department. ABAG's and Planning Department's projections are used in combination with an analysis of the characteristics of water use in the San Francisco retail service area to develop water demands.

3 Although these customers are located outside of the corporate boundaries of the City, for the purposes of water billing and accounting, they are considered SFPUC's Retail Customers, as shown in **Table 12**.

4 1971-2000 data from the two San Francisco monitoring stations (Mission Dolores/SF#047772 and Richmond/SF#047767). Source: www.wrcc.dri.edu.

Figure 3: SFPUC Wholesale Customers



LEGEND

Municipalities

1 City of Brisbane
2 City of Burlingame
3 City of Daly City
4 City of East Palo Alto
5 City of Hayward
6 City of Menlo Park
7 City of Millbrae
8 City of Milpitas
9 City of Mountain View
10 City of Palo Alto
11 City of Redwood City
12 City of San Bruno
13 City of San Jose[2]
14 City of Santa Clara[2]
15 City of Sunnyvale
16 Town of Hillsborough

Water Purveying Districts

17 Alameda County Water District
18 Coastside County Water District
19 Cordilleras Mutual Water Company
20 Estero Municipal Improvement District
21 Guadalupe Valley Municipal Improvement District
22 Mid-Peninsula Water District
23 North Coast County Water District
24 Purissima Hills Water District
25 Westborough Water District

Private Entities

26 CA Water Service Company[1]
27 Stanford University

1. California Water Service Company, an investor-owned utility, provides water service to four separate districts: Bear Gulch (Atherton vicinity), San Carlos/San Mateo, South San Francisco and Skyline County Water District.
2. The SFPUC provides water on an interruptible basis to fixed service areas in the northern portions of the Cities of San Jose and Santa Clara.

The following provides demographic estimates and projections for the SFPUC's retail sector. This information is used as the basis for a detailed analysis of the SFPUC's retail water demand projections provided later in this document. A brief discussion of job growth and population estimates and projections for the SFPUC's Wholesale Customers is also included. Section 3 provides information on projected Retail and Wholesale Customer water demands.

Population: As shown in the table below, the current total population of San Francisco is estimated to be 856,095. The total population of San Francisco is projected to increase to 954,899 by year 2035, representing an average growth rate of 0.4% per year.

Households, Household Population, and Household Size: San Francisco projects water use within its residential sectors using factors such as household population[5], households (occupied dwelling units), and persons per household (the household population divided by the number of households). These factors are important when projecting water use, which is based on end use of water within households. Population, household population, and housing trends for the 2010-2035 period are summarized in **Table 3**. Over the next 25 years, household units are projected to increase by approximately 0.7% per year. The majority of new housing will be multi-family units.

Table 3: San Francisco County Demographic Trends

DEMOGRAPHIC	2010	2015	2020	2025	2030	2035
Population [1]	856,095	875,856	895,617	915,377	935,138	954,899
Household Population [2]	835,021	854,755	874,956	895,633	916,800	941,263
Household Units [3]	350,758	363,213	376,109	389,463	403,292	415,000
Single-Family Units [4]	110,759	112,109	113,475	114,857	116,257	117,674
Persons per Single-Family Household [5]	3.2	3.1	3.1	3.1	3.1	3.1
Multi-Family Units [6]	239,999	251,104	262,634	274,606	287,035	297,326
Persons per Multi-Family Household [5]	2.0	2.0	2.0	2.0	2.0	2.0

1. Population estimate for 2010 from California Department of Finance E-5 Housing and Population Estimates, dated May 2010. Population estimate for 2030 from ABAG Projections (2009). Population projections for 2015, 2020, and 2025 developed by interpolating between 2010 estimate and 2030 projection. 2035 projected by extrapolation.
2. Household population for 2010 based on Department of Finance E-5 Housing and Population Estimates, dated May 2010. The 2030 population estimate was taken from the Citywide Projections, dated July 2009. Household populations for 2015, 2020, and 2025 were interpolated using the 2010 and 2030 projections. The 2035 projection of population is based on the 2035 forecast of housing units assuming average persons per household are unchanged between 2030 and 2035.
3. Number of housing units for 2010 based on Department of Finance E-5 Housing and Population Estimates, dated May 2010. The 2030 housing unit estimate was taken from the Citywide Projections, dated July 2009. Housing unit projections for 2015, 2020, and 2025 were interpolated using the 2010 and 2030 projections. The 2035 projection of total housing units is taken from updated ABAG Projection 2009 developed as part of the Bay Area's Sustainable Communities Strategy (SCS), December 2010.
4. Single-family housing units in 2010 were set equal to the number of single-family residential accounts for those years. Single-family housing units for other years were interpolated using the average rate of single-family account growth from 1990 to 2010.
5. Updated persons per household projection derived from Census 2000 data and then scaled so that household population computed by multiplying the number of housing units by persons per household equaled the updated population projection. Projected persons per household were assumed to be the same in 2030 and 2035.
6. The number of multifamily housing units was calculated as the difference between the projection of total housing units and single-family housing units.

5 All persons living in individual housing units, not including persons who reside in places such as nursing homes, military facilities or rooming houses.

Industrial and Commercial Businesses: The current number of people employed in San Francisco is estimated to be 544,056. This number is projected to increase to 698,790 by 2035, amounting to 1.01% growth per year over the next 25 years. **Table 4** shows the current and projected number of people employed in San Francisco.

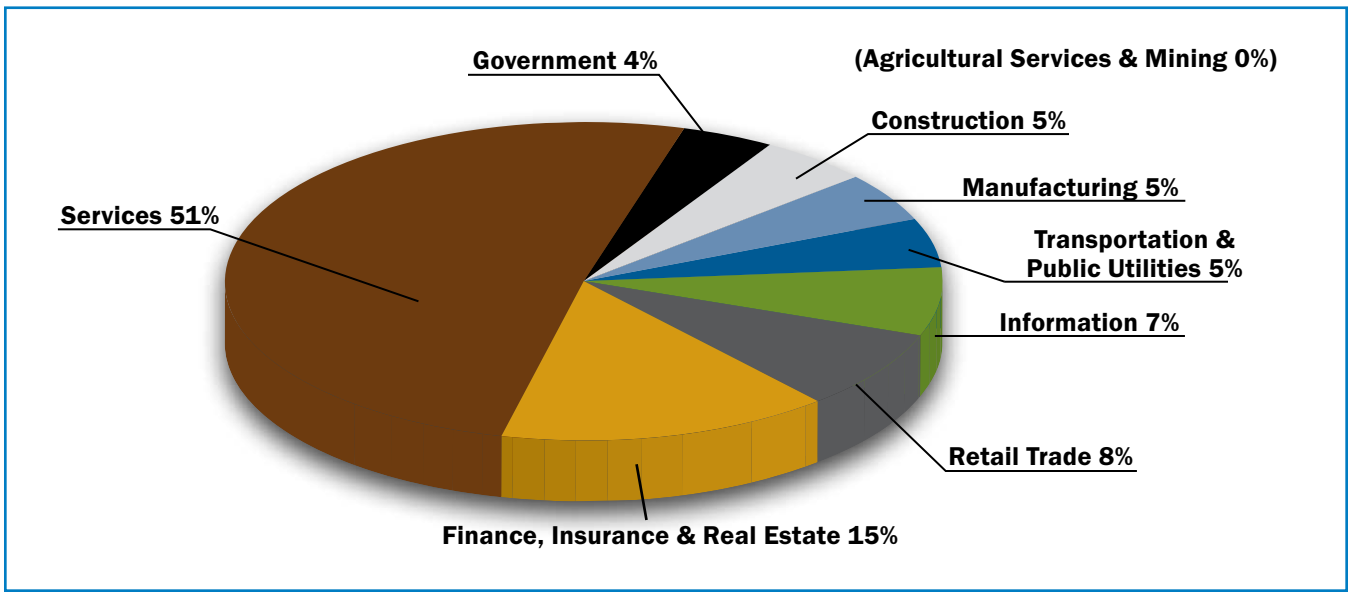
Table 4: San Francisco County Number of Jobs in Industrial and Commercial Businesses[1]

JOB SECTOR CATEGORY	2010	2015	2020	2025	2030	2035
Agricultural Services and Mining	1,020	958	944	927	907	953
Construction	27,060	27,606	29,444	32,316	34,687	36,448
Manufacturing	25,760	26,845	29,546	31,434	33,709	35,421
Transportation & Public Utilities	28,150	27,202	27,741	27,433	27,531	28,929
Information	36,860	36,877	38,497	41,436	43,932	46,163
Retail Trade	45,000	44,983	47,281	53,165	56,067	58,913
Finance, Insurance, Real Estate	79,720	78,722	82,594	87,836	91,918	96,585
Services	276,086	302,434	318,149	330,775	349,050	366,769
Government	24,400	24,093	24,862	26,469	27,229	28,611
Total	**544,056**	**569,720**	**599,060**	**631,790**	**665,030**	**698,790**

1. Based on updated ABAG Projection 2009 developed as part of the Bay Area's Sustainable Communities Strategy, December 2010.

Figure 4 illustrates the current distribution of jobs among the various employment categories in San Francisco. The values have been delineated by job sectors as classified by Standard Industrial Classification (SIC) code. The majority of the job growth between now and 2035 is anticipated to occur in the construction and manufacturing sectors, as well as in the service sector.

Figure 4: Number of Jobs in Industrial and Commercial Businesses, San Francisco County 2010



2.5 WHOLESALE CUSTOMER POPULATION & JOB GROWTH ESTIMATES

Table 5 provides estimates and projections of population for the Wholesale Customer service area. The population for the Wholesale Customers is expected to increase over the next 25 years. During this period, employment in the Wholesale Customer service area is projected to increase from 1,145,843 (2010) to 1,665,743 (2035). Water demands were determined by applying the growth rate in population and employment to the applicable water accounts. Section 4.3 provides information on projected Wholesale Customer water demands.

Table 5: Wholesale Population Estimates and Projections

WHOLESALE CUSTOMERS [1]	2010	2015	2020	2025	2030	2035
Total Population	1,745,292	1,819,263	1,906,202	1,982,976	2,054,820	2,124,854
Total Employment	1,145,843	1,242,146	1,355,199	1,455,465	1,559,154	1,665,743

1. Estimates and projections from BAWSCA 2009 Water Conservation Implementation Plan. ABAG (2007) population and employment projections were primarily used as a basis for projections.

SECTION 3: SYSTEM SUPPLIES

This section summarizes current and projected SFPUC water supplies and describes the various sources of water supplies available to meet the retail and wholesale water demands. This section also summarizes the options used, or being considered, by the SFPUC to maximize resources and minimize the need to import water from the RWS watersheds.

3.1 SFPUC REGIONAL WATER SUPPLY SOURCES

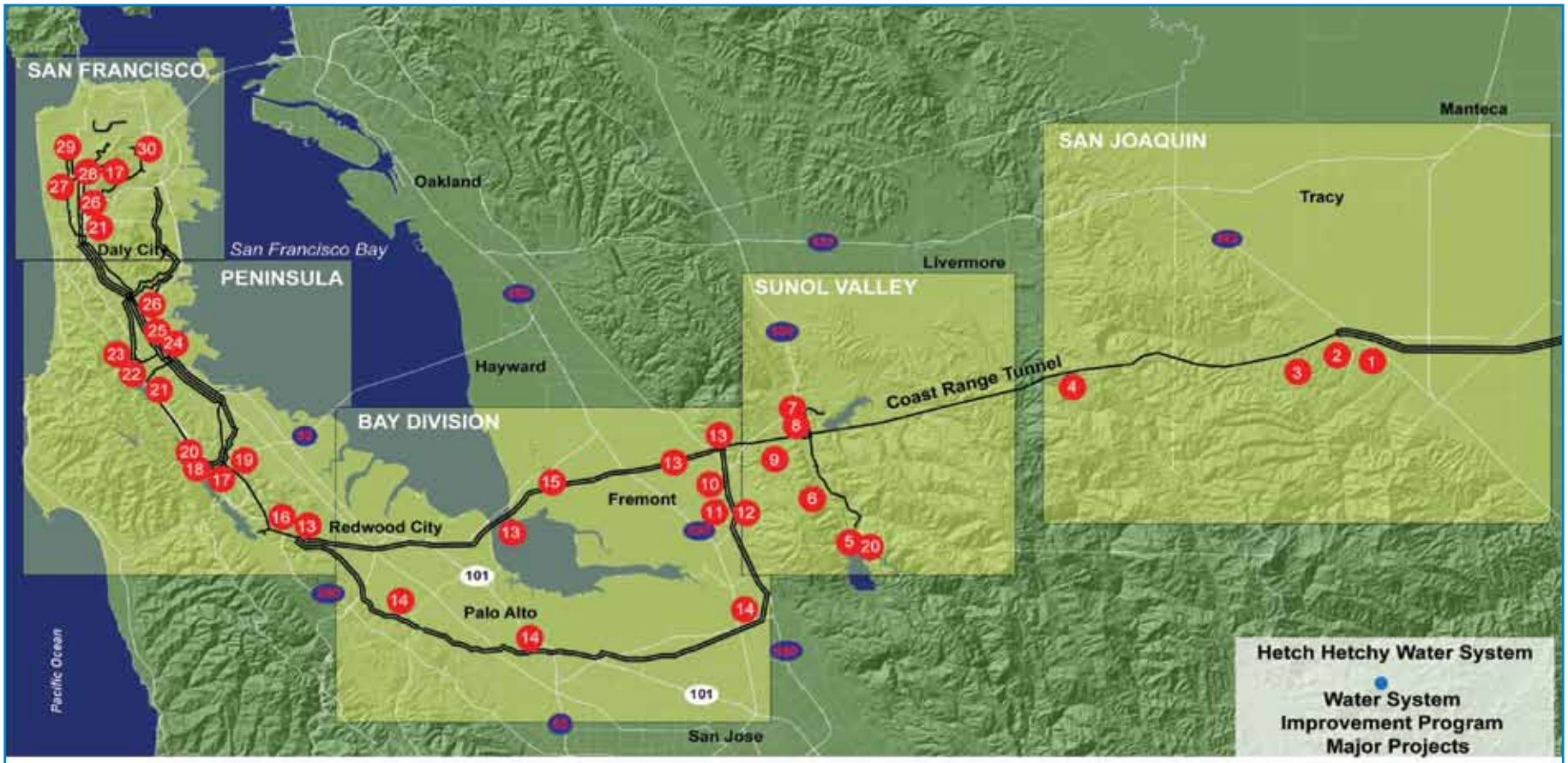
The SFPUC serves its retail and wholesale water demands with an integrated operation of local Bay Area water production and imported water from the Hetch Hetchy Project. The local watershed facilities are operated to conserve local runoff for delivery. Water demands that are not met by local runoff are met with water diverted from the Tuolumne River through the Hetch Hetchy Project. On average, the Hetch Hetchy Project provides over 85% of the water delivered by the SFPUC. During drought, the water received from the Hetch Hetchy Project can amount to over 93% of the total water delivered.

The amount of water available to the SFPUC is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, the SFPUC is very dependent on reservoir storage to maximize the reliability of its water supplies. More importantly, reservoir storage provides water supply carry-over capability. During dry years, the SFPUC has a very small share of Tuolumne River runoff available and the local Bay Area watersheds produce very little water. Reservoir storage is critical during drought cycles because it enables the SFPUC to carry-over water supply from wet years to dry years.

3.1.1 SFPUC Water System Improvement Program

To enhance the ability of the SFPUC water system to meet the service goals for water quality, seismic reliability, delivery reliability, and water supply, the SFPUC is undertaking the WSIP. The WSIP is a 4.6 billion dollar, multi-year, capital program to upgrade the RWS. The program will deliver improvements that enhance the SFPUC's ability to provide reliable, affordable, high-quality drinking water to its Wholesale Customers and Retail Customers in an environmentally sustainable manner. **Figure 5** lists the WSIP projects and their locations. The goals and objectives of the WSIP are presented in **Table 6**.

Figure 5: SFPUC Water System Improvement Program (WSIP)



1. San Joaquin Pipeline System
2. Rehabilitation of Existing San Joaquin Pipelines
3. Tesla Treatment Facility
4. Lawrence Livermore Water Quality Improvement
5. Calaveras Dam Replacement
5. Calaveras Reservoir Upgrades
5. San Antonio Backup Pipeline
6. SVWTP Expansion & Treated Water Reservoir
7. Upper Alameda Creek Filter Gallery
8. Alameda Siphon #4
8. San Antonio Pump Station Upgrade
9. New Irvington Tunnel
10. BDPL No. 4 Condition Assessment PCCP Sections
11. Seismic Upgrade of BDPL Nos. 3 & 4
12. BDPL Nos. 3 & 4 Crossover/Isolation Valves
13. BDPL Reliability Upgrade - Tunnel
13. BDPL Reliability Upgrade - Pipeline
13. BDPL Reliability Upgrade - Relocation of BDPL Nos. 1 & 2
14. BDPL Nos. 3 & 4 Crossovers
15. SFPUC / EBMUD Intertie
16. Pulgas Balancing - Inlet/Outlet Work
16. Pulgas Balancing - Discharge Channel Modifications
16. Pulgas Balancing - Structural Rehabiliation & Roof Replacement
16. Pulgas Balancing - Modifications of the Existing Dechlorination Facility
17. Crystal Springs Pipeline No. 2 Replacement
18. Lower Crystal Springs Dam Improvements
19. New Crystal Springs Bypass Tunnel
20. Adit Leak Repair - Crystal Springs/Calaveras
21. Crystal Springs/San Andreas Transmission Upgrade
22. HTWTP Long-Term Improvements
23. HTWTP Short-Term Improvements - Demo Filters
23. HTWTP Short-Term Improvements - Coagulation & Flocculation/Remaining Filters
24. Capuchino Valve Lot Improvements
25. Peninsula Pipelines Seismic Upgrade
26. Baden and San Pedro Valve Lots Improvements
27. Regional Groundwater Storage and Recovery
28. San Andreas Pipeline No. 3 Installation
29. Sunset Reservoir - North Basin
30. University Mound Reservoir - North Basin

WSIP Project in Various Locations

- Standby Power Facilities - Various Locations
- Pipeline Repair & Readiness Improvements
- SCADA System - Phase II
- System Security Upgrades
- Cross Connection Controls
- Programmatic EIR
- Habitat Reserve Program
- Watershed Environment Improvement Program

Table 6: WSIP Goals and Objectives

PROGRAM GOAL	SYSTEM PERFORMANCE OBJECTIVE
Water Quality: maintain high water quality	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filtered water from local watersheds. • Continue to implement watershed protection measures.
Seismic Reliability: reduce vulnerability to earthquakes	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for design of the regional system is 229 mgd. The performance objective is to provide delivery to at least 70% of the turnouts in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco, respectively. • Restore facilities to meet average-day demand of up to 300 mgd within 30 days after a major earthquake.
Delivery Reliability: increase delivery reliability and improve ability to maintain the system	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage due to a natural disaster, emergency, or facility failure/upset.
Water Supply: meet customer water needs in non-drought and drought periods	• Meet average annual demand of 265 mgd from the SFPUC watersheds for Retail and Wholesale Customers during non -drought years for system demands through 2018. • Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts. • Diversify water supply options during non-drought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.
Sustainability: enhance sustainability in all system activities	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness: achieve a cost-effective, fully operational system	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

3.1.2 Phased WSIP Variant

As required under the California Environmental Quality Act (CEQA), the San Francisco Planning Department prepared a Program Environmental Impact Report (PEIR) for the WSIP. The PEIR evaluated the potential environmental impacts of the proposed WSIP projects and identified potential mitigations to those impacts. The PEIR also evaluated several alternatives to meet the SFPUC service area's projected increase in water demand between now and 2030. The water supply improvement options investigated included 10 alternatives using various water supply combinations from the local watersheds; the Tuolumne and Lower Tuolumne River; ocean desalination; and additional recycled water, groundwater, and conservation. The PEIR was certified by the San Francisco Planning Commission on October 30, 2008. On the same day, the SFPUC adopted the Phased WSIP Variant option in Resolutions No. 08-200.

At the request of the SFPUC, the San Francisco Planning Department studied the Phased WSIP Variant as part of the environmental analysis. The SFPUC identified this variant to consider a program scenario that involved full implementation of all proposed WSIP facility improvement projects to achieve public health, seismic safety, and delivery reliability goals as soon as possible, but phased implementation of a water supply program to meet projected water purchases through 2030. Deferring the 2030 water supply element of the WSIP until 2018 would allow the SFPUC and its Wholesale Customers to focus first on implementing additional local recycled water, groundwater, and demand management actions while minimizing additional diversions from the watersheds.

The Phased WSIP Variant establishes a mid-term planning milestone in 2018 when the SFPUC would reevaluate water demands through 2030 in the context of then-current information, analysis, and available water resources. The SFPUC has historically made annual average deliveries ranging from 285 mgd in 1987 to 265 mgd in 2005 from local watersheds (Peninsula and Alameda Creek) and the Tuolumne River Watershed. Annual average deliveries in 2005 provided the baseline year for the Phased WSIP. The Phased WSIP Variant would meet the projected 2018 purchase requests of 285 mgd from the RWS by capping purchases from the watersheds at 265 mgd; the remaining 20 mgd would be met through water efficiencies and conservation, water recycling and local groundwater use: 10 mgd by Wholesale Customers and 10 mgd in the City. By December 31, 2018, the SFPUC will reevaluate water system demands and supply options and conduct additional studies and environmental reviews necessary to address water supply needs after 2018. Additionally, in response to the SFPUC's adoption of the Phased WSIP Variant, the Wholesale Customers, through the BAWSCA, an agency they elected to create, began developing a Long-Term Reliable Water Supply Strategy to meet the projected water needs of its member agencies and their customers through 2035 and to increase their water supply reliability under normal and drought conditions.

The Phased WSIP Variant includes the following water supply elements:

- Water supply delivery to RWS customers through 2018 only of 265 mgd average annual target delivery originating from the watersheds. This includes 184 mgd for the Wholesale Customers and 81 mgd for Retail Customers.

- Water supply sources include 265 mgd average annual from the Tuolumne River and local watersheds and 20 mgd of water conservation[6], recycled water and local groundwater developed within the SFPUC's service area (10 mgd Retail; 10 mgd Wholesale);
- Water supply projects to meet dry-year demands with no greater than 20% system-wide rationing in any one year:
  - Restoration of Calaveras Reservoir capacity;
  - Restoration of Crystal Springs Reservoir capacity;
  - Westside Basin Groundwater Conjunctive Use;
  - Water Transfer with Modesto Irrigation District (MID)/Turlock Irrigation District (TID); and
- Reevaluation of 2030 demand projections, potential RWS purchase requests, and water supply options by December 31, 2018 and a separate SFPUC decision no later than 2018 regarding RWS future water deliveries after 2018.

3.1.3 Future Regional Supplies

In addition to the supply options discussed above, the SFPUC is exploring a range of additional options to improve water supply reliability in future years for the purposes of managing the water supply loss associated with instream flow release requirements (discussed further in Section 5). In adopting the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements Project, the SFPUC committed to providing instream flow releases below Calaveras Dam and Lower Crystal Springs Dam, as well as bypass flows below Alameda Creek Diversion Dam. The instream flow release requirements for Alameda Creek and San Mateo Creek represent a potential decrease in available water supply of an average annual 3.9 mgd and 3.5 mgd, respectively, for a total of 7.4 mgd average annually[7]. These instream flow release requirements could potentially create a shortfall in meeting the SFPUC demands of 265 mgd and slightly increase the SFPUC's dry year water supply needs. If a shortfall occurs, it is anticipated at the completion of construction of both the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements Project in approximately 2015 and 2013, respectively, when the SFPUC will be required to provide instream flow releases.

The SFPUC is committed to meeting its contractual obligation to its Wholesale Customers of 184 mgd and its delivery reliability goal of 265 mgd with no greater than 20% rationing in any one year of a drought.

6 Water conservation is accounted for as a demand reduction.

7 This water supply decrease assumes the adopted WSIP program element of an average annual target delivery of 265 mgd. The analysis also assumes that all of the water supply components of the adopted WSIP are implemented and all WSIP projects are implemented, including the Upper Alameda Creek Filter Gallery project, which in accordance with the Program Environmental Impact Report (PEIR) assumptions is estimated to recapture up to 6300 acre-feet (AF) per year (5.6 mgd).

The following actions are currently being considered:

- Development of additional conservation and recycling
- Development of additional groundwater supply
- Water transfer from MID and/or TID
- Increase in Tuolumne River supply
- Revising the Upper Alameda Creek Filter Gallery Project capacity
- Development of a desalination project

These other future supplies have been included with projected RWS supplies to offset the instream flow release requirements, maintaining a total of 265 mgd from the RWS watersheds through 2035.

3.1.4. Summary of RWS Supplies

As discussed above, deliveries from the RWS watersheds are limited to an average annual of 265 mgd through 2018. As a decision on future water deliveries beyond 2018 has not yet been made, the 2010 UWMP assumes that the 265 mgd supply limitation extends to 2035.

Table 7: SFPUC RWS Supplies to Retail and Wholesale Customers in Normal Years

SFPUC RWS WATERSHEDS (MGD)[1]	2010	2015	2020	2025	2030	2035
Retail Customers	81.0	81.0	81.0	81.0	81.0	81.0
Wholesale Customers	184.0	184.0	184.0	184.0	184.0	184.0
TOTAL (MGD)	**265.0**	**265.0**	**265.0**	**265.0**	**265.0**	**265.0**

1. The RWS watershed supply reflects a 7.4-mgd reduction in total regional system supplies due to instream flow release requirements beginning in 2015, offset by other future supplies to be developed.

3.2 SFPUC RETAIL WATER SUPPLY SOURCES

The RWS provides more than 97% of the City's retail water supplies. A small portion (less than 3%) of the retail water demand is met through locally produced groundwater and secondary treated recycled water.

3.2.1 Local Groundwater

San Francisco overlies all or part of seven un-adjudicated groundwater basins. These groundwater basins include the Westside, Lobos, Marina, Downtown, Islais Valley, South, and Visitation Valley basins. The Lobos, Marina, Downtown and South basins are located wholly within the City limits, while the remaining three extend south into San Mateo County. The portion of the Westside Basin aquifer located within San Francisco is referred to as the North Westside Basin. With the exception

of the Westside and Lobos basins, all of the basins are generally inadequate to supply groundwater for municipal supply due to low yield, contamination or potential subsidence concerns.

Early in its history, San Francisco made use of local groundwater, springs, and spring-fed surface water. By 1913, it was estimated that San Francisco was using approximately 8.5 mgd of groundwater from private and City wells, springs, and Lobos Creek, which is fed by springs. Prior to the completion of Calaveras Reservoir on Alameda Creek, part of the City's water supply was also from Lake Merced, which was significantly spring-fed at the time. Lake Merced was substantially lowered by diversions in the 1920s and early 1930s, the latter as a result of diverting from the lake for emergency water supply during drought conditions from 1929 to 1932.

In the 1930's, the Sunset well field was installed on the west side of San Francisco and groundwater was extracted for a short period of time, from late 1930 through mid-1935. Pumping rates were reported to be up to 6 mgd. After imports of water from the Hetch Hetchy Reservoir began in October, 1934, the municipal water supply system began to rely almost exclusively on surface water from the Alameda and Peninsula watersheds and from the Hetch Hetchy Water and Power Project.

Local groundwater use, however, has continued in the City. Since 1926, groundwater has been pumped from wells located in Golden Gate Park and the San Francisco Zoo. Based on flow meter data, about 1.5 mgd is produced by these wells. The groundwater is mostly used in the Westside Groundwater Basin by the City's Recreation and Park Department for irrigation in Golden Gate Park and at the Zoo. These wells are located in the North Westside Groundwater Basin. DWR has not identified this basin as overdrafted, or as projected to be overdrafted in the future. There is currently no adopted groundwater management plan for the SFPUC's groundwater basins.

About 0.7 mgd of groundwater is delivered to the Castlewood community in Pleasanton from a well field operated by the SFPUC. This groundwater is drawn from the Central Groundwater Sub Basin in the Livermore/Amador Valley. DWR has not identified this basin as over-drafted, nor as projected to be over-drafted in the future. These wells are metered and have been in operation for several decades. The system serving Castlewood is not connected to the RWS.

3.2.2 Local Recycled Water

The following summarizes the quantity and quality of wastewater generated and disposed of in the retail system, and the past and current use of recycled water.

Wastewater Generation, Collection, Treatment, and Disposal: San Francisco's wastewater collection, treatment, and disposal system consists of a combined sewer system (which collects both sewage and storm water), three water pollution control plants (WPCPs) and outfalls to San Francisco Bay and the Pacific Ocean. The collection and conveyance system consists of approximately 900 miles of various sizes of underground sewer pipes, transport/storage structures, and pump stations located throughout the City. Two of the City's water pollution control plants, the Southeast WPCP and Oceanside WPCP, provide secondary treatment and operate

year-round, while the third plant, the North Point WPCP, operates only during wet weather and provides primary treatment. Ultimate disposal of treated wastewater effluent is currently through outfalls to both San Francisco Bay and the Pacific Ocean. **Table 8** and **Table 9** summarize the actual and projected volumes of San Francisco wastewater collected, treated and discharged to the Bay and Ocean.

Table 8: Wastewater Collection and Treatment

WASTEWATER	2005	2010	2015	2020	2025	2030	2035
Collected & treated (mgd)	106.9	96.0	98.1	96.3	95.8	96.7	98.2
Volume that will meet recycled water standard (mgd)	0	0	2	4	4	4	4

Table 9: Disposal of Wastewater (non-recycled)

DISPOSAL & TREATMENT METHOD	2010	2015	2020	2025	2030	2035
Secondary Effluent to Deep Water Outfalls (mgd)	80.3	82.5	80.6	80.1	81.0	82.6
Secondary Effluent to Islais Creek (mgd)	5.7	5.7	5.7	5.7	5.7	5.7
Primary Effluent to Deep Water Outfalls (mgd)	9.9	9.9	9.9	9.9	9.9	9.9
TOTAL (MGD):	**96.0**	**98.1**	**96.3**	**95.8**	**96.7**	**98.2**

Past and Current Recycled Water Use: From 1932 to 1981, the City's McQueen Treatment Plant, using an activated sludge process, provided recycled water to Golden Gate Park for irrigation and flow augmentation of its streams and lakes. Due to changes in State regulations, the plant could no longer meet standards, and the City closed the McQueen plant and discontinued use of recycled water in Golden Gate Park.

In 1991, the San Francisco Board of Supervisors passed Ordinances 390-91 and 391-91 that outline specific components to be addressed in a Recycled Water Master Plan (RWMP), designate recycled water use areas within San Francisco, and require the installation of dual-plumbing systems for recycled water use within the designed recycled water use areas for the following situations:

- New or remodeled buildings and all subdivisions with a total area of 40,000 square feet or more
- New and existing irrigated areas of 10,000 square feet or more

The SFPUC first developed a RWMP that outlined a phased water recycling project for San Francisco in 1996. However, the Plan was not implemented due to limited funding. An updated RWMP was subsequently completed in 2006. The 2006 RWMP identifies recycled water project alternatives and a plan for implementation of recycled water projects in the City. These projects will help the City meet its long-term water demands with a local resource in a more reliable and sustainable manner.

Currently, recycled water use in San Francisco is limited, but the SFPUC is moving forward with expanding the use within the City. Disinfected secondary-treated recycled water from the SFPUC's Southeast WPCP is used on a limited basis for wash-down operations, and is provided to construction contractors for soil compaction and dust control and other nonessential construction purposes. Current use of recycled water for these purposes does not materially contribute to reducing the retail demands.

3.3 FUTURE RETAIL WATER SUPPLY SOURCES

To reliably and sustainably meet the future water needs of its Retail Customers, the SFPUC is diversifying its water supply portfolio through the development of local water supplies such as increasing recycled water and groundwater production. Projects related to these efforts are described below.

3.3.1 San Francisco Groundwater Supply Project

The San Francisco Groundwater Supply Project proposes the construction of up to six wells and associated facilities in the western part of San Francisco to extract up to 4 mgd of groundwater from the northern Westside Basin for distribution in the City. The extracted groundwater, which would be used both for regular and emergency water supply purposes, would be disinfected and blended with imported surface water before entering the municipal drinking water system. The environmental review for this project began in December 2009. Construction is expected to be complete by 2015.

3.3.2 Recycled Water Supply Projects

Recycled water projects being developed in San Francisco (retail service area) are the Harding Park, Pacifica, and proposed Westside and Eastside Recycled Water Projects. These projects would provide up to 4 mgd of recycled water to a variety of users in San Francisco – primarily for landscape irrigation, toilet flushing, and industrial purposes – and are detailed below.

- The Harding Park Recycled Water Project would use available recycled water from the North San Mateo County Sanitation District (NSMCSD) located in Daly City, to irrigate Harding Park and Fleming Park golf courses in San Francisco. The SFPUC has partnered with the NSMCSD for this proposed project. The Harding Park Project has completed environmental review and design. Construction has begun and will be completed in June 2012.

- The Pacifica Recycled Water Project will provide recycled water to irrigate the Sharp Park Golf Course in Pacifica (which is owned by the City) and other nearby areas. When completed, the project will save approximately 40 million gallons of drinking water each year. SFPUC has partnered with the North Coast County Water District on this project. Construction has begun and will be completed by December 2011.

- The proposed Westside Project would construct a tertiary recycled water plant and associated pipelines to replace surface and groundwater currently used to irrigate Golden Gate Park, Lincoln Park and Golf Course, and the Presidio Golf Course. Additionally recycled water would be used for various non-potable uses in Golden Gate Park, including those at the California Academy of Sciences. The environmental review process was initiated with the release of the Notice of Preparation in September 2010.

- Currently, the SFPUC is conducting a recycled water demand assessment of potential users and uses in the Eastside of San Francisco. The assessment is examining the potential uses of recycled water for irrigation, toilet flushing, and various commercial and industrial applications. The WSIP contains funding for planning, design, and environmental review for the proposed Eastside Recycled Water Project.

In addition, the planned Candlestick Point-Hunters Point Shipyard Phase II, Treasure Island-Yerba Buena Island, and Parkmerced development projects may include the development of recycled water to help offset potable demand. These new projects could produce up to 1.5 mgd of recycled water. This represents additional recycled water supply and has not been included as part of SFPUC's local supplies. In the event that recycled water is produced at the project sites, recycled water could offset as much as 1.5 mgd in total San Francisco retail potable water demand.

Regional Recycled Water Planning Efforts: The SFPUC is working with local agencies to develop recycled water projects that will benefit the SFPUC and local partners by reducing demands for SFPUC regional system water, and/or freeing up groundwater that could be used for potable supplies. In addition, these projects would reduce wastewater discharges into San Francisco Bay and the Pacific Ocean.

- The SFPUC, the Cities of South San Francisco and San Bruno, and California Water Service Company (Bayshore District) are jointly pursuing a project to produce and distribute recycled water in the South San Francisco and San Bruno areas. Recycled water for the project will be produced at the South San Francisco/San Bruno Water Quality Control Plant jointly operated by the Cities of South San Francisco and San Bruno.

- The SFPUC is also exploring opportunities to partner with Daly City on a recycled water expansion project and with Redwood City to provide recycled water to the Menlo Country Club.

Additional regional recycled water partnership opportunities with other Bay Area agencies will be evaluated as opportunities arise.

The SFPUC is a member of the Bay Area Clean Water Agencies (BACWA) Recycled Water Committee. BACWA is composed of Bay Area wastewater agencies that discharge into the San Francisco Bay estuary. The purpose of the Recycled Water Committee is to further regional water recycling efforts from a wastewater agency perspective. The SFPUC is currently serving as the Chair of this committee.

The City is also an active member of the International, California Section, and Northern California

Chapter of the WateReuse Association. The international organization is dedicated to increasing the amount of recycled water produced and used in a beneficial and efficient manner in the United States and abroad. The California Section focuses on promoting this mission in California.

3.3.3 Proposed Actions to Encourage Use of Recycled Water

To encourage the use of recycled water in San Francisco, the City adopted Ordinances 390-91 and 391-91[8]. As mentioned previously, these ordinances require the installation of dual-plumbing systems within a specific geographic area for the following situations:

- New or remodeled buildings and all subdivisions with a total of 40,000 square feet or greater, for uses such as irrigation, toilet flushing, and industrial processes
- New and existing landscaped areas of 10,000 square feet or larger, for irrigation

The City also passed Ordinance 175-91[9], which requires the use of non-potable water for soil compaction and dust control for construction and demolition projects.

The SFPUC also initiated a Large Landscape Grant Program in 2009. Retail Customers in San Francisco with 2.5 acres or more of irrigated landscapes are eligible to apply. Grant funding is available for water-saving and recycled water retrofits that reduce potable water use for landscape irrigation.

3.3.4 Recycled Water Optimization Plan

As mentioned in the above section, the San Francisco Board of Supervisors passed Ordinances 390-91 and 391-91, which require the installation of dual-plumbing systems in buildings and subdivisions and landscaped areas within a specific geographic area. In addition, Ordinance 175-91 was also passed requiring the use of non-potable water for soil compaction and dust control for construction and demolition projects.

Also, as discussed previously in Section 3.2.2, the 2006 RWMP identifies recycled water project alternatives and a plan for implementation of recycled water projects in the City. The SFPUC is working with retail customers located outside San Francisco to develop recycled water projects that will benefit the SFPUC and local partners by reducing demands for SFPUC Regional System water, and/or freeing up groundwater that could be used for potable supplies. In addition, these projects would reduce wastewater discharges into San Francisco Bay and the Pacific Ocean. Examples of these projects are described below.

Table 10 summarizes the current and projected uses of recycled water in San Francisco, assuming the proposed projects described above are developed.

8 San Francisco Public Works Code, Article 22, Sections 1200-1210. Note that this Ordinance was amended in 1994 by Ordinance 393-94, which expanded the designated recycled water use area to include Treasure Island, Yerba Buena Island, and Hunters Point Shipyard4. .

9 San Francisco Public Works Code, Article 21, Sections 1100-1107.

Table 10: Recycled Water Uses - Current and Projected

USE TYPE[1]	2005[2]	2010[2]	2015	2020	2025	2030	2035
Irrigation (mgd) [3]	0	0	0.3	2.68	2.68	2.68	2.68
Lake Fill (mgd) [4]	0	0	0	0.4	0.4	0.4	0.4
Com/Ind (mgd) [5]	0	0	0	1.0	1.0	1.0	1.0
TOTAL (MGD)	**0**	**0**	**0.30**	**4.08**	**4.08**	**4.08**	**4.08**

1. Indirect potable reuse has been evaluated and determined to be economically infeasible at this time.
2. 2005 and 2010 reflect actual values.
3. Includes landscape irrigation. Demand for agricultural irrigation for the SFPUC's retail service area is negligible, and therefore economically infeasible.
4. Includes wildlife habitat enhancement, wetland recharge, and groundwater recharge.
5. Com / Ind = Commercial / Industrial.

3.3.5 Summary of Current and Future Retail Water Supplies

Table 11 provides a breakdown of current and projected water supply sources for meeting SFPUC retail water demand over the next 25 years.

Table 11: SFPUC Retail Water Supplies 2010 – 2035 (Normal Year)

CURRENT AND FUTURE WATER SUPPLY SOURCES	2010	2015	2020	2025	2030	2035
RWS Watersheds – Retail Supply [1]	**81**	**81**	**81[1]**	**81[1]**	**81[1]**	**81[1]**
Groundwater Sources [2]						
In-City Irrigation Purposes	1.5	1.5	0.3	0.3	0.3	0.3
Groundwater at Castlewood and Sunol	0.7	0.7	0.7	0.7	0.7	0.7
Treated for Potable (previously used for in-City irrigation purposes)	0.0	0.0	1.2	1.2	1.2	1.2
Groundwater Subtotal	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**
Future Water Supply Sources						
Groundwater: Potable from North Westside Groundwater Basin	0.0	2.8	2.8	2.8	2.8	2.8
Recycled Water	0.0	0.3	4.0	4.0	4.0	4.0
Future Supply Subtotal	**0.0**	**3.1**	**6.8**	**6.8**	**6.8**	**6.8**
TOTAL SUPPLY	**83.2**	**86.3**	**90.0**	**90.0**	**90.0**	**90.0**

1. Assumes 2018 supply limitation extends to 2035.
2. Groundwater currently serves irrigation to Golden Gate Park, the San Francisco Zoo, and the Great Highway median. A groundwater reserve of 0.3 mgd for irrigation purposes will remain as part of the SFPUC's non-potable groundwater supply (SFPUC 2008 Phased WSIP Variant). Castlewood and Sunol projected supplies remain unchanged over the 20-year planning horizon.

3.4 WATER QUALITY

As discussed previously, the SFPUC's retail demand is primarily met with water from the RWS watersheds, with a small portion (less than 3%) from local groundwater supplies and recycled water. Each of these sources delivers high-quality water relative to its intended use. Supplies from the RWS are of extremely high quality, used for both potable and non-potable uses. Existing groundwater and recycled water supplies are currently used for non-potable applications.

It has been assumed in this UWMP that these existing supplies will be available in the future. The SFPUC does not anticipate that future, water quality issues will alter the SFPUC's current water management strategies or supply reliability. This section provides information on the water quality of the SFPUC's existing retail water supplies.

3.4.1 Quality of Regional Water System Supplies

The SFPUC RWS watersheds deliver high-quality water. The current surface water supplies available to the RWS include the Tuolumne River and supplies from local Bay Area reservoirs. The majority of the water supply originates in the upper Tuolumne River watershed high in the Sierra Nevada, remote from human development and pollution. This pristine water, referred to as Hetch Hetchy water, is protected in pipes and tunnels as it is conveyed to the Bay Area, requiring only primary disinfection and pH adjustment to control corrosion in the pipelines.

The USEPA and the DHS have approved the use of this drinking water source without requiring filtration at a treatment plant. However, local water from the Alameda and Peninsula Watersheds requires filtration to meet drinking water quality requirements. The filtered and treated water from the local watersheds is blended with Hetch Hetchy water, and most customers receive water from a blended source. System water quality, including both raw water and treated water, is continuously monitored and tested to assure that water delivered to customers meets or exceeds federal and State drinking water/public health requirements.

The SFPUC will continue to rely on these high-quality water sources. No degradation of water quality is anticipated in the future.

3.4.2 Quality of Local Water Supplies

Quality of local groundwater and recycled water supplies is discussed in the following paragraphs.

Groundwater Supplies: Based on semi-annual monitoring, the groundwater currently used for irrigation and other non-potable uses in San Francisco meets or exceeds the quality needed for these end uses.

Plans for development of additional groundwater in San Francisco include plans for potable supply in the North Westside Groundwater Basin. As part of this effort, the groundwater quality at new

proposed well sites is being sampled for all drinking water parameters. The groundwater would be disinfected and blended with imported surface water before entering the municipal drinking water system. Based on information collected to date, the water quality of this blended water would meet drinking water standards.

Recycled Water Supplies: Recycled water in San Francisco is currently being used on a limited basis for in-plant wash-down purposes. This recycled water undergoes secondary treatment at SFPUC's Southeast Water Pollution Control Plant and meets the Title 22 California Code of Regulation requirements for recycled water use for non-potable uses.

Recycled water projects being developed in San Francisco (retail service area) are the Harding Park, Pacifica, and proposed Westside and Eastside recycled water projects. These projects would provide up to 4 mgd of recycled water to a variety of users in San Francisco primarily for landscape irrigation and toilet flushing. This recycled water will undergo tertiary treatment, which will result in water quality sufficient to meet the needs and requirements associated with each end use.

This section focuses on the projection of the SFPUC's water demands. Retail demands are based on recent demographic information and a detailed analysis of the SFPUC's retail water use characteristics. Wholesale Customer demands for SFPUC supplies are based on projections developed by Wholesale Customers. This section also presents the baseline and target per capita water consumption rate, as required by SB X7-7.

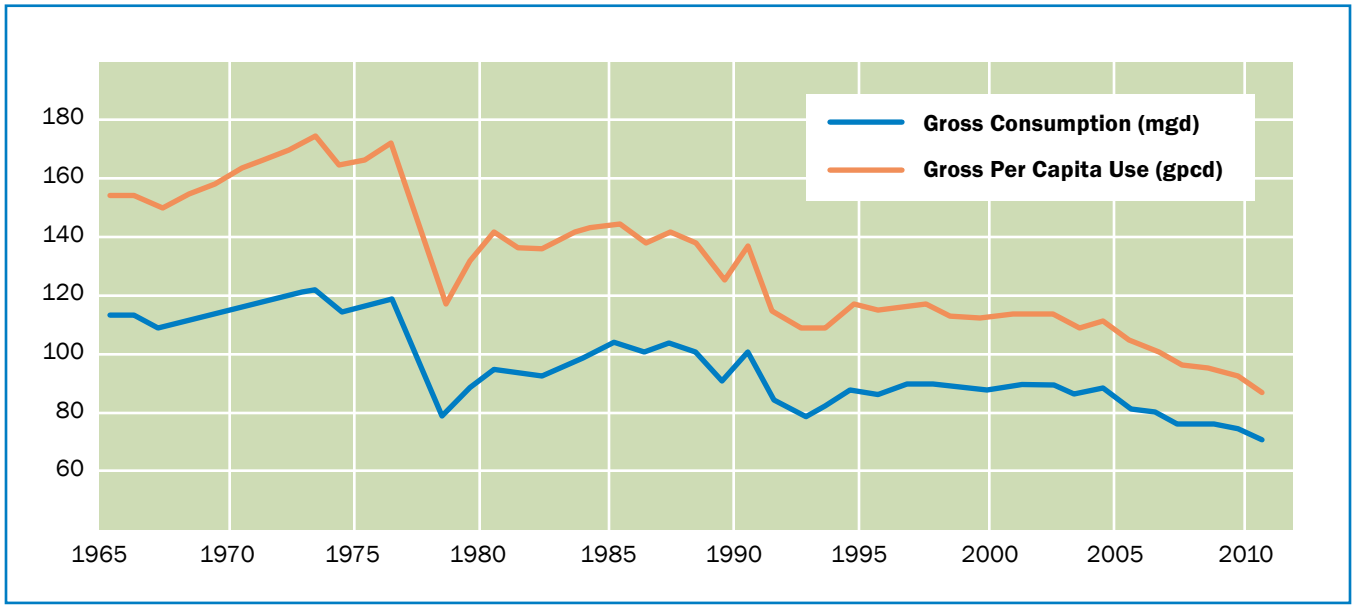
4.1 RETAIL WATER DEMANDS

Water use within San Francisco is currently below historic consumption. Both the total consumption and the per capita use of water have been on a general decline in San Francisco since the mid-1970s. Many factors have contributed to this reduction in water use, including significant changes to the mix of industrial and commercial businesses and their associated water demand, and the general characteristics of water use by San Francisco water customers. In particular, the severe droughts of 1976-77 and 1987-92, changes in plumbing codes, and conservation programs (either voluntarily embraced by residents and businesses or mandated by San Francisco), have apparently affected water demands.

Figure 6 shows the historical record of retail water deliveries by San Francisco for the 1965 through 2010 period in terms of both total deliveries and gross per capita consumption (gallons per capita per day, or gpcd).

While the gross per capita consumption is not a true measure of the water used by an individual (since it includes water use by all categories of customers, e.g., industrial, commercial and losses), it does provide insight when comparing water use among regions. The current per capita consumption rate by San Francisco in-City water customers is 85.6 gpcd, one of the lowest in the state.

Figure 6: Historical San Francisco Water Consumption



4.1.1 Current Retail Demand

All of the SFPUC's Retail Customers have been metered since 1916. In 2010, total SFPUC retail water use was 77.7 mgd. Of this demand, in-City Retail Customers used approximately 71 million gallons per day (mgd)[10]. Water use by suburban Retail Customers totaled approximately 4.1 mgd, and groundwater irrigation use was approximately 2.2 mgd.

Water use in 2010 was lower than expected. This decreased demand can be attributed to three main reasons. First, the very wet spring and cool summer California experienced in 2010 depressed urban water demand across the state. Second, 2008 and 2009 were both dry and the SFPUC asked its customers to reduce their water consumption by 10%. While rainfall returned to normal or above normal in 2010, the reductions in water use have continued. Third, the sharp economic decline which started in 2008 pushed down commercial and industrial demands. When preparing the 2005 UWMP, the number of jobs in 2010 was projected to be 692,420. According to the 2010 estimates from the California Employment Development Department, the number of jobs in 2010 was closer to 545,000.

Residential Water Use: Single-family units comprise approximately 32% of the total households in San Francisco, and use approximately 40% of the total water delivered to the residential sector. The remainder of residential water (60%) is used by multi-family units such as apartments.

Combined, the single-family and multi-family residential sectors have a current per capita consumption rate of approximately 50 gpcd. Due to San Francisco's moderate climate and high density housing, residential water use is used almost entirely indoors. For multi-family units, the average outdoor water use is considered negligible. Outdoor water use makes up less than 10% of single-family residential uses, on average.

Non-residential Water Use: Non-residential water use accounts for approximately 30% of San Francisco's retail water demands. This includes all sectors of water users not designated as residential, such as manufacturing, transportation, trade, finance, and government employment sectors, and the large services sector.

Unaccounted for Water Loss: Unaccounted for Water Loss represents both unbilled authorized consumption (including metered high pressure fire fighting consumption, unmetered main flushing, street cleaning and dust control and low pressure fire hydrant use) and unbilled unauthorized consumption (including water lost to the system through all types of leaks, breaks and overflows). These losses are assumed to be approximately 6.9% of total in-City demand. Meter under-registration is also considered unbilled unauthorized consumption and is captured in the demand calculations for each billing sector. It is assumed that meter under-registration is 2.2% of residential demand and 2.1% of non-residential demand. Total loss in the City due to meter under-registration, unbilled authorized consumption and unbilled unauthorized consumption is approximately 9% of in-City demand.

10 This only refers to in-City retail demand, not total retail demand (which includes Retail Customers outside of the city and county boundary, such as Lawrence Livermore National Laboratory), and this does not include groundwater.

4.1.2 Projected Retail Water Demands

Projected water use for the SFPUC's in-City Retail Customers was estimated using the City's Retail Water Use Models. The models were first developed in 2004 and updated in 2010. These models have incorporated economic and demographic forecast data, including projections of population, housing stock and employment. These forecast data were based on the ABAG reports *Projections 2002, Projections 2009*, and *Draft Projections 2011* (developed as part of the Bay Area's Sustainable Communities Strategy). These reports summarize demographic projections for the City at 5-year intervals as well as California Department of Finance estimates and projections 10-year intervals. These projections were reviewed and refined by the San Francisco Planning Department using up-to-date planning information for the City.

Results of the water demand forecasts show that SFPUC's in-City retail water demand will only slightly increase (**Table 12**), even though the household population in San Francisco is expected to increase by nearly 12% for the same period (year 2010 through year 2035). The projected increase in in-City retail water demands is due to estimated growth in business and industry, which will translate into a commensurate increase in water use. The expected increase in water use in the non-residential sector, however, is expected to be partially balanced by decreases in water use in the residential sector.

The decreased water use forecast for the residential sectors is attributed primarily to market penetration of current plumbing codes within the residential sectors. Market penetration will increase as time progresses, resulting in an increase in water savings due to the installation of more water-efficient fixtures.

A decrease in water use can also be expected, in both the residential and non-residential sectors, as a result of water conservation programs. The SFPUC has increased its water conservation programs in an effort to achieve new water savings by 2018. The SFPUC's conservation program is based on the SFPUC Retail Demand Model Update and Calibration Technical Memorandum (The Demand Study) (**Appendix D**), which identified water savings and implementation costs associated with a number of water conservation and efficiency measures. The Demand Study evaluated the costs and benefits of implementing various conservation measures using an end-use model. These estimates include new conservation programs such as high-efficiency toilet replacement in low-income communities and water-efficient irrigation systems for large irrigators (e.g., municipal parks and commercial landscaping). Through its conservation program, the SFPUC anticipates reducing gross per capita consumption to 82 gpcd by 2020 for an average daily savings of approximately 6 mgd.[11] Demand reduction due to local conservation is accounted for in the demand projection shown in **Table 12**.

11 Per capita estimates were calculated based on household population. SBX7-7 per capita estimates contained in Section 4.1.5 were calculated based on the total population data obtained from the Department of Finance.

Table 12: San Francisco Retail Water Demands

WATER USE ENTITY	2005[1] (mgd)	2010[1] (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)	2030 (mgd)	2035 (mgd)
IN-CITY CUSTOMERS							
Single-Family Residential [2]	18.4	16.4	17.9	17.1	16.5	16.0	15.8
Multi-Family Residential [2]	27.7	25.1	28.9	28.4	28.2	28.3	28.6
Non Residential[2]	24.8	23.5	25.6	26.5	27.5	28.7	29.9
Other In-City Demands [2,3]	0.2	0.1	0.2	0.2	0.2	0.2	0.2
Losses[4]	8.2	6.3	5.0	4.9	5.0	5.0	5.1
In-City Subtotal [5]	**79.3**	**71.4**	**77.7**	**77.1**	**77.3**	**78.2**	**79.7**
In-City Subtotal w/Conservation[6]	**79.3**	**71.4**	**73.6**	**71.7**	**71.2**	**72.1**	**73.7**
SUBURBAN RETAIL CUSTOMERS [7]							
Other Retail Customers [8]	4.4	3.0	3.8	3.8	3.8	3.8	3.8
Lawrence Livermore Lab	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Groveland CSD	0.4	0.7	0.8	0.8	0.8	0.8	0.8
Suburban Retail Subtotal	**5.2**	**4.1**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
GROUNDWATER CUSTOMERS							
City Irrigation Uses [9]	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Castlewood & Sunol Golf Course [10]	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Groundwater Subtotal	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Total Retail Demand [11]	**86.7**	**77.7**	**80.7**	**78.9**	**78.5**	**79.2**	**80.9**

1. 2005 and 2010 data are based on actual billing data (SFPUC, 2010). 2015-2035 are projections from the SFPUC Retail Demand Model Update and Calibration Technical Memorandum (April 2011).
2. Water demands reflect the adjusted demand, taking into consideration the potential savings due to plumbing codes.
3. Builders and Contractors, Docks & Shipping
4. Losses reported for 2005 and 2010 include meter under-registration. Losses in 2015 – 2035 exclude meter under-registration because they are included in the retail demand projections for residential and non-residential sectors. Meter under-registration losses estimated at 2.2% of residential and 2.1% of non-residential sector demands. System losses excluding meter under-registration estimated at 6.86% of sector demand.
5. "In-City subtotal" refers to demand that includes code-driven savings from changes in state and federal plumbing codes and regulations.
6. "In-City Subtotal with Conservation" refers to demand that includes code-driven savings plus savings from SFPUC-initiated conservation programs.
7. Suburban retail customer future demands do not include active conservation savings. The SFPUC plans on working with the suburban Retail Customers on conservation activities, but has not yet quantified the savings. Accordingly, demands are kept constant through 2035, but will be adjusted as more information becomes available.
8. The San Francisco County Jail, San Francisco International Airport, and other suburban or municipal accounts.
9. Irrigation at Golden Gate Park, the Great Highway median, and the San Francisco Zoo.
10. 100% of Castlewood demand (0.4 mgd) is met by groundwater wells in Pleasanton and 75% of Sunol Golf course demand (0.3 mgd) met by subsurface diversions of surface water at the Sunol Filter Galleries. Projected demands are based on average use from 2000-2010 and remain unchanged over the 25 year planning horizon.
11. This refers to the sum of "in-City subtotal with conservation", suburban retail subtotal, and groundwater subtotal.

4.1.3 Non-residential Water Demands

Average employee-use rates, gallons per employee-day (GED), have been estimated for the various employment categories in the development of the end-use study. These values range from approximately 18 GED for the government category to approximately 94 GED for the agriculture and mining category.

Table 13 provides a breakdown by industry type of the SFPUC's projected water demands for the retail non-residential sector for 2005 through 2035 in 5-year increments.

Table 13: SFPUC Projected Retail Non-Residential Water Demands

INDUSTRY[1]	2005 (mgd)	2010 (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)	2030 (mgd)	2035 (mgd)
Ag. & Mining	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction	0.5	0.5	0.5	0.6	0.6	0.7	0.7
Manufacturing	2.0	2.1	2.1	2.4	2.5	2.7	2.8
Transportation	0.7	0.6	0.6	0.6	0.6	0.6	0.7
Information	1.5	1.5	1.5	1.6	1.7	1.8	1.9
Retail Trade	2.5	2.4	2.4	2.5	2.9	3.0	3.2
F.I.R.E.[2]	1.5	1.5	1.4	1.5	1.6	1.7	1.8
Services	15.7	15.4	16.9	17.8	18.5	19.5	20.5
Government	0.5	0.4	0.4	0.5	0.5	0.5	0.5
Total without Conservation [3]	**25.0**	**24.6**	**26.1**	**27.5**	**29.0**	**30.5**	**32.1**
Total with Conservation	**24.8**	**23.5**	**25.6**	**26.5**	**27.5**	**28.7**	**29.9**

1. Projections from the SFPUC Retail Demand Model Update and Calibration Technical Memorandum.
2. FIRE = finance, insurance, and real estate.
3. Totals calculated using gallon-per-day equivalents (GED) and employment estimates and projections and do not include passive or active conservation savings.

4.1.4 Water Demands of Lower Income Households

The future water use of planned lower income housing (less than 80% of the AMI) is estimated by multiplying the planned future housing units for lower income residents by the average number of persons per household and the estimated per capita water use.

As described in Section II.A of the 2009 San Francisco Housing Element (page 1.41), ABAG, in coordination with the California State Department of Housing and Community Development (HCD), determine the Bay Area's regional housing need based on regional trends, projected job growth and existing needs. San Francisco's fair share of the regional housing need for January 2007 through June 2014 was calculated as 31,190 units, or about 4,160 units per year total. This estimate includes units for all adjusted median income (AMI) categories: extremely low (less than 30% of AMI), very low (31% - 50% of AMI), low (51% - 80% of AMI), moderate (81% - 120% of AMI), and above moderate (greater than 120% of AMI) categories. Planned housing units for the extremely low, very low, and low categories total 3,294, 3,295, and 5,535, respectively, for a total number of planned lower housing units of 12,124 units between 2007 and 2014. Assuming a consistent number of units are build per year, approximately 1,617 units will be built per year between 2007 and June of 2014. It is assumed that approximately 4,851 of the planned 12,124 units were built between 2007 and 2010, leaving 7,273 additional units to be constructed in between January of 2011 and June of 2014.

As described in the SFPUC Retail Demand Model Update and Calibration Technical Memorandum (**Appendix D**), the average persons per household in single-family and multi-family households are estimated to be approximately 3.1 and 2.0, respectively, by 2015. Because the distribution of single-family versus multi-family planned housing units is currently unknown, it is assumed that the planned units will house approximately 2.55 persons per household, the average of the projected values for single- and multi-family households. As a result, it is estimated that approximately 18,546 residents will occupy planned lower income housing units by June of 2014.

As described in Section 4.2, per capita water use in the SFPUC's retail water service area is currently approximately 85.6 gpcd. Water use in planned lower income housing units is therefore estimated to be approximately 1.6 mgd (18,546 people x 85.6 gpcd) by June of 2014.

This estimated future lower income water demand is included in the retail water demand projections presented in **Table 12**, which include all demands of existing and planned lower-income housing. The SFPUC has always included lower income households as part of the overall city demand in its planning efforts, and all demands presented in Section 4 include lower income demands. Updates to the Urban Water Management Planning Act require that entities separately calculate the water demands for lower income households in this UWMP, and this estimate reflects the SFPUC's best effort to do so. Please note that the SFPUC does not use this number for any planning purposes.

4.1.5 Methodology Used to Project Retail Water Demands

The SFPUC uses disaggregated end-use models to project its retail water demands. San Francisco's water demand is segregated into three distinct categories of water use: non-residential (industrial, commercial and municipal uses); multi-family residential (e.g. townhouses and apartments); and single-family residential. The remainder of San Francisco's water demands such as unaccounted for water and minor uses such as docks and shipping are forecast through trend analysis.

Future non-residential water use is projected using relationships between employment within San Francisco and employee use of water. These coefficients are segregated by type of business or service enterprise, which is based on SIC codes. Appropriate employee-use rates within San Francisco's model were determined by extensive review of industry literature.

Two separate end-use models estimate multi-family and single family residential water use. These models rely on a disaggregation of household end-use of water, such as the number and volume of toilet flushes, duration of showering, and the size and frequency of use of washing machines and dishwashers. These data were derived from available residential end-use monitoring studies.[12]

The models have been verified with water delivery records for historical periods, including periods of time when water demands were affected by drought-induced rationing programs. Water use projections through the year 2035 were developed using these models. The water use projections incorporate the effects of water-saving plumbing code requirements, among other factors. **Appendix D** contains a detailed discussion of the methodology.

12 End-use studies include the Residential End Uses of Water Study (American Water Works Association Research Foundation, 1999) and the California Single-Family Water Use Efficiency Study (Prepared by Aquacraft, Inc. with Stratus Consulting & the Pacific Institute. Sponsored by the California Department of Water Resources, Draft Final April 2011).

4.1.6 Differences between 2005 and 2010 Water Demand Projections

Although the SFPUC used the same methodology to project retail water demands in the 2005 UWMP, a few key assumptions were updated in the models used for the 2010 UWMP, resulting in lower projected water demands. The SFPUC Retail Demand Model Update and Calibration Technical Memorandum in **Appendix D** contains a detailed description of these changes. **Table 14** contains a summary of these key changes.

Table 14: Updated Demand Model Assumptions

UPDATED ASSUMPTIONS	CHANGES FROM 2005
Population, housing, and employment projections	Since the 2005 UWMP, new population, employment and housing projections were released. Updates were primarily based on data obtained from Association of Bay Area Governments (ABAG), California Department of Finance, and the City's Planning Department. The updated projections resulted in increased water demands in the multi family sector in 2030 due to a projected increase of 37,081 households. However, the revised projections decreased the employment projections in 2030 by 130,370 jobs, which resulted in decreased water demands in the non-residential sector.
Water Loss	The model was updated to more accurately account for water loss due to meter under-registration. The original model specification included water losses due to customer meter under-registration, both within each billing sector's projected water demand and as a component of the Unaccounted-for-Water causing the model to overestimate in-City retail demands.
Conservation Savings	The original model projected 4.5 mgd of active water conservation savings by 2030. The suite of conservation measures included in the 2004 model was updated to better reflect the mix of conservation measures and technologies that the SFPUC expects to implement in the near future. Additionally savings from new regulations were added into the model, including the City's 2009 Retrofit on Resale (ROR) ordinance, the phase-in of high-efficiency toilet standards under AB 715, California Energy Commission's (CEC) proposed efficiency standards for residential clothes washers, and California's and the City's green building standards. These changes resulted in 2.0 mgd of additional conservation savings.
Other Retail Customer Demands	The demands associated with "other Retail Customers" were updated to reflect a decrease in water use over the past 10 years by these customers. Additionally the groundwater demands of Castlewood and Sunol were removed from this category as these demands are already captured under the groundwater demands.
City Irrigation Demands	City Irrigation demands were updated based on new data. In 2005, City irrigation demands were projected to be 2.5 mgd. Based on the latest metered data, city irrigation demands have been decreased to 1.5 mgd.

The changes summarized above result in decrease in demand of nearly 9.0 mgd in 2030 between the 2005 UWMP and the 2010 UWMP. The 2005 UWMP did not project 2035 demands.

4.2 PER CAPITA WATER USE: BASELINE AND TARGET

SBx7-7 (California Water Code section 10608 [e]) requires the SFPUC to include the following in its UWMP.

- Baseline daily per capita water use: how much water is used within an urban water supplier's distribution system area on a per-capita basis. It is determined using water use and population estimates from a defined range of years.

- Urban water use target: how much water is planned to be delivered in 2020 to each resident within an urban water supplier's distribution system area, taking into account water conservation practices that currently are and plan to be implemented.

- Interim urban water use target: the planned daily per capita water use in 2015, a value halfway between the baseline daily per capita water use and the urban water use target.

In 2015 and 2020, the SFPUC will report on daily per capita water use to assess progress toward meeting the interim and 2020 urban water use targets developed herein.

4.2.1 Baseline Daily Per Capita Water Use

As described in *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009)*, the Water Conservation Bill of 2009 requires each urban retail water supplier to include in its UWMP an estimate of base daily per capita water use, expressed in gpcd, for a continuous multiyear base period. The Water Code specifies two different base periods for calculating Base Daily Per Capita Water Use:

- A 10- to 15-year continuous period used to calculate baseline per capita water use per Section 10608.20.

- A continuous 5-year period used to determine whether the 2020 per capita water use target meets the legislation's minimum water use reduction requirement per Section 10608.22.

Because the SFPUC's current and past recycled water use is minimal (<1 mgd; much less than the 10% of 2008 water use needed to justify a 15-year baseline), the SFPUC will utilize a 10-year baseline. Water use data from fiscal year (FY) 2000/01 to FY 2009/10 have been used for this analysis.

Base Daily Per Capita Water Use has been calculated for the 10-year period as follows:

Step 1: Estimate distribution system area

Step 2: Estimate Service Area Population for each year in the base period

Step 3: Calculate Gross Water Use for each year in the base period (in gallons/day)

Step 4: Calculate Annual Daily Per Capita water use for each year in the base period by dividing Gross Water Use by Service Area Population

Step 5: Calculate Base Daily Per Capita Water Use as the average per capita water use

Step 1: Estimate Distribution System Area (10-Year Baseline). The distribution system area is the SFPUC's in-City Retail System, shown in **Figure 7**.

Figure 7: Distribution System Area and Metering Locations

Step 2: Estimate Service Area Population for Base Period (10-Year Baseline). As shown in **Table 15**, the retail population was developed for the period from FY 00/01 to FY 09/10 based on Department of Finance total population data for the City and County of San Francisco (2000 – 2009).

Step 3: Calculate Gross Water Use (10-Year Baseline). Gross water use for the City is provided in **Table 15**. Gross water use was developed by compiling water from the SFPUC's own sources delivered to Retail Customers (total production minus deliveries to Wholesale Customers). Changes in in-City storage were then factored in to develop gross water use. The SFPUC compiles daily flow data for the County-line meters, System Input and In-Line Meters, and daily reservoir water level data. The meters, water level sensors, and associated metering equipment are all inspected, tested, calibrated, and maintained according to the applicable meter calibration and maintenance frequency by an independent metering consultant. These include annual pitot tube tests, quarterly secondary meter equipment testing and calibration, cleaning, flushing, inspecting, and lubricating. The flow quantities are expected to be accurate and no meter error adjustment is necessary. Gross water use is shown in rows 1 through 5 in **Table 15**.

Step 4: Calculate Annual Daily Per Capita Water Use (10-Year Baseline). Annual Daily Per Capita Water Use was calculated by dividing gross water use by population. Annual Daily Per Capita Water Use is shown on the last row in **Table 15**.

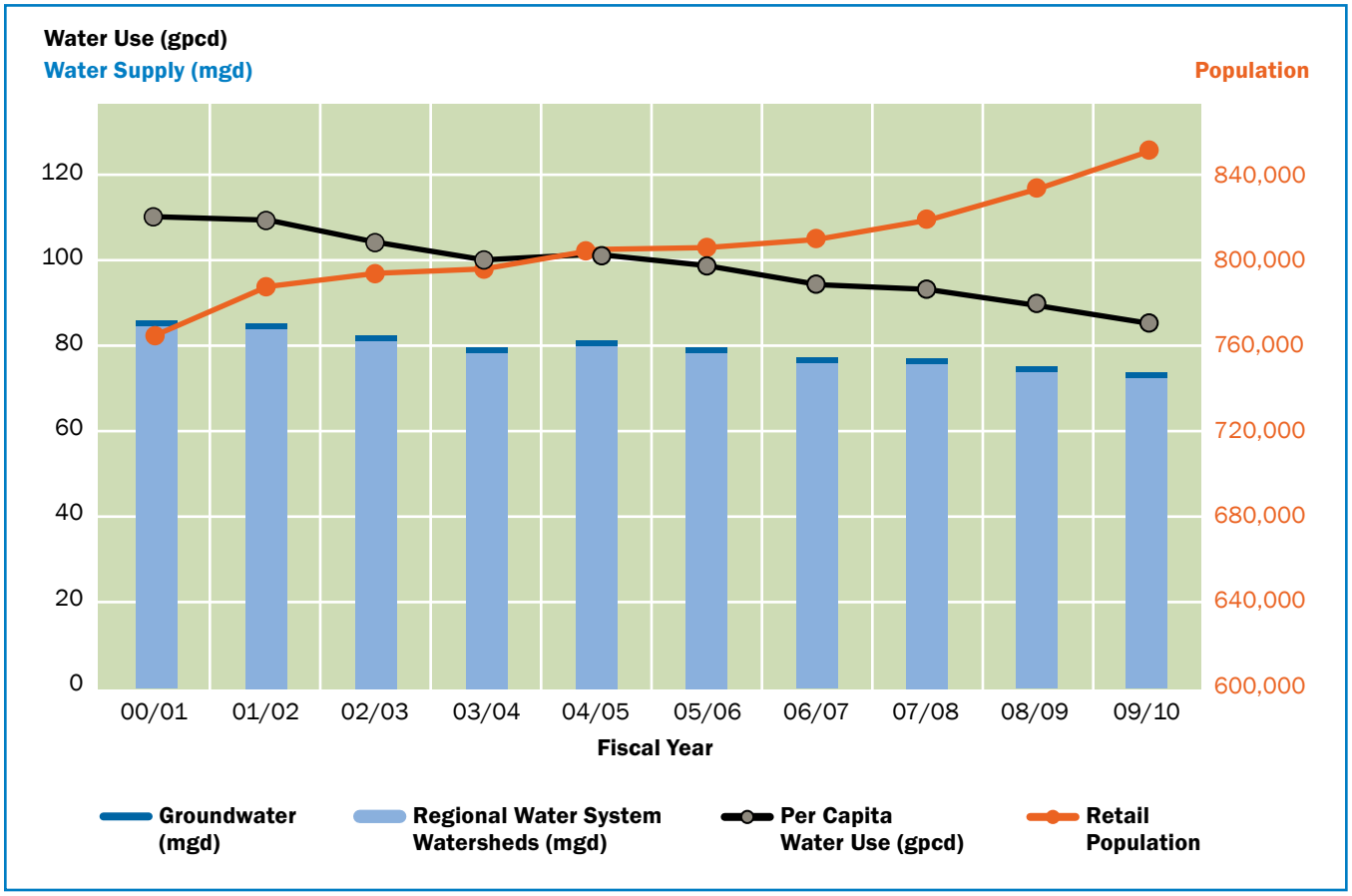
Step 5: Calculate Base Daily Per Capita Water Use (10-Year Baseline). Base Daily Per Capita Water Use is calculated as the average of per capita water use, or 98.4 gpcd.

Table 15: SFPUC In-City Retail Gross Water Use from FY 00/01 to FY 09/10 (mgd)

	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
Own Sources [1]	85.4	85.4	82.5	79.6	80.6	79.4	76.8	76.7	75.0	72.5
Imported Sources	0	0	0	0	0	0	0	0	0	0
Volume Exported	0	0	0	0	0	0	0	0	0	0
Change in Storage	-0.01	0.00	0.15	0.02	-0.09	0.00	0.03	0.00	-0.01	0.06
Gross Water Use	85.4	85.4	82.3	79.6	80.7	79.4	76.8	76.7	75.0	72.4
Retail Population [2]	776,733	785,654	793,462	798,574	802,512	807,382	813,929	823,940	836,360	846,601
Per Capita Use (gpcd) [3]	**110.0**	**108.7**	**103.8**	**99.6**	**100.6**	**98.3**	**94.3**	**93.1**	**89.7**	**85.6**

1. All sources are metered, and all meters are calibrated annually.
2. Population data from California Department of Finance for City and County of San Francisco (http://www.dof.ca.gov/research/demographic/reports/estimates/e-5/2001-10/view.php), 2000-2001 / 2008-2009.
3. Per capita water use has been calculated in compliance with the requirements of the Water Conservation Bill of 2009.

Figure 8: SFPUC In-City Retail 10-Year Gross Water Use



4.2.2 Urban Water Use Target

The SFPUC has elected to use Method 3 of the four approved methods provided for by the Water Conservation Bill of 2009 for determining urban water use targets. The SFPUC in-City Retail distribution system is contained entirely within the San Francisco Bay hydrologic region. The hydrologic region baseline, interim, and 2020 targets are 157, 144, and 131 gpcd, respectively. To calculate the SFPUC urban water use targets using Method 3, 95% of the interim and 2020 targets are calculated, yielding interim and 2020 urban water use targets of 136.8 and 124.5 gpcd, respectively.

4.2.3 Confirmation of Urban Water Use Target

California Water Code Section 10608.22 requires confirmation of the base daily per capita water use using a 5-year base period to assure that the use target meets a minimum threshold. The 5-year continuous base period is to end no earlier than December 31, 2007, and no later than December 31, 2010. The SFPUC has used the 5-year period from FY 05-06 to FY 09/10 for calculation of the 5-year baseline.

Calculation of Base Daily Per Capita Water Use for the 5-year period is calculated in the same way as for the 10-year period (see above):

Step 1b: Estimate distribution system area

Step 2b: Estimate Service Area Population for each year in the base period

Step 3b: Calculate Gross Water Use for each year in the base period (expressed in gallons per day)

Step 4b: Calculate Annual Daily Per Capita water use for each year in the base period by dividing Gross Water Use by Service Area Population

Step 5b: Calculate Base Daily Per Capita Water Use as the average per capita water use

Each calculation step for determining Base Daily Per Capital Water Use for the 5-year period is shown below.

Step 1: Estimate Distribution System Area (Five-Year Baseline). The distribution system area is the SFPUC's in-City retail distribution system, shown previously in **Figure 7**.

Step 2: Estimate Service Area Population for Base Period (5-Year Baseline). As shown in **Table 16**, the retail population was developed for the period from FY 00/05 to FY 09/10 based on Department of Finance total population data for the City and County of San Francisco (2005 – 2009).

Step 3: Calculate Gross Water Use (5-Year Baseline). Gross water use for the City of San Francisco is provided in **Table 16**. As discussed previously, gross water use was developed by compiling water from the SFPUC's own sources delivered to Retail Customers (total production minus deliveries to Wholesale Customers). Changes in in-City storage were then factored in to develop gross water use.

The SFPUC compiles daily flow data for the County-line meters, System Input and In-Line Meters, and daily reservoir water level data. The meters, water level sensors, and associated metering equipment are all inspected, tested, calibrated, and maintained according to the applicable meter calibration and maintenance frequency by an independent metering consultant. These include annual pitot tube tests, quarterly secondary meter equipment testing and calibration, cleaning, flushing, inspecting, and lubricating. The flow quantities are expected to be accurate and no meter error adjustment is necessary.

Step 4: Calculate Annual Daily Per Capita Water Use (5-Year Baseline). Annual Daily Per Capita Water Use was calculated by dividing gross water use by population. Annual Daily Per Capita Water Use is shown on the last row in **Table 16**.

Step 5: Calculate Base Daily Per Capita Water Use (5-Year Baseline). Base Daily Per Capita Water Use is calculated as the average of per capita water use, or 92.2 gpcd.

Table 16: SFPUC In-City Retail Gross Water Use from FY 00/05 to FY 09/10

	05/06	06/07	07/08	08/09	09/10
Own Sources (mgd)[1]	79.4	76.8	76.7	75.0	72.5
Imported Sources (mgd)	0	0	0	0	0
Volume Exported (mgd)	0	0	0	0	0
Change in Storage (mgd)	0.00	0.03	0.00	-0.01	0.06
Gross Water Use (mgd)	79.4	76.8	76.7	75.0	72.4
Retail Population[2]	807,382	813,929	823,940	836,360	846,601
Per Capita Use (gpcd)[3]	**98.3**	**94.3**	**93.1**	**89.7**	**85.6**

1. All sources are metered, and all meters are calibrated annually.
2. Population data from California Department of Finance for City and County of San Francisco (http://www.dof.ca.gov/research/demographic/reports/estimates/e-5/2001-10/view.php), 2005 - 2009.
3. Per capita water use has been calculated in compliance with the requirements of the Water Conservation Bill of 2009.

The SFPUC's in-City Retail Base Daily Per Capita Water Use for the 5-year period from 05/06 to 09/10 is 92.2 gpcd. Because this is below 100 gpcd, no adjustments to the urban water use target are needed (California Water Code Section 10608.22).

4.2.4 Water Use Reduction Plan

The SFPUC's in-City Retail current Base Daily Per Capita Water Use is 92.2 gpcd, which is below both the interim and 2020 urban water use targets of 136.8 and 124.5 gpcd, respectively; therefore, the SFPUC is already in compliance with the requirements of the Water Conservation Bill of 2009.

Although it is already in compliance with the Water Conservation Bill, the SFPUC remains committed to implementing conservation as an important component of its water supply portfolio, and will continue its efforts to minimize retail water demands through conservation. In 2010, the SFPUC conducted a detailed analysis on the effectiveness of its water conservation measures. The analysis projected a total savings potential of 5.0 mgd by 2018 and 6.0 mgd by 2035 from active conservation. Detail of the analysis is documented in the SFPUC Retail Demand Model Update and Calibration Technical Memorandum (**Appendix D**), which was developed as part of the 2011 Retail Water Conservation Plan. This Plan is intended to serve as a living document that will be reviewed and updated periodically as part of the SFPUC's adaptive management approach.

4.3 WHOLESALE WATER DEMANDS

The SFPUC provides water to 27 Wholesale Customers in San Mateo, Alameda and Santa Clara Counties under contractual agreements. These entities receive over two-thirds of the SFPUC's RWS watershed supply. Of the 27 Wholesale Customers (**Figure 3**), 14 derive 100% of their water from the SFPUC.

4.3.1 Wholesale Water Contractual Obligations and Demands

The following sections describe the various water supply contracts and other contractual obligations that the SFPUC has entered into with its Wholesale Customers.

1984 Settlement Agreement and Master Water Sales Contract: Between 1984 and 2009, the SFPUC provided water to its Wholesale Customers under the terms of the 1984 Settlement Agreement and Master Water Sales Contract (1984 Agreement). The 1984 Agreement created a total "Supply Assurance" of 184 mgd (measured on an annual average basis) for 25 of the Wholesale Customers. The Cities of San Jose and Santa Clara are served wholesale water on an interruptible basis and such sales are not deemed to be within the Supply Assurance. The Supply Assurance is not a guarantee of water delivery in every year, but may be reduced due to emergencies, water shortages, drought, or system maintenance and repair. Of the 25 Wholesale Customers within the Supply Assurance, 24 have Individual Supply Guarantees (ISG) within the 184 mgd. The City of Hayward does not have an ISG because it had previously negotiated a permanent, all requirements individual contract. The City of Hayward continues to receive water under a contract entered into in 1960 with no expiration date or limitation in supply. Under the 184 mgd Supply Assurance, the 24 Wholesale Customers with ISGs would be required to reduce their allocation to accommodate the needs of the City of Hayward in the event that Hayward's water use exceeds its estimated share of the Supply Assurance.

2009 Water Supply Agreement: The 1984 Agreement expired on June 30, 2009. In July 2009, the SFPUC entered into the Water Supply Agreement (WSA) with the Wholesale Customers. The WSA continues the existing 184 mgd Supply Assurance. The WSA includes an "Interim Supply Limitation", which limits water sales to Retail and Wholesale Customers from the RWS watersheds to 265 mgd through 2018 based upon the water supply variant adopted by the SFPUC in its approval of the WSIP in Res. No. 08-200. Under the Interim Supply Limitation, Retail Customers receive 81 mgd and the Wholesale Customers receive 184 mgd from the RWS. The 184 mgd Interim Supply Limitation includes 9 mg of demand allocated to the Cities of San Jose and Santa Clara, but both cities retain their temporary, interruptible status.

As part of the implementation of the Interim Supply Limitation, on December 14, 2010 the SFPUC established each individual Wholesale Customer's share of the Interim Supply Limitation, referred to as "Interim Supply Allocations" (ISAs – see SFPUC Res. No. 10-0213). The ISAs are effective until December 31, 2018 and do not affect the Supply Assurance or the ISGs. The ISGs and ISAs are listed in **Table 17**.

Environmental Enhancement Surcharge: If combined sales to Wholesale and Retail Customers exceed the Interim Supply Limitation of 265 mgd, the SFPUC will impose an Environmental Enhancement Surcharge on Retail Customers if sales exceed 81 mgd and on individual Wholesale Customers whose purchases exceed their ISAs. As described in Section 4.04 of the WSA, the SFPUC plans to establish the Environmental Enhancement Surcharge concurrently with the budget-coordinated rate process to be effective for water sales in FY 2011/12 through 2017/18. The SFPUC is in the process of developing the methodology and amount of this volume-based charge.

2018 Water Supply Decisions: Subject to completion of necessary CEQA review and the exercise of retained discretion by the SFPUC to reject or modify proposed projects, the WSA requires the SFPUC to make the following decisions by December 31, 2018:

- Whether to make San Jose and Santa Clara permanent customers, to the extent that the SFPUC determines that long-term water supplies are available.
- Whether to provide water in excess of the supply assurance to meet wholesale demands through the year 2030, and whether to offer a corresponding increase in the supply assurance.

Wholesale Demands: **Table 17** and **Table 18** show the demands of the Wholesale Customers on the SFPUC RWS. **Table 17** shows the unrestricted purchase projections of the Wholesale Customers through 2035 assuming the 265 mgd supply limitation from the RWS watersheds ends in 2018. **Table 18** shows the wholesale customer demands for the same time period, assuming the 265 mgd supply limitation extends beyond 2018.

Table 17: SFPUC Wholesale Customer Water Demands (mgd)[1]

Wholesale Customer	ISG[2]	ISA[3]	2005	2010	2015	2020	2025	2030	2035
Alameda County Water District	13.76	13.76	10.80	10.81	13.76	13.76	13.76	13.76	13.76
City of Brisbane / Guadalupe Valley Municipal Improvement District	0.98	0.96	0.68	0.58	0.98	1.02	1.04	1.06	*1.07*
City of Burlingame	5.23	4.97	4.52	3.93	4.69	4.84	4.94	5.05	5.24
California Water Service Company	35.68	35.68	34.83	32.57	33.70	31.73	32.43	33.16	33.91
Coastside County Water District	2.18	2.18	1.75	1.82	2.18	2.18	2.18	2.18	2.18
Cordilleras Mutual Water Association	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
City of Daly City	4.29	4.29	6.94	3.21	4.29	4.29	4.59	4.89	5.37
City of East Palo Alto	1.96	1.96	2.02	1.81	2.37	2.48	2.64	2.82	3.04
Estero Municipal Improvement District	5.90	5.85	5.21	4.9	5.70	5.30	5.40	5.40	5.90
City of Hayward	22.08	22.92	18.51	17.25	22.00	23.60	25.80	28.10	30.70
Town of Hillsborough	4.09	3.72	3.37	2.97	3.72	4.09	4.09	4.09	4.09
City of Menlo Park	4.46	4.1	3.38	3.04	3.96	4.13	4.44	4.62	*4.46*
Mid-Peninsula Water District	3.89	3.71	3.30	2.87	3.70	3.80	3.80	3.90	*3.89*
City of Millbrae	3.15	3.13	2.43	2.24	3.20	3.30	3.30	3.40	*3.41*
City of Milpitas	9.23	8.96	6.67	6.28	7.07	7.69	8.25	8.80	*8.90*
City of Mountain View	13.46	11.43	10.53	8.95	10.64	10.72	11.16	11.62	12.11
North Coast County Water District	3.84	3.67	3.42	3.02	3.62	3.70	*3.70*	3.70	3.76
City of Palo Alto	17.08	14.7	12.08	10.99	12.67	12.91	13.12	13.84	*13.90*
Purissima Hills Water District	1.63	1.63	2.01	1.75	1.74	1.74	1.80	1.84	1.84
City of Redwood City	10.93	10.88	11.11	9.61	11.20	11.40	11.50	11.60	*11.62*
City of San Bruno	3.25	2.65	3.11	1.46	2.65	3.25	3.25	3.25	*3.28*
City of San Jose [4,5]	0.00	4.13	4.40	4.13	4.50	6.34	6.34	6.34	6.34

Wholesale Customer	ISG[2]	ISA[3]	2005	2010	2015	2020	2025	2030	2035
City of Santa Clara [4]	0.00	4.13	4.14	2.35	4.50	4.50	4.50	4.50	4.50
Stanford University	3.03	2.91	2.32	2.14	2.70	2.90	3.10	3.30	3.50
City of Sunnyvale	12.58	10.59	8.76	9.92	8.93	8.93	8.93	8.93	8.93
Westborough County Water District	1.32	1.08	1.06	0.84	0.89	0.88	0.87	0.85	0.84
Total:	**184.0**	**184.0**	**167.4**	**149.5**	**175.4**	**179.5**	**184.9**	**191.0**	**196.5**

1. Projections reflect SFPUC unrestricted purchase projections provided by Wholesale Customers, regardless of ISG or ISA. Italicized values indicate interpolation or extrapolation. Wholesale Customers projections are currently being updated through individual Urban Water Management Planning processes, and therefore may change.
2. Individual Supply Guarantee (ISG) refers to each Wholesale Customer's share of the 184 mgd Supply Assurance as defined in section 3.01 of the 2009 Water Supply Agreement between the City and County of San Francisco and Wholesale Customers (2009 WSA). The Supply Assurance is the 184 mgd maximum annual average metered supply of water dedicated by San Francisco to public use in the wholesale service area (not including the cities of San Jose and Santa Clara). Hayward's ISG value was calculated as 184 mgd less the total of permanent customer ISG values (161.91 mgd).
3. ISA refers to each Wholesale Customer's share of the 265 mgd Interim Supply Limitation through 2018.
4. The Cities of San Jose and Santa Clara are provided water by the SFPUC on a temporary, interruptible basis. Subject to the process requirements for interruption or reduction of supply provided in Section 4.06 of the WSA, the SFPUC will continue to supply water to San Jose and Santa Clara on a temporary, interruptible basis pending a decision by the Commission, pursuant to Section 4.05H of the WSA, as to whether to make San Jose and Santa Clara permanent customers of the RWS. Per the WSA, the combined annual average water usage of San Jose and Santa Clara shall not exceed 9 mgd average annual supply.
5. In a letter to BAWSCA, the City of San Jose indicated a desire to purchase between 4.50 and 6.34 mgd from the SFPUC between 2020 and 2035; however, pending the 2018 decisions by the SFPUC regarding whether to (1) grant permanent status to San Jose and Santa Clara, and (2) increase the Supply Assurance, the WSA limits combined purchases to the cities to 9.0 mgd on a temporary, interruptible basis.

For the purposes of the supply and demand comparisons provided in Section 5.7, it is assumed that the 265 mgd supply limitation extends beyond 2018. Projected Wholesale Customer demands have been limited to 184 mgd. Prior to 2018, this 184 mgd includes the demands of San Jose and Santa Clara. After 2018, subject to the process requirements for interruption or reduction of supply provided in Section 4.06 of the WSA, the SFPUC will continue to supply water to San Jose and Santa Clara on a temporary, interruptible basis pending a decision by the Commission, pursuant to Section 4.05H of the WSA, as to whether to make San Jose and Santa Clara permanent customers of the RWS. Per the WSA, the combined annual average water usage of San Jose and Santa Clara shall not exceed 9 mgd average annual supply.

Table 18 presents wholesale demands under this assumption.

Table 18: SFPUC Wholesale Customer Purchase Projections with Extended 265 mgd Supply Limitation[1]

Purchase Projections (mgd)	2005	2010	2015	2020	2025	2030	2035
Wholesale Customer Purchase Projections	167.4	149.5	175.4	177.6	183.1	184.0	184.0

1. Projected Wholesale Customer demands limited to 184 mgd. Prior to 2018, 184 mgd includes the demands of San Jose and Santa Clara. After 2018, San Jose and Santa Clara will be supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2018).

SECTION 5: WATER SUPPLY RELIABILITY

This section addresses the reliability of both the SFPUC RWS and deliveries to the SFPUC's Retail Customers. As previously described, the Retail Customers' water supply comes from the SFPUC RWS watersheds and local water supply sources (groundwater and recycled water). Approximately 32% of the SFPUC's RWS supply is delivered to Retail Customers, and the remaining 68% is delivered to Wholesale Customers.

5.1 RWS SUPPLY RELIABILITY

The SFPUC's regional water supply system reliability is expressed in terms of the system's ability to deliver water during droughts. Reliability is defined by the amount and frequency of water delivery reductions (deficiencies) required to balance customer demands with available supplies in droughts. The SFPUC plans its water deliveries anticipating that a drought more severe than the worst drought ever experienced may occur. This section discusses both system-wide deficiencies and anticipated retail deficiencies that the City may experience.

The SFPUC's RWS watershed supplies have experienced infrequent, short-term outages as a result of water quality events. Because Hetch Hetchy water is not filtered, it is subject to strict water quality standards set by the California Department of Public Health. However, as a result of weather events, turbidity levels can exceed standards requiring the Hetch Hetchy supply to be diverted to local storage (in the case of short-term events) or shut off (in the case of longer-term events) until turbidity levels drop to within standards. During these periods, the SFPUC's entire supply comes from the Sunol Valley Water Treatment Plant and the Harry Tracy Water Treatment Plant, both of which are supplied by local Bay Area reservoirs.

Table 19 summarizes the legal, environmental, water quality, climatic, and other factors potentially resulting in inconsistency of supply. As described previously, the RWS may be subject to volume reductions due to required instream flow releases as well as climatic variation. Groundwater supplies are typically limited by the quality and quantity of available supplies. Institutional arrangements governing potential water transfers may affect their availability, and climatic variability may impact the availability of surface water in some years. Recycled water is limited by water quality requirements that legally restrict recycled water supply for some uses.

Table 19: Factors Potentially Affecting Consistency of Supplies

WATER SUPPLY SOURCES	LEGAL	ENVIRONMENTAL	WATER QUALITY	CLIMATIC	OTHER (SPECIFY)
Regional Water System		✓		✓	
Groundwater			✓	✓	
Water Transfer				✓	Institutional
Recycled Water	✓		✓		

5.1.1 Estimating the Frequency and Magnitude of SFPUC RWS Supply Deficiencies

The total amount of water the SFPUC has available to deliver to Retail and Wholesale Customers during a defined period of time depends on several factors, including the amount of water that is available to SFPUC from natural runoff, the amount of water in reservoir storage, and the amount of that water that must be released from the SFPUC's system for purposes other than customer deliveries (e.g., releases below Hetch Hetchy reservoirs to meet Raker Act and instream flow release requirements, and future releases from Lower Crystal Springs and Calaveras Reservoirs to support anadromous fisheries).

The 1987-92 drought profoundly highlighted the shortfall between the SFPUC's water supplies and its demands. Other than during the drought of 1976-77, drought sequences in the past did not seriously affect the ability of the SFPUC RWS to sustain full deliveries to its Retail and Wholesale Customers. Based on the 1987-92 drought experience, the SFPUC assumes its "firm" capability to be the amount the system can be expected to deliver during historically experienced drought periods. In estimating this firm capability, the SFPUC assumes the potential recurrence of a drought such as that which occurred during 1987-92, plus an additional 2-year period of limited water availability. This drought sequence is referred to as the "design drought" and serves as the basis for planning and modeling of future drought scenarios.

5.1.2 SFPUC's Normal Year and Design Drought

For planning purposes, the SFPUC "normal year" is based on historical hydrology under conditions that allow the reservoirs to be filled over the course of the snowmelt season, allowing full deliveries to customers.

The SFPUC Design Drought, used for planning and modeling of future drought scenarios, is based on historic droughts and hydrology. As detailed below, it is a drought sequence that is more severe than what the SFPUC RWS has historically experienced.

The 1987-92 drought defines the most extreme recorded drought for SFPUC water deliveries, and establishes the basis for the Design Drought sequence. The drought covered a 6½-year period from July 1986 (when the SFPUC reservoirs were full) to about November/December 1992 (when the SFPUC reservoirs reached minimum storage). Although the SFPUC reservoir system began to recover with precipitation during the last 6 months of the drought, from July 1992 through December 1992, SFPUC customer purchases exceeded SFPUC inflow and the SFPUC system storage continued to decline through November/December 1992. Because the last 6 months of the 1987-92 drought includes the beginning of this recovery period, it has been removed from the SFPUC's Design Drought.

In summary, the design drought sequence used by the SFPUC for reliability planning totals an 8½-year period and is based on the following factors:

- **Historical Hydrology:** The 6 years of hydrology from the historical drought (July 1986 to June 1992);

- **Prospective Drought:** A 2½-year period which includes the 1976-1977 drought (to represent a drought sequence worse than historical); and
- **System Recovery Period:** The last 6 months of the Design Drought are the beginning of the system recovery period. The precipitation begins in the fall, and by approximately the month of December the SFPUC reservoir inflow exceeds customer demands and SFPUC system storage begins to recover.

For the purposes of the required UWMP 3-year drought sequence for 2010, years two through four of the SFPUC Design Drought sequence are used. **Table 20** summarizes the expected reductions in available water supply in normal, single dry, and multiple dry years. Section 5.2.5 describes the available water supply for years 2015-2035.

Table 20: Year 2010 SFPUC System Water Availability During Normal and Drought Scenarios

	AVERAGE / NORMAL WATER YEAR	SINGLE DRY WATER YEAR[2]	MULTIPLE DRY YEARS[1]		
			YEAR 1	YEAR 2	YEAR 3
Regional Water System Watersheds	100%	90%	90%	80%	80%
Groundwater [3]	100%	100%	100%	100%	100%
Recycled Water [3]	100%	100%	100%	100%	100%

1. The multiple dry years shown in this table reflect years 2-4 of the SFPUC 8.5-year design drought for year 2010, and years 6-8 of the SFPUC 8.5-year design drought for years 2015 through 2035.
2. Measured as percentage of normal year availability.
3. Groundwater and recycled water are San Francisco local supplies and are only available for use in the retail service area.

At current delivery levels, the SFPUC RWS can be expected to experience up to a 25% shortage 15 to 20% of the time during multiple-year drought sequences. Therefore, the SFPUC is faced with the necessity to develop a long-term strategy to accommodate or rectify the potential of future water shortages throughout its wholesale and retail operations.

5.2 DRY YEAR WATER SUPPLY OPTIONS

As an established major water supplier for the Bay Area region, the SFPUC is responsible for securing and managing its existing system supplies and planning for future needs, as well as securing its own retail supply.

The WSIP water supply program includes development of dry year supplies for the RWS. The PEIR included an analysis of dry year water supply transfers from the senior water rights holders on the Tuolumne River, MID and TID; a groundwater conjunctive use project (the Groundwater Storage and Recovery Project); and a regional desalination project. The SFPUC is investigating the possibility of a dry year water transfer with MID and TID for 2 mgd, and the SFPUC is implementing the Groundwater Storage and Recovery Project.

The SFPUC's WSIP provides goals and objectives to improve the supply reliability and delivery reliability of the RWS. The goals and objectives of the WSIP related to water supply are presented in **Table 21**.

Table 21: WSIP System Performance Objectives

PROGRAM GOAL	SYSTEM PERFORMANCE OBJECTIVE
Water Supply: meet customer water needs in non-drought and drought periods	• Meet average annual water demand of 265 mgd from the SFPUC watersheds for Retail and Wholesale Customers during non-drought years for system demands through 2018. • Meet dry year delivery needs through 2018 while limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts. • Diversify water supply options during non-drought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.

The adopted WSIP included several water supply elements to address the WSIP water supply goals and objectives, which together will allow the SFPUC to meet at least 80% of its customer demand during droughts. The SFPUC will continue to rely on rationing up to no more than 20% in any one year of a drought.

The following describes the dry year projects of the adopted WSIP to augment all year type water supplies during drought:

- Restoration of Calaveras Reservoir capacity
- Restoration of Crystal Springs Reservoir capacity
- Groundwater Storage and Recovery Project
- Water transfer with MID/TID

5.2.1 Restoration of Calaveras Reservoir Capacity

The adopted WSIP includes the Calaveras Dam Replacement Project, which restores the reservoir capacity of Calaveras Dam from 38,100 acre-feet to 96,850 acre-feet, returning about 60,000 acre-feet of reservoir storage to the SFPUC water system. The restored capacity provides storage for emergency and drought water supplies, providing up to 7 mgd over the SFPUC design drought. In general, a restored Calaveras Reservoir provides 40% of the SFPUC's local system storage capacity. Nearly 66% of local water system yield comes through Calaveras Reservoir from the Alameda Creek watershed. The Environmental Impact Report (EIR) was certified and the project was adopted by the SFPUC in January 2011. Construction is expected to be completed in 2015.

5.2.2 Restoration of Crystal Springs Reservoir Capacity

The adopted WSIP includes the Lower Crystal Springs Dam Improvements Project, which will increase the average storage of the reservoir from 15.4 billion gallons to 17.8 billion gallons with a maximum normal operating level of 287.8 feet, providing an additional 2.4 billion gallons of storage to the SFPUC water system. The restored capacity provides storage for emergency and drought water supplies, providing up to an additional 0.5 mgd over the SFPUC design drought. The Project EIR was certified and the project was adopted by the SFPUC in October 2010. Construction is expected to be completed in 2013.[13]

5.2.3 Regional Groundwater Storage and Recovery Project

The proposed Regional Groundwater Storage and Recovery Project is an in-lieu conjunctive use project that would balance the use of both groundwater and surface water to increase water supply reliability during dry years or in emergencies. The proposed project is located in the South Westside Basin in northern San Mateo County and is sponsored by the SFPUC in coordination with its partner agencies, the California Water Service Company, the City of Daly City and the City of San Bruno. The partner agencies currently purchase wholesale surface water from the SFPUC and also independently operate groundwater production wells for drinking water and irrigation.

The proposed Regional Groundwater Storage and Recovery Project would extract stored groundwater from the South Westside Basin groundwater aquifer in San Mateo County for delivery to the RWS and the partner agencies. During years of normal or heavy precipitation, the proposed project would provide surface water to the partner agencies to reduce the amount of groundwater pumped (sometimes called "in lieu recharge"). Over time, the reduced pumping would result in the storage of approximately 61,000 acre-feet of water (more than the supply contained in the Crystal Springs Reservoir on the SFPUC Peninsula Watershed). The project would consist of installing up to 16 new wells to pump the stored groundwater during a drought. The new wells would allow recovery of the stored water at a rate of up to 7.2 mgd for a 7.5-year dry period. The water would be in compliance with the California DPH requirements for drinking water supplies. The proposed project would include construction of well pump stations, disinfection units, and piping. The proposed project is currently undergoing environmental review. EIR certification is expected in September 2012, and construction is expected to begin in May 2013.[13]

5.2.4 Water Transfer with Modesto Irrigation District/Turlock Irrigation District

The adopted WSIP includes a water transfer between the SFPUC and its partners on the Tuolumne River. Certification of the WSIP PEIR, in October 2008, has allowed the SFPUC to move forward in securing a dry year water transfer in the Tuolumne River basin from the senior water rights holders: MID and TID. The water transfer would yield an average of 2 mgd over the design drought.

13 This UWMP reflects that this supply will be available during the 2015-2020 time increment because information in this document is presented in 5-year increments and this supply will be available during the majority of this time period. The SFPUC believes there will be sufficient supply for the three-year drought period analyzed in this document.

5.2.5 Summary of Dry Year Supplies

The dry year water supplies described above will allow the SFPUC to meet at least 80% of its customer demand during droughts. The SFPUC will continue to rely on rationing up to no more than 20% in any one year of a drought. This UWMP assumes that these resources will be available to the RWS in the volumes and timeframes indicated in **Table 22**.

Table 22: Dry Year Water Supply Reliability Water Supply Options (2010 to 2035)

SUPPLY OPTION[1]	SUPPLY AVAILABLE(MGD)					
	2010	2015	2020	2025	2030	2035
Crystal Springs Reservoir Storage Recovered to 22.1 bg [2,3]	0	0.5	0.5	0.5	0.5	0.5
Regional Groundwater Storage and Recovery (mgd)	0	7.2	7.2	7.2	7.2	7.2
Calaveras Reservoir Storage Recovered to 31.5 bg	0	7	7	7	7	7
Water Transfers (mgd)	0	2.0	2.0	2.0	2.0	2.0

1. Water supply option schedule information from SFPUC WSIP, as adopted by the SFPUC on 11/29/05.
2. bg = Billion gallons
3. Crystal Springs Reservoir has a maximum storage capacity of 22.1 billion gallons (at 291.8 feet). When the Lower Crystal Springs Dam Improvement is complete, the reservoir will be operated normally at 287.8 feet (4 feet below capacity) based on permit conditions.

With current water supplies, the SFPUC experiences shortages between 10% and 25% at the planning level demand of 265 mgd. **Table 23** illustrates the delivery reduction sequence over the design drought. Implementation of the WSIP water supply projects will improve the SFPUC's water supply reliability, particularly in the earlier years of the drought, however, as the drought progresses the SFPUC continues to experience multiple years of 20% rationing as shown in **Table 23**. For the purposes of the UWMP multiple dry-year sequence, the SFPUC uses years 2-4 of the design drought for year 2010 supply and demand comparisons and uses years 6-8 for the supply and demand comparisons for 2015-2035. Any sequence of years can be used in the analysis, however, the SFPUC chose to use the worst sequence of years from 2015-2035 to demonstrate that even with the WSIP water supply projects in place the SFPUC system is still subject to multiple years of 20% shortage at a planning level demand of 265 mgd.

Table 23: SFPUC Design Drought Water Delivery Reduction Sequence

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 8.5
	% REDUCTION OVER DESIGN DROUGHT								
RWS Watersheds 2010 (pre-WSIP)	0%	10%	20%	20%	20%	20%	20%	25%	25%
RWS Watersheds 2015-2035 (post-WSIP)	0%	0%	10%	10%	20%	10%	20%	20%	20%

Continued progress on the dry year supply projects is an important component of the SFPUC's dry year water supply program. As discussed previously, in adopting the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements project, the SFPUC agreed to provide instream flow releases below Calaveras Dam and Lower Crystal Springs Dam, as well as bypass flows below Alameda Creek Diversion Dam, to obtain required federal and state resource agency permits for construction of these projects. The instream flow release requirements for Alameda Creek and San Mateo Creek represent a potential decrease in available annual average water supply of 3.9 mgd and 3.5 mgd, respectively, for a total shortfall of 7.4 mgd on an average annual basis.[14] These instream flow releases could potentially create a shortfall in meeting the SFPUC demands of 265 mgd and slightly increase the SFPUC's dry year water supply needs. The effects of such a shortfall, if any, would occur upon the completion of construction of both the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements project in approximately 2015 and 2013, respectively, at the time when the SFPUC will be required to provide the instream flow releases.

The SFPUC is currently exploring other future supplies to offset the 7.4 mgd in instream flow release requirements. These projects may include:

- Development of additional conservation and recycling
- Development of additional groundwater supplies
- Additional water transfer volumes from MID and/or TID
- Increase in Tuolumne River supply
- Revising the Upper Alameda Creek Filter Gallery Project capacity
- Development of a desalination project

Section 3.3 provides additional information on the SFPUC's planned future water supply projects.

5.3 BAY AREA REGIONAL EFFORTS TO IMPROVE WATER SUPPLY RELIABILITY

The following projects and efforts currently underway or completed will help the SFPUC RWS meet its water supply reliability needs. Some of these projects are reflected in the SFPUC's current strategy for meeting water supply needs. As the remainder of these projects move through the planning stages they will continue to inform the SFPUC water supply strategy.

14 This water supply decrease assumes the adopted WSIP program element of an average annual target delivery of 265 mgd. The analysis also assumes that all of the water supply components of the adopted WSIP are implemented and all WSIP projects are implemented, including the Upper Alameda Creek Filter Gallery project, which in accordance with the Program Environmental Impact Report (PEIR) assumptions is estimated to recapture up to 6300 acre-feet (AF) per year (5.6 mgd).

5.3.1 Desalination

The SFPUC's investigations of desalination as a water supply source have focused primarily on the potential for regional facilities. The proposed Bay Area Regional Desalination Project is a joint venture between the SFPUC, CCWD, EBMUD, SCVWD, and Zone 7 Water Agency.

The regional desalination project would provide an additional source of water during emergencies, provide a supplemental water supply source during extended droughts, allow other major water facilities to be taken out of service for maintenance or repairs, and increase supply reliability by providing water supply from a regional facility. The Bay Area Regional Desalination Project will produce 10 to 50 mgd.

5.3.2 Regional Interties

Regional interties help increase the reliability of the SFPUC RWS by allowing for water exchanges during emergencies, water shortages or maintenance.

- **EBMUD-Hayward SFPUC Intertie:** In 2002, the SFPUC formed a partnership with EBMUD and the City of Hayward to construct Skywest Pump Station and 1.5 miles of pipeline to link their systems. These facilities are now completed and can convey up to 30 mgd among these three agencies to boost water supply reliability when needed. EBMUD and the SFPUC own these facilities jointly, while the City of Hayward maintains and operates them in coordination with EBMUD and the SFPUC.
- **Milpitas Intertie:** The SFPUC and SCVWD constructed a 40 mgd intertie between their two systems to exchange water during emergencies and planned maintenance. The intertie was recently used during maintenance of one of SCVWD's water treatment plants.
- **South Bay Aqueduct Interties:** The SFPUC has in the past used one permanent and one temporary intertie to the SBA for water transfers, which if reactivated would enable the SFPUC to receive SWP water.

5.3.3 Bay Area Integrated Regional Water Management Plan

The SFPUC is an active participant in the nine-county Bay Area Integrated Regional Water Management planning process. The Integrated Regional Water Management Plan (IRWMP) was first completed in November 2006 and most recently amended in December 2010. The IRWMP covers water supply and water quality, wastewater and water recycling, storm water and flood protection, and habitat protection and ecosystem restoration objectives and efforts in the Bay Area. The IRWMP also identifies integrated and collaborative projects among Bay Area agencies. DWR has recently recommended over $800,000 in Proposition 84 grant funding for the Bay Area region to be used to update the Bay Area IRWMP.

5.4 DROUGHT RESPONSE

This section presents the SFPUC's water shortage contingency plan and includes the following information:

- An overview of SFPUC's response to past water shortage experiences;
- A summary of the procedures for allocating reduced deliveries from the SFPUC RWS; and
- A summary of the SFPUC's retail plan for responding to water shortages.

5.4.1 Past Experience with Water Shortages

Every water system has vulnerabilities in terms of its ability to provide a safe and reliable supply of water. Water shortages can occur in a number of ways. Very localized shortages can occur due to distribution system problems and system shortages can occur due to major facility failures. Yet, beyond system facility contingencies, there exists the potential vulnerability to drought, which limits the amount of water that is available over a series of years. This latter type of contingency is not necessarily caused by physical facility limitations. Within the past 25 years, San Francisco has experienced both localized shortages due to earthquakes and system-wide shortages due to drought.

The SFPUC's past experiences with water shortages, due to drought and earthquakes, have helped shape its current plans and policies relative to water shortage preparedness and response:

- In 1987-92 San Francisco experienced a serious drought. This 6-year drought provides an example of how various stages of action were taken in times when the operational capabilities of Hetch Hetchy and other water supplies available to the SFPUC were taxed to a point that forced drastic actions to avoid running out of water.

- Following the October 17, 1989 Loma Prieta earthquake, the SFPUC worked with the Mayor's Office of Emergency Response to reconnect service to those who were impacted by the earthquake. Most of the homes that lost water service were reconnected to the water system's lines within 72 hours.

- In April 2007, below normal precipitation and snow pack caused the SFPUC to initiate a 10% voluntary reduction in water use in the service area. The call for a voluntary reduction continued through 2009.

The 1987-92 drought illustrated the deficit between the SFPUC's water supplies and its demands. Other than the 1976-77 drought, drought sequences in the past did not seriously affect the ability of the SFPUC to maintain full deliveries to its customers. As the SFPUC progressed into the drought and reservoir storage continued to decline, it became evident that full water deliveries could not be sustained without a risk of running out of water before the drought was over. This circumstance became a reality in early 1991 when the Hetch Hetchy Reservoir became so depleted (less than 25,000 acre-feet of storage in a reservoir with over 360,000 acre-feet of capacity)

that minimum instream flow releases and anticipated demands required the SFPUC to initiate programs to achieve a 45% reduction in system-wide water deliveries to balance water supplies with deliveries. Fortunately, unexpected runoff provided relief from the severity of that instance of water shortage; however, the drought was far from over. **Appendix E** provides a more detailed summary of San Francisco's 1987-92 drought experience and the actions taken at the time.

5.4.2 Water Shortage Allocation Plan

As the 1987-1992 drought progressed and reservoir storage continued to decline, it became apparent that continued full deliveries could not be sustained without the risk of running out of water before the drought ended.

To provide some level of assurance that water could be delivered continuously throughout a drought (although at reduced levels), the SFPUC adopted a drought planning sequence and associated operating procedures that trigger different levels of water delivery reduction rationing relative to the volume of water actually stored in SFPUC reservoirs. Each year, during the snowmelt period, the SFPUC evaluates the amount of total water storage expected to occur throughout the RWS. If this evaluation finds the projected total water storage to be less than an identified level sufficient to provide sustained deliveries during drought, the SFPUC may impose delivery reductions or rationing.

SFPUC's response to water shortages also included the adoption of new agreements regarding how water would be allocated in future drought periods. In connection with the adoption of the WSA, the Wholesale Customers and San Francisco adopted the Water Shortage Allocation Plan (WSAP) which outlines procedures for allocating water from the RWS to retail and Wholesale Customers during system-wide shortages of 20% or less.

In connection with the adoption of the WSA, the Wholesale Customers and San Francisco adopted the Water Shortage Allocation Plan (WSAP) which outlines procedures for allocating water from the RWS to retail and Wholesale Customers during system-wide shortages of 20% or less (Tier 1 Plan). Section 3.11.C of the WSA authorizes the Wholesale Customers to adopt a methodology for allocating the collective wholesale allocation among the individual Wholesale Customers (see "Tier 2 Drought Implementation Plan" discussion).

For shortages in excess of 20%, the SFPUC will meet with the wholesale customers to determine if modifications to the Tier 1 Plan can be agreed upon by the SFPUC and the wholesale customers. If they cannot agree, the SFPUC may allocate water in its discretion, subject to challenge by the wholesale customers, unless all of the wholesale customers direct that a particular Tier 2 allocation methodology be used.

Regional Water Shortage Allocations: During a drought, it is expected that the Retail and Wholesale Customers would experience a reduction in the amount of water received from the RWS. The WSAP provides specific allocations of the available water supply between the Retail and Wholesale Customers collectively associated with varying system-wide shortages of up to 20%, as shown in **Table 24.**

Table 24: Retail / Wholesale Water Allocation during System-wide Water Shortage

LEVEL OF SYSTEMWIDE REDUCTION IN WATER USE REQUIRED	SFPUC SHARE OF AVAILABLE WATER	WHOLESALE CUSTOMERS SHARE (COLLECTIVELY)
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

In addition to providing an allocation method, the WSAP also includes provisions for transfers, banking and excess use charges. See **Appendix G** for the full text of the WSAP.

According to the WSAP allocations presented above in **Table 24**, **Table 25** and **Table 26** show SFPUC RWS Retail and Wholesale supply schedules during normal, single dry year, and multiple dry year periods. For the purposes of this analysis, the SFPUC assumed a delivery goal of 265 mgd. System-wide shortages were applied to a demand of 265 mgd and the subsequent allocations between retail and wholesale collectively.

Table 25: SFPUC Retail RWS Allocations in Normal, Dry and Multiple Dry Years

	NORMAL YEAR		SINGLE DRY YEAR		MULTIPLE DRY YEARS[1]					
					YEAR 1		YEAR 2		YEAR 3	
	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)
2010	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2015	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2020	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2025	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2030	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1
2035	81.0	100	81.0	100.0	81.0	100.0	79.5	98.1	79.5	98.1

1. Under the WSAP, the SFUPC retail allocations at a 10% shortage are 85.86 mgd. However, due to the Phased WSIP Variant, only 81 mgd of RWS supply is shown.

Table 26: SFPUC Wholesale RWS Allocations in Normal, Dry and Multiple Dry Years

	NORMAL YEAR		SINGLE DRY YEAR		MULTIPLE DRY YEARS[1]					
					YEAR 1		YEAR 2		YEAR 3	
	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)	(mgd)	(%)
2010	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0
2015	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0
2020	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0
2025	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0
2030	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0
2035	184.0	100	152.6	83.0	152.6	83.0	132.5	72.0	132.5	72.0

1. Under the WSAP, the SFUPC wholesale allocations at a 10% shortage are 64% of available supply or 152.6 mgd; at a 20% shortage, the SFPUC wholesale allocations are 62.5% of available supply or 132.5 mgd.

Retail Water Shortage Allocation Plan: The RWSAP was adopted to formalize a three-stage program of action to be taken in San Francisco to reduce water use during a drought. In accordance with the RWSAP, prior to the initiation of any water delivery reductions in San Francisco, whether it be initial implementation of reduction delivery or increasing the severity of water shortage, the SFPUC will outline a drought response plan to address the following: the water supply situation; proposed water use reduction objectives; alternatives to water use reductions; methods to calculate water use allocations and adjustments; compliance methodology and enforcement measures; and budget considerations.

This drought response plan will be presented at a regularly scheduled SFPUC Commission meeting for public input. The meeting will be advertised in accordance with the requirements of California Water Code Section 6066 of the Government Code, and the public will be invited to comment on the SFPUC's intent to reduce deliveries.

Depending on the level of water demand and the desired objective for water use reduction, one, two or all three stages of the RWSAP may be required. **Table 27** identifies the water shortage stages of action. Additional information is provided in **Appendix F**.

Table 27: SFPUC Retail Water Shortage Stages of Action

STAGE	ACTIONS	TRIGGER PT. (% SYSTEM SHORTAGE)	TARGET WATER USE REDUCTION (%)
1 - Voluntary	• Voluntary rationing request of customers • Customers are alerted to water supply conditions • Remind customers of existing water use prohibitions	10-20%	5 – 10%
	• Customers are alerted to water supply conditions		
	• Remind customers of existing water use prohibitions		
	• Education on, and possible acceleration of, incentive programs (e.g., toilet rebates)		
2 - Mandatory	• All Stage 1 actions implemented	21-50%	11 – 20%
	• All customers receive an "allotment" of water based on the Inside/Outside allocation method (based on base year water usages for each account)		
	• Water use above the "allocation" level will be subject to excess use charges, installation of flow restrictor devices and shut-off of water		
3 - Mandatory	• Same actions as in Stage 2 with further reduced allocations	>50%	>20%

Table 28 summarizes potential prohibitions that may be enforced during a drought. **Appendix E** discusses various measures employed during the 1987-92 drought in an attempt to achieve a 45% reduction in Retail Customer demands (as applied to the pre-drought demand). These measures included absolute limitations on water use based on residential customer classification and a proportion of historical use within the non-residential sectors. Although not anticipated to be required in the near-term, San Francisco would employ similar procedures to accommodate system-wide water shortages in excess of 20%, if necessary.

The Retail Water Shortage Allocation plan is provided in **Appendix F**.

Table 28: Potential Prohibitions That May Be Enforced During a Drought

#	WATER SHORTAGE CONTINGENCY – MANDATORY PROHIBITIONS[1]	STAGE
1	Water waste, including but not limited to, any flooding or runoff into the street or gutters, was prohibited.	2, 3
2	Hoses could not be used to clean sidewalks, driveways, patios, plazas, homes, businesses, parking lots, roofs, awnings or other hard surfaces areas.	2, 3
3	Hoses used for any purpose had to have positive shutoff valves.	2, 3
4	Restaurants served water to customers only upon request.	2, 3
5	Potable water was not to be used to clean, fill or maintain levels in decorative fountains.	2, 3
6	Use of additional water was not allowed for new landscaping or expansion of existing facilities unless low water use landscaping designs and irrigation systems were employed.	2, 3
7	Water service connections for new construction were granted only if water saving fixtures or devices were incorporated into the plumbing system.	2, 3
8	Use of potable water for consolidation of backfill, dust control or other non-essential construction purposes was prohibited.	2, 3
9	Irrigation of lawns, play fields, parks, golf courses, cemeteries, and landscaping of any type with potable water would be reduced by at least the amount specified for outside use in the adopted rationing plan.	2, 3
10	Verified water waste as determined by the Water Department would serve as prima facie evidence that the allocation assigned to the water account is excessive; therefore, the allocation was subject to review and possible reduction, including termination of service.	2, 3
11	Water used for all cooling purposes was to be recycled.	2, 3
12	The use of groundwater and/or reclaimed water for irrigation of golf courses, median strips, and similar turf areas was strongly encouraged.	2, 3
13	The use of groundwater and/or reclaimed water for street sweepers/washers was strongly encouraged.	2, 3

1. Prohibitions prescribed in the 1987-92 drought that **may be** enforced during a future drought.

Wholesale Customer Water Shortage Plan (Tier 2 Drought Implementation Plan, or DRIP):

Section 3.11.C of the WSA authorizes the Wholesale Customers to adopt a methodology for allocating the collective wholesale allocation among the individual Wholesale Customers. In 2000, the Wholesale Customers adopted the Interim Water Shortage Allocation Plan among Suburban Customers, which details how the SFPUC water allocated to wholesale customers collectively was to be allocated to each individual Wholesale Customer. The Tier 2 Drought Implementation Plan (DRIP), which was adopted by the Wholesale Customers, provides an update to the 2000 Interim Water Shortage Allocation Plan Among Suburban Customers. The allocation included in the DRIP is based on a formula that takes two primary factors into account: (1) each agency's Supply Assurance from SFPUC, with certain exceptions, and (2) each agency's purchases from SFPUC during the 3 years preceding adoption of the Plan. **Appendix G** contains a copy of the Tier 1 WSAP.

5.4.3 Mechanisms to Determine Reductions in Water Use

All SFPUC Retail and Wholesale Customers are metered. Monthly water use reports are prepared by the SFPUC's Customer Service Bureau. Based on a comparison between months the SFPUC is able to determine reductions in water use for both wholesale and Retail Customers.

5.4.4 Revenue and Expenditure Impacts During Water Shortages

If the SFPUC declares a water shortage emergency under Water Code section 350 and implements the WSAP, the SFPUC may raise water rates independently of coordination with the annual budget process to make up for lost revenue due to reduced water use (WSA Section 6.03C). The SFPUC also maintains an unappropriated fund balance that can be used to offset the effects of revenue shortfalls caused by drought.

5.5 PREPARATION FOR CATASTROPHIC WATER SUPPLY INTERRUPTION

The SFPUC has various planning documents which, in combination, address its emergency preparedness and planned response in case of a catastrophic interruption of water supplies due to power outages, earthquakes or other disasters. Additionally, the SFPUC WSIP, previously discussed in this document, includes capital projects related to seismic reliability and overall system reliability.

5.5.1 Emergency Preparedness Plans

Following the 1989 Loma Prieta Earthquake, the SFPUC created a departmental SFPUC Emergency Operations Plan (EOP). The SFPUC EOP was originally released in 1992, and has been updated approximately every 2 years. The latest EOP update will be released in Spring 2011. The EOP addresses a broad range of potential emergency situations that may affect the SFPUC and supplements the City and County of San Francisco's EOP, which was prepared by the Department of Emergency Management and most recently updated in 2008. Specifically, the purpose of the SFPUC EOP is to describe its emergency management organization, roles and responsibilities, and emergency policies and procedures.

In addition, SFPUC divisions and bureaus have their own EOPs (in alignment with the SFPUC EOP), which detail that entity's specific emergency management organization, roles and responsibilities, and emergency policies and procedures. The SFPUC tests its EOPs on a regular basis by conducting emergency exercises. Through these exercises, the SFPUC learns how well the plans and procedures will or will not work in response to an emergency. EOP improvements are based on the results of these exercises and real-world event response and evaluation. The SFPUC also has an emergency response training plan that is based on federal, State and local standards and exercise and incident improvement plans. SFPUC employees have emergency training requirements that are based on their emergency response roles.

5.5.2 Emergency Drinking Water Planning

In February 2005, the SFPUC Water Quality Bureau published the *City Emergency Drinking Water Alternatives* report. The purpose of this project was to develop a plan for supplying emergency drinking water in the City after damage and/or contamination of the SFPUC raw and/or treated water systems resulting from a major disaster. Since the publication of this report, the SFPUC has implemented a number of projects to increase its capability to support the provision of emergency drinking water during an emergency. These projects include:

- Completion of many WSIP projects and other capital upgrades to improve security, detection, and communication
- Public Information and materials for home and business
- Designation and identification of 67 emergency drinking water hydrants throughout San Francisco
- Construction of a disinfection and fill station at the existing San Francisco Zoo well, and obtaining a permit to utilize this well as a standby emergency drinking water source
- Purchase of emergency-related equipment, including water bladders and water bagging machines, to help with distribution post-disaster
- Coordination of planning with City departments, neighboring jurisdictions and other public and private partners to maximize resources and supplies for emergency response

With respect to emergency response for the SFPUC RWS, the SFPUC has prepared the SFPUC Regional Water System Emergency Response and Recovery Plan (ERRP), completed in 2003 and updated in 2006. The purpose of the ERRP is to describe the SFPUC RWS emergency management organizations, roles and responsibilities within those organizations, and emergency management procedures. This contingency plan addresses how to respond to and to recover from a major RWS seismic event, or other major disaster. The ERRP complements the other SFPUC emergency operations plans at the department, division and bureau levels for major system emergencies.

The SFPUC has also prepared in the *SFPUC Regional Water System Notification and Communications Plan*. This plan, which has been updated several times since it was first prepared in 1996 (most recently in July of 2010), provides contact information, procedures and guidelines to be implemented by the following entities when a potential or actual water quality problem arises: the SFPUC Water Supply and Treatment Division, Water Quality Division, SFPUC wholesale customers, BAWSCA, and City Distribution Division (considered to be a customer for the purposes of this plan). The plan treats water quality issues as potential or actual supply problems, which fall under the emergency response structure of the ERRP.

5.5.3 Power Outage Preparedness and Response

The SFPUC's water transmission system is primarily gravity fed, from the Hetch Hetchy Reservoir to the City. Within San Francisco's in-City distribution system, the key pump stations have generators in place and all others have connections in place that would allow portable generators to be used.

Although water conveyance throughout the RWS would not be greatly impacted by power outages because it is gravity fed, the SFPUC has prepared for potential regional power outages as follows:

- The Tesla Treatment Facility, the Sunol Valley Water Treatment Plant, and the San Antonio Pump Station, have back-up power in place in the form of generators or diesel powered pumps.
- Both the Harry Tracy Water Treatment Plant and the Baden Pump Station have back-up generators in place.
- Administrative facilities that will act as emergency operation centers also have back-up power.
- Additionally, as described in the next section, the WSIP includes projects which will expand the SFPUC's ability to remain in operation during power outages, seismic and other emergency situations.

5.5.4 Capital Projects for Seismic Reliability and Overall System Reliability

As discussed previously, the SFPUC is also undertaking a WSIP to enhance the ability of the SFPUC water system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply.

As illustrated previously, the WSIP projects include several projects located in San Francisco to improve the seismic reliability of the in-City distribution system, including more wells that can be used as emergency drinking water sources. The WSIP also incorporates many projects related to the SFPUC RWS to address both seismic reliability and overall system reliability. All WSIP projects are expected to be completed by 2016.

In addition to the improvements that will come from the WSIP, San Francisco has already constructed the following system interties for use during catastrophic emergencies, short-term facility maintenance and upgrade activities, and in times of water shortages:

- A 40 mgd system intertie between the SFPUC and SCVWD (Milpitas Intertie);
- A 35 mgd intertie with EBMUD allowing EBMUD to serve the City of Hayward's demand and/or supply the SFPUC directly (and vice versa); and,
- One permanent and one temporary intertie to the South Bay Aqueduct, which would enable the SFPUC to receive State Water Project water.

The WSIP intertie projects include the EBMUD-Hayward-SFPUC Intertie. The WSIP also includes projects related to standby power facilities at various locations. These projects will provide for standby electrical power at 6 critical facilities to allow these facilities to remain in operation during power outages and other emergency situations. Permanent engine generators will be provided at 4 locations (San Pedro Valve Lot, Millbrae Facility, Alameda West, and Harry Tracy Water Treatment Plant), while hookups for portable engine generators will be provided at 2 locations (San Antonio Reservoir and Calaveras Reservoir).

5.6 SUPPLY & DEMAND COMPARISON OF THE RETAIL WATER SYSTEM

This section provides an assessment of the reliability of the SFPUC retail water supply during normal, dry and multiple dry years.

The Tier 1 allocation in the WSAP translates to 81 mgd of available retail water supplies from the RWS in year 2 of a drought and 79.5 mgd of retail water supplies from the RWS in years 3 and 4 of a multi-year drought.

The following tables for supply and demand comparison assume that the recycled water and groundwater projects in San Francisco are adopted and constructed. Currently, the Planning Department is undertaking environmental review for the Westside Recycled Water project and the San Francisco Groundwater Project. The SFPUC is undertaking feasibility studies for recycled water projects on the Eastside of San Francisco and anticipates that those projects have the potential to develop an additional 2 mgd of water supply. The tables below assume these projects come on line prior to 2020; however, the SFPUC might need to rely on the full 81 mgd supply from the SFPUC watersheds. In addition, ABAG and the Metropolitan Transportation Authority are required under SB375 to allocate additional growth in the nine county Bay Area in a manner that limits GHG emissions. ABAG has recently released its draft Vision Scenario to meet these objectives. The Vision Scenario places additional housing units and jobs in San Francisco through 2035 beyond what the SFPUC included in its demand projection analysis. The Vision Scenario currently reflects 19,000 more housing units and 16,000 more jobs than were included in the demand projections. If the growth in the Vision Scenario is promoted, it could result in increased retail demands on the RWS.

Normal Years: **Table 29** compares current and projected supply and demand of the SFPUC retail system. It indicates that during normal precipitation years, the SFPUC has adequate supplies to meet its projected retail water demands.

Single Dry Year: **Table 30** illustrates the level of single dry year water delivery shortage that could occur with the projected 5-year increments of water demands. As shown in this table, the SFPUC is projected to have sufficient supply to meet demands in a single dry year in all scenarios.

Table 29: Projected Normal Year Retail System Water Supply and Demand Comparison

SUPPLY / DEMAND	2010	2015	2020	2025	2030	2035
Demands (mgd)						
Retail System Demand	77.7	80.7	78.9	78.5	79.2	80.9
Supplies (mgd)						
Groundwater	2.2	5.0	5.0	5.0	5.0	5.0
Recycled Water	0.0	0.3	4.0	4.0	4.0	4.0
SFPUC RWS Watersheds[1]	75.5	75.4	69.9	69.5	70.2	71.9
Supply and Demand Comparison						
Demand Totals (mgd)	78	81	79	79	79	81
Supply Totals (mgd)	78	81	79	79	79	81
Difference (mgd)	0	0	0	0	0	0
Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Difference as % of Supply	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

1. Assumes groundwater and recycled water are used before RWS watershed supplies to meet retail demand. However, if these supplies are not available, additional RWS watershed supply could be used up to 81 mgd.

Table 30: Projected Single Dry Year Retail System Supply and Demand Comparison

SUPPLY / DEMAND	2010 (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)	2030 (mgd)	2035 (mgd)
Demands (mgd)						
Retail System Demand	77.7	80.7	78.9	78.5	79.2	80.9
Supplies (mgd)						
Groundwater	2.2	5.0	5.0	5.0	5.0	5.0
Recycled Water	0.0	0.3	4.0	4.0	4.0	4.0
SFPUC RWS Watershed[1]	75.5	75.4	69.9	69.5	70.2	71.9
Supply and Demand Comparison						
Demand Totals (mgd)	78	81	79	79	79	81
Supply Totals (mgd)	78	81	79	79	79	81
Difference (mgd)	0	0	0	0	0	0
Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Difference as % of Supply	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

1. Assumes groundwater and recycled water are used before RWS watershed supplies to meet retail demand. However, if these supplies are not available, additional RWS watershed supply could be used up to 85.86 mgd. Due to the Phased WSIP Variant, it is assumed that only 81 mgd would be used.

Multiple Dry Years: **Table 31** illustrates the level of water delivery shortages that would be anticipated

if a three-year dry hydrologic condition occurred, for each year of the 5-year intervals shown. It attempts to illustrate a theoretical application of how the different water supplies may be used in multiple dry years per the UWMP requirements. As described previously, in the event of a multi-year drought, no cutbacks are anticipated in year 1. Therefore, the dry year sequences shown below begin in year 2 of a multi-year drought.

Table 31: Projected Multiple Dry Year Retail System Supply and Demand Comparison [1,2]

YEAR1	SFPUC SUPPLY AND DEMAND [2,3]	MULTIPLE DRY YEAR EVENT (MGD)		
		YEAR 1	YEAR 2	YEAR 3
2010	Total Retail Demand	77.7	77.7	77.7
	Groundwater	2.2	2.2	2.2
	Recycled Water	0.0	0.0	0.0
	RWS Watersheds[3]	75.5	75.5	75.5
	Total Retail Supply	77.7	77.7	77.7
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**
2015	Total Retail Demand	80.7	80.7	80.7
	Groundwater	5.0	5.0	5.0
	Recycled Water	0.3	0.3	0.3
	RWS Watersheds[3]	75.4	75.4	75.4
	Total Retail Supply	80.7	80.7	80.7
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**
2020	Total Retail Demand	78.9	78.9	78.9
	Groundwater	5.0	5.0	5.0
	Recycled Water	4.0	4.0	4.0
	RWS Watersheds[3]	69.9	69.9	69.9
	Total Retail Supply	78.9	78.9	78.9
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**

YEAR1	SFPUC SUPPLY AND DEMAND [2,3]	MULTIPLE DRY YEAR EVENT (MGD)		
		YEAR 1	YEAR 2	YEAR 3
2025	Total Retail Demand	78.5	78.5	78.5
	Groundwater	5.0	5.0	5.0
	Recycled Water	4.0	4.0	4.0
	RWS Watersheds[3]	69.5	69.5	69.5
	Total Retail Supply	78.5	78.5	78.5
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**
2030	Total Retail Demand	79.2	79.2	79.2
	Groundwater	5.0	5.0	5.0
	Recycled Water	4.0	4.0	4.0
	RWS Watersheds[3]	70.2	70.2	70.2
	Total Retail Supply	79.2	79.2	79.2
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**
2035	Total Retail Demand	80.9	80.9	80.9
	Groundwater	5.0	5.0	5.0
	Recycled Water	4.0	4.0	4.0
	RWS Watersheds	71.9	71.9	71.9
	Total Retail Supply	80.9	80.9	80.9
	Difference	**0**	**0**	**0**
	Difference as % of Demand	**0%**	**0%**	**0%**
	Difference as % of Supply	**0%**	**0%**	**0%**

1. The multiple dry years shown in this table reflect years 2-4 of the SFPUC's 8.5-year design drought for 2010, and years 6-8 of the SFPUC's 8.5-year design drought for years 2015 through 2035.
2. Under the WSAP, the SFPUC Retail allocations at a 10% shortage are 85.86 mgd. However, due to the Phased WSIP Variant (see Section 3.1.2, only 81 mgd of RWS watershed supply is shown.
3. Assumes groundwater and recycled water are used before RWS watershed supplies to meet retail demand. However, if these supplies are not available, additional RWS watershed supply could be used up to 79.5 mgd.

5.7 SUPPLY AND DEMAND COMPARISON OF THE WHOLESALE WATER SYSTEM

This section provides an assessment of the reliability of the SFPUC water supply during normal, dry and multiple dry years for the SFPUC's Wholesale Customers. The reliability analysis included in the following tables does not reflect decisions that may be made by 2018 regarding serving the Wholesale Customers additional water supplies in excess of the Supply Assurance or converting San Jose and Santa Clara to permanent customers. In either case, the SFPUC would serve more than 184 mgd to the Wholesale Customers which in combination with the Retail Customers may result in a watershed demand above 265 mgd. If the SFPUC were to take on serving more than 265 mgd within the service area, the SFPUC would need to develop the additional water supplies identified in Section 3.2 to continue meeting the water supply objectives of the adopted WSIP (see **Table 21**). The SFPUC is required by the WSA to consider meeting Wholesale Customer demands beyond the Supply Assurance and converting San Jose and Santa Clara to permanent customers. As those decisions have not yet been made, the SFPUC's reliability analysis carries the current Supply Assurance forward through 2035 and does not factor either the development of additional water supplies beyond those necessary to meet demands through 2018 or meeting demands in excess of the Supply Assurance. Future UWMPs will include additional information and analysis related to decisions regarding post-2018 water supply and demand comparisons.

Normal Years: **Table 32** compares current and projected supply and demand of the SFPUC wholesale system. It indicates that during normal precipitation years, the SFPUC has adequate supplies to meet its projected wholesale water demands.

Table 32: Projected Normal Year Wholesale Water Supply and Demand Comparison

SUPPLY / DEMAND	2010	2015	2020	2025	2030	2035
Demands (mgd)						
SFPUC Wholesale Demand[1]	149.5	175.4	177.6	183.1	184.0	184.0
Supplies						
SFPUC RWS Watershed Supplies to Wholesale Customers	149.5	175.4	177.6	183.1	184.0	184.0
Supply and Demand Comparison						
Demand Totals	149	175	178	183	184	184
Supply Totals	149	175	178	183	184	184
Difference	**0**	**0**	**0**	**0**	**0**	**0**
Difference as % of Supply	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Difference as % of Demand	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

1. Assumes that the 265 mgd supply limitation extends beyond 2018, and projected Wholesale Customer demands are limited to 184 mgd. Prior to 2018, 184 mgd includes the demands of San Jose and Santa Clara. After 2018, San Jose and Santa Clara will be supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2018).

Single Dry Year: Given the additional supplies assumed to be available, **Table 33** illustrates the level of first dry year water delivery shortage that could occur with the projected 5-year increments of water demands. As shown in this table, the maximum projected shortage of 17% (calculated as % of demand) would occur in 2035.

Table 33: Projected Single Dry Year Wholesale Water Supply and Demand Comparison

SUPPLY / DEMAND	2010 (mgd)	2015 (mgd)	2020 (mgd)	2025 (mgd)	2030 (mgd)	2035 (mgd)
Demands (mgd)						
SFPUC Wholesale Demands[1]	149.5	175.4	177.6	183.1	184.0	184.0
Supplies (mgd)						
SFPUC RWS Watershed Supplies to Wholesale Customers	149.5	152.6	152.6	152.6	152.6	152.6
Supply and Demand Comparison						
Demand Totals (mgd)	149	175	178	183	184	184
Supply Totals (mgd)	149	153	153	153	153	153
Difference (mgd)	**0**	**23**	**25**	**30**	**31**	**31**
Difference as % of Supply	**0%**	**15%**	**16%**	**20%**	**21%**	**21%**
Difference as % of Demand	**0%**	**13%**	**14%**	**17%**	**17%**	**17%**

1. Assumes that the 265 mgd supply limitation extends beyond 2018, and projected Wholesale Customer demands are limited to 184 mgd. Prior to 2018, 184 mgd includes the demands of San Jose and Santa Clara. After 2018, San Jose and Santa Clara will be supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2018).

Multiple Dry Years: Multiple-year drought sequences could subject the SFPUC customers to greater levels of shortage. **Table 34** illustrates the level of water delivery shortages that would be anticipated if a 3-year dry hydrologic condition occurred, for each year of the 5-year intervals shown. It attempts to illustrate a theoretical application of how the different water supplies may be used in multiple dry years per UWMP requirements. As described previously, in the event of a multi-year drought, no cutbacks are anticipated in year 1. Therefore, the dry year sequences shown below begin on year 2 of a multi-year drought.

Table 34: Projected Multiple Dry Year Wholesale Water Supply and Demand Comparison

YEAR	SFPUC SUPPLY AND DEMAND (MGD)	MULTIPLE DRY YEAR EVENT [1]		
		YEAR 1	YEAR 2	YEAR 3
2010	SFPUC Wholesale Demands[2]	149.5	149.5	149.5
	RWS Watershed Supplies to Wholesale Customers	149.5	132.5	132.5
	Difference	**0**	**17**	**17**
	Difference as % of Supply	**0%**	**13%**	**13%**
	Difference as % of Demand	**0%**	**11%**	**11%**
2015	SFPUC Wholesale Demands[2]	175.4	175.4	175.4
	RWS Watershed Supplies to Wholesale Customers	152.6	132.5	132.5
	Difference	**23**	**43**	**43**
	Difference as % of Supply	**15%**	**32%**	**32%**
	Difference as % of Demand	**13%**	**24%**	**24%**
2020	SFPUC Wholesale Demands[2]	177.6	177.6	177.6
	RWS Watershed Supplies to Wholesale Customers	152.6	132.5	132.5
	Difference	**25**	**45**	**45**
	Difference as % of Supply	**16%**	**34%**	**34%**
	Difference as % of Demand	**14%**	**25%**	**25%**
2025	SFPUC Wholesale Demands[2]	183.1	183.1	183.1
	RWS Watershed Supplies to Wholesale Customers	152.6	132.5	132.5
	Difference	**30**	**51**	**51**
	Difference as % of Supply	**20%**	**38%**	**38%**
	Difference as % of Demand	**17%**	**28%**	**28%**
2030	SFPUC Wholesale Demands[2]	184.0	184.0	184.0
	RWS Watershed Supplies to Wholesale Customers	152.6	132.5	132.5
	Difference	**31**	**52**	**52**
	Difference as % of Supply	**21%**	**39%**	**39%**
	Difference as % of Demand	**17%**	**28%**	**28%**
2035	SFPUC Wholesale Demands[2]	184.0	184.0	184.0
	RWS Watershed Supplies to Wholesale Customers	152.6	132.5	132.5
	Difference	**31**	**52**	**52**
	Difference as % of Supply	**21%**	**39%**	**39%**
	Difference as % of Demand	**17%**	**28%**	**28%**

1. The multiple dry years shown in this table reflect years 2-4 of the SFPUC's 8.5-year design drought for year 2010, and years 6-8 of the SFPUC's 8.5-year design drought for years 2015 through 2035.
2. Assumes that the 265 mgd supply limitation extends beyond 2018, and projected Wholesale Customer demands are limited to 184 mgd. Prior to 2018, 184 mgd includes the demands of San Jose and Santa Clara. After 2018, San Jose and Santa Clara will be supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2018).

5.8 FUTURE ACTIONS AFFECTING WATER SUPPLY AND DEMAND

The previous supply and demand comparison is based on assumptions that reflect decisions made to date. There are a multitude of upcoming actions that affect the SFPUC's water supply and may increase SFPUC water demands. These actions include:

- **Securing an additional 7.4 mgd annual average in water supply to meet the shortfall in current watershed supplies resulting from instream flow requirements in San Mateo and Alameda Creeks.** The 7.4 mgd shortfall also assumes that the Upper Alameda Creek Filter Gallery Project is able to provide an annual average water supply of approximately 5.4 mgd. Additional supplies will be necessary to resolve this shortfall long-term.

- **Resolving the status of San Jose and Santa Clara as temporary, interruptible customers.** Converting San Jose and Santa Clara to permanent, non-interruptible customers would require the SFPUC to secure 9 mgd of additional water supply. Currently, San Jose and Santa Clara are temporary customers with an interruptible status. The SFPUC will continue to meet the two cities' demands up to 9 mgd through 2018, but may issue a conditional five-year notice of termination or reduction in supply to San Jose and Santa Clara if water use by the Wholesale Customers is projected to exceed 184 mgd before June 30, 2018. Development of additional supplies would be necessary to offer San Jose and Santa Clara permanent status.

- **Resolving the additional unmet needs of the Wholesale Customers beyond 2018.** Demand projections indicate an unmet need of 5 mgd in 2035 beyond the needs of San Jose and Santa Clara. Currently, the SFPUC is obligated to meet the Wholesale Customers' Supply Assurance of 184 mgd. The SFPUC has limited its deliveries from the watersheds to the Wholesale Customers collectively to 184 mgd through 2018. The Wholesale Customers have projected an increased need for water from the SFPUC greater than 184 mgd through 2035. Development of additional supplies would be necessary to meet Wholesale Customer demands beyond 184 mgd.

- **Incorporating the results of SB 375 in demand projections for the retail and wholesale customers.** SB 375 requires ABAG and MTC to develop a Bay Area Sustainable Communities Strategy (SCS) which 1) achieves a greenhouse gas emissions reduction target set by the California Air Resources Board by reducing vehicle travel, and 2) identifies a strategy to meet the Bay Area's entire housing need by income level within the Bay Area. The SCS is scheduled to be adopted by April 2013. Results of the SCS planning effort to-date suggest an increase of 903,000 more housing units and 1,222,000 more jobs in the nine-county Bay Area by 2035 which is 269,000 more housing units and 92,900 more jobs than under ABAG Projections 2009. Of this total increase, the SCS currently proposes that San Francisco would accommodate 19,000 more housing units and 16,000 more jobs than were included in this UWMP's 2035 demand projections. Wholesale Customers in the SFPUC service are expected to absorb much of this additional growth in housing and jobs under the SCS as well. If the adopted SCS places more growth in the SFPUC service area, water demand may increase.

- **Resolving additional potential shortfalls attributed to State and Federal regulatory actions or proceedings that may affect SFPUC water supplies from the Tuolumne River and local watersheds including the following:**
  - Federal Energy Regulatory Commission (FERC) relicensing of the Don Pedro Project
    - State Water Resources Control Board (SWRCB) 401 Certification of FERC relicense
    - Endangered Species Act (ESA) Section 7 consultation for FERC relicense
  - Central Valley Total Maximum Daily Load regulations
  - Bay- Delta proceedings (SWRCB, Legislative actions)
  - ESA Habitat Conservation Plans for SFPUC local watersheds

This section describes the SFPUC's water demand management measures (DMMs). The SFPUC is currently implementing various conservation measures and is meeting the 14 DMMs identified under the Urban Water Management Planning Act, which also correspond to the Best Management Practices (BMPs) developed by the California Urban Water Conservation Council (CUWCC). The SFPUC is preparing its 2008-2009 and 2009-2010 BMP Reports, and expects to be in compliance with the BMP requirements.

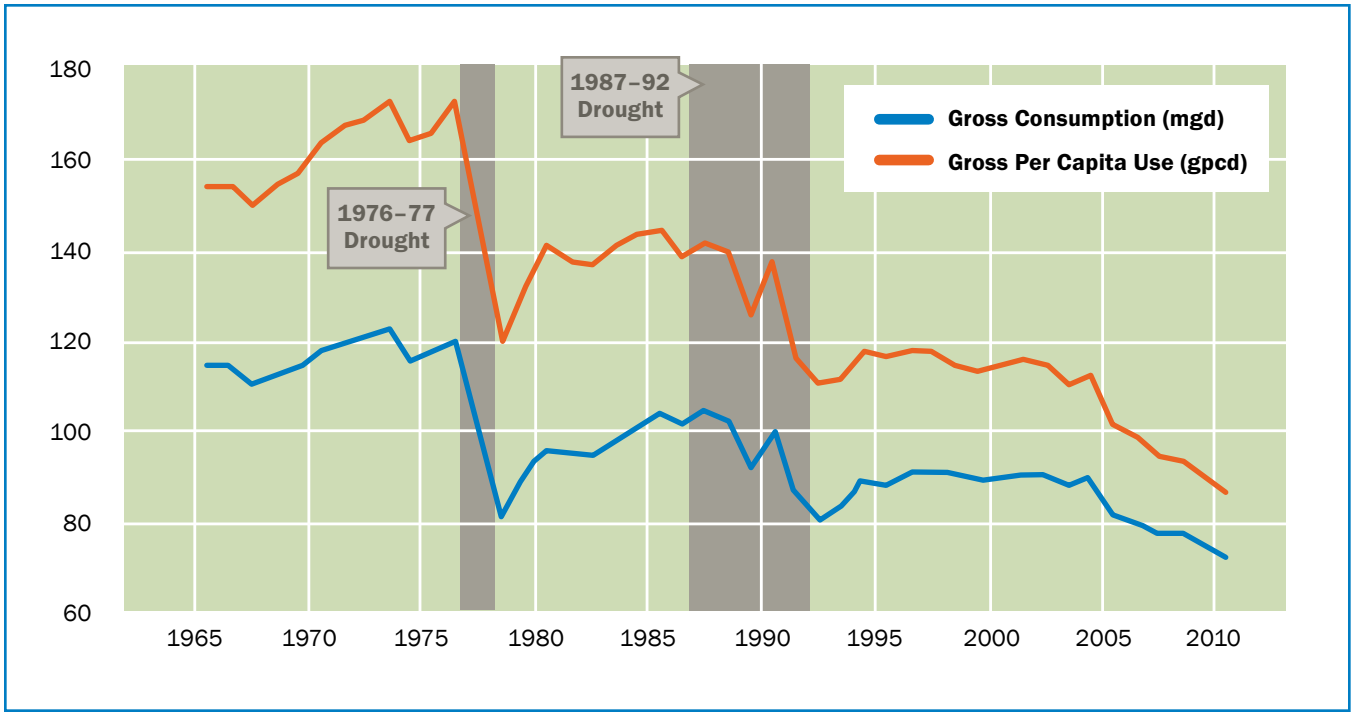
6.1 INTRODUCTION

The SFPUC has been implementing conservation programs for over 20 years. Through its continuous promotion and effort in educating San Franciscans on efficient and appropriate use of water, its conservation efforts have helped to reduce per capita water use by over one-third since 1965.

As illustrated in **Figure 9**, the first substantial decrease occurred after the 1976-77 drought in which gross per capita water use dropped from over 160 to below 120 gpcd. Despite continuous growth in San Francisco since then, total water demand remains lower than the pre-drought levels.

A second substantial decrease in water use occurred as a result of the 1987-92 drought when a new level of conservation activities resulted in a further reduction in water use. Through the continuation and expansion of these programs, per capita water use is anticipated to decrease well into the future. Today, the City's gross per capita water use is about 85.6 gpcd, one of the lowest of major urban areas in the state.

Figure 9: SFPUC Water Use During Historic Drought Periods



6.2 DEMAND MANAGEMENT BMPS

The conservation programs implemented by the SFPUC are based on the 14 BMPs identified by signatories of the CUWCC Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) in 1991. The BMPs describe actions and activities that encourage water conservation and are a result of balanced collaboration between urban water agencies, public interest organizations, and private entities. These 14 BMPs also correspond to the 14 DMMs identified in the Urban Water Management Planning Act. The SFPUC is in process of compiling its 2008-2009 and 2009-2010 BMP reports to the CUWCC and expects to be on track to comply with BMP goals.

Under the MOU, the CUWCC was created and charged with responsibilities and authorities, including but not limited to recommending study methodologies for BMPs, collecting and summarizing information on implementation of BMPs and submitting annual reports to the State Water Resources Control Board. Signatories of the MOU are required to submit bi-annual reports to the CUWCC outlining progress toward implementing the BMPs.

The CUWCC amended the MOU in 2008, re-organizing the 14 BMPs into five categories and offering its signatories more flexible options for meeting the BMP requirements. The new BMP structure and compliance options reflect the evolutionary nature of water conservation measures as new implementation strategies are developed and new plumbing codes and technology advancements take place. **Table 35** summarizes the re-structured BMPs and the corresponding DMMs, and also lists some of the conservation measures implemented by the SFPUC that correspond to each BMP/DMM, as well as the year that each measure was implemented. A more detailed discussion of each BMP/DMM is provided in the subsequent subsections.

Table 35: SFPUC Conservation Programs and BMP/DMM Compliance

DMM[1]	BMP Categories[2]	BMP/DMM DESCRIPTION	SFPUC MEASURES, PROGRAMS, OR ORDINANCES (Implementation Year)[3]
A	P-Residential (3.1)	Residential Assistance Program: Water survey programs for SFR and MFR customers[4]	• Water Wise Evaluations (1920s*) • Water Audits for Direct Install Program (2008*) • Leak Allowance Program (1960s*) • Distribution of free devices (1990s*)
A	P-Residential (3.2)	Landscape Water Survey: Water survey programs for SFR and MFR customers	• Water Wise Evaluations (1920s*) • Water Audits for Direct Install Program (2008*)
B	P-Residential (3.1)	Residential Assistance Program: Residential Plumbing Retrofit	• Ordinance 392-90 (1990) • Ordinance 359-91, 185-91 and 346-91 (1991) • Ordinance 76-09 (2009)

DMM[1]	BMP Categories[2]	BMP/DMM DESCRIPTION	SFPUC MEASURES, PROGRAMS, OR ORDINANCES (Implementation Year)[3]
C	F-Operations (1.2)	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	• 2-Tier water and wastewater rate structure (2009)
D	F-Operations (1.3)	Water Loss Control	• Unaccounted for Water Study (2005) • Automated Water Meter Program (2010-2012) • Pipeline Inspection Program (1990s*)
E	P-Landscape (5)	Large Landscape Conservation Programs and Incentives	• Large Landscape Audits (2008*) • Large Landscape Grant Program (2009*) • Ordinance 92-91 (1991), amended by Ordinance 192-00 (2000) • Ordinance 301-10 (2010)
F	P-Residential (3.3)	High-Efficiency Clothes Washing Machine Financial Incentive Programs	• Bay Area Clothes Washer Rebate Program (2006) • PG&E Water and Energy Rebate Program (2008*)[7] • Smart Rebates Program (2008*)
G	F-Education (2.1)	Public Information Programs	• Multiple Ongoing Activities * • "Water Conservation Starts with You" Newsletter (2008) • Garden for the Environment Workshops and Tours (2008*)
H	F-Education (2.2)	School Education Programs	• Conservation Connection Program (2008*) • Garden for the Environment School Field Trips (2009*) • Water Resources Curriculum and Classroom Presentations (2009*)
I	P-CII[5] (4)	Conservation Programs for CII Accounts[5]	• Water Wise Evaluations (1989*) • Water Savers Pilot Program (2005) • Large Municipal Facilities Audits (2009*) • SFUSD[8] Green Team School Audits (2009*) • Leak Allowance Program (1960s*)
J	F-Operations (1.1.3)	Wholesale Agency Assistance Programs	• As-needed staff resource to collaborate on regional efforts through BAWSCA*
K	F-Operations (1.4)	Retail Conservation Pricing	• 2-Tier water and wastewater rate structure (2009)

DMM[1]	BMP Categories[2]	BMP/DMM DESCRIPTION	SFPUC MEASURES, PROGRAMS, OR ORDINANCES (Implementation Year)[3]
L	F-Operations (1.1.1)	Conservation Coordinator	• Full-Time position(s) for Water Conservation Administrators (1986)
M	F-Operations (1.1.2)	Water Waste Prohibition	• SFPUC's Rules and Regulations for Water Service, Section E (original requirement 1960s, amendments made later) • SFPUC's Rules and Regulations for Water Service, Section F (2010, pertains to irrigation) • Ordinance 301-10 (2010)
N	P-Residential (3.4)	WaterSense Specification toilets, Residential ULFT[6] Replacement Programs	• ULFT Rebate Programs (1995-2008) • HET[9] Rebate Programs (2006*) • Direct Install Program (2009*)

1. The Urban Water Management Planning Act identified 14 DMMs that agencies need to evaluate in each UWMP.
2. F = foundational BMPs; P = programmatic BMPs. Foundational BMPs are considered to be essential water conservation activities by any utility and are adopted for implementation by all signatories to the MOU as ongoing practices with no time limits.
3. Many conservation programs listed in this table are ongoing efforts and are active to date. They are marked with an asterisk (*) after the implementation year.
4. SFR = single-family residential; MFR = multi-family residential
5. CII = commercial, industrial, and institutional
6. ULFT = ultra-low-flush toilet
7. PG&E = Pacific Gas and Electric Company
8. SFUSD = San Francisco Unified School District
9. HET = high-efficiency toilet

DMM A (BMP 3.1 & 3.2): Water Survey Programs for Residential Customers

San Francisco has provided water survey programs to its single- and multi-family residential accounts since the 1920s, focusing on the identification and repair of leaks, as well as promoting ongoing rebate programs for water-efficient fixtures. Since approximately 1989, the SFPUC has conducted conservation audits for over 30,000 single-family and 30,000 multi-family residential customers.

On average, SFPUC conducts over 600 residential water survey programs every year. Between 2007 and 2009, SFPUC conservation staff conducted 1,619 and 487 water surveys for single- and multi-family customers respectively, corresponding to an estimated water savings of over 5 acre-feet[15]. In 2008, Section staff also identified and contacted the top 5% of residential water users to encourage them to take advantage of the free water surveys program to help reduce their water use.

The surveys (also referred to as water audits) are conducted by the Section's inspectors and focus on educating customers about leak detection and water-efficient practices. During each audit, an inspector monitors the site's meter, laundry area, water heater, and plumbing fixtures, as well as landscape if applicable. In larger multi-unit buildings, the inspector will then typically inspect

15 SFPUC Water Conservation Report 2007-2010 (SFPUC, 2010). Savings were estimated for single-family water survey programs. SFPUC is currently refining its method for attributing savings to multi-family surveys

25-50% of the building's apartments or flats to identify additional leaks. For each site, the inspector will create a checklist for needed repairs and give a copy of the checklist to the owner or manager. A written summary is then returned to the owner or manager. At the request of the customer, the inspectors will mark the building's water shut-off valve with a plastic tag to improve its visibility in case of an emergency.

Starting in 2010, SFPUC inspectors also conducted thorough water surveys for single family homes that participate in the SFPUC's low-income Community Assistance Program (CAP). Free devices such as showerheads and faucet aerators are provided during the surveys, and customers found to have toilets eligible for replacement are scheduled for free installation of high-efficiency models (more details are available below under DMM N). To date, the SFPUC has conducted over 3,000 water surveys at CAP participant homes under this program and replaced over 2,000 toilets. The program also includes a multi-family component for which over 700 free toilets were provided to 28 buildings in 2010, and starting 2011 is expanding to include free toilets and installations to qualifying low-income multi-family buildings as part of coordination with the Mayor's Office of Housing for properties undergoing energy and water retrofits.

DMM B (BMP 3.1): Residential Plumbing Retrofit

Beginning with the adoption of *Ordinance 392-90*[16] in 1990, the City began efforts to require customers to install water-conserving devices. This ordinance changed the City's plumbing codes to require all new buildings (including any buildings in which the water drainage system is substantially altered, modified or renovated) to retrofit toilets and urinals with fixtures using no more than 1.6 gallons per flush (gpf) and 1 gpf, respectively. *Ordinance 359-91*[17], passed in 1991, requires the same plumbing retrofit requirements for commercial buildings, including hotels and motels.

The City then adopted a series of additional ordinances to address conservation within existing dwellings. In May and September 1991, San Francisco adopted *Ordinance 185-91* and *Ordinance 346-91*[18]. Together, these ordinances require water conservation device retrofits within single- and multi-family residential buildings upon sale, transfer of title, or major improvement to a dwelling. In 2009, an updated Residential Water Conservation Ordinance, *Ordinance 76-09*, was adopted, which requires homeowners to comply with more restrictive requirements before selling a home, including:

- Replace toilets exceeding 1.6 gpf;
- Replace showerheads with flow rate exceeding 2.5 gallons per minute (gpm);
- Replace faucets and faucet aerators having a flow rate exceeding 2.2 gpm; and
- Locate and repair all leaks.

16 San Francisco Plumbing Code sections 905 and 1001.1
17 San Francisco Building Code, Chapter 53B, Sections 53B01-53B15
18 San Francisco Housing Code, Chapter 12A, Section 12A01-12A14

DMM C (BMP 1.2): Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

All of San Francisco's Retail Customers have been metered since 1916, and are billed by volume for both water and sewer use. There are approximately 178,000 existing water meters in San Francisco. A vast majority (close to 90%) of these meters are small meters (2-inch or less) used for residential and some small commercial accounts. The remaining are large meters (3-inch or greater) used for commercial, industrial or irrigation accounts.

Since 2009, the SFPUC has implemented a 2-tier water and wastewater rate structure and a 5-year rate increase[19] for its residential accounts that promotes conservation practices by sending appropriate price signals. The rate structures are summarized in **Table 36** and **Table 37**. Non-residential sewer rates vary by the type and concentration of pollutants discharged, with more polluted the sewage being assessed a greater sewer service charge per hundred cubic foot (CCF).

Table 36: Residential 2-Tier Water Rate Structure ($/CCF)

ACCOUNT TYPE	WATER USE	EFFECTIVE 7/1/2009	EFFECTIVE 7/1/2010	EFFECTIVE 7/1/2011	EFFECTIVE 7/1/2012	EFFECTIVE 7/1/2013
Single Family Residential	≤ 3 CCF	$2.61	$3.09	$3.50	$3.90	$4.20
	>3 CCF	$3.48	$4.12	$4.60	$5.20	$5.50
Multi-Family Residential	≤ 3 CCF	$2.87	$3.28	$3.70	$4.20	$4.50
	>3 CCF	$3.82	$4.37	$4.90	$5.50	$5.90

Table 37: Residential 2-Tier Wastewater Rate Structure ($/CCF)

ACCOUNT TYPE	WATER USE	EFFECTIVE 7/1/2009	EFFECTIVE 7/1/2010	EFFECTIVE 7/1/2011	EFFECTIVE 7/1/2012	EFFECTIVE 7/1/2013
Single Family Residential	≤ 3 CCF	$6.05	$6.91	$7.16	$7.52	$7.90
	>3 CCF	$8.35	$9.21	$9.55	$10.03	$10.53
Multi-Family Residential	≤ 3 CCF	$5.66	$6.51	$7.49	$7.86	$8.25
	>3 CCF	$7.45	$8.68	$9.99	$10.49	$11.01

DMM D (BMP 1.3): Water Loss Control

An efficient distribution system is a key factor in ensuring efficient water use. The difference between the amount of water produced or purchased by an agency and the amount recorded as sold at customers' meters is referred to as "unaccounted for water. Some amount of loss in distribution is unavoidable due to necessary but un-metered uses such as fire fighting, main flushing, and storage facility cleaning. However, a portion of a system's losses can be controlled.

19 The SFPUC was previously bound by Proposition H, passed in 1998, which restricted the SFPUC's ability to increase or restructure water rates. Proposition H expired in 2006.

Retail Service Area: The SFPUC has an ongoing program to minimize the loss of water within its distribution system. Measures include regular investments in repair and replacement of old, leak-prone mains, systematic leak detection programs and regular meter calibration and repair programs. Since the 1970s, the SFPUC has implemented system-wide leak inspection and repair programs to reduce distribution system losses. From the use of advanced pitometer measurements and system zone analysis in the 1990s to the use of Permaloggers in 2005, the SFPUC has continuously enhanced its practices to identify leaks and reduce the unaccounted for water. In 2005, the SFPUC also completed an independent Unaccounted for Water Study to identify and quantify water losses. The study results indicate that the SFPUC leak management program is one of the most effective out of a nationwide sample. The SFPUC's system water loss is estimated to be less than 9% of total in-City demand (7% from unbilled authorized and unauthorized consumption, 2% from meter under-registration).

In Spring 2010, the SFPUC began deployment of the Automated Water Meter Program (AWMP), which will upgrade all of San Francisco's approximately 178,000 retail water meters with wireless advanced metering technology. Full deployment is anticipated by the end of 2012. The new system will measure, collect and analyze water usage more accurately and more frequently (on an hourly basis), which allows the SFPUC and customers to monitor water use and detect leaks faster and without the need for physical field visits and manual meter readings.

Wholesale Customer Service Area: The SFPUC initiated a Pipeline Inspection Program in the early 1990s on its RWS's 350 miles of water transmission lines. Routine inspections are considered preventive maintenance measures, but they also provide information on pipeline leaks. These inspections are usually conducted year-round with no more than one section of a major pipeline out of service at any time. The Pipeline Inspection Program covers the entire water transmission system over a 20-year period and then repeats. The SFPUC has a goal to inspect one section per quarter (4 inspections per year), with each section averaging 4-6 miles. Technically, the regional system does not have any distribution system components, only transmission system components. SFPUC staff perform meter calculations that estimate the leakage rate by comparing customer usage, plant production and water crossing the San Francisco County line.

DMM E (BMP 5): Large Landscape Conservation Programs and Incentives

In 2007, the SFPUC teamed with the City Department of Recreation and Parks to conduct a study that provided detailed audits and improvement recommendations to 12 of the highest water using parks in the City.

Recognizing that irrigation of large landscapes contributes significantly to the City's water use, the SFPUC initiated a Large Landscape Grant Program in 2009. This program provides large water users the financial incentives to implement retrofits and install fixtures to maximize the use of non-potable water or to reduce irrigation water use through conservation measures and innovative practices. The program was open to all SFPUC Retail Customers with landscape size greater than or equal to 2.5 acres. The SFPUC posted notice of the grant program on its website and mailed letters to notify a number of Retail Customers with large landscapes. In response, the SFPUC received a total of eight proposals from five

organizations. The proposals were evaluated based on a number of factors such as funding availability, estimated water savings, and community use and benefits. In FY 2009/10 and 2011/12, the program provided a total of over $4 million in funding for six projects. Upon completion of these projects, the SFPUC expects to achieve a water savings of over 20 million gallons per year.

To promote efficient irrigation water use and to comply with the State's Water Conservation in Landscaping Act (Assembly Bill 1881), the SFPUC replaced the existing irrigation ordinance (*Ordinance 92-91* Chapter 63 of the San Francisco Administration Code) with a new Water Efficient Irrigation Ordinance, adopted in 2010, *Ordinance 301-10*. Beginning in January 2011, new landscape projects or landscape modification projects between 1,000 and 2,500 square feet are required to increase their water-efficient plantings and limit turf plantings. Landscape projects greater than 2,500 square feet must demonstrate that their irrigation water use will stay within their assigned water budget, and must also obtain approval from the SFPUC Conservation Administrator of their landscape, irrigation, and soil management plans prior to any landscape installation. Owners of large landscaped areas greater than 10 acres must work with SFPUC staff to develop a compliance plan that lays out an implementation strategy and schedule for improving landscape water use efficiency.

DMM F (BMP 3.3): HECW Financial Incentive Programs

The SFPUC has offered a clothes washer rebate program for residential customers since 1999, and expanded the program to commercial customers in 2004.

In 2006 and 2007, the SFPUC partnered with six water agencies to implement the Bay Area Clothes Washer Rebate Program, which offered rebates of up to $150 per residential clothes washer depending on the efficiency level. The program was co-funded by a grant from the State of California, and was featured in San Francisco's local retail appliance stores and in larger regional stores through store visits, direct mailings, and bill inserts.

Starting in 2008, the SFPUC and over 20 local water agencies have partnered with Pacific Gas and Electric Company (PG&E) to provide a combined water and energy rebate for high-efficiency clothes washing (HECW) machines. Rebate amounts for qualifying machines have ranged from $200 for the first year ($125 from the SFPUC and $75 from PG&E) to $125 as of 2011 ($75 from the SFPUC and $50 from PG&E).

To date, the SFPUC has provided almost 15,000 residential HECW rebates through both programs. Total water savings from these rebates is estimated to be more than 7,000 acre-feet over the lifetime of the machines.

The SFPUC also provides HECW rebate programs to non-residential customers. In 2008, the SFPUC partnered with the CUWCC and 36 California water agencies in the Smart Rebates Program, which received grant funding from the State to provide commercial, industrial, and institutional (CII) customers with financial incentives for fixture upgrades, including HECWs. CII customers purchasing HECWs for common area laundry facilities (such as laundromats) are eligible. To date, approximately

280 commercial HECW rebates have been provided, corresponding to an estimated lifetime savings of 1,354 acre-feet. The SFPUC also extended the rebate program in 2010 to business owners with leased washers.

DMM G (BMP 2.1): Public Information Programs

Retail Service Area: The SFPUC works hard to promote conservation initiatives and educate the public about efficient and appropriate use of water. Ongoing activities include:

- Newspaper advertisements;
- Direct mailings;
- Distribution of educational materials and brochures to libraries and community centers,
- Participation in community events (the SFPUC staffed more than 115 events between 2007 and 2009); and
- SFPUC websites and newsletters.

In 2008, the SFPUC also created a series of direct-mailed newsletters entitled "Water Conservation Starts with You." These newsletter series addressed the need to implement voluntary cutbacks in response to historic dry winter conditions. A total of more than 350,000 newsletters were mailed to residential and commercial accounts, informing them of dry year conditions, simple conservation practices and SFPUC conservation program incentives.

Since 2008, the SFPUC has provided funding and is working with the Garden for the Environment, a public demonstration garden in San Francisco, to offer environmental education programs to interested San Francisco residents on organic gardening, urban compost systems and sustainable food systems. The partnership includes free workshops focused on climate appropriate plant selection, efficient watering practices, and pollution prevention strategies, and compliance with local irrigation ordinance requirements.

The SFPUC has also been reaching out to customers and the public directly through its billing process. On each bill, the account's current average daily water use is shown in comparison to its water use during the same period of the previous year. The bill also provides water-saving tips for home and business owners. This information helps customers recognize their water use trends and alerts them to any significant leakage issues. Conservation-related articles and tips are also included in most of the SFPUC's bi-monthly *Currents* newsletters that are mailed to customers with their bills, e-mailed, and posted on the SFPUC's web site.

In addition, the SFPUC maintains a close relationship with high-efficiency toilet and clothes washer vendors. The SFPUC staff routinely visits plumbing and appliance retail outlets to educate vendors about the SFPUC's rebate programs. A close relationship with vendors assures that the most efficient models are available to customers and that rebate program information is accurate.

Wholesale Customer Service Area: The SFPUC provides technical and administrative assistance for public information to its Wholesale Customer agencies, as requested. In addition, the SFPUC completed a series of comprehensive water demand and conservation potential studies with its Wholesale Customers in 2004. These conservation studies evaluated the cost-effectiveness of 32 conservation measures and the resulting water savings potential for each individual Wholesale Customer. These studies provided informative and educational data for the Wholesale Customers about water conservation measures and associated water savings.

The SFPUC has also been active in many regional activities to promote water conservation in the Bay Area. Recently, the SFPUC along with BAWSCA and several other Bay Area water agencies submitted a proposal for implementation grant funding through Proposition 84 for regional water conservation activities, including public information and outreach in the Bay Area.

DMM H (BMP 2.2): School Education Programs

Retail Service Area: The SFPUC's water conservation education program enriches the knowledge of students to encourage protection and preservation of our water resources. To assist with this learning, the SFPUC offers a variety of education resources developed in partnership with the San Francisco Unified School District (SFUSD), municipal departments, community gardens and non-profit education organizations.

The SFPUC provides annual funding to the SFUSD's Conservation Connection Program for the design and implementation of a comprehensive environmental education program for underserved communities. This program provides environmentally-themed workshops for educators and field trips for students.

The SFPUC also provides funding to the Garden for the Environment, an organic community garden, to offer field trips to San Francisco schools. Each field trip includes a pre-trip classroom visits in which students are introduced to water conservation and pollution prevention concepts that they can practice at the garden.

The SFPUC's education programs also bring water conservation to San Francisco classrooms. In 2009, the SFPUC partnered with the San Francisco Department of Environment (SFE) to develop a water resources curriculum for San Francisco's 4th and 5th grade students that covers the history of San Francisco's water supply, the water cycle, drought, alternative water resources, and the importance of water conservation. The curriculum includes fact sheets, lesson plans, and activity sheets that meet State of California curriculum standards. Each year the curriculum is marketed to a wide network of educators and the SFPUC and SFE also provide classroom presentations. In 2011, the SFPUC established a partnership with the Tuolumne River Trust to conduct annual presentations on source water and conservation to City elementary schools.

Together, the SFPUC's school education programs are expected to reach over 4,000 educators and students each year throughout San Francisco's public and private schools.

Wholesale Customer Service Area: The SFPUC is available to provide technical and administrative assistance for school education to its Wholesale Customer agencies, as requested. In several instances, the SFPUC has provided information packets on the SFPUC water system, such as the two-piece map series of the Hetch Hetchy/Peninsula Water Supply System and San Francisco's Water Distribution System to Wholesale Customers for inclusion in their school education programs.

DMM I (BMP 4): Conservation Programs for CII Accounts

Similar to the residential water survey program, San Francisco offers a commercial and industrial audit program to identify and repair leaks for its non-residential customers. Since 1989, the SFPUC has conducted conservation audits on over 15,000 CII accounts.

From 2007 to 2009, the SFPUC conducted 429 water audits in large commercial buildings, corresponding to an estimated lifetime savings of over 560 acre-feet. The audits are tailored to specific business operations and provide recommendations for increasing efficiency of processes on site, including cooling towers; meter(s); laundry facilities; restrooms; boilers; landscapes; and food service equipment such as ice machines, food steamers, and pre-rinse spray valves. The SFPUC inspector also reviews water consumption history, assesses fixture efficiencies, and informs the customers of possible financial incentives for which the property may qualify. Free water-saving devices and materials are provided as needed.

The SFPUC also launched a Water Savers Pilot Program in 2005 to pursue long-term, verifiable savings for large CII customers through incentives based on the volume of water saved. Participants included hotels, hospitals, colleges, and urban food harvesters. The potential lifetime water savings from the 2-year pilot were estimated at 566 acre-feet.

In response to Mayor Gavin Newsom's Executive Directive in 2009 to reduce municipal water use by 10%, San Francisco's municipal departments have implemented measures and sought assistance from the SFPUC to reduce water use. Comparison of FY 2008/2009 water consumption data to 2007/2008 data reveals that City departments met the savings goal, achieving a total savings of over 700 acre-feet for the City.

In addition, the SFPUC provided technical support and conducted detailed audits on a number of large municipal facilities, including:

- City Hall
- War Memorial and Performing Arts Center (War Memorial Opera House, Louise M. Davies Symphony Hall, War Memorial Veteran's Building)
- Main Library
- San Francisco Zoo

- Police Department (10 police stations, stables, shooting range, police academy)
- Fire Department (42 fire stations, headquarters, arson unit)
- Combined Emergency Communications Center
- 25 Van Ness (Department of Public Health, Office of Housing, and others)
- 30 Van Ness (Departments of Public Health, Public Works, Parks and Recreation, etc.)
- 1650 Mission (San Francisco Planning Department, Code Enforcement Section, etc.)
- 1660 Mission (Department of Building Inspection)

The SFPUC also partnered with the SFUSD to conduct water audits at San Francisco's Green Team schools. Audits were conducted at nine schools in 2009. The program continued in 2010 with audits for additional four schools. The SFPUC inspectors were also able to perform on-site fixture retrofits such as installing 0.5 gpm aerators on lavatory faucets and 1.5 gpm aerators on classrooms and break room faucets, helping the schools realize significant instant water savings. Together, these audits represent a potential savings of over 15 acre-feet of water annually.

DMM J (BMP 1.1.3): Wholesale Agency Assistance Programs

Under the terms of the long-term WSA with its Wholesale Customers, the SFPUC cannot provide direct financial assistance for conservation programs to a Wholesale Customer and subsequently add this expense to the suburban wholesale rate base for that year. The SFPUC can provide staff to assist Wholesale Customer conservation efforts and through agreement with BAWSCA can develop service area-wide conservation programs that can be funded as a joint expense by its Retail and Wholesale Customers.

DMM K (BMP 1.4): Conservation Pricing

Retail Service Area: For many years, the SFPUC has used conservation pricing as an incentive to conserve water. To promote the installation of efficient plumbing fixtures, the SFPUC implemented an incentive rate structure for its Retail Customers.

Water and wastewater rates were last revised in 2009 with the introduction of the 2-tier rate structure and a 5-year rate increase schedule for single- and multi-family residential accounts. The rate structures are summarized previously in **Table 2** and **Table 3**. Non-residential sewer rates vary by the quantity and type of pollutants in the wastewater discharged, with more polluted wastewater assessed a greater sewer service charge per CCF.

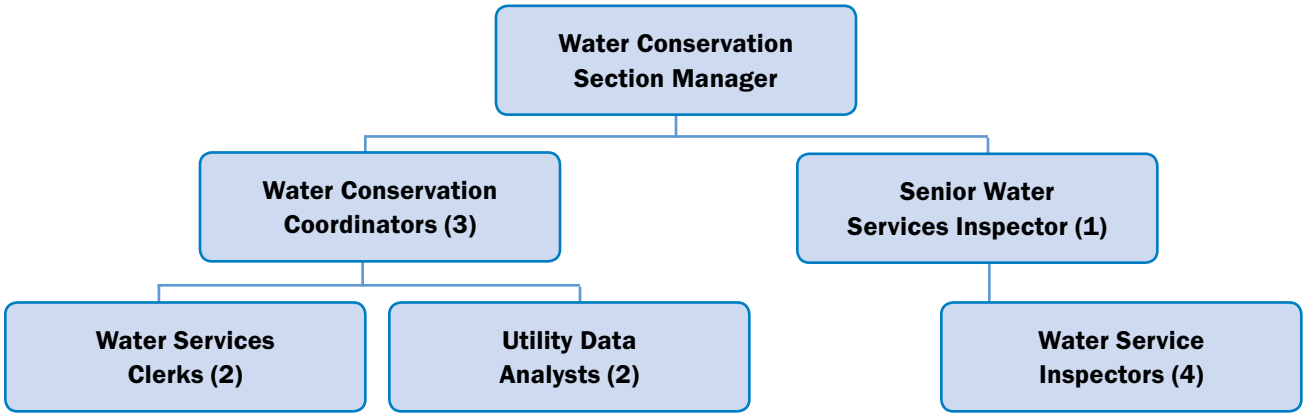
The SFPUC also addresses water use violations through its rate schedule. Violations of any water use restriction may result in the discontinuance of water service or the installation of flow restricting devices. The costs of these actions are borne by the customer.

Wholesale Customer Service Area: The SFPUC's wholesale rate structure complies with conservation pricing principles and is designed to recover the cost of providing service. Billing is based on meter readings, and utilizes an uniform rate structure. In addition, the SFPUC assesses excess use surcharges during drought periods.

DMM L (BMP 1.1.1): Water Conservation Coordinator

Retail Service Area: The SFPUC Water Conservation Section currently has 3 full-time Water Conservation Coordinators and 2 Utility Analysts. Under the direction of the Water Conservation Section Manager, these staff positions conduct implementation of various residential, landscape, and CII conservation programs. The Section also has its own inspection team and 2 water services clerks. **Figure 10** presents the current organizational chart of the SFPUC Water Conservation Section.

Figure 10: SFPUC Water Conservation Section Organization Chart (2010)



DMM M (BMP 1.1.2): Water Waste Prohibition

Section E of the SFPUC's Rules and Regulations for Water Service includes a provision regarding water waste prohibition. During the 1987-92 drought, the SFPUC enacted numerous water use restrictions and prohibitions in response to the severe water shortage. These measures are discussed in the Water Shortage Contingency Planning section of this report. With the end of the drought in 1993, the SFPUC elected to continue certain water use restrictions to further long-term conservation program. These measures are listed below and included in Section E of the SFPUC's Rules and Regulations for Water Service:

- Water waste shall be avoided, including (but not limited to) flooding or runoff into the sewers or gutters.
- Hoses used for any purpose must have positive shutoff valves.
- Restaurants shall serve water to customers only upon request.
- Decorative fountains must recycle water.

- Use of potable water for consolidation of backfill, dust control or other non-essential construction purposes is prohibited if other sources such as groundwater or reclaimed water are available and approved by the Department of Health.
- Water used for all cooling purposes and commercial car washes must be recycled.

Violation of any water use restriction may result in the installation of a flow-restricting device in the service line of the customer. Continued violation could result in termination of service. The customer bears the cost of any enforcement action.

Effective 2010, Section F of the SFPUC's Rules and Regulations for Water Service includes additional water waste prevention measures specific to irrigation, these measures are also now in the City's Water Efficient Irrigation Ordinance, *Ordinance 301-1* and include prohibition of water runoff from landscapes of all size in caused by low head drainage, overspray, broken irrigation hardware, or other conditions where water flows onto adjacent property, walks, roadways, parking lots or other structures.

DMM N (BMP 3.4): WaterSense Specification Toilets & ULFT Replacement Program

Between 2005 and 2008 the SFPUC conducted a highly visible ultralow-flush toilet (ULFT) residential rebate program providing rebates for replacement of inefficient toilets with that flush at 3.5 gpf or higher with toilets that flush at 1.6 gpf. Starting in 2006 and continuing, San Francisco has been offering rebates for replacement of 3.5 gpf or higher model toilets with High Efficient Toilets (HETs) that flush as 1.28 gpf or lower. The goal is to catalyze a market transformation toward HETs, which, unlike ULFTs, until July 2011 were not captured in the plumbing codes. Since ULFT and HET rebate program inception, San Francisco has replaced over 30,000 inefficient toilets.

Also, under the 2009 Residential Water Conservation Ordinance, residential buildings are required to install water conservation devices upon sale, transfer of title, or major improvement. This is expected to accelerate the replacement of inefficient devices (The Commercial Water Conservation Ordinance requires the same installation of efficient fixtures in all commercial properties by 2017).

San Francisco's water use patterns reveal that the highest household density and water consumption occur in the lower-income residential population. To assist these residential customers in overcoming the financial burden of initial fixture and installation costs, the SFPUC launched a high-efficiency toilet direct installation and water survey program in 2008. In this program, the SFPUC originally partnered with a local nonprofit organization to conduct water efficiency surveys, provide free high-efficiency devices, and identify potential households for the direct toilet install program. In 2010, the program was shifted mainly to recipients of the SFPUC's low-income CAP, which provides discounted water and wastewater to single family homes. Customers found to have toilets eligible for replacement are scheduled for free installation of high-efficiency models. Under the program, the SFPUC also delivered free HETs to more than 30 multi-family properties and starting in 2011 will be expanding free toilets and installations to low-income multi-family buildings. These toilet replacements represent a lifetime savings of over 3,000 acre-feet of water.

6.3 BEYOND BMPS AND DMMS

In addition to the 14 BMPs/DMMs, the SFPUC also seeks water savings through innovative programs that encourage the use of graywater and rainwater.

The SFPUC Water Enterprise teamed with the SFPUC Wastewater Enterprise in 2009 to develop a framework to promote safe use of graywater in the City. This effort included development of a guidance manual for customers on how to design simple graywater systems and launched a small laundry-to-landscape pilot program in 2011 for residential customers.

The Wastewater Enterprise also administers a rain barrel and cistern discount program and provides technical assistance related to rain barrel installation. The program also developed stormwater design guidelines and provided technical assistance on swales, rainwater gardens, stormwater planters, green roofs, and permeable pavement that captures rainwater for irrigation and recharge purposes.

Like many other water utilities, the SFPUC provides free conservation fixtures and devices to its residents during water audits and for pick up at its customer service office, such as 1.5-gpm showerheads, 0.5-gpm faucet aerators, garden spray nozzles, and toilet replacement parts (e.g. flappers and fill valves). Conservation device giveaways are a simple and cost-effective way to help customers reduce their water use. From July 2007 to June 2010, the SFPUC estimated that it distributed nearly 100,000 water-efficient devices to both residential and commercial customers.

6.4 REGIONAL COORDINATION

The SFPUC seeks opportunities to work with BAWSCA and its member agencies and other water agencies, including the SCVWD, to leverage available resources on an ongoing basis. The SFPUC's commitment to regional coordination is evident in many of its conservation programs, such as the Bay Area Clothes Washer Rebate Program in 2006 and the PG&E HECW Water and Energy Rebate Program in 2008 (both programs are discussed in previous subsections).

In 2007, the SFPUC, BAWSCA, and five other Bay Area water agencies secured $1 million in grant funding for a regional "Water Saving Hero" public education campaign. This campaign provided a consistent message about water supply conditions and long-term challenges, and informed customers across the region via simple and effective water conservation examples. The integrated advertising and marketing program included regional print, transit and radio ads, marketing materials, and a new website. Throughout the campaign, the SFPUC reduced systemwide water usage by more than 13% compared to historic consumption under similar hydrologic conditions.

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The issue of climate change has become an important factor in water resources planning in the State, and it is being considered during planning for the RWS. There is evidence that increasing concentrations of greenhouse gases have caused and will continue to cause a rise in temperatures around the world, which will result in a wide range of changes in climate patterns. These changes will have a direct effect on water resources in California, and numerous studies on climate change have been conducted to determine the potential impacts on water resources. Based on these studies, climate change could result in the following types of water resource impacts, including impacts on the RWS and associated watersheds:

- Reductions in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low- and medium-elevation zones, such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year,
- Changes in the timing, intensity, and variability of precipitation, and an increased amount of precipitation falling as rain instead of as snow,
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality,
- Sea level rise and an increase in saltwater intrusion,
- Increased water temperatures with accompanying potential adverse effects on some fisheries and water quality,
- Increases in evaporation and concomitant increased irrigation need, and
- Changes in urban and agricultural water demand.

However, other than the general trends listed above, there is no clear scientific consensus on exactly how global warming will quantitatively affect the state's water supplies, and current models of State water systems generally do not reflect the potential effects of global warming.

The SFPUC performed an initial assessment of the potential effects of climate change on the RWS. This initial assessment evaluated a temperature rise of 1.5-degrees Celsius (°C) between 2000 and 2025 with no change in precipitation. The temperature rise of 1.5°C is based on a consensus among many climatologists that current global climate modeling suggests a 3°C rise may occur between 2000 and 2050. The evaluation predicts that an increase in temperature of 1.5°C will raise the snowline approximately 500 feet. The elevation of the watershed draining into Hetch Hetchy Reservoir ranges from 3,800 to 12,000 feet above mean sea level, with about 87% of the watershed area above 6,000 feet. In 2000 (a normal hydrologic year in the 82-year period of historical record), the average snowline in this watershed was approximately 6,000 feet during the winter months. Therefore, the SFPUC evaluation indicates that a rise in temperature of 1.5°C between 2000 and 2025 will result in less or no snowpack between 6,000 and 6,500 feet and faster melting of the snowpack above 6,500 feet. Statistical modeling of a 1.5°C increase indicates that about 7% of the runoff currently draining into Hetch Hetchy Reservoir will shift from the spring/ summer seasons to the fall/winter seasons in the Hetch Hetchy basin by 2025. This percentage is within the current interannual variation in runoff and is within the range accounted for during normal runoff forecasting and existing reservoir management practices. The predicted shift in

runoff timing is similar to the results found by other researchers modeling water resource impacts in the Sierra Nevada due to warming trends associated with climate change.

The SFPUC is currently planning two additional assessment analyses. The first will utilize a newly calibrated hydrologic model of the Hetch Hetchy watershed to explore sensitivities to different climate change scenarios involving changes in air temperature and precipitation. The hydrologic model, HFAM II, simulates hydrologic processes using hourly input meteorological data to produce runoff into Hetch Hetchy Reservoir under varying conditions. Climate change parameters will be fed into the model to gauge sensitivity of runoff to those changing parameters. Because 85% of the SFPUC's supply derives from the Hetch Hetchy basin, this is an important part of understanding the potential effects of climate change on our system.

In addition, the SFPUC is project manager of a national pilot project under the auspices of the Water Utility Climate Alliance, a national coalition of drinking water providers chaired by the SFPUC general manager since its founding in 2007. The project, Piloting Utility Modeling Applications for Climate Change (PUMA) is a partnership between five water utilities, four Regional Integrated Sciences and Assessment (RISA) programs, and selected climate science experts. The project has five primary objectives:

1. Identify state-of-the-art climate modeling tools and techniques for use in assessment;
2. Articulate the uncertainties embedded in modeling results, as well as how to best use down-scaled and other climate modeling data in planning;
3. Acquire climate projection data utilizing the identified modeling tools and translate that data into a form and scale that can be used by utility hydrologic models to generate watershed and/or urban runoff information;
4. Build a national collaboration with the RISA program by engaging RISA experts from the north-west, California-Nevada, southeast, and northeast regional RISA enterprises;
5. Inform developing conversations between climate science users and providers regarding how existing research meets or does not meet the needs of the adaptation community, how future investment in research might better serve society, and the nature of climate services needed on the ground in communities facing adaptation challenges.

Three utilities – the SFPUC, Seattle Public Utilities, and Tampa Bay Water – are committed to conducting pilot project assessment in conjunction with the PUMA project. Two others, Portland Water Bureau and New York City Department of Environmental Protection, are active with the project and are currently considering participating at the pilot level. Given the level of collaboration between utilities facing adaptation challenges, RISA leaders, and other climate science experts in the PUMA project, the SFPUC expects both enhancement of the collective understanding of best practices in this arena, as well as a more detailed and robust assessment of the SFPUC's potential vulnerability to climate change, to emerge from the project. Thus, the SFPUC will be better equipped to make risk-based decisions in the future. A team of top climate scientists and the California RISA program, under the management of SFPUC staff, is currently developing a workplan for the SFPUC's assessment, which will encompass both Hetch Hetchy and local watersheds.

This section provides the UWMP checklist to facilitate DWR's review of the completeness of this document. The tables are organized according to subject matter.

Contingency

#[20]	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
35	Provide an urban water shortage contingency analysis that specifies stages of action, including up to a 50-% water supply reduction, and an outline of specific water supply conditions at each stage.	10632 (a)	Table 27 (p.61)
36	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.	10632 (b)	Table 31 (p.68), Table 34 (p.72)
37	Identify actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.	10632 (c)	Section 5.5 (p.63)
38	Identify additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.	10632 (d)	Table 28 (p.62)
39	Specify consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50% reduction in water supply.	10632 (e)	Section 5.4.2 (p.58), Table 27 (p.61)
40	Indicated penalties or charges for excessive use, where applicable.	10632 (f)	Table 28 (p.62)
41	Provide an analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.	10632 (g)	Section 5.4.4 (p.63)
42	Provide a draft water shortage contingency resolution or ordinance.	10632 (h)	Appendix H
43	Indicate a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632 (i)	Section 4.2.4 (p.45)

20 Numbers are according to Table I-2 of the 2010 UWMP Draft Guidebook

Demand Management Measures (DMMs)

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
26	Describe how each water demand management measures is being implemented or scheduled for implementation. Use the list provided.	10631 (f) (1)	Table 35, Section 6.2 (p.76)
27	Describe the methods the supplier uses to evaluate the effectiveness of DMMs implemented or described in the UWMP.	10631 (f) (3)	Section 6.2 (p.76)
28	Provide an estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the ability to further reduce demand.	10631 (f) (4)	Section 6.2 (p.76)
29	Evaluate each water demand management measure that is not currently being implemented or scheduled for implementation. The evaluation should include economic and non-economic factors, cost-benefit analysis, available funding, and the water suppliers' legal authority to implement the work.	10631 (g)	N/A All 14 DMMs are being implemented (see Section 6.2, p.76)
30	Include the annual reports submitted to meet the Section 6.2 requirements, if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631 (j)	N/A - Section completed in lieu of attaching BMP Report (currently under development)

Reliability

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
22	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage and provide data for (A) an average water year, (B) a single dry water year, and (C) multiple dry water years.	10631 (c) (1)	Section 5 (p.49)
23	For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.	10631 (c) (2)	Table 19 (p.49)
53	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. Base the assessment on the information compiled under Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.	10635 (a)	Section 5.7 (p.70), Section 5.6 (p.66)

External Coordination and Outreach

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
4	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	10620 (d) (2)	Section 1.1 (p.3)
6	Notify, at least 60 days prior to the public hearing on the plan required by Section 10642, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Any city or county receiving the notice may be consulted and provide comments.	10621 (b)	Section 1.2 (p.4)
7	Provide supporting documentation that the UWMP or any amendments to, or changes in, have been adopted as described in Section 10640 et seq.	10621 (c)	Appendix B
54	Provide supporting documentation that the urban water management plan has been or will be provided to any city or county within which it provides water, no later than 60 days after the submission of this urban water management plan.	10635 (b)	Appendix B
55	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	10642	Appendix B
56	Provide supporting documentation that the urban water supplier made the plan available for public inspection and held a public hearing about the plan. For public agencies, the hearing notice is to be provided pursuant to Section 6066 of the Government Code. The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. Privately-owned water suppliers shall provide an equivalent notice within its service area.	10642	Appendix B
57	Provide supporting documentation that the plan has been adopted as prepared or modified.	10642	Section 1.3 (p.5), Appendix C
58	Provide supporting documentation as to how the water supplier plans to implement its plan.	10643	Section 1.3 (p.5)
59	Provide supporting documentation that, in addition to submittal to DWR, the urban water supplier has submitted this UWMP to the California State Library and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. This also includes amendments or changes.	10644 (a)	Section 1.3 (p.5), Appendix B
60	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the urban water supplier has or will make the plan available for public review during normal business hours	10645	Section 1.3 (p.5), Appendix B

Service Area

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
8	Describe the water supplier service area.	10631 (a)	Section 2.1 (p.7)
9	Describe the climate and other demographic factors of the service area of the supplier	10631 (a)	Section 2.3 (p.14), Section 2.4 (p.14)
10	Indicate the current population of the service area	10631 (a)	Section 2.4 (p.14), Section 2.5 (p.18), Table 3 (p.16), Table 5 (p.18)
11	Provide population projections for 2015, 2020, 2025, and 2030, based on data from State, regional, or local service area population projections.	10631 (a)	Section 2.4 (p.14), Section 2.5 (p.18), Table 3 (p.16), Table 5 (p.18)
12	Describe other demographic factors affecting the supplier's water management planning.	10631 (a)	Section 2.4 (p.14), Section 2.5 (p.18)

Water Conservation

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
1	Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	10608.20 (e)	Section 4.2 (p.40)
-	Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions.	10608.36	Section 4.2.4 (p.45)
3	Report progress in meeting urban water use targets using the standardized form.	10608.40	N/A. Does not apply until 2015 UWMP

Water Demands

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
25	Quantify past, current, and projected water use, identifying the uses among water use sectors, for the following: (A) single-family residential, (B) multifamily, (C) commercial, (D) industrial, (E) institutional and governmental, (F) landscape, (G) sales to other agencies, (H) saline water intrusion barriers, groundwater recharge, conjunctive use, and (I) agriculture.	10631 (e)(1)	Table 12 (p.36), Table 13 (p.37), Table 17 (p.47)
34	Include projected water use for single-family and multifamily residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)	Section 4.1.4 (pg.37)

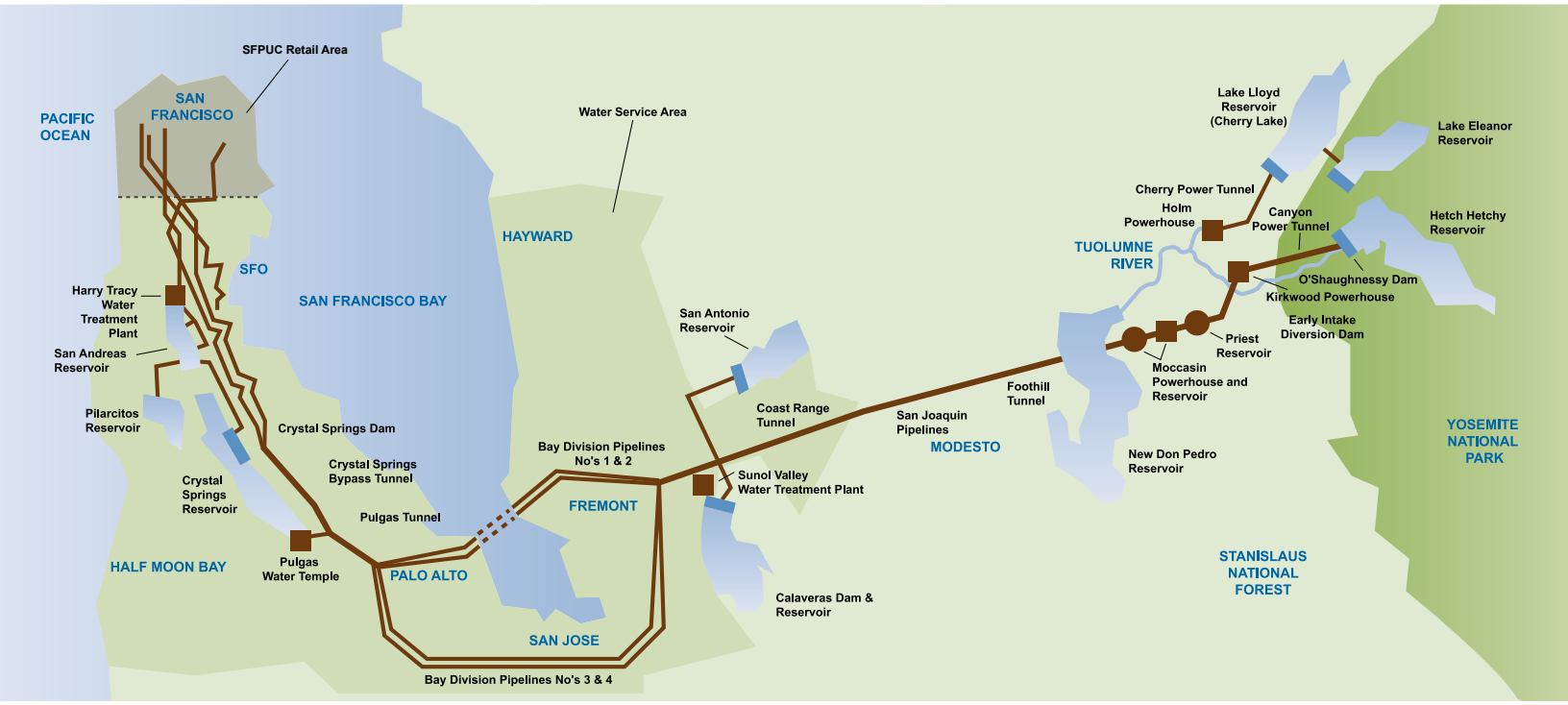
Recycled Water

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
44	Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	10633	Section 3.3.2 (p.27)
45	Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633 (a)	Section 3.2.2 (p.25), Table 9 (p.26)
46	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633 (b)	Table 8 (p.26)
47	Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633 (c)	Section 3.2.2 (p.25)
48	Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633 (d)	Table 10 (p.30)
49	The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	10633 (e)	Table 10 (p.30)
50	Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633 (f)	Section 3.3.3 (p.29)
51	Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote re-circulating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633 (g)	Section 3.3.4 (p.29)

Water Supply

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
5	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	10620 (f)	Section 3.3 (p.27)
13	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030.	10631 (b)	Sections 3.1, 3.2 (p.19-26)
14	Indicate whether groundwater is an existing or planned source of water available to the supplier. If yes, then complete 15 through 21 of the UWMP Checklist. If no, then indicate "not applicable" in lines 15 through 21 under the UWMP location column.	10631 (b)	Yes
15	Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631 (b) (1)	Section 3.2 (p.24)
16	Describe the groundwater basin.	10631(b) (2)	Section 3.2 (p.24)
17	Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree.	10631 (b) (2)	Section 3.2 (p.24)
18	Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. If the basin is not adjudicated, indicate "not applicable" in the UWMP location column.	10631 (b) (2)	Not Applicable
19	For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. If the basin is adjudicated, indicate "not applicable" in the UWMP location column.	10631 (b) (2)	Section 3.2 (p.24)
20	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years.	10631 (b) (3)	Section 3.2 (p.24)
21	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	10631 (b) (4)	Section 3.2 (p.24), Section 3.3.1 (p.27)
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631 (d)	Section 5.2.4 (p.53)
30	Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project.	10631 (h)	Section 5.2 (p.51)
31	Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and GW.	10631 (i)	Section 5.3.1 (p.56)

#	UWMP REQUIREMENT	CA WATER CODE	2010 UWMP LOCATION
33	Provide documentation that either the retail agency provided the wholesale agency with water use projections for at least 20 years, if the UWMP agency is a retail agency, OR, if a wholesale agency, it provided its urban Retail Customers with future planned and existing water source available to it from the wholesale agency during the required water-year types.	10631 (k)	Appendix G
52	Provide information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments, and the manner in which water quality affects water management strategies and supply reliability.	10634	Section 3.4 (p.31)



2010 Urban Water Management Plan

for the City and County of San Francisco

Prepared by: The San Francisco Public Utilities Commission

San Francisco Water Power Sewer

Services of the San Francisco Public Utilities Commission