Sunnyvale

# 2020 Urban Water Management Plan





Adopted June 29, 2021

HydroScience

City of Sunnyvale

# 2020 Urban Water Management Plan

Prepared by HydroScience Engineers, Inc.

June 29, 2021

HydroScience
Strategic Water Solutions

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## TABLE OF CONTENTS

## LIST OF APPENDICES



## LIST OF FIGURES

## LIST OF TABLES

## ACRONYMNS AND ABBREVIATIONS

| | |
|---|---|
| AB | Assembly Bill |
| ABAG | Association of Bay Area Governments |
| ACS | American Community Survey |
| ACWD | Alameda County Water District |
| AF | acre-feet, acre-foot |
| AFU | affordable rental units |
| AFY | acre-feet per year |
| AWIA | America's Water Infrastructure Act |
| AWSP | Alternative Water Supply Planning |
| AWWA | American Water Works Association |
| BAIRWMP | Bay Area Integrated Regional Water Management Plan |
| BARDP | Bay Area Regional Desalination Project |
| BARR | Bay Area Regional Reliability |
| BAWSCA | Bay Area Water Supply and Conservation Agency |
| BayQWEL | Bay Area Qualified Water Efficient Landscaper Training |
| BMR | below market rate |
| Cal Water | California Water Service Company |
| CalWEP | California Water Efficiency Partnership |
| CCAP | Climate Change Action Plan |
| CCF | hundred cubic feet |
| CCWD | Contra Costa Water District |
| CII | commercial, industrial, and institutional |
| City | City of Sunnyvale |
| Corps | Army Corps of Engineers |
| COVID-19 | Coronavirus |
| CPC | California Plumbing Code |
| CVP | Central Valley Project |
| CWRMP | Countywide Water Reuse Master Plan |
| DCR | Delivery Capability Report |
| Demand Study | BAWSCA Regional Water Demand and Conservation Projections, June 2020 report |
| DEOP | Division Emergency Operations Plan |
| DMMs | demand management measures |

## ACRONYMNS AND ABBREVIATIONS

| | |
|---|---|
| DOF | Department of Finance |
| DOSD | Division of Safety of Dams |
| DRA | drought risk assessment |
| DSS Model | Demand Side Management Least Cost Planning Decision Support System model |
| DWR | Department of Water Resources |
| EBMUD | East Bay Municipal Utilities District |
| EIR | Environmental Impact Report |
| EO | education outreach |
| EOC | Emergency Operations Center |
| EOP | Emergency Operations Plan |
| ERP | Emergency Response Plan |
| ESSU | Emergency Services and Security Unit |
| FEMA | Federal Emergency Management Agency |
| ft | feet, foot |
| FY | fiscal year |
| GHG | greenhouse gas |
| GMP | Groundwater Management Plan |
| gpcd | gallon per day per capita |
| gpf | gallon(s) per flush |
| GSA | Groundwater Sustainability Agency |
| GSI | green stormwater infrastructure |
| GSP | Groundwater Sustainability Plan |
| GSR | Groundwater Storage and Recovery |
| Guidebook | Final Draft 2020 Urban Water Management Plans: Guidebook for Urban Water Suppliers |
| HET | high-efficiency toilet |
| HEU | high-efficiency urinal |
| HHLSM | Hetch Hetchy and Local Simulation Model |
| HydroScience | HydroScience Engineers, Inc |
| IPCC | International Panel on Climate Change |
| IRP | Infrastructure Reliability Plan |
| ISG | Individual Supply Guarantee |

## ACRONYMNS AND ABBREVIATIONS

| | |
|---|---|
| ITR | industrial to residential |
| JPA | Joint Powers Authority |
| kWh | kilowatt-hour |
| L2L | Graywater Laundry to Landscape |
| LCSD | Lower Crystal Springs Dam |
| LHMP | Local Hazard Mitigation Plan |
| LOS | Level of Service |
| LVE | Los Vaqueros Reservoir Expansion |
| MAP | Monitoring and Assessment Program |
| MCL | maximum contaminant level |
| MGD | million gallons per day |
| MID | Modesto Irrigation District |
| MMWD | Marin Municipal Water District |
| MRP | Municipal Regional Stormwater Permit |
| NPDES | National Pollutant Discharge Elimination System |
| OCF | Our City Forest |
| OES | Office of Emergency Services |
| Playbook | Sunnyvale's Climate Action Playbook |
| PREP | Potable Reuse Exploratory Plan |
| PRSV | pre-rinse spray valves |
| psi | pounds per square inch |
| RCP | representative concentration pathways |
| Region | Bay Area Region |
| RWJC | Recycled Water Joint Committee |
| RWS | City and County of San Francisco's Regional Water System |
| SB | Senate Bill |
| SBX7-7 | Senate Bill Seven of the Senate’s Seventh Extraordinary Session of 2009 |
| SCADA | supervisory control and data acquisition |
| SCVURPPP | Santa Clara Valley Urban Runoff Pollution Prevention Program |
| SFPUC | San Francisco Public Utilities Commission |
| SGMA | Sustainable Groundwater Management Act |
| SMaRT® Station | Sunnyvale Materials Recovery and Transfer Station |

## ACRONYMNS AND ABBREVIATIONS

| | |
|---|---|
| SMP | Surface Mining Permit |
| SOC | Sunnyvale Office Center |
| sq ft | square feet |
| State | State of California |
| STEAM | Science, Technology, Engineering, the Arts and Mathematics |
| STORMS | Strategy to Optimize Resource Management of Stormwater |
| SVCE | Silicon Valley Clean Energy |
| SVCW | Silicon Valley Clean Water |
| SWAP | Shared Water Access Program |
| SWP | State Water Project |
| SWRCB | State Water Resources Control Board |
| TID | Turlock Irrigation District |
| U.S. | United States |
| USBR | U.S. Bureau of Reclamation |
| USD | Union Sanitary District |
| UWMP | Urban Water Management Plan |
| Valley Water | Santa Clara Valley Water District |
| WCIP | Water Conservation Implementation Plan |
| WEAP | Water Evaluation and Planning |
| WET | Water Education for Teachers |
| WPCP, Plant | Sunnyvale's Water Pollution Control Plant |
| WRPS | Wolfe Road Pump Station |
| WSA | Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County |
| WSAP | Water Shortage Allocation Plan |
| WSCP | Water Shortage Contingency Plan |
| WSIP | Water System Improvement Program |
| WSMP | Water Supply Master Plan |

# SECTION 1 – INTRODUCTION AND OVERVIEW

The City of Sunnyvale's (City) 2020 Urban Water Management Plan (UWMP) was prepared to provide a comprehensive update to the 2015 UWMP, which was adopted by City Council on June 21, 2016. The 1983 California Urban Water Management Act (Act), also referred to as Assembly Bill (AB) 797, requires all urban water suppliers who directly serve 3,000 or more customers or who provide 3,000 or more acre-feet of water per year (AFY), to prepare a UWMP every five years.

The UWMP will enable the Department of Water Resources (DWR) to make projections on water usage and determine the status of water conservation efforts throughout the State. Although the efficient use of water supplies is a statewide concern, the planning and implementation of such use can best be accomplished at the local level.

The 2020 update to the City's 2015 UWMP builds upon previous updates, incorporates relevant water management issues, addresses supply and demand projections for the next 20 years within the City, and presents future water supply reliability. It demonstrates compliance with State legislative mandates that have been enacted, in particular Senate Bill (SB) X7-7 Water Conservation Act of 2009, AB 1420 Water Demand Management Measures, and 2018 Water Conservation Legislation AB 1668 (Friedman) and SB 606 (Hertzberg). Some of these legislative mandates target a 20% water use reduction per capita by December 31, 2020. Specific requirements include identifying the base daily per capita water use (baseline), urban water use target, interim water use target, and compliant daily per capita water use.

Beginning in the 2020 UWMP reporting period, each Supplier is now required to develop and adopt a Water Shortage Contingency Plan (WSCP). The 2020 UWMP must also include information on water deliveries and uses; water supply sources; efficient water uses; and demand management measures, including implementation strategy and schedule. DWR has the responsibility for the review and certification process of the UWMP pursuant to the Act. A current UWMP is required to be eligible for a water management grant or loan administered by the State including DWR, the State Water Resources Control Board, or the Delta Stewardship Council.

The goals of the 2020 UWMP update include:

- To provide a valuable resource tool to be used by policy makers at City, County, and local government levels to facilitate making sound and consistent decisions relating to water management and regional growth in the area.
- To meet all Federal and State regulatory requirements.
- To update the City's water conservation plan and projections for future conservation efforts.
- To prepare a realistic Drought Risk Assessment.
- To update the City's Water Shortage Contingency Plan and Seismic Risk Assessment and Mitigation Plan.
- To calculate water service energy usage.
- To identify communication links between key departments at both City and County levels, and to strengthen ties for cooperatively addressing water supply and land use planning issues.
- To continue and solidify relationships with other retailers and wholesalers to better address issues concerning water supply and demand.

## 1.1 Lay Description

The City owns, operates, and maintains a drinking water system that serves its approximately 156,500 residents. Most of the City's water comes from treated surface water from two wholesalers: the San Francisco Public Utilities Commission (SFPUC) and Santa Clara Valley Water District (Valley Water). The remainder of the City's water is comprised of groundwater from six City-owned wells. The City also owns and operates a recycled water system that supplies water for irrigation to some customers in the City. The recycled water is produced at the City's Water Pollution Control Plant (WPCP, Plant). The City's water demand projections have been updated in this 2020 UWMP to reflect population growth, planned development, water conservation estimates, and the anticipated effects of climate change. Water demands within City boundaries are expected to increase from 19,906 acre-feet per year (AFY) in 2020 to approximately 25,618 AFY in 2040.

There are several factors in determining the City's water supply reliability. In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) to establish water quality objectives with the stated goal of increasing salmon populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. It remains unclear how or if the Bay-Delta Plan will be implemented. This UWMP assumes the Bay-Delta Plan will be implemented in 2023, leading to cutbacks in projected wholesaler supplies (SFPUC and Valley Water). SFPUC expects that some of these cutbacks will trickle down to its retailers, including the City; however, Valley Water expects to absorb cutbacks by implementing other water supply strategies. Even with some expected cutbacks by SFPUC, based on the information provided by both wholesalers, the City will be able to meet projected water demands under normal, single-dry, and five consecutive dry-year conditions both in the near term and long term (through 2040).

Although the projections indicate no shortfalls, the City will work closely with SFPUC, Valley Water, and other water retail agencies to implement any stages of action as appropriate to reduce the demand for water during water shortage conditions. As part of the 2020 UWMP, the City also developed a Water Shortage Contingency Plan (WSCP) that describes the City's approach and response in the event of a water shortage ranging from 10% to greater than 50%. If a shortage is identified, the WSCP outlines the appropriate response actions, such as restrictions on irrigation and expanding public information campaigns, and relevant enforcements to mitigate the shortage. In the event of a decrease of local supplies, the City would respond by implementing demand reduction strategies outlined in this UWMP in line with the severity of the supply shortage. Thus any supply deficits would be compensated for by increased conservation and restrictions in consumption, if needed.

# SECTION 2 – PLAN PREPARATION

The UWMP was prepared in accordance with the *Final Draft 2020 Urban Water Management Plans: Guidebook for Urban Water Suppliers* dated March 29, 2021 (Guidebook). The City retained HydroScience Engineers, Inc. (HydroScience) to prepare the 2020 UWMP update. HydroScience worked closely with the City's Environmental Services Department during the development of the UWMP to assure accurate and updated information was collected and incorporated. Based on the number of municipal connections as shown in **Table 2-1**, the City is required to prepare an update to the 2015 UWMP.

**Table 2-1: Public Water System**

| Public Water System Number | Public Water System Name | Number of Municipal Connections 2020 | Volume of Water Supplied 2020[1] |
|---|---|---|---|
| CA4310014 | City of Sunnyvale | 28,343 | 19,906 |

Notes:
1. Volume of water supplied within City limits.

The UWMP organization and coordination efforts are detailed below.

## 2.1 Plan Organization

The 2020 UWMP is organized as recommended in the Guidebook to expedite review and approval by DWR. The sections contained in the 2020 UWMP are as follows:

- Section 1 – Introduction and Overview
- Section 2 – Plan Preparation
- Section 3 – System Description
- Section 4 – Water Use Characterization
- Section 5 – SBX7-7 Baselines and Targets
- Section 6 – Water Supply Characterization
- Section 7 – Water Supply Reliability and Drought Risk Assessment
- Section 8 – Water Shortage Contingency Plan
- Section 9 – Demand Management Measures
- Section 10 – Plan Adoption, Submittal, and Implementation

## 2.2 Inclusion of All 2020 Data

The 2020 UWMP includes all data for water use and planning for the calendar year of 2020. Data is shown in calendar year with units in acre-feet (AF) (**Table 2-2**).

**Table 2-2: Supplier Identification**

| Supplier and UWMP Format | |
|---|---|
| Type of Supplier | |
| | Supplier is a wholesaler |
| X | Supplier is a retailer |
| Fiscal or Calendar Year | |
| X | UWMP Tables are in calendar years |
| | UWMP Tables are in fiscal years |
| Units of measure used in UWMP | |
| Unit | Acre Feet (AF) |

## 2.3 Coordination

This UWMP was developed as an individual UWMP (**Table 2-3**) but included coordination with several regional partners.

**Table 2-3: Plan Identification**

| Select Only One | Type of Plan |
|---|---|
| X | Individual UWMP |
| | Water Supplier is also a member of a RUWMP |
| | Water Supplier is also a member of a Regional Alliance |
| | Regional Urban Water Management Plan (RUWMP) |

The City participates in area and regional planning with the Bay Area Water Supply and Conservation Agency (BAWSCA), the San Francisco Public Utilities Commission (SFPUC) and the Santa Clara Valley Water District (Valley Water). The City also participates in basin-wide groundwater and conservation planning with Valley Water. Valley Water provides management of local groundwater resources and contracts for imported water to Santa Clara County. Participation in these planning efforts helps ensure that the City will receive an adequate amount of water to provide for its residents and businesses. It also provides for drought-condition planning and coordination with the rest of the region so that no water provider is unduly impacted by lack of water.

BAWSCA provides regional water reliability planning and conservation programming for the benefit of its 26 member agencies that purchase wholesale water supplies from SFPUC. Collectively, the BAWSCA member agencies deliver water to over 1.8 million residents and nearly 40,000 commercial, industrial, and institutional accounts in Alameda, San Mateo, and Santa Clara Counties.

BAWSCA also represents the collective interests of these wholesale water customers on all significant technical, financial, and policy matters related to the operation and improvement of the SFPUC's Regional Water System (RWS).

BAWSCA's role in the development of the 2020 UWMP updates is to work with its member agencies and the SFPUC to seek consistency among UWMP documents.

The City contacted the SFPUC (through BAWSCA) and Valley Water for assistance with its UWMP and at the same time provided those agencies with pertinent data for their own plans.

The City encouraged the involvement of social, cultural, and economic community groups during the preparation of the 2020 UWMP. Specific efforts were made to send out a public notification mailer to all community groups, including public and private water suppliers. BAWSCA agencies were notified of the 2020 preparation process. The City directed these agencies to the location of the Draft UWMP and solicited comments and suggestions.

The City published its intention to update the 2015 UWMP and invited public comments on the City's Web page. Copies of notices for participation in the 2020 UWMP preparation can be found in **Appendix A**.

A Notice of Preparation of the UWMP was sent on February 2, 2021 to the following agencies listed in **Table 2-4**.

**Table 2-4: List of Notified Agencies**

| Agency Name | |
|---|---|
| Alameda County Water District | Santa Clara Valley Water District |
| City of Hayward | Mid-Peninsula Water District |
| City of Milpitas | North Coast County Water District |
| City of Mountain View | City of East Palo Alto |
| City of Palo Alto | Westborough Water District |
| City of Santa Clara | California Water Service Company |
| Stanford University | San Jose Water Company |
| Purissma Hills Water District | City of San Jose |
| City of Brisbane | City of San Bruno |
| City of Burlingame | Coastside County Water District |
| City of Daly City | City of Foster City |
| Town of Hillsborough | County of Santa Clara |
| City of Menlo Park | Bay Area Water Supply & Conservation Agency |
| City of Millbrae | San Francisco Public Utilities Commission |
| City of Redwood City | |

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# SECTION 3 – SYSTEM DESCRIPTION

This section provides information about the City and service area including the organization structure and history, climate, demographics, and the water distribution system.

## 3.1 History

The City of Sunnyvale is in Santa Clara County, just minutes from the City of San Jose and approximately 40 miles south of the City and County of San Francisco. The City of Sunnyvale was incorporated in 1912 and became an official charter city in 1950. When the City was incorporated in 1912, its population was approximately 1,500 and the entire municipal water system relied exclusively on groundwater for its potable water supply source. The original water supply source was from a privately-owned well at the Joshua Hendy Iron Works Factory in Sunnyvale. By 1926, a total of three wells were operational, none of which are in use today. During World War II, the Federal government awarded several war contracts that led to the development of the Central Water Plant and groundwater well.

At the close of World War II, Sunnyvale began to grow very quickly. By the early 1950s, demand for water surpassed the supplies available from groundwater and led to overdraft of the aquifers. As a direct consequence of the overdraft of the groundwater, land subsidence in the northern region of the City was at 0.3 feet per year. By 1952, the population had grown to 10,000, and it was at that time that Sunnyvale entered into a contractual agreement with the City and County of San Francisco for delivery of imported SFPUC water. That same year, three connections were made to the SFPUC supply to serve as a primary water source, to be supplemented by the now seven City-owned and operated wells located throughout the City. In the 17 years that followed, the City population grew to 96,000. Sunnyvale realized the need for an additional water supply source and contracted with the Valley Water for two connections to the Valley Water's West Pipeline. By 1970, the City had developed three of its four current water supply sources (SFPUC/Hetch Hetchy, Valley Water Central Valley Project water, and City-owned wells).

As the demand for water was steadily on the rise during the period of 1970 through the mid-1980s, the City expanded the number of Hetch Hetchy connections to its current total of six. Sunnyvale also added two well water producing facilities, which gave the City a total of 11 City-owned and operated wells at that time.

The City also expanded its interconnections with surrounding water utilities in the immediate area to ensure a sustainable water supply during times of emergencies, thus adding to the system's reliability. The City has, at the present time, connections to the cities of Mountain View, Cupertino, and Santa Clara, as well as to the California Water Service Company.

The water demand reached an all-time-high in 1987 and demand was expected to increase, reaching approximately 36,000 AFY at the projected system build-out. The six-year drought that started in the late 1980s and ended in the mid-1990s brought about many changes in water usage, which came largely from the industrial sector. Conservation measures and a recycled water program adopted by the City were some of the most important drought-induced changes. Changes in the economic dynamics of the area occurring after 2001 brought about new reductions to the water demand. Current projections for the water system build-out expect a slow increase to less than 30,000 AFY over the next 30 years.

## 3.2 Organization Structure

The City operates under a Council-manager form of government. Council, as the legislative body, represents the entire community and is empowered by the City Charter to formulate citywide policy. Six Council members are elected by District by City voters for numbered seats and serve four-year terms. The mayor is elected city-wide by the voters. The City Charter limits the Mayor and Council members to serving two consecutive terms. The Vice Mayor is selected from among the ranks of the Council. The City Manager is appointed by Council and serves as the Chief Executive Officer, responsible for day-to-day administration of City affairs and implementation of Council policies. Boards and commissions, through public meetings, advise the City Council on policy issues. The City Council meetings are open to the public with few exceptions as allowed by law and take place between one and four Tuesdays per month.

The City's water utility is managed, operated, and maintained by the Environmental Services Department. This Division is responsible for the purchase and distribution of potable and non-potable water as well as construction of new and replacement infrastructure.

## 3.3 Climate

The City enjoys a generally mild, temperate climate with relatively low levels of precipitation. Daytime temperatures range from the mid 80's during the summer to typically not less than 50°F in the winter. Climate information for the area is illustrated in **Table 3-1**.

**Table 3-1: Local Climate Data**

| Parameter | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Tot/ Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Average $ET_o$ (inches)[1,2] | 1.37 | 1.96 | 3.31 | 4.44 | 5.39 | 6.04 | 6.23 | 5.39 | 4.38 | 3.08 | 1.68 | 1.22 | 44.49 |
| Precipitation (inches)[3] | 4.7 | 4.0 | 3.7 | 1.7 | 0.7 | 0.1 | 0.0 | 0.0 | 0.2 | 1.1 | 2.5 | 4.2 | 23.0 |
| Average Max Temperature (°F)[3] | 55.0 | 57.6 | 60.7 | 65.2 | 71.1 | 78.1 | 83.1 | 82.6 | 80.3 | 73.2 | 62.9 | 55.7 | 68.8 |
| Average Min Temperature (°F)[3] | 37.2 | 39.0 | 40.2 | 42.0 | 46.4 | 51.0 | 55.2 | 55.0 | 53.1 | 48.2 | 41.4 | 37.3 | 45.5 |
| Average Temperature (°F)[3] | 46.1 | 48.3 | 50.5 | 53.6 | 58.8 | 64.6 | 69.1 | 68.8 | 66.7 | 60.7 | 52.1 | 46.5 | 57.2 |

Notes:
2. $ET_o$ = Evapotranspiration is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues).
3. 2020 data from California Irrigation Management Information System (CIMIS) Station 171 – Union City.
4. 1895-2020 data for Santa Clara County from the National Oceanic and Atmospheric Administration (NOAA).

### 3.3.1 Climate Change Impacts

Several scientific reports have confirmed that greenhouse gas (GHG) emissions from human activities is contributing to a progressively warming climate. A slight increase in global temperatures could cause several environmental impacts, including increased wildfires, reduced snowpack, sea level rise, intensifying droughts and storms, and shorter and more intense water seasons. According to the BAWSCA Regional Water Demand and Conservation Projections, June 2020 (Demand Study), some climate change effects are already apparent in the State. Precipitation in the Bay Area has had high variability each year, leading to some very wet years and some very dry years. This variability is expected to continue, leading to potential changes in water supply and management. Additionally, the State is predicted to experience longer and deeper droughts due to increasing temperatures, which could pose a significant challenge to water supply reliability.

The City has consistently incorporated sustainability and climate action into their goals and planning efforts to address these potential threats. In 2014, the City created the Climate Action Plan (CAP 1.0) to set sustainability goals and outline strategies to reduce emissions. The City built on CAP 1.0 and adopted a new Climate Action Playbook (Playbook) in 2019 (2019 Climate Action Playbook). The Playbook identifies updated strategies to reach the State level GHG emissions reduction targets, which include:

- 1990 levels by 2020 (AB 32, 2006)
- 40% below 1990 levels by 2030 (SB 32, 2016)
- 80% below 1990 levels by 2050 (Executive Order S-3-05, 2005)

The City has already met the 2020 emissions goal and is on track to meeting 2030 levels. The Playbook outlines strategies to meet the 2050 goal, including promoting clean electricity, decarbonizing buildings, decarbonizing transportation, sustainable land use, and managing resources sustainably.

## 3.4 Service Area Population

The City currently provides water service to a population of 156,503 people. Since the City's service area overlaps the City boundaries by more than 95%, the 2020 population estimate was sourced from the 2020 Department of Finance (DOF) E-5 Population and Housing Estimates for Cities. According to the DOF data, the average annual population growth rate between 2010 and 2020 is approximately 1.12%. This rate was used to project the population of the water service area through 2040. As shown in **Table 3-2,** city population is projected to increase approximately 25% in the next 20 years.

**Table 3-2: Population Projections for City of Sunnyvale**

| | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| City Population[1] | 156,503 | 165,436 | 174,880 | 184,862 | 195,414 |

Notes:
1. Department of Finance 2020 estimate and 2025-2040 projections based on the 2010-2020 historical annual growth rate of 1.12%.

## 3.5 Demographics

The City is a diverse community with a residential population of 156,503. Approximately 58% of residents speak a language other than English at home. The percent population by race is summarized in **Table 3-3**.

**Table 3-3: Population by Race for City of Sunnyvale**

| Race | Percent |
|---|---|
| Asian alone | 46.7% |
| White alone | 39.8% |
| Black or African American alone | 1.6% |
| Native American and Alaska Native alone | 0.5% |
| Native Hawaiian and Other Pacific Islander alone | 0.3% |
| Some other race alone | 6.2% |
| Two or more races | 4.9% |

Source: 2019 American Community Survey 5-Year Narrative Profile

According to the 2019 American Community Survey (ACS) 5-Year Narrative Profile, the City's median household income is estimated to be $140,631, which is one of the highest in the nation. The City also has one of the lowest crime rates for a city of its size. It has a solid economic base, and poverty levels in the City have remained consistently lower than those of Santa Clara County or the State. Residents are generally well educated, with approximately 65% having a bachelor's degree or higher. With its Silicon Valley location, the City has an established high-tech presence having transitioned from agricultural to defense to the current high-tech economy. It has remained on the cutting edge of Silicon Valley's innovation. According to the 2012 Survey of Business Owners, the number of firms in the City is estimated to be 12,588. The top industries in the City include professional, scientific, management, and administrative and waste management services (29.1%); manufacturing (18.9%); education services, health care and social assistance (14.3%); information (8.9%); and retail trade (7.2%). The City is home to growing clusters of emerging technology companies in the high-tech and biotechnology industries.

### 3.5.1 Low-Income Housing

Based on the 2017 Association of Bay Area Governments (ABAG) projections, the City is estimated to have 59,020 housing units as of 2020. Projections also show an additional 3,665 units through the year 2030. Over 1,800 units are designated as low-income housing. The City has actively supported affordable rental housing utilizing a variety of local, State, and Federal funds, and works extensively with non-profit housing developers in the ownership and management of its projects. Rent-restricted housing in Sunnyvale includes both publicly subsidized affordable housing, generally assisted with any combination of Federal, State, local, and/or private subsidies, and deed-restricted rental units provided through the City's Below Market Rate (BMR) program. The City's BMR program currently requires that a percentage of units within some market-rate rental properties be offered at below-market-rate rent for lower-income residents. Lower-income residents are defined as households at 80% of the Area Median Income. Very low-income residents, defined as households at 50% of the Area Median Income, can take advantage of a subset of BMR units referred to as Affordable Rental Units (ARUs). Additional detailed demographic data can be found in **Appendix B**.

## 3.6 Land Uses within Service Area

The City has an approximate area of 24 square miles. Although the City is mostly built-out, factors such as population growth and climate change call for changes in the City's land use over time. The 2017 Update to the Sunnyvale General Plan identified areas of the City that will be preserved, enhanced, and transformed from 2010-2035. Preserved and enhanced areas are expected to have minor upgrades but no major character shift. Transformed areas include older shopping centers and office areas that will be transformed into new mixed-use developments called Village Centers. The Village Centers are meant to provide residential diversity in existing residential areas.

As part of the 1993 "Industrial to Residential" program (ITR), the City has encouraged specific industrial areas to redevelop to residential use. Each ITR site allows industrial, office, commercial, and residential uses to exist within the same district while gradually converting to residential use. As of 2007, ITR designated sites totaled approximately 320 acres, accommodating up to 7,700 dwelling units.

## 3.7 Water Supply Sources

The City has three sources of potable water supplies: purchased water from SFPUC, treated purchased water from Valley Water, and City-owned and operated groundwater wells. In addition, the City has multiple potable water interties with the City of Santa Clara, the City of Mountain View, the City of Cupertino, and the California Water Service Company (Cal Water), which can all provide water service in the event of an emergency. The City also has a recycled water program that supplies water treated at the City's WPCP for non-potable purposes such as landscape irrigation and watering golf courses.

## 3.8 Distribution System

The City retails potable drinking water and non-potable (recycled) water within the City limits. The City also wholesales recycled water through a developed recycled water program in partnership with Valley Water. Recycled water pipelines serve communities both within and beyond city limits. Cal Water retails potable drinking water from Cal Water owned groundwater wells in pocket areas of the City (see **Figure 3-1**).

The City owns, operates, and maintains a water supply and distribution system worth more than $200 million. The system is a closed network consisting of three different pressure zones. Sunnyvale's elevation varies from sea level at the northern end of town to approximately 300 feet above sea level at the southwest corner of town. Zone I extends roughly from El Camino Real northward to the San Francisco Bay and is supplied primarily by SFPUC water. Zone II consists of everything south of Zone I except for the southwest corner of the City and is served by a supply mixture of SFPUC water, City groundwater wells, and Valley Water treated water. Zone III serves the southwest section of town with Hollenbeck Avenue on the east side and Fremont Avenue on the north side and is served by a combination of Valley Water treated water and City well water. The conveyance system extends approximately 348 miles in length, with pipe diameters ranging from 4 inches to 36 inches.

Water pressure within the distribution system is maintained within a range of 40 pounds per square inch (psi) to 105 psi throughout all three zones. A Supervisory Control and Data

Acquisition (SCADA) system allows the City to maintain a balanced system, generally keeping water deliveries between those pressure readings. The average operating pressure is 68 psi. Zone I receives direct downstream pressure from the SFPUC pipeline system with an operating pressure of approximately 130 psi, though that pressure is reduced by pressure regulating valves before it is delivered to customers.

Several pocketed areas within the City boundaries, located primarily along Fremont Avenue and Sunnyvale-Saratoga Road, receive water from Cal Water. These areas were at one time part of unincorporated Santa Clara County, but have since been annexed by the City. Cal Water produces its own water from wells the company owns exclusively. The City, through a cooperative effort, provides emergency connections to Cal Water's system to improve fire flows when needed.

There are eight active potable water storage reservoirs at four different locations throughout the City with a total storage capacity of 26.5 million gallons (81 AF). There is also one recycled water reservoir with a storage capacity of two million gallons (6 AF). This volume of water can meet at least one day of average water demand during the summer for the entire City.

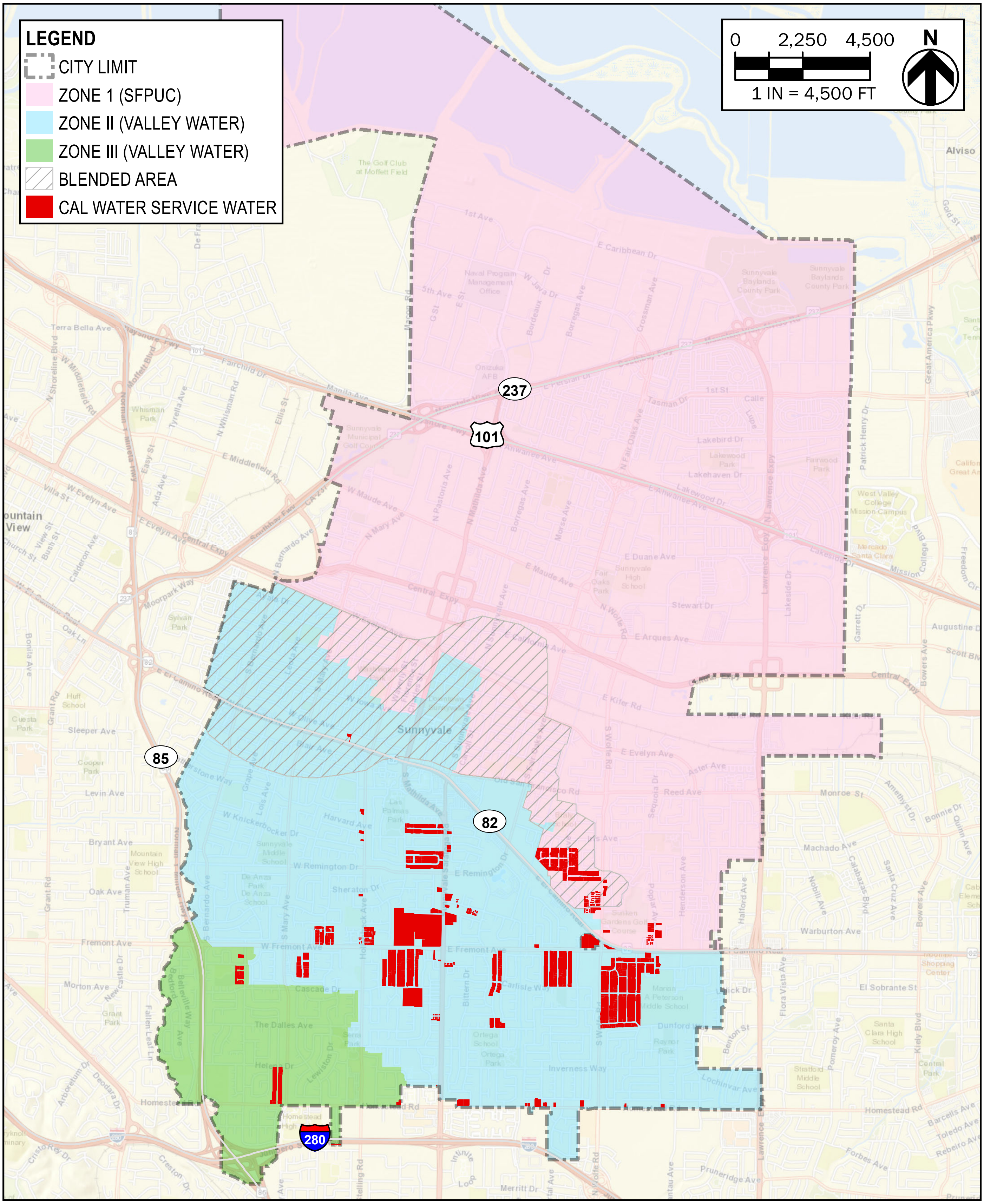


**FIGURE 3-2**
CITY OF SUNNYVALE
URBAN WATER MANAGEMENT PLAN
SERVICE AREA MAP

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# SECTION 4 – WATER USE CHARACTERIZATION

This section provides information on past, current, and projected water use within the City's service area. Note that water use is provided on a calendar year basis.

## 4.1 Non-Potable Versus Potable Water Use

The City supplies both treated drinking water (potable) and recycled water (non-potable) to service area customers. Recycled water is supplied for non-potable purposes such as irrigation and toilet flushing. To provide redundancy to the recycled water system, Potable water is available as backup to the recycled water system, occasionally supplementing the recycled water system with potable water. Although some potable water is used in the recycled water system, potable and recycled water are reported separately throughout this UWMP. Potable water supply totals include any potable water added to the recycled water system. Recycled water is discussed further in **Section 6**.

## 4.2 Past, Current, and Projected Water Use by Sector

The City of Sunnyvale categorizes its water accounts into six broad customer categories: single-family, multi-family, commercial (incorporating industrial), institutional, irrigation, and fire services. The commercial sector includes all non-residential accounts that are not classified as irrigation or institutional. These six sectors include all service area accounts and will be used to report past, current, and projected water use throughout this UWMP.

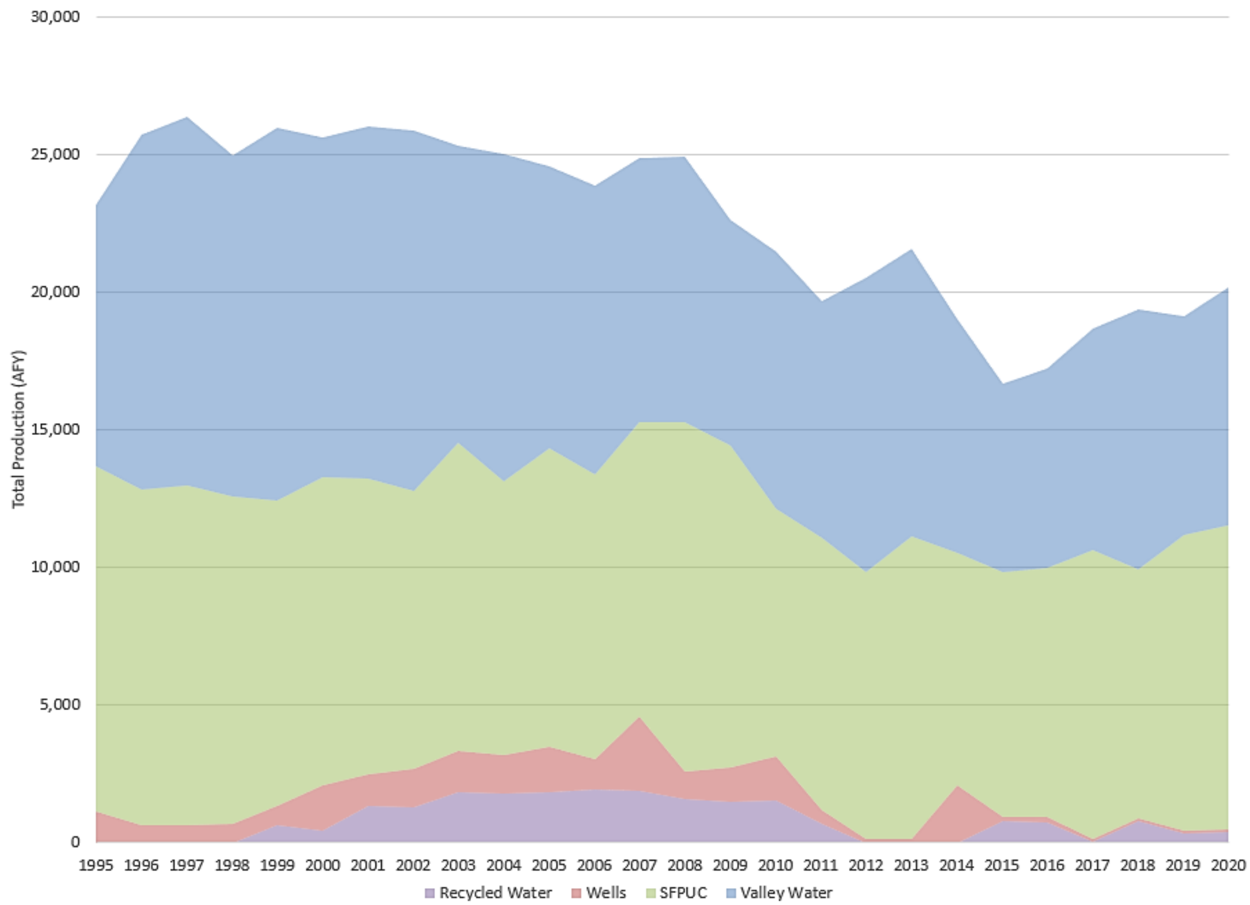
### 4.2.1 Historical Water Use

Water use varies depending on factors such as population, weather, policy change, and the economic climate. Recognizing these factors and long-term general trends in water use is valuable in projecting future supply needs. Historical water production is generally representative of water demand and can be used as a surrogate to quantify historical water use. The City has three potable water supply sources: SFPUC, Valley Water, and groundwater wells. In the 1990's, the City modified its traditional sewer treatment plant to produce recycled water. The City began using recycled water in 1999, supplementing the overall water supply.

**Figure 4-1** is a graphical depiction of the total annual water supply in AFY categorized by supply source from 1995 to 2020. Water use in Sunnyvale generally increased from 1995 to 2001. After 2002, water use began to steadily decline in response to drought-related conservation measures, economic factors, and contractual limitations previously negotiated.

The City purchases water from Valley Water and SFPUC, so the increase in deliveries from one source will generally be accompanied by a decrease from the other. The sharp decline in water use from 2013 to 2015 was due to drought conditions and implementation of local and regional water conservation measures. Water use since 2015 has partially recovered, which can be attributed to recovery from the drought.

**Figure 4-1: Annual Water Production 1995-2020 (AFY)**




### 4.2.2 Distribution System Water Loss

Water loss within the City's distribution system may be due to leaks, breaks, malfunctioning valves, and water meter inaccuracies. Other losses come from legitimate uses such as water/sewer main and hydrant flushing, tests of fire suppression systems, and street cleaning. SB 555, approved in October 2015, requires all water retailers to report distribution system losses annually based on the American Water Works Association's (AWWA) Water Audit Software.

The water losses from 2016 to 2020 are summarized in **Table 4-1**. As seen in the data, system losses have been consistently between 4% and 6% of total water supplied each year. These losses are substantially lower than the 10% losses normally experienced by systems in urban areas (AWWA, Water Resource Planning; Manual of Water Supply Practices M50, 2001, p33).

**Table 4-1: Water Loss Audit Reporting**

| Reporting Period Start Date (mm/yyyy) | Volume of Water Loss (AFY)[1] | System Loss Percentage[2] |
|---|---|---|
| 01/2016 | 866 | 5% |
| 01/2017 | 1,122 | 6% |
| 01/2018 | 768 | 4% |
| 01/2019 | 1,172 | 6% |
| 01/2020 | 1,457 | 7% |

Notes:
1. Values for 2016-2019 were reported to DWR (https://wuedata.water.ca.gov/awwa_plans). Water loss for 2020 is estimated as the difference between actual water sales and water supplied.
2. Percentage of water loss out of total water supplied each year.

The system loss projections and total demand projections contained in this UWMP assume a future system loss percentage of approximately 7%, which represents a conservative estimate based on the actual system losses experienced by the City. Saline water intrusion barriers, groundwater recharge, and conjunctive use are not included in water loss estimates for this UWMP since these uses are managed by Valley Water and are reflected in Valley Water's UWMP for the entire County.

### 4.2.3 Current Water Use

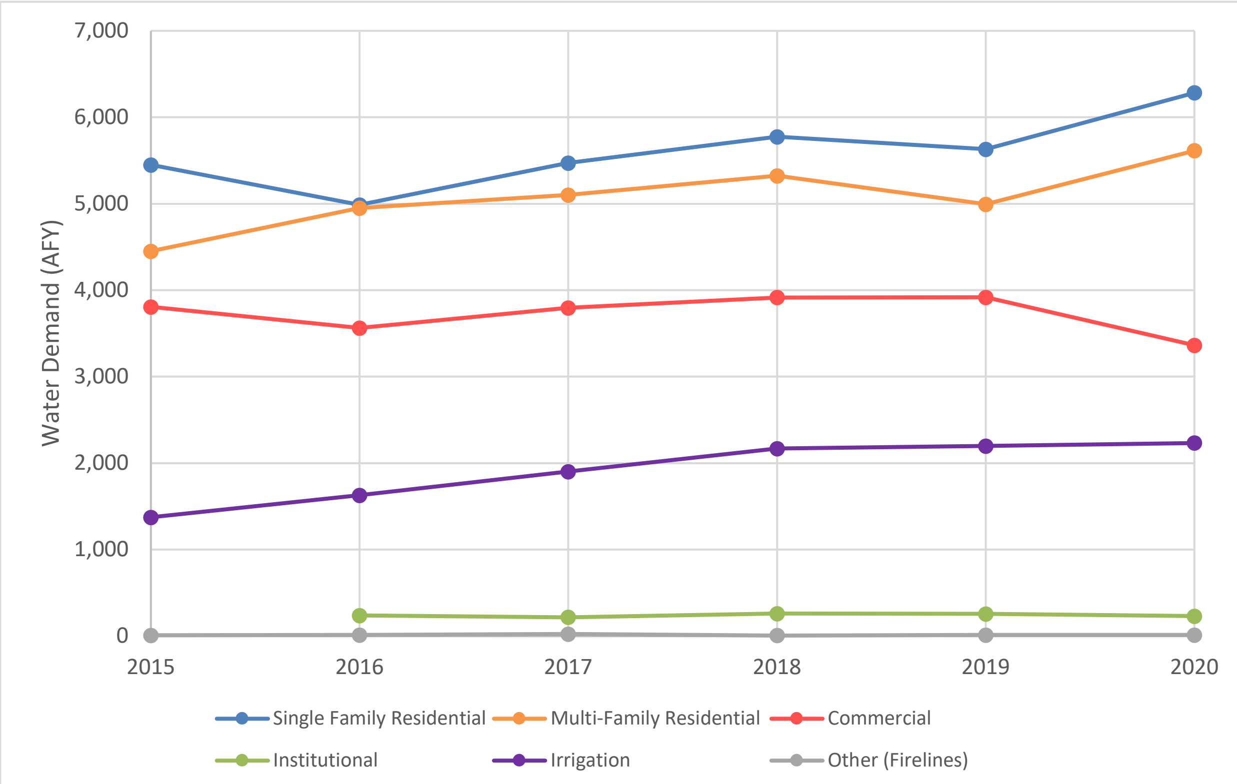
**Table 4-2** presents the City's 2020 potable water use categorized by customer type, including estimated system losses. It is noted that water use patterns for 2020 were greatly affected by the Coronavirus (COVID-19) pandemic. The pandemic began in early 2020 and led to several Regional Shelter-In-Place/Stay-at-Home Orders and local emergency restrictions. These restrictions caused a shift in water demand from all sectors to majority residential use. Most non-essential businesses shifted to remote work, and several businesses were unable to continue operation due to the Stay-at-Home Orders. It is expected that water use patterns will return to historical trends in the future, once returning to normal (post-pandemic) conditions. **Table 4-2** shows these demands compared to historic water use by customer type from 2015 to 2019.

**Table 4-2: 2020 Demands for Potable Water**

| Customer Type | Level of Treatment When Delivered | Volume (AFY) |
|---|---|---|
| Single Family Residential | Drinking Water | 6,285 |
| Multi-Family Residential | Drinking Water | 5,614 |
| Commercial/Industrial (combined) | Drinking Water | 3,364 |
| Institutional | Drinking Water | 229 |
| Landscape Irrigation (potable) | Drinking Water | 2,233 |
| Other (Firelines) | Drinking Water | 11 |
| System Losses[1] | Drinking Water | 1,457 |
| **Total** | | **19,193** |

Notes:
1. Water loss is estimated as the difference between actual water sales and water supplied.

**Figure 4-2: Potable Water Demands by Sector 2015-2020 (AFY)**




Total annual potable water use in 2020 was approximately 3,000 AF less than the projected 2020 water use from the previous UWMP. However, overall demand increased from 2015 to 2020. This increase in water use can be attributed to the relaxation of water rationing mandates and measures related to the drought.

As mentioned previously, water use in 2020 was affected by the COVID-19 pandemic. Commercial water use in 2020 showed a significant decline compared to 2019 demand and trends from 2015 to 2019. The decline in commercial use was offset by the increase in single-family and multi-family residential water use. Both single-family and multi-family water use showed the highest monthly usage in 2020 compared to the previous five years. This shift is attributed to the Regional Shelter-In-Place/Stay-at-Home Orders.

### 4.2.4 Projected Water Use

Projected water demands are an important factor in predicting water system reliability. These estimates provide a basis to assure that there is adequate water supply to meet future demands. All projections in this section are based on methodologies implemented in the BAWSCA Regional Water Demand and Conservation Projections, June 2020 (Demand Study). The Demand Study included long-term water demand estimates with and without passive/active conservation developed specifically for the City. Only passive conservation is considered for the purpose of projecting future water demand for this UWMP. The full Demand Study is included as **Appendix C**.

The potable water use projections were developed using the Demand Side Management Least Cost Planning Decision Support System model (DSS Model) developed by Maddaus Water Management, Inc. for long-term projections. The DSS Model considered expected service area population and economic growth as well as passive conservation from plumbing codes. The data collected to develop the model included monthly water demand from 1995 through 2018, historical conservation, weather data, unemployment, and several other water use factors. The full description of the DSS Model is included in the Demand Study (**Appendix C**).

Projected City potable water use is summarized by customer classification in **Table 4-3**. Because the City is largely built-out, it is expected that water use will continue to rise in future years primarily due to increasing population.

**Table 4-3: Projected Potable Water Use by Customer Type (AFY)**

| Customer Type | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|
| Single Family Residential | 5,884 | 5,939 | 7,234 | 7,805 |
| Multi-Family Residential | 5,301 | 5,295 | 6,379 | 6,835 |
| Commercial/Industrial (combined) | 4,111 | 4,257 | 4,583 | 4,770 |
| Institutional | 280 | 289 | 362 | 395 |
| Irrigation (potable) | 2,346 | 2,471 | 2,702 | 2,843 |
| Other (Firelines) | 7 | 7 | 9 | 9 |
| System Losses[1] | 1,358 | 1,381 | 1,632 | 1,729 |
| **Total Potable** | **19,287** | **19,639** | **22,901** | **24,386** |

Notes:
1. Projected system losses are 7% of projected potable demand.
2. Projected demand from DSS Model with passive conservation categorized by customer use type.

**Table 4-4** provides current and projected total water demands, which includes the potable water use reported in **Table 4-3** and recycled (non-potable) water use. Projected recycled water is based on anticipated recycled water development. Recycled water is discussed further in **Section 6**. The City provides projected demands to each wholesale water agency (attached as **Appendix D**).

**Table 4-4: Total Gross Water Use (Potable and Non-Potable) (AFY)**

| Water Demand Type | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| Potable Water | 19,193 | 19,287 | 19,639 | 22,901 | 24,386 |
| Recycled Water[1,2] | 713 | 896 | 1,010 | 1,120 | 1,232 |
| **Total Water Use** | **19,906** | **20,183** | **20,649** | **24,021** | **25,618** |

Notes:
1. Projected recycled water is based on anticipated recycled water development.
2. Includes recycled water and any potable water added to the recycled water system.
3. Water use within the City's service area.

## 4.3 Future Water Savings

Future water use estimates were based on Demand Study projections with passive conservation. Passive conservation considers any codes or standards that could affect future water use. The model used for the Demand Study projections incorporated passive conservation savings from plumbing codes, which is based on federal and state legislated efficiency standards (Energy Policy Act of 1992, CALGreen Building Code, AB 715, and SB 407). These standards govern the available type of fixtures and appliances such as toilets, showers, and washers, which in turn are expected to reduce water usage. Current and projected passive water conservation savings as outlined in the Demand Study are shown in **Table 4-5**. Passive conservation is expected to increase in the future due to fixture and appliance replacement over time.

**Table 4-5: Current and Projected Passive Water Conservation Savings**

| Conservation | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| Passive Conservation Savings | 407 | 953 | 1,404 | 2,264 | 2,776 |

Notes:
1. Data from the 2020 BAWSCA Demand Study.

## 4.4 Low-Income Housing Water Use Projection

Section 10631.1(a) of the California Water Code requires that water use projections specifically identify the projected water use for lower-income single-family and multi-family residential homes. As stated in **Section 3**, lower-income residents are defined as households at 80% of the Area Median Income. The City records the annual number of low- to moderate-income units but does not track the difference between single-family and multi-family homes. For this reason, this section reports total residential (single-family and multi-family) demand for low-income units. These demands are already included in **Table 4-3** and **Table 4-4** (See **Table 4-6**).

**Table 4-6: Inclusion in Water Use Projections**

| Parameter | Response |
|---|---|
| Are future water savings included in projections? | Yes |
| If “yes” to above, state the section or page number where citations of the codes, ordinances, etc. utilized in projections are found. | Section 4.3 |
| Are lower income residential demands included in projections? | Yes |

The City has 1,842 low-income units and 439 moderate-income units as of December 31, 2020. The City projects that there will be an additional 1,014 low-income units and 114 moderate-income units by 2025. It is assumed that the number of units will remain the same beyond 2025.

Projected low-income water use is based on the number of units, the average household size within the City, and the projected water use factors. **Table 4-7** provides the water use projections for low-income households within the City service area.

**Table 4-7: Low-Income Estimated Current and Projected Water Use (AFY)**

| Parameter | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| Low-Income Units | 1,842 | 2,856 | 2,856 | 2,856 | 2,856 |
| Low-Income Residential Water Use (AF) | 641 | 993 | 993 | 993 | 993 |

Notes:
1. Average Household Size of 2.7 determined from the 2020 Department of Finance E-5 Population and Housing Estimates for Cities.
2. Projected water use factors are based on 2020 per capita water use (115 gallon per day per capita [gpcd]) and assumed to be constant.

## 4.5 Climate Change Considerations

As described in **Section 3**, global climate change has a significant effect on water supply reliability. One of the risks of climate change is the potential for longer and deeper droughts. Although the City addresses ways to ensure reliability in the event of a drought in their Water Shortage Contingency Plan, it is also important to incorporate climate change impacts in water use projections.

Future water use estimates in this UWMP were determined from Demand Study projections, which account for potential effects of climate change. Background data for the Demand Study model is sourced from International Panel on Climate Change (IPCC) climate change scenarios, which are referred to as Representative Concentration Pathways (RCP). These scenarios provide estimates of global temperature based on $CO_2$ emissions under a variety of mitigation conditions. Under a "business as usual" condition, which represents minimal mitigation and higher emissions, the Demand Study estimated an annual mean temperature increase of 1.7 degrees Fahrenheit for the 2019-2045 period. This temperature increase was incorporated into all water use projections.

Most of the City's water supply comes from SFPUC and Valley Water. Valley Water released the 2040 Water Supply Master Plan (2040 WSMP) in 2019, which includes a discussion on the effects of climate change on water supply reliability (Valley Water 2040 Water Supply Master Plan). Some of the outlined effects include decreased imported water supplies, increased seasonal irrigation demands, reduced utilization of local surface water supplies, and increased cooling water demand.

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# SECTION 5 – BASELINES AND TARGETS

The Water Conservation Bill of 2009 (SBX7-7) required a statewide reduction in urban per capita water use by 20% by the year 2020. To achieve this statewide objective, the California Legislature required each water retail supplier to develop a 2020 water use target based on population to help the state collectively achieve a 20% reduction. Reporting for SBX7-7 began in the 2010 UWMP with the calculation of the Baseline, the 2015 Interim Target, and the 2020 Target, each in units of gpcd. In the 2015 UWMP, each retail agency was required to demonstrate compliance with its 2015 Interim Target to ensure they were on track to meet the goal of 20% reduction by 2020. In the 2020 UWMP, each retail agency is required to demonstrate compliance with its 2020 Target. The Baseline, 2015 Interim and 2020 Targets, and 2020 Compliance are calculated through completion of the SBX7-7 Verification Form prepared by DWR, submitted as **Appendix E** of the 2020 UWMP, and summarized in **Table 5-1** and **Table 5-2**.

## 5.1 Service Area Population

Accurate service area population estimates are necessary to calculate representative daily per capita water use. The 2020 population for the City's service area is based on DOF estimates for the City of Sunnyvale, as described in **Section 3.4**. Historical populations from 1995-2007 using DWR methodology and DOF data were used to calculate baseline water use. Population estimates used for SBX7-7 calculations are included in **SBX7-7 Table 3** (**Appendix E**).

## 5.2 Gross Water Use

Gross Water Use is defined in Water Code Section 10608.12 (h) as the total volume of water entering the distribution system of a retail water supplier with four possible deductions:

- Recycled water,
- Water placed in long term storage,
- Water exported for use by another urban water supplier, and/or
- Agricultural water use.

The City did not make any deductions to their reported total volume of water entering the distribution system. Gross water use is categorized by supply source and presented in **SBX7-7 Table 4** and **SBX7-7 Table 4-A** in **Appendix E**.

## 5.3 Baselines and Targets Summary

Baselines and targets were established as part of the 2010 UWMP. For recycled water retailers, there was the option, if eligible, to use a base period of up to 15 years for calculating the Base Daily Water Use. The City was not eligible for the 15-year base period, so the baseline water use was calculated using a 10-year base period. The City selected the period of 1995-2004 as the 10-year base period. The five-year period 2003-2007 was used to calculate the minimum water use reduction requirement. Baseline periods are included in **SBX7-7 Table 1** (**Appendix E).**

The baseline per capita water use for each period was calculated using gross water use totals for each year and the historical service area population estimates. Calculations are described and presented in **SBX7-7 Table 5** in **Appendix E**. Because the 5-year baseline per capita water use was greater than 100 gpcd, the minimum water use reduction requirement was also calculated. This calculation was used to determine whether the City's 2020 water use target meets the minimum water use reduction requirement (per section 10608.22 of the California Water Code).

Four methods are allowed by Water Conservation Bill of 2009 for calculating the 2020 water use targets. Method 1 states that the target per capita daily water use in 2020 is 80% of the 10-year baseline per capita daily water use. This method was used because it was the most applicable to the available data. The 2020 per capita water use target cannot exceed 95% of the five-year compliance baseline water use. The calculated Method 1 2020 target of 139 gpcd is below the minimum water use target of 158 gpcd (95% of the City's 5-year average baseline), therefore no adjustment to the 2020 target is necessary. **Table 5-1** presents a summary of the baselines, targets, and Method 1 2020 minimum water use reduction target.

**Table 5-1: Baselines and Targets Summary**

| Baseline Period | Start Year | End Year | Average Baseline Water Use[1] | Confirmed 2020 Target[1,2] |
|---|---|---|---|---|
| 10-year | 1995 | 2004 | 174 | 139 |
| 5-year | 2003 | 2007 | 167 | |

Notes:
1. All values are in gpcd.
2. Method 1 2020 minimum water use reduction based on 80% of the 10-year baseline.

## 5.4 2020 Compliance Daily per Capita Water Use

The City's 2020 per capita water use is 115 gpcd using the 2020 gross water use (potable and recycled water) detailed in **Section 4** and the DOF population estimates for 2020. This is well below the 2020 target of 139 gpcd; thus, achieving compliance with SBX7-7.

As mentioned in **Section 4**, water use for 2020 was affected by the COVID-19 pandemic. Although 2020 water use by sector showed a slight decline in commercial water compared to 2015, that decrease was offset by the increase in residential water use. Since the total gross water use is assumed to be representative of a non-pandemic year, no adjustments were made to the 2020 gpcd.

**Table 5-2** presents the final 2020 water use and confirmed compliance with SBX7-7.

**Table 5-2: 2020 Compliance**

| Actual 2020 GPCD | 2020 Total Adjustments | Adjusted 2020 GPCD | 2020 Confirmed Target GPCD | Did Supplier Achieve Targeted Reduction for 2020? Y/N |
|---|---|---|---|---|
| 115 | 0 | 115 | 139 | Y |

# SECTION 6 – WATER SUPPLY CHARACTERIZATION

The section presents the City's past, current, and future water supply for potable and non-potable demand. The City has three sources of potable water supply: purchased surface water from SFPUC, purchased treated surface water from Valley Water, and groundwater from six City-owned and operated wells. Recycled water (non-potable) is supplied by the City's WPCP. The City also has an additional stand-by well for emergency use and emergency interties to the City of Cupertino, the City of Mountain View, the City of Santa Clara, and Cal Water.

## 6.1 Purchased Water

Most of the City's water supply comes from purchased surface water from SFPUC and Valley Water. The City does not use any other surface water for supply. The following section describes each wholesaler in more detail.

### 6.1.1 SFPUC – Wholesaler (Surface Water)

The City receives surface water from the City and County of San Francisco's RWS, operated by SFPUC. This supply is predominantly from the Tuolumne River watershed in the Sierra Nevada Mountains, delivered through the Hetch-Hetchy aqueduct, but also includes treated water produced by SFPUC from local watersheds and facilities in Alameda and Santa Clara counties. The Alameda watershed, located in Alameda county, is designed to capture local runoff.

The amount of imported water available to SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, SFPUC is dependent on reservoir storage to ensure ongoing water supply.

The business relationship between the SFPUC and its wholesale customers is largely defined by the "Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County" (WSA), effective since July 2009. This 25-year WSA replaced the Settlement Agreement and Master Water Sales Contract that expired in June 2009. The WSA addresses the rate-making methodology used by the SFPUC in setting wholesale water rates for its customers in addition to addressing water supply and water shortages for the RWS.

The WSA is supplemented by an individual Water Supply Contract between SFPUC and each individual retailer, also active since July 2009. These contracts expire in 25 years. The City has an Individual Supply Guarantee (ISG) of 12.58 MGD (approximately 14,100 AFY). Although the WSA and accompanying Water Supply Contract expire in 2034, the ISG (which quantifies San Francisco's obligation to supply water to its individual wholesale customers) surpasses their expiration and continues indefinitely. The City's contract also includes a minimum purchase amount of 8.93 MGD (10,003 AFY), which Sunnyvale agrees to buy, regardless of whether sales drop below this level.

The WSA provides for a 184 MGD (expressed on an annual average basis) Supply Assurance to the SFPUC's wholesale customers. This Assurance is subject to reduction, to the extent and for the period made necessary by reason of water shortage, due to drought, emergencies, or by malfunctioning or rehabilitation of the RWS. The WSA does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of the 184 MGD Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on Attachment C to the WSA.

### 6.1.2 Valley Water – Wholesaler (Surface Water)

Valley Water supplies the City of Sunnyvale with treated surface water through an entitlement of imported water that is Delta-conveyed from the Central Valley Project (CVP) and State Water Project (SWP), as well as surface water from local reservoirs. The City has a 70-year contractual agreement with Valley Water, effective 1981 to 2051.

Valley Water's imported water is conveyed through the Sacramento-San Joaquin Delta and pumped and delivered to the county through three main pipelines: the South Bay Aqueduct, which carries water from the SWP, and the Santa Clara Conduit and Pacheco Conduit, which convey water from the federal CVP. More than 70% of this supply is delivered to treatment plants and almost 30% is used for recharge. Any excess Delta-conveyed supplies is stored in the local Anderson and Calero Reservoirs or the Semitropic Groundwater Bank and San Luis Reservoir in the Central Valley (Valley Water 2040 WSMP, 2019).

Valley Water has a contract for 100,000 AFY from the SWP and 152,500 AFY from the CVP. However, the actual amount of water delivered is typically less than these contractual amounts and depends on hydrology, conveyance limitations, and environmental regulations. Nearly all the imported water supply is used for municipal and industrial needs. Valley Water expects average allocations of Delta-conveyed water to decline over time due to climate change and regulatory requirements, averaging around 133,000 AFY in 2040 (2040 WSMP, 2019). However, over the years, Valley Water has attempted to sustain overall existing supplies by participating in projects that would offset the predicted decline of Delta-conveyed imported water supplies. In October 2019, Valley Water voted to support the Delta Conveyance Project, which is a proposed plan to improve the infrastructure that conveys water through the Sacramento-San Joaquin Delta. This plan would potentially increase the average available Delta-conveyed imported supply from 133,000 AFY to 170,000 AFY.

Local runoff is captured in local reservoirs for recharge into the groundwater basin or treatment at one of Valley Water's three water treatment plants. The total storage capacity of the ten Valley Water operated reservoirs in Santa Clara County is approximately 170,000 AF without the State Division of Safety of Dams (DSOD) restrictions. Water stored in local reservoirs provides up to 25% of Santa Clara County's water supply. Reservoir operations are coordinated with imported Bay-Delta water received from the SWP and the CVP.

## 6.2 Groundwater

The City of Sunnyvale has six active wells and one well on stand-by for emergencies. Groundwater makes up a small percentage of the City's total water supply and is used to supplement imported SFPUC and Valley Water supply.

Valley Water manages the groundwater basin and provides county-wide groundwater and conservation planning assistance. Local groundwater supplies represents up to half of the county's water supply during normal years and is crucial to the region's future water supply reliability. Valley Water uses conjunctive use management, a practice by which the groundwater basin is pumped more in drier years and then replenished (or recharged) during wet and average years, to ensure the sustainability of groundwater basins. Groundwater is replenished naturally from rainfall and augmented by Valley Water-operated recharge. Conjunctive use helps to protect the groundwater basin from overdraft, land subsidence, and saltwater intrusion, and provides critical groundwater storage reserves.

Within Santa Clara County, Valley Water manages two groundwater subbasins that transmit, filter, and store water: the Santa Clara Subbasin (DWR Subbasin 2-9.02) and the Llagas Subbasin (DWR Subbasin 3-3.01). The Santa Clara Subbasin is part of the Santa Clara Valley Basin. For water supply planning purposes, Valley Water frequently splits the Santa Clara Subbasin into two subareas for water, the Santa Clara Plain and the Coyote Valley. These two subareas are in separate groundwater charge zones and have different groundwater management challenges and opportunities. The City's groundwater is supplied by the Santa Clara Plain subarea of the Santa Clara subbasin. A general discussion of this subarea is provided below.

### 6.2.1 Basin Description

The Santa Clara Plain is part of the Santa Clara Subbasin, located in a structural trough that is bounded by the Santa Cruz Mountains to the west and the Diablo Range to the east. The Plain, which is approximately 22 miles long, narrows from a width of 15 miles near the county's northern boundary to about half a mile wide at the Coyote Narrows, where the two ranges nearly converge. The Santa Clara Plain covers a surface area of approximately 279 square miles, which is approximately 18 square miles smaller than the Santa Clara Subbasin. This is because the Santa Clara Plain does not include the Coyote Valley portion of the Santa Clara Subbasin. Although hydraulically connected, Valley Water refers to the Coyote Valley separately since it is in a different groundwater charge zone and has fewer water supply options than the Santa Clara Plain. **Figure 6-1** illustrates the groundwater basin in relationship to the City's groundwater wells.

These subbasins contain young alluvial fill formation and the older Santa Clara Formation. Both formations are similar in character and consist of gravel, sandy gravel, gravel and clay, sand, and silt and clay. The coarser materials are usually deposited along the elevated lateral edges of the subbasins, while the flat subbasin interiors are predominantly thick silt and clay sections inter-bedded with smaller beds of clean sand and gravel.

Valley Water manages the groundwater supply in Santa Clara County and works with various water retailers in the area to prevent subsidence and overdraft of the basin. The Santa Clara Valley Basin is currently not adjudicated and has not been identified as critically overdrafted by DWR. The Santa Clara Subbasin is designated by the DWR as a high priority subbasin based on a variety of factors identified in statue such as population, irrigated acreage, and the number of wells (Water Code Section 10933(b)). Basin Prioritization is based on the Sustainable Groundwater Management Act (SGMA) Basin Prioritization program, updated in 2019. SGMA requires high-priority basins to develop Groundwater Sustainability Agencies (GSAs) and Groundwater Sustainability Plans (GSPs) to manage groundwater for long-term sustainability.

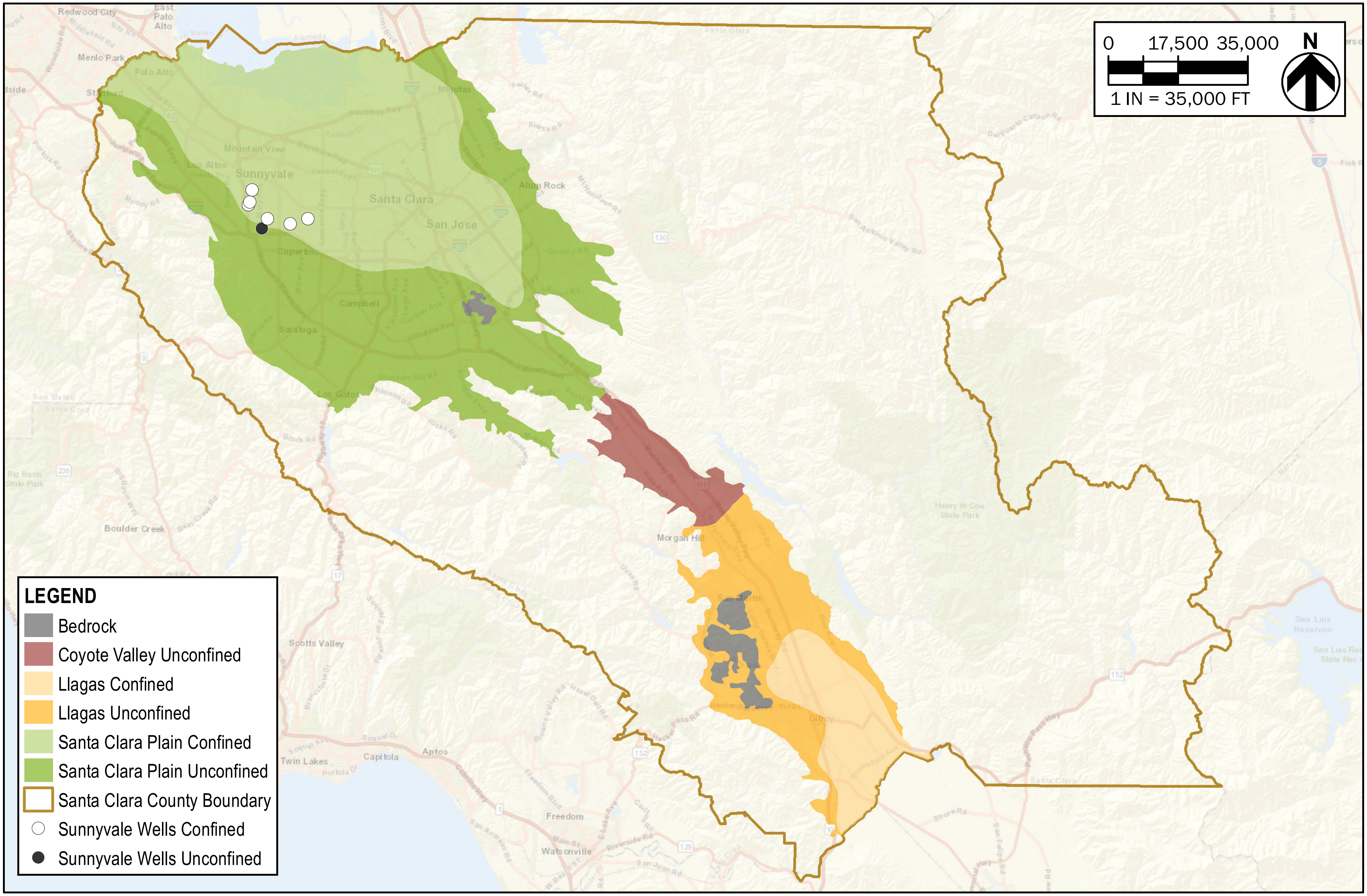


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**FIGURE 6-1**
CITY OF SUNNYVALE
URBAN WATER MANAGEMENT PLAN
SANTA CLARA VALLEY BASIN

### 6.2.2 Historical Groundwater Pumping

In April of each year, when the quantity of imported water available to Valley Water by contract and the local water yield can be estimated somewhat accurately, Valley Water estimates the carryover storage. Based on the calculated carryover capacity and anticipated customer demand, Valley Water reviews and modifies its groundwater management strategy to maintain adequate water in the basin and avoid subsidence. A copy of the 2016 Santa Clara Valley Water District Groundwater Management Plan (GMP) is included as **Appendix F**.

Groundwater is extracted by way of wells, either owned or operated by area retailers or private property owners. The allowable withdrawal of groundwater by the City depends on multiple factors, including withdrawals by other water agencies, the quantity of water recharged, and carry-over storage from the previous year. According to Valley Water's 2019 annual groundwater report, the City accounts for less than 1% of the total groundwater pumping for the Santa Clara Plain subbasin designated as North County (Zone W-2).

The City has six active wells that can produce up to 8,000 AF annually. However, the City seldom uses these wells since water demand can be adequately met with purchased treated water from SFPUC and Valley Water. The City intends to pump about 112 AF annually to prevent stagnation and keep the wells active for sampling. **Table 6-1** shows historic metered groundwater pumping data for the City from 2016 to 2020.

**Table 6-1: Past and Current Groundwater Volume Pumped (AFY)**

| Groundwater Type | Basin Name | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Alluvial Basin | Santa Clara Plain Subarea | 154 | 118 | 105 | 92 | 87 |

## 6.3 Stormwater

The City owns and operates approximately 150 miles of storm drains and two pump stations that collect runoff and discharge to creeks and sloughs. Stormwater is conveyed through the City's storm sewer system, separate from the sanitary sewer system, to four waterways that flow to San Francisco Bay: Sunnyvale West Channel, Sunnyvale East Channel, Stevens Creek, and Calabazas Creek. The City does not currently utilize stormwater to meet local water supply demands. However, the City is subject to regulations that aim to improve the quality of stormwater runoff and manage stormwater flows.

The 2014 California Water Action Plan led to the State Water Board's "Strategy to Optimize Resource Management of Stormwater" (STORMS), which was created to promote stormwater as a valuable resource and provide support and funding for collaborative watershed-level storm water management and pollution prevention. STORMS is one of many Federal and State initiatives that have influenced new stormwater management requirements in Bay Area municipal stormwater National Pollutant Discharge Elimination System (NPDES) permits.

Since 2016, the City is subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I municipalities and agencies in the San Francisco Bay area (Order R2-2015-0049). The current MRP includes new requirements and targets concerning reducing trash loads from stormwater, improving water quality of discharge, and implementing green stormwater infrastructure (GSI). GSI attempts to mimic natural watershed processes by using plants and soil systems to capture stormwater, therefore reducing stormwater runoff and pollutant load discharged into receiving surface waters. The City's Green Stormwater Infrastructure Plan, adopted September 2019, provides a framework to gradually transform the City's traditional storm drainage infrastructure to GSI.

The City is a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), which is an association of thirteen cities and towns in the Santa Clara Valley, the County of Santa Clara, and Valley Water that collaborate on stormwater regulatory activities and compliance. This program aims to improve the water quality of south San Francisco Bay and the streams of Santa Clara County by reducing nonpoint source pollution in storm water runoff and other surface flows.

## 6.4 Wastewater and Recycled Water

The City treats its wastewater and produces recycled water at the WPCP located at 1444 Borregas Avenue. A wastewater reclamation program was developed in 1991 when the City first identified short-term goals of recycling 20-30% of wastewater to produce high-quality effluent from the Plant. Today the City has a developed recycled water program, in partnership with Valley Water, which today serves parks, golf courses and the landscaping needs of diverse industries. The long-term goal of the City is to maximize the use of recycled water which is projected to reach 1.3 million gallons per day (MGD) for non-potable uses.

### 6.4.1 Wastewater Collection, Treatment, and Disposal

The WPCP has a permitted dry weather flow capacity of 29.5 MGD with a 40 MGD peak wet weather flow capacity, though current flows average approximately 15 MGD. The amount of influent wastewater handled by the Plant varies with the time of day and seasonal changes in demand. Wastewater is collected from the sanitary sewer system, which consists of more than 380 miles of gravity fed pipes that converge at the Plant. Collected wastewater is then treated to tertiary standards before it is discharged to the Lower South Bay subembayment of the San Francisco Bay. The overall treatment consists of the following processes:

- Primary Treatment (Sedimentation)
- Secondary Treatment (Oxidation)
- Tertiary Treatment (Filtration and Disinfection)

These processes provide treatment to a level that will meet NPDES discharge requirements. Most of the treated water is discharged to the San Francisco Bay via the Moffett Channel and Guadalupe Slough. Approximately 10% of the Plant flow is treated to a higher level to meet the necessary recycled water quality and delivered to customers for non-potable uses, primarily irrigation.

Sunnyvale has experienced a slight decrease in influent over the past five years but anticipates a conservative level of 15 MGD for plant influent over the next 25 years. **Table 6-2** and **Table 6-3** summarize the City's collected, treated, and discharged wastewater in 2020.

**Table 6-2: Wastewater Collected within Service Area in 2020 (AFY)**

| Wastewater Collection | | | Recipient of Collected Wastewater | | | |
|---|---|---|---|---|---|---|
| Name of Wastewater Collection Agency | Wastewater Volume Metered or Estimated? | Volume of Wastewater Collected from UWMP Service Area 2020 | Name of Wastewater Treatment Agency Receiving Collected Wastewater | Treatment Plant Name | Is WWTP Located within UWMP Area? | Is WWTP Operation Contracted to a Third Party? |
| City of Sunnyvale | Metered | 14,332 | City of Sunnyvale | Sunnyvale Water Pollution Control Plant | Yes | No |

**Table 6-3: Wastewater Treatment and Discharge Within Service Area in 2020**

| Wastewater Treatment Plant Name | Discharge Location Name of Identified | Discharge Location Description | Method of Disposal | Does This Plant Treat Wastewater Generated Outside the Service Area? | Treatment Level | 2020 Volumes (AFY) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Wastewater Treated | Discharged Treated Wastewater[1] | Recycled Within Service Area[2] | Recycled Outside of Service Area[2,3] | Instream Flow Permit Requirement[4] |
| Sunnyvale Water Pollution Control Plant | Lower South Bay of San Francisco Bay | Discharged via the Moffett Channel and Guadalupe Slough | Bay or estuary outfall | No | Tertiary | 14,332 | 12,183 | 713 | 281 | - |

Notes:

1. Effluent flows do not include No. 3 water or backwash water. No. 3 water is used in several plant processes, including polymer dilution, washdown water, Syagro dewatering, and heat loop/engine cooling.
2. Total usage includes recycled water and potable water delivered through the recycled water system. Recycled water produced at the WPCP accounts for approximately 38% of total usage.
3. Services outside City limits include Moffett Field and the Apple® Campus 2.
4. City does not currently have instream flow requirements.

### 6.4.2 Future Wastewater Improvement Projects

The WPCP was originally constructed in 1956 and is one of the oldest wastewater treatment facilities on the West Coast. Although the Plant continues to provide reliable wastewater treatment, several of the Plant's existing facilities are nearing the end of their useful life. The City created the Cleanwater Program to upgrade the Plant through a series of projects that will rehabilitate existing Plant facilities and construct new facilities, ensuring future wastewater treatment reliability. These projects include upgrades to the secondary and tertiary treatment facilities, construction of new biosolids handling facilities, and construction of new administration and maintenance buildings at the Plant. Several improvements are currently in design phase and some have started construction. The projects associated with the Cleanwater Program are outlined in more detail in the WPCP Master Plan (2014-2016).

### 6.4.3 Recycled Water System Description

The City's current recycled water system consists of the Recycled Water Pump Station located at the WPCP, the Sunnyvale Golf Course pump station, the San Lucar Tank and Pump Station, the Wolfe Road Pump Station (WRPS), and approximately 18 miles of recycled water pipelines ranging in diameter from 6- to 36-inches. The WRPS was completed in 2018 as part of the Wolfe Road Pipeline Extension Project, which added approximately 13,000 feet of pipeline to extend the recycled water system along Wolfe Road, reaching the Apple® Campus 2. Both the WRPS and the pipeline extension are owned by Valley Water and maintained by the City's Water and Sewer Services Division. In 2018 the City completed a Capital Improvement Project to facilitate parallel production of recycled water and NPDES discharge, thereby providing enhanced production and delivery reliability.

The use of recycled water provides substantial benefits to the environment and a variety of communities. The following examples outline how the City's use of recycled water positively impacts different groups:

- Potable water users benefit from the decreased reliance on imported supply.
- All Sunnyvale residents benefit from securing a long-term adequate water supply to sustain economic growth and ensure public health.
- Recycled water users benefit by avoiding strict conservation requirements and water use restrictions during times of drought, and by paying less than the cost of potable water.
- All water users benefit from bringing in another water source to augment supplies.
- Area wetlands benefit from reduced freshwater discharges into the saline wetlands.

### 6.4.4 Potential, Current, and Projected Recycled Water Use

The City supplements their recycled water system with potable water additions at the Plant or the San Lucar Pump Station. This is used to offset the difference between recycled water production and demand and to improve water quality for irrigation of sensitive plants. The City's recycled water system supplies an average of 0.8 MGD for approximately 95 services within the City Limits as well as Moffett Field and the Apple® Campus 2. Current and projected recycled water usage is categorized by reuse application, or beneficial use type, and reported in **Table 6-4**.

**Table 6-4: Current/Projected Recycled Water Direct Beneficial Uses within Service Area**

| Beneficial Use Type | General Description of 2020 Uses | Level of Treatment | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|---|
| Landscape Irrigation (excl. golf courses) | Parks, Green Belts, Schools, etc. | Tertiary | 521 | 486 | 586 | 681 | 779 |
| Golf Course Irrigation | Fairway Irrigation | Tertiary | 65 | 293 | 293 | 293 | 293 |
| Commercial Use | Dual Plumbing | Tertiary | 102 | 90 | 101 | 112 | 123 |
| Industrial | Cooling | Tertiary | 25 | 27 | 30 | 34 | 37 |
| **Total** | | | **713** | **896** | **1,010** | **1,120** | **1,232** |
| Internal Reuse[1] | | | 440 | | | | |

Notes:
1. Disinfected secondary recycled water diverted for WPCP process prior to recycled water distribution system. Not counted towards Statewide Recycled Water volume.
2. Units in AFY
3. Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2).

**Table 6-5** compares the actual 2020 uses of recycled water to the projected uses in the 2015 UWMP. Total recycled water use in 2020 was less than projected in 2015. Although the expected expansion of recycled water was not realized in the last five years, recycled water use has stayed consistent with 2015 recycled water use (717 AF).

**Table 6-5: UWMP Recycled Water Use Projection Compared to 2020 Actual (AFY)**

| Use Type | 2015 Projection for 2020 | 2020 Actual Use |
|---|---|---|
| Landscape Irrigation (excl. golf courses) | 715 | 521 |
| Golf Course Irrigation | 290 | 65 |
| Commercial | 331 | 102 |
| Industrial | 120 | 25 |
| **Total** | **1,456** | **713** |

Note: Recycled water use within service area.

### 6.4.5 Projected Future Uses of Recycled Water

The City conducted a Feasibility Study in 2013 to identify potential expansions of the recycled water system. The proposed recycled water system pipeline alignments were based on existing customers with dedicated landscape meters, locations of other major customers and demand clusters, and the proximity of potential customers to the existing recycled water pipeline. Four alignment/connection types were developed and include:

- **Wolfe Road Main:** This pipeline extends the recycled water system to the south to capture users along the Sunnyvale-Cupertino boundary, including the Apple® Campus 2. The pipeline to the Apple® Campus 2 has been implemented and is currently active.
- **Main Loop:** This alignment is intended to loop the existing recycled water system to provide reliability, connect to future storage tank site(s), and provide opportunity for further expansion and recycled water use along the alignment.
- **Potential Recycled Water Alignments:** These alignments are intended to capture outlying potential high demand users that are not located along the mainline or Wolfe Road alignments. These alignments generally extend to a specific high demand user or cluster of users and attempts to pick up as many viable users along the way.
- **Infill Connections:** These connections relate to customers that have been identified along the existing recycled water pipelines and require only retrofits of existing sites to receive recycled water.

The City plans to build the alignments in four Phases as part of their Capital Improvement Program. Estimates of recycled water demand for sites within the City are based on actual or projected irrigation use, as determined by the review of City water billing records. Pipeline alignments were selected according to costs and benefits, and to accommodate a phased approach to construction. The Wolfe Road Main extension was completed in 2018. **Figure 6-2** illustrates the existing recycled water distribution system and the potential recycled water system based on the 2013 Feasibility Study. The City has no planned action at this time to expand the recycled water system.

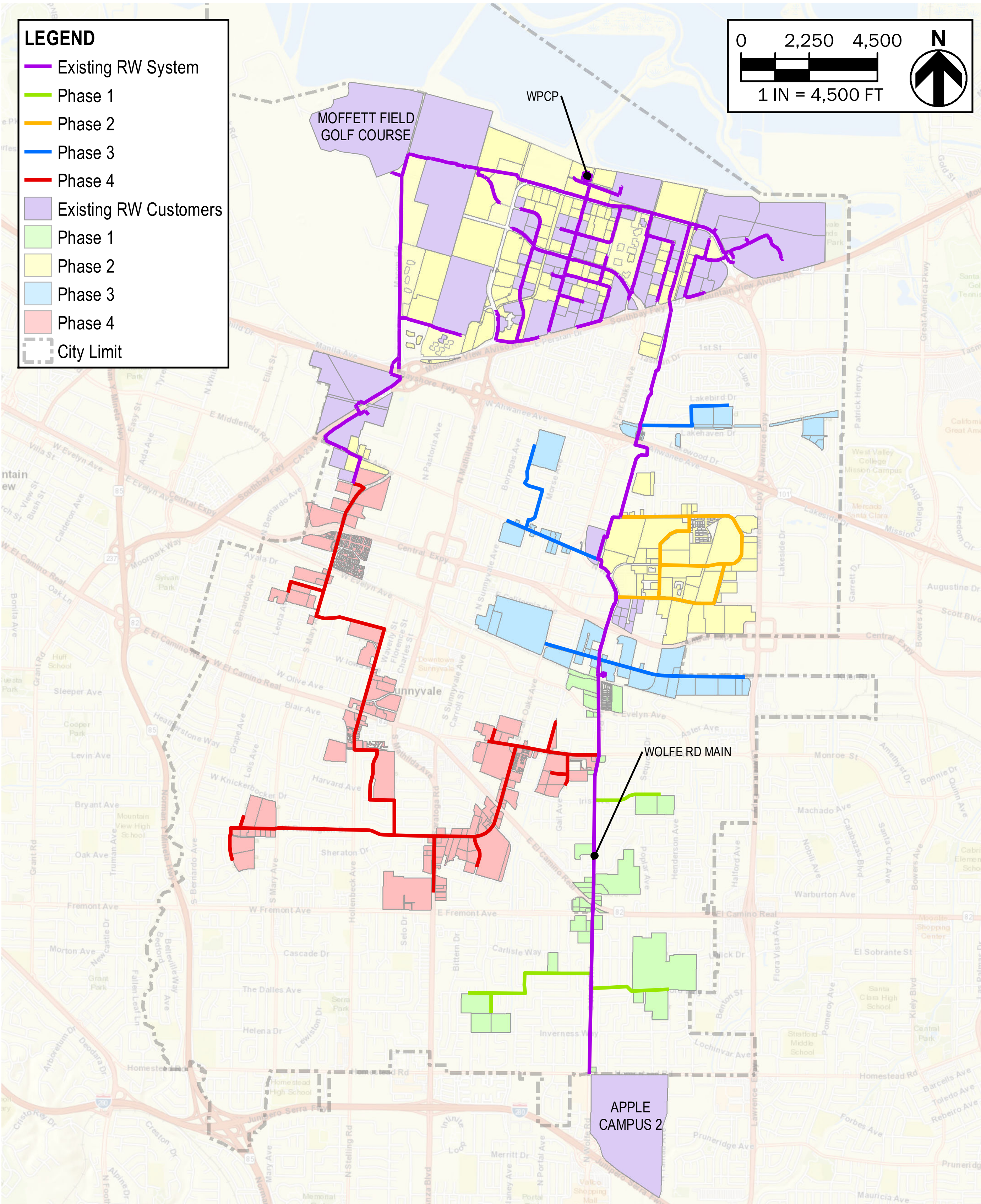
Valley Water, in collaboration with the City and other local stakeholders, is currently developing a Countywide Water Reuse Master Plan (CWRMP). This plan outlines strategies to integrate and expand recycled and purified water throughout Santa Clara County. Once completed, the plan will include options to build purified water pipelines or extend recycled water pipelines through Sunnyvale, potentially creating future opportunities to expand the City's recycled water system.

### 6.4.6 Recycled Water Optimization and Incentives

Division 7, Chapter 7 of the Water Code, known as the Water Recycling Law, provides a legal basis for mandating the use of recycled water. The law states that the use of potable water for non-potable purposes (including irrigation) constitutes a waste or unreasonable use of water if recycled water of suitable quality is available at reasonable cost. Based on State law, some jurisdictions have implemented "mandatory use" policies through local ordinance.

The City currently has several incentives to encourage the use of recycled water, including:

- **Reduced cost:** Recycled water is priced at 90% of the prevailing, first-tier potable water rate. The City intends to continue this financial incentive in the foreseeable future. With few exceptions, the pricing policy has been successful in encouraging prospective users to convert to use of recycled water in areas where it is available.
- **Dual plumbing:** The City is seeing growth through redevelopment, bringing opportunity to install dual plumbed systems in commercial buildings under new construction. Dual plumbed buildings use recycled water for toilets and urinals, cooling towers, and any other identified non-potable water use.




HydroScience

**FIGURE 6-2**
CITY OF SUNNYVALE
URBAN WATER MANAGEMENT PLAN
POTENTIAL RECYCLED WATER ALIGNMENTS

- **Permit process enhancement:** The City provides fast-tracked permit processing for recycled water applications.
- **Public outreach and marketing:** The active public education process increases awareness on recycled water.
- **Retrofit assistance:** The City offers retrofit assistance for dedicated irrigation meters.

These incentives are planned to be implemented on an on-going basis. Environmental changes such as a re-occurrence of drought conditions is also expected to cause further interest in recycled water. At this time, there is no plan to expand the existing recycled water system; however, recycled water continues to be available to existing recycled water customers and to potential redevelopment that occurs within the existing recycled water service area. The market for recycled water is otherwise saturated within the recycled water service area and the City does not expect to realize any additional recycled water use until such time as the system is expanded.

### 6.4.7 Recycled Water Streamflow Augmentation and Groundwater Recharge

Non-irrigation uses such as stream flow augmentation and groundwater recharge represent long-term options and solutions that could potentially accommodate large amounts of recycled water flow. The City relies on Valley Water activities to maintain sustainable supplies, including managed groundwater recharge and in-lieu groundwater recharge (e.g., treated surface water deliveries, demand management programs, and SFPUC supply).

### 6.4.8 Recycled Water Coordination

The City collaborated with the Valley Water, Cal Water, DWR, and Apple® to complete the Wolfe Road Pipeline Extension Project in 2018.

The City partnered with Valley Water through the Recycled Water Joint Committee (RWJC), which facilitates partnership opportunities such as expanding recycled water beyond City borders and exploring the potential of advanced treatment of recycled water for potable reuse. The City is also collaborating with Valley Water on the Countywide Water Reuse Master Plan.

DDW and the State Board regulate the production and use of recycled water in the State of California. The City complies with Water Reclamation Requirements for Recycled Water Use (Order WQ 2016-0068-DDW, General Order), adopted by the State Board on June 7, 2016. The General Order outlines standard conditions concerning recycled water. Recycled water provided by the City meets the requirements of California Code of Regulations Title 22 as disinfected tertiary treated water.

## 6.5 Desalinated Water

Both SFPUC and Valley Water are working together with the East Bay Municipal Utilities District, Contra Costa Water District, and the Zone 7 Water Agency as the Bay Area Regional Desalination Project (BARDP). BARDP was created in 2002 and originally proposed a 120 MGD desalination facility that would remove salt from seawater or other brackish water sources. This facility was intended to be used during major facility outages and emergencies. Over the years the concept has evolved to consist of locating one 10-20 MGD desalination facility in eastern Contra Costa

County. Desalination would provide potential potable water supply for municipal and industrial use. The goals of desalination are to:

- Increase supply reliability by providing water supply when needed from a regional facility.
- Provide additional source of water during emergencies such as earthquakes or levee failures.
- Provide a supplemental water supply source during extended droughts.
- Allow other major facilities, such as treatment plants, water pipelines, and pump stations, to be taken out of service for maintenance or repairs.

Pre-feasibility studies, pilot testing, institutional analysis and site analysis have been completed. The dates for design completion, permitting, and construction is still to be determined. Additional details regarding desalinated water opportunities can be found in the SFPUC and Valley Water UWMPs.

## 6.6 Water Exchanges and Transfers

The City is currently connected to the City of Cupertino, the City of Mountain View, the City of Santa Clara, and Cal Water through service connections located within Sunnyvale. These interties are intended for use during emergency situations, as presented in **Table 6-6**.

**Table 6-6: Transfer and Exchange Opportunities**

| Transfer Agency | Transfer or Exchange | Short Term or Long Term | Proposed Volume (AFY) |
|---|---|---|---|
| City of Cupertino | Emergency Transfer | Short Term | 0 |
| City of Mountain View | Emergency Transfer | Short Term | 0 |
| City of Santa Clara | Emergency Transfer | Short Term | 0 |
| California Water Service Company | Emergency Transfer | Short Term | 0 |

Notes:
1. The City is not proposing to transfer or exchange any water other than in the case of emergency.

Most of the regional transfer/exchange opportunities are managed by the wholesalers SFPUC and Valley Water. In general, SFPUC can purchase additional water from the Tuolumne River and those sellers south of the Delta with water rights or entitlements to water diverted from the Delta. Water can also be purchased upstream of the Delta from sellers along the Sacramento, Feather, Yuba, American, and San Joaquin Rivers; and their tributaries.

Valley Water routinely uses short-term water transfers and exchanges as a part of its routine imported water operations. Although Valley Water considers water exchange and transfers as one of the potential options to secure additional water during critical dry years through long term agreements, due to the uncertainties regarding long term costs and ability to make transfers in critical dry years, Valley Water did not include water transfers and exchanges in its 2020 UWMP projected water supplies.

## 6.7 Future Water Projects

The City's water is supplied primarily by the two wholesale providers, Valley Water and SFPUC. Groundwater is typically used to offset peak daily demands and for emergency purposes such as drought conditions and wholesale water service interruptions. The 20-year budget includes conceptual funding to reconstruct the Central Well, which has been out of working order since 2007. This well would be used as a backup to Valley Water and SFPUC supply. Preliminary investigation and design are anticipated to commence in FY 2027/28, with construction following in FY 2028/29. This project is not a joint project with other suppliers.

## 6.8 Summary of Existing and Planned Sources of Water

As outlined in this section, the City's existing water supply sources are purchased surface water from SFPUC and Valley Water, groundwater, and recycled water. A breakdown of the City's 2020 water supply sources is provided in **Table 6-7** and presented in **Figure 6-3**.

**Table 6-7: 2020 Water Supplies – Actual (AFY)**

| Water Supply | Additional Detail on Water Supply | Actual Volume | Water Quality | Total Right or Safe Yield |
|---|---|---|---|---|
| Purchased Water[1] | SFPUC | 11,052 | Drinking Water | 14,100 |
| Purchased Water[2] | Valley Water | 8,665 | Drinking Water | 9,200 |
| Groundwater | Wells | 87 | Drinking Water | 8,000 |
| Recycled Water[3] | Produced recycled water | 383 | Recycled Water | |
| **Total Supply** | - | **20,187** | **-** | 31,300 |

Notes:
1. Approximately 611 AF of purchased potable water was added to the recycled water distribution system.
2. Contractual volumes from Valley Water vary from year to year.
3. Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2).

Supply projections for the City's four sources of potable and non-potable water provide a basis for assessing water supply reliability. The breakdown of total supply by source was determined using the City's contractual agreements with each wholesaler and historical production trends. Current and projected water supply is listed by source in **Table 6-8**.

**Figure 6-3: Percentage of Water Supply Sources (2020)**

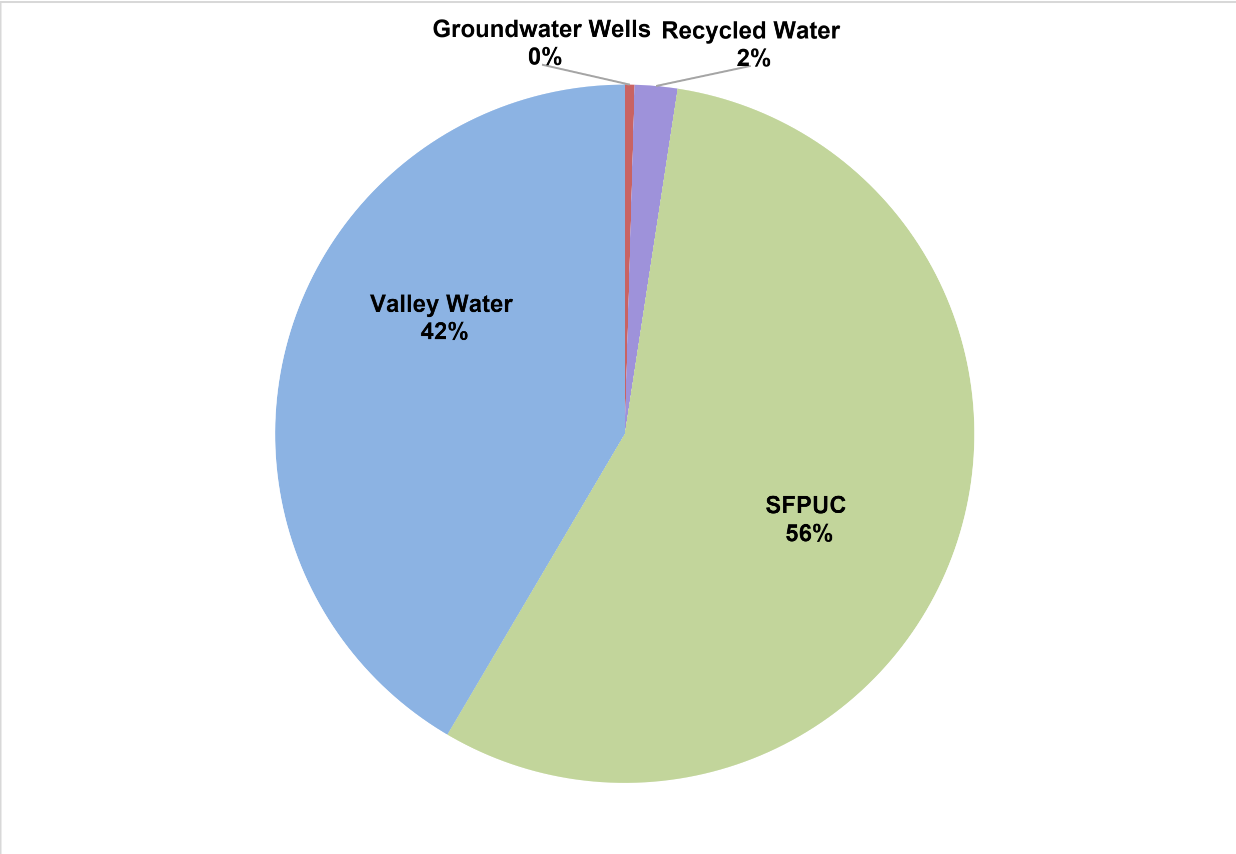



**Table 6-8: Water Supplies – Projected (AFY)**

| Water Supply | Additional Detail on Water Supply | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| Purchased Water[1] | SFPUC | 14,100 | 14,100 | 14,100 | 14,100 |
| Purchased Water[2] | Valley Water | 9,215 | 9,338 | 11,226 | 11,923 |
| Groundwater[3] | Wells | 8,000 | 8,000 | 8,000 | 8,000 |
| Recycled Water | Recycled Water | 896 | 1,010 | 1,120 | 1,232 |
| **Total[2]** | | **32,211** | **32,448** | **34,446** | **35,255** |

Notes:
1. Total available supply from SFPUC reflects the City's contractual agreement.
2. The City can purchase additional available water from Valley Water during non-dry years when water is available.
3. Although the City expects to pump approximately 112 AFY, the total safe yield of groundwater is 8,000 AFY.

As can be seen from the data presented, the City has adequate supply to meet the projected water demand outlined in **Section 4** under normal year conditions.

## 6.9 Energy Intensity

Water Code section 10631.2.(a) details new requirements for the 2020 UWMP for each Supplier to address the amount of energy used to extract, divert, convey, distribute, treat, and store treated or non-treated water supply, based on readily available information. For the purposes of this UWMP, energy consumption from utility bills was analyzed to determine the quantity of energy used for water management processes.

Monthly PG&E billing data for the City's six wells (Hamilton Wells 2 and 3, Serra, Ortega, Westmoor, and Raynor) and the Hamilton Well Pump Station were used to determine metered electric usage for 2020. Since wells and pumps were combined on the utility bills, energy use from all wells and pumps is totaled as a lump sum for all potable water management processes. Estimated electric usage for 2020, based on available data, is shown in **Table 6-9**.

**Table 6-9: Energy Usage for Calendar Year 2020**

| Sum of All Potable Management Processes (Total Utility) | |
|---|---|
| Volume of Water Delivered (AF) | 19,193 |
| Energy Consumed (kWh) | 151,027 |

Notes:
1. The City does not currently utilize non-consequential hydropower; therefore, this energy source was not included in the table.
2. Energy consumed reflects the sum of available data only.

In 2016, the City and twelve other local communities formed Silicon Valley Clean Energy (SVCE) to provide the region with clean electricity and reduce greenhouse gas emissions. SVCE supplies electricity principally from wind, solar and hydro resources, and is helping communities switch from fossil fuels to clean electricity in buildings and transportation. The City currently purchases clean energy from SVCE.

Energy demands to treat recycled water supplies at the WPCP is supplied in large part by cogeneration. Cogeneration is a process which uses an internal combustion engine to produce heat and electrical power from biogas, or methane, emitted during the treatment process. Biogas produced in the Plant's anaerobic digesters and the adjacent landfill satisfy most of the Plant's operational energy demands. The City's budget includes funds dedicated to replacing existing cogeneration facilities and upgrading units with newer technologies.

The City also plans to install solar panels at the Sunnyvale Materials Recovery and Transfer Station (SMaRT® Station) and the Corporation Yard. This would reduce operational energy costs for each facility and reduce the City's greenhouse gas emissions, aligning with the City's Energy Policy and the goals outlined in the City's CAP. The City has approved a Power Purchase Agreement approach to implementing the solar project and is in the process of identifying a solar provider for the two sites.

## 6.10 Climate Change Impacts to Supply

The region is subject to growing water supply challenges concerning climate change, including recurring droughts and increased demand from population growth. The City's potable water is primarily supplied by SFPUC and Valley Water; as such, the City relies on each wholesaler to address the effects of climate change in their long-term planning efforts.

As mentioned in **Section 3**, the City has considered the effects of climate change on water supply in local projects and plans. The City built on its 2014 CAP 1.0 with a new Climate Action Playbook (Playbook) in 2019 (2019 Climate Action Playbook). The Playbook's Strategy 4 (Managing Resources Sustainably) includes a Play 4.2 to ensure the resilience of the City's water supply in the face of climate change. Methods listed to achieve this goal include reducing the amount of water consumed and promoting water conservation and water reuse, in the form of recycled and purified water. The City will continue to develop specific actions (called "Moves") every five years to ensure the goal of resilient water supply is achieved.

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# SECTION 7 – WATER SUPPLY RELIABILITY AND DROUGHT RISK ASSESSMENT

Water service reliability reflects the City's ability to meet the water needs of its customers under varying conditions. Assessing water service reliability and potential risk is critically important to future City planning and water management. This Section evaluates and addresses the City's long-term reliability of local and regional water supplies under normal conditions, a single dry year, and five consecutive dry years. Supply and demand projections from **Section 4** and **Section 6** are used for this analysis, along with consideration of foreseeable hydrologic variability, regulatory variability, climate conditions, etc. that may affect supply. This section also includes a Drought Risk Assessment (DRA) to evaluate the City's risk under a severe drought period lasting for the next five consecutive years.

The City relies on four water supply sources; surface water from SFPUC, treated surface water from Valley Water, groundwater, and recycled water. Surface water from the two wholesalers, SFPUC and Valley Water, provides most of the City's water supply, averaging about 97% since 2015. City owned- and operated-wells provide less than 1% of water supply, and recycled water makes up the remaining 3%.

## 7.1 Constraints on Water Sources

In addition to drought, constraints such as water quality, climate change, and changes in regulation can impact water supply. Sunnyvale relies on their diversification of water supply, continuous work with SFPUC and Valley Water, demand management strategies as discussed in **Section 9**, and Water Conservation Plan (included as **Appendix G**) to address these constraints.

### 7.1.1 Water Quality Impacts on Reliability

**SFPUC**

SFPUC provides safe, high quality drinking water, most of which originates from the upper Tuolumne River Watershed high in the Sierra Nevada, remote from human development and pollution. This water is referred to as Hetch-Hetchy water and is protected and conveyed through pipes and tunnels. SFPUC aggressively protects the natural water resources entrusted to its care. Its annual Hetch Hetchy Watershed survey evaluates the sanitary conditions, water quality, potential contamination sources, and the results of watershed management activities by the SFPUC and its partner agencies, including the National Park Service, to reduce or eliminate contamination sources. SFPUC also conducts sanitary surveys of the local Alameda and Peninsula watersheds every five years. The latest sanitary surveys for the non-Hetch Hetchy watersheds were completed in 2021 for the period of 2016-2020. The purposes of the surveys are to evaluate the sanitary conditions and water quality of the watersheds and to review results of watershed management activities conducted in the preceding years. Wildlife, stock, and human activities continue to be the potential contamination sources.

Water from the Hetch Hetchy Reservoir is exempt from state and federal filtration requirements but receives the following treatment: ultraviolet light and chlorine disinfection, pH adjustment for optimum corrosion control, fluoridation for dental health protection, and chloramination for maintaining disinfectant residual and minimizing the formation of regulated disinfection byproducts. SFPUC regularly collects and tests water samples from reservoirs and designated sampling points throughout the sources and the transmission system to ensure the water delivered to its customers meets or exceeds federal and State drinking water standards. In 2020, SFPUC conducted more than 47,200 drinking water tests in the sources and the transmission system. This is in addition to the extensive treatment process control monitoring performed by SFPUC's certified operators and online instruments.

**Bay-Delta Plan**

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted Bay-Delta Plan was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The Bay-Delta Plan requires the release of 30-50% of the "unimpaired flow" on the three tributaries from February through June in every year type. In SFPUC modeling of the new flow standard, it is assumed that the required release is 40% of unimpaired flow.

If the Bay-Delta Plan is implemented, the SFPUC will be able to meet the projected water demands presented in this UWMP in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges – both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

The SWRCB has stated that it intends to implement the Bay-Delta Plan on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. But implementation of the Plan Amendment is uncertain for multiple reasons.

- First, since adoption of the Bay-Delta Plan, over a dozen lawsuits have been filed in both state and federal courts, challenging the SWRCB's adoption of the Bay-Delta Plan, including a legal challenge filed by the federal government, at the request of the U.S. Department of Interior, Bureau of Reclamation. This litigation is in the early stages and there have been no dispositive court rulings as of this date.
- Second, the Bay-Delta Plan is not self-implementing and does not automatically allocate responsibility for meeting its new flow requirements to the SFPUC or any other water rights holders. Rather, the Bay-Delta Plan merely provides a regulatory framework for flow allocation, which must be accomplished by other regulatory and/or adjudicatory proceedings, such as a comprehensive water rights adjudication or, in the case of the Tuolumne River, may be implemented through the water quality certification process set forth in section 401 of the Clean Water Act as part of the Federal Energy Regulatory Commission's licensing proceedings for the Don Pedro and La Grange hydroelectric projects. It is currently unclear when the license amendment process is expected to be completed. This process and the other regulatory and/or adjudicatory proceedings would likely face legal challenges and have

lengthy timelines, and quite possibly could result in a different assignment of flow responsibility (and therefore a different water supply impact on the SFPUC).

- Third, in recognition of the obstacles to implementation of the Bay-Delta Plan, the SWRCB Resolution No. 2018-0059 adopting the Bay-Delta Plan directed staff to help complete a "Delta watershed-wide agreement, including potential flow measures for the Tuolumne River" by March 1, 2019, and to incorporate such agreements as an "alternative" for a future amendment to the Bay-Delta Plan to be presented to the SWRCB "as early as possible after December 1, 2019." In accordance with the SWRCB's instruction, on March 1, 2019, SFPUC, in partnership with other key stakeholders, submitted a proposed project description for the Tuolumne River that could be the basis for a voluntary substitute agreement with the SWRCB ("March 1st Proposed Voluntary Agreement"). On March 26, 2019, the Commission adopted Resolution No. 19-0057 to support the SFPUC's participation in the Voluntary Agreement negotiation process. To date, those negotiations are ongoing under the California Natural Resources Agency and the leadership of the Newsom administration (California Natural Resources Agency, "Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds,").

**Valley Water**

Valley Water provides treated surface water to local municipalities and private water retailers who deliver the water directly to homes and businesses in Santa Clara County. Valley Water's surface water is mainly imported from the South Bay Aqueduct, Dyer Reservoir, Lake Del Valle, and San Luis Reservoir, which all draw water from the Sacramento - San Joaquin Delta watershed. Valley Water's local water sources include Anderson and Calero Reservoirs. Water from imported and local sources is pumped to and treated at three water treatment plants located in Santa Clara County. Treatment of surface water is necessary to ensure that the water provided meets or exceeds all federal and state drinking water standards. Surface water quality programs include treating local and imported surface water for sale to retailers; participating in regional and statewide coalitions to safeguard source water quality protection; and investigating opportunities for water quality improvements through partnership in regional facilities or exchanges.

Valley Water's source waters are vulnerable to potential contamination from a variety of land use practices, such as agricultural and urban runoff, recreational activities, livestock grazing, and residential and industrial development. The imported sources are also vulnerable to wastewater treatment plant discharges, seawater intrusion, and wildfires in open space areas. In addition, local sources are also vulnerable to potential contamination from commercial stables and historic mining practices. No contaminant associated with any of these activities has been detected in Valley Water's treated water. The water treatment plants provide multiple barriers for physical removal of contaminants and disinfection of pathogens.

**Groundwater**

Valley Water monitors groundwater quality to assess current conditions and identify trends or areas of special concern. Wells are monitored for major ions, such as calcium and sodium, nutrients such as nitrate, and trace elements such as iron. Wells are also monitored for man-made contaminants, such as organic solvents. The type and frequency of monitoring depends on the well location, historic and current land use, and the availability of groundwater data in the area. In general, the Santa Clara and Llagas Subbasins have high-quality groundwater, except for nitrate, which is elevated in some wells in the Coyote Valley and Llagas Subbasin from historic and ongoing sources including fertilizers, septic systems, and animal waste. However, nitrate concentrations are generally stable or declining and Valley Water has many programs to protect groundwater quality, including several targeted to improve nitrate in groundwater.

As the groundwater management agency in Santa Clara County, Valley Water has ongoing groundwater protection programs to ensure high water quality and more reliable water supplies. These programs include well permitting, well destruction, wellhead protection, land use and development review, nitrate management (targeted to areas of elevated nitrate in the Coyote Subarea and the Llagas Subbasin), saltwater intrusion programs, and providing technical assistance to regulatory agencies to ensure local groundwater resources are protected. Additional details about constraints on groundwater supply and quality and Valley Water's comprehensive groundwater management strategies are described in the 2016 Groundwater Management Plan (**Appendix F**).

Nitrate in the environment comes from both natural and anthropogenic sources. Small amounts of nitrate in groundwater (less than 10 mg/L) are normal, but higher concentrations suggest an anthropogenic origin. Common anthropogenic sources of nitrate in groundwater are fertilizers, septic systems, and animal waste. The drinking water maximum contaminant level (MCL) for nitrate is 10 mg/L as nitrogen. Since the Santa Clara Valley has a long history of agricultural production and septic systems are still in use in the unincorporated areas of the county, monitoring for nitrate contamination is an essential groundwater management function. The City's groundwater nitrate concentrations are generally stable or declining and Valley Water has many programs to protect groundwater quality, including several targeted to improve nitrate in groundwater.

### 7.1.2 Climate Change

Impacts to the City's supply reliability due to climate change is discussed in **Section 6.10**. The following is climate change impacts to the City's wholesalers.

**SFPUC**

The issue of climate change has become an important factor in water resources planning in the State and is frequently considered in urban water management planning processes, though the extent and precise effects of climate change remain uncertain. There is convincing evidence that increasing concentrations of greenhouse gasses 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. Moreover, observational data show that a warming trend occurred during the latter part of the 20th century and virtually all projections indicate this will continue through the 21st century. These changes will have a direct effect on water resources in California, and numerous studies have been conducted to determine the potential impacts to water resources. Based on these studies, climate change could result in the following types of water resource impacts, including impacts on the watersheds in the Bay Area:

- 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, annual average, intensity and variability of precipitation, and an increased amount of precipitation falling as rain rather than snow;

- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality and quantity;
- 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.

Both the SFPUC and BAWSCA participated in the 2020 update of the Bay Area Integrated Regional Water Management Plan (BAIRWMP), which includes an assessment of the potential climate change vulnerabilities of the region's water resources and identifies climate change adaptation strategies. In addition, the SFPUC continues to study the effect of climate change on the RWS. These works are summarized below.

**Bay Area Integrated Regional Water Management Plan**

Climate change adaptation continues to be an overarching theme for the 2019 BAIRWMP update. As stated in the BAIRWMP, identification of watershed characteristics that could potentially be vulnerable to future climate change is the first step in assessing vulnerabilities of water resources in the Bay Area Region (Region). Vulnerability is defined as the degree to which a system is exposed to, susceptible to, and able to cope with or adjust to, the adverse effects of climate change. A vulnerability assessment was conducted in accordance with the DWR's Climate Change Handbook for Regional Water Planning and using the most current science available for the Region.

The vulnerability assessment, summarized **Table 7-1** below, provides the main water planning categories applicable to the Region and a general overview of the qualitative assessment of each category with respect to anticipated climate change impacts.

**Table 7-1: Summary of BAIRWMP Climate Change Vulnerability Assessment**

| Vulnerability Areas | General Overview of Vulnerabilities1 |
|---|---|
| Water Demand | • **Urban and Agricultural Water Demand** – Changes to hydrology in the Region because of climate change could lead to changes in total water demand and use patterns. Increased irrigation (outdoor landscape or agricultural) is anticipated to occur with temperature rise, increased evaporative losses due to warmer temperature, and a longer growing season. Water treatment and distribution systems are most vulnerable to increases in maximum day demand. |
| Water Supply | • **Imported Water** – Imported water derived from the Sierra Nevada sources and Delta diversions provide 66% of the water resources available to the Region. Potential impacts on the availability of these sources resulting from climate change directly affect the amount of imported water supply delivered to the Region.<br>• **Regional Surface Water** – Although future projections suggest that small changes in total annual precipitation over the Region will not change much, there may be changes to when precipitation occurs with reductions in the spring and more intense rainfall in the winter.<br>• **Regional Groundwater** – Changes in local hydrology could affect natural recharge to the local groundwater aquifers and the quantity of groundwater that could be pumped sustainably over the long-term in some areas. Decreased inflow from more flashy or more intense runoff, increased evaporative losses and warmer and shorter winter seasons can alter natural recharge of groundwater. Salinity intrusion into coastal groundwater aquifers due to sea-level rise could interfere with local groundwater uses. Furthermore, additional reductions in imported water supplies would lead to less imported water available for managed recharge of local groundwater basins and potentially more groundwater pumping in lieu of imported water availability. |
| Water Quality | • **Imported Water** – For sources derived from the Delta, sea-level rise could result in increases in chloride and bromide (a disinfection by-product [DBP] precursor that is also a component of sea water), potentially requiring changes in treatment for drinking water. Increased temperature could result in an increase in algal blooms, taste and odor events, and a general increase in DBP formation.<br>• **Regional Surface Water** – Increased temperature could result in lower dissolved oxygen in streams and prolong thermocline stratification in lakes and reservoirs forming anoxic bottom conditions and algal blooms. Decrease in annual precipitation could result in higher concentrations of contaminants in streams during droughts or in association with flushing rain events. Increased wildfire risk and flashier or more intense storms could increase turbidity loads for water treatment.<br>• **Regional Groundwater –** Sea-level rise could result in increases in chlorides and bromide for some coastal groundwater basins in the Region. Water quality changes in imported water used for recharge could also impact groundwater quality. |
| Sea-Level Rise | • Sea-level rise is additive to tidal range, storm surges, stream flows, and wind waves, which together will increase the potential for higher total water levels, overtopping, and erosion.<br>• Much of the bay shoreline is comprised of low-lying diked baylands which are already vulnerable to flooding. In addition to rising mean sea level, continued subsidence due to tectonic activity will increase the rate of relative sea-level rise.<br>• As sea-level rise increases, both the frequency and consequences of coastal storm events, and the cost of damage to the built and natural environment, will increase. Existing coastal armoring (including levees, breakwaters, and other structures) is likely to be insufficient to protect against projected sea-level rise. Crest elevations of structures will have to be raised or structures relocated to reduce hazards from higher total water levels and larger waves. |
| Flooding | • Climate change projections are not sensitive enough to assess localized flooding, but the general expectation is that more intense storms would occur thereby leading to more frequent, longer, and deeper flooding.<br>• Changes to precipitation regimes may increase flooding.<br>• Elevated Bay elevations due to sea-level rise will increase backwater effects exacerbating the effect of fluvial floods and storm drain backwater flooding. |

| Vulnerability Areas | General Overview of Vulnerabilities1 |
|---|---|
| Ecosystem and Habitat | • Changes in the seasonal patterns of temperature, precipitation, and fire due to climate change can dramatically alter ecosystems that provide habitats for California's native species. These impacts can result in species loss, increased invasive species ranges, loss of ecosystem functions, and changes in vegetation growing ranges.<br>• Reduced rain and changes in the seasonal distribution of rainfall may alter timing of low flows in streams and rivers, which in turn would have consequences for aquatic ecosystems. Changes in rainfall patterns and air temperature may affect water temperatures, potentially affecting coldwater aquatic species.<br>• Bay Area ecosystems and habitat provide important ecosystem services, such as: carbon storage, enhanced water supply and quality, flood protection, food, and fiber production. Climate change is expected to substantially change several of these services.<br>• The Region provides substantial aquatic and habitat-related recreational opportunities, including fishing, wildlife viewing, and wine industry tourism (a significant asset to the Region) that may be at risk due to climate change effects. |
| Hydropower | • Currently, several agencies in the Region produce or rely on hydropower produced outside of the Region for a portion of their power needs. As the hydropower is produced in the Sierra, there may be changes in the future in the timing and amount of energy produced due to changes in the timing and amount of runoff because of climate change.<br>• Some hydropower is also produced within the region and could also be affected by changes in the timing and amount of runoff. |

Source: 2019 Bay Area Integrated Regional Water Management Plan (BAIRWMP), Table 16-3.

**SFPUC Climate Change Studies**

The SFPUC views assessment of the effects of climate change as an ongoing project requiring regular updating to reflect improvements in climate science, atmospheric/ocean modeling, and human response to the threat of greenhouse gas emissions. Climate change research by the SFPUC began in 2009 and continues to be refined. In its 2012 report "Sensitivity of Upper Tuolumne River Flow to Climate Change Scenarios," the SFPUC assessed the sensitivity of runoff into Hetch Hetchy Reservoir to a range of changes in temperature and precipitation due to climate change. Key conclusions from the report include the following:

- With differing increases in temperature alone, the median annual runoff at Hetch Hetchy would decrease by 0.7-2.1% from present-day conditions by 2040 and by 2.6-10.2% from present-day by 2100. Adding differing decreases in precipitation on top of temperature increases, the median annual runoff at Hetch Hetchy would decrease by 7.6-8.6% from present-day conditions by 2040 and by 24.7-29.4% from present-day conditions by 2100.
- In critically dry years, these reductions in annual runoff at Hetch Hetchy would be significantly greater, with runoff decreasing up to 46.5% from present day conditions by 2100 utilizing the same climate change scenarios.
- In addition to the total change in runoff, there will be a shift in the annual distribution of runoff. Winter and early spring runoff would increase, and late spring and summer runoff would decrease.
- Under all scenarios, snow accumulation would be reduced, and snow would melt earlier in the spring, with significant reductions in maximum peak snow water equivalent under most scenarios.

Currently, the SFPUC is conducting a comprehensive assessment of the potential effects of climate change on water supply using a wide range of plausible increases in temperature and changes in precipitation to address the wide uncertainty in climate projections over the planning horizon 2020 to 2070. There are many uncertain factors such as climate change, changing regulations, water quality, growth and economic cycles that may create vulnerabilities for the RWS's ability to meet levels of service. The uncertainties associated with the degree to which these factors will occur and how much risk they present to the water system is difficult to predict, but nonetheless they need to be considered in SFPUC planning. To address this planning challenge, the project uses a vulnerability-based planning approach to explore a range of future conditions to identify vulnerabilities, assess the risks associated with these vulnerabilities that could lead to developing an adaptation plan that is flexible and robust to a wide range of future outcomes.

**Valley Water**

Statewide and local changes in precipitation and temperature could significantly impact Valley Water's water supplies and operations, the effectiveness of potential water supply investments, and water demand patterns. Specifically, Valley Water's water supply vulnerabilities to climate change include:

- **Decreases in the quantity of imported water supplies.** Currently the Sierra snowpack acts as a reservoir that captures precipitation as snow in the winter and releases it as runoff through the spring and summer where it is captured by reservoirs in the SWP and CVP system. More precipitation falling as rain and earlier snowmelt in the Sierra may exceed the storage capabilities of the existing SWP and CVP reservoirs meaning much of this runoff would be lost as a water supply. Increases in temperature and evapotranspiration may also lead to a higher intensity of droughts, which can decrease imported water allocations. Rising air temperatures will also increase water temperatures in reservoirs and the Delta, which can lead to increased evaporation rates, a higher risk of harmful algal blooms, and negative impacts to fish and wildlife, all of which can impact the availability of imported water supplies for Valley Water. Sea level rise will also have negative impacts on imported water supplies, largely because of saltwater intrusion into the Delta. Saltwater intrusion can impact water supply allocations, as more fresh water will be needed to flow through the Delta and into San Francisco Bay to hold back saltwater, making it unavailable for CVP and SWP use.
- **Decreases in the ability to utilize local surface water supplies.** Shifts in the timing and intensity of rainfall and runoff could affect Valley Water's ability to capture and use local surface water supplies. It is difficult to capture rainfall when it comes in a few intense storms because reservoirs are more likely to fill and spill, or additional releases will be needed to make room for the storm flows. When it is wet, there are typically lower demands for water, so storm flows and releases to provide additional storage capacity are difficult to put to immediate use. Thus, even if average annual rainfall stays the same, the ability to utilize local supplies may decrease.
- **Increases in irrigation and cooling water demands.** Higher temperatures will increase irrigation demands for agricultural, residential, and commercial/institutional uses, which account for about 40% of water use in the county. Also, the county has several energy plants, multiple data centers, and facilities with cooling towers. Higher temperatures may also increase demands by these users.
- **Decreases in water quality.** Higher temperatures, wildfire, and changes in flow patterns could result in more algal blooms, and increased turbidity in imported and local surface water

supplies. Sea level rise could also contribute to increased salinity in Delta conveyed supplies. At a minimum, changes in water quality require additional monitoring. Often, degrading in water quality requires changes to treatment processes, and sometimes, can result in the interruption of supplies from the CVP or SWP.

- **Increases in the severity and duration of droughts.** Droughts are already Valley Water's greatest water supply challenge. With increases in demands and potential reductions in supplies from climate change, this challenge will only grow. Without additional supplies and demand management measures, Valley Water would need to call for more frequent and severe water use reductions. These actions affect the economic and social well-being of the county. More severe and longer droughts will also affect the environmental well-being of the county. Valley Water needs to implement a water supply strategy that will adapt well to future climate change by managing demands, providing drought-resilient supplies, and increasing system flexibility in managing supplies and water quality.

Recognizing the challenges posed by climate change to water supply reliability, Valley Water has embarked on several efforts to understand and develop mitigation actions for climate change impacts. Through several modeling efforts, Valley Water is analyzing climate impacts to quantify the effect on its existing and future supply. Valley Water relies on its long-term master planning efforts to continually develop and improve resilient and adaptable water supplies and strategies. Valley Water's 2040 WSMP is reviewed annually and updated every five years to adapt to changing conditions. The most recent update was completed in 2019 and is available at: Water Supply Master Plan 2040 (valleywater.org). The 2040 WSMP will continue to develop elements that adapt to future climate changes.

Furthermore, to address climate change impacts to ensure it can continue to provide a clean, reliable water supply, natural flood protection, and water resources stewardship in the future, Valley Water developed a Climate Change Action Plan (CCAP). The CCAP provides goals, strategies, and actions for each of Valley Water's mission areas, including water supply reliability, flood risk reduction, and water resources stewardship, as well as for emergency response. The goals and strategies developed through the CCAP planning process will guide the implementation of specific actions to address climate change. More information about the CCAP can be found at: Climate Change Action Plan (valleywater.org).

For the implementation actions, Valley Water is actively promoting water conservation and reuse to increase resilience and mitigate climate change impacts. Valley Water's long-term and comprehensive water conservation and demand management efforts are described in the Valley Water 2020 UWMP.

## 7.2 Regional Supply Reliability

The City relies mostly on SFPUC and Valley Water for its water supply and is directly affected by the water supply conditions each wholesaler faces. The following describes the measures each wholesaler is taking to ensure regional supply reliability.

### 7.2.1 SFPUC

**Tier One Drought Allocations**

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the WSA, which includes a Water Shortage Allocation Plan (WSAP) that describes the method for allocating water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. The following table shows the SFPUC (i.e., Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

**Table 7-2: SFPUC Tier One Drought Allocations**

| Level of System-Wide Reduction in Water Use Required | Share of Available Water | |
|---|---|---|
| | SFPUC Share | Wholesale Customers Share |
| 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% |

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail) then the excess percentage would be re-allocated to the Wholesale Customers' share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code

Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

**Tier Two Drought Allocations**

The Wholesale Customers have negotiated and adopted the Tier Two Plan, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that considers multiple factors for each Wholesale Customer including:

- ISG;
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer's Allocation Basis, expressed in MGD, which in turn is the weighted average of two components. The first component is the Wholesale Customer's ISG, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain wholesale customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers' Allocation Bases to determine each Wholesale Customer's Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers' collectively under the Tier One Plan, by the Wholesale Customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

Per WSA Section 3.11, the Tier One and Tier Two Plans will be used to allocate water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. For RWS shortages more than 20%, San Francisco shall (a) follow the Tier One Shortage Plan allocations up to the 20% reduction, (b) meet and discuss how to implement incremental reductions above 20% with the Wholesale Customers, and (c) make a final determination of allocations above the 20% reduction. After the SFPUC has made the final allocation decision, the Wholesale Customers shall be free to challenge the allocation on any applicable legal or equitable basis. For purposes of the 2020 UWMPs, for RWS shortages more than 20%, the allocations among the Wholesale Customers is assumed to be equivalent among them and to equal the drought cutback to Wholesale Customer by the SFPUC.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

## Individual Supply Guarantee

San Francisco has a perpetual commitment (Supply Assurance) to deliver 184 MGD (206,107 AFY) to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco. Sunnyvale's ISG is 14,100 AFY.

## SFPUC Water System Improvement Program

The SFPUC's WSIP provides goals and objectives to improve the delivery reliability of the RWS, including water supply reliability. In 2008, the SFPUC adopted Level of Service (LOS) Goals and Objectives in conjunction with the adoption of WSIP. The SFPUC updated the LOS Goals and Objectives in February 2020. The goals and objectives of the LOS related to water supply are provided in **Table 7-3**.

**Table 7-3: SFPUC's LOS Goals and Objectives**

| Program Goal | System Performance Objective |
|---|---|
| Water Supply – meet customer water needs in non-drought and drought periods | • Meet all state and federal regulations to support the proper operation of the water system and related power facilities.<br>• Meet average annual water demand of 265 MGD from the SFPUC watersheds for retail and Wholesale Customers during non–drought years for system demands consistent with the 2009 Water Supply Agreement.<br>• Meet dry-year delivery needs while limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts.<br>• Diversify water supply options during non-drought and drought periods.<br>• Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers. |

The SFPUC historically has met demand in its service area in all year types from its watersheds, which consist of:

- Tuolumne River watershed
- Alameda Creek watershed
- San Mateo County watersheds

In general, 85% of the supply comes from the Tuolumne River through Hetch Hetchy Reservoir and the remaining 15% comes from the local watersheds through the San Antonio, Calaveras, Crystal Springs, Pilarcitos and San Andreas Reservoirs. The adopted WSIP retains this mix of water supply for all year types.

**WSIP Dry Year Water Supply Projects**

The WSIP authorized the SFPUC to undertake several water supply projects to meet dry-year demands with no greater than 20% system-wide rationing in any one year. Those projects include the following:

- **Calaveras Dam Replacement Project.** Calaveras Dam is located near a seismically active fault zone and was determined to be seismically vulnerable. To address this vulnerability, the SFPUC constructed a new dam of equal height downstream of the existing dam. Construction on the project occurred between 2011 and July 2019. The SFPUC began impounding water behind the new dam in accordance with State Division of Safety of Dams (DSOD) guidance in the winter of 2018/2019.
- **Alameda Creek Recapture Project.** As a part of the regulatory requirements for future operations of Calaveras Reservoir, the SFPUC must implement bypass and instream flow schedules for Alameda Creek. The Alameda Creek Recapture Project will recapture a portion of the water system yield lost due to the instream flow releases at Calaveras Reservoir or bypassed around the Alameda Creek Diversion Dam and return this yield to the RWS through facilities in the Sunol Valley. Water that naturally infiltrates from Alameda Creek will be recaptured into an existing quarry pond known as SMP (Surface Mining Permit)-24 Pond F2. The project will be designed to allow the recaptured water to be pumped to the Sunol Valley Water Treatment Plant or to San Antonio Reservoir. Construction of this project will occur from spring 2021 to fall 2022.
- **Lower Crystal Springs Dam Improvements.** The Lower Crystal Springs Dam (LCSD) Improvements were substantially completed in November 2011. The joint San Mateo County/SFPUC Bridge Replacement Project to replace the bridge across the dam was completed in January 2019. A WSIP follow up project to modify the LCSD Stilling Basin for fish habitat and upgrade the fish water release and other valves started in April 2019. While the main improvements to the dam have been completed, environmental permitting issues for reservoir operation remain significant. While the reservoir elevation was lowered due to DSOD restrictions, the habitat for the Fountain Thistle, an endangered plant, followed the lowered reservoir elevation. Raising the reservoir elevation now requires that new plant populations be restored incrementally before the reservoir elevation is raised. The result is that it may be several years before pre-project water storage volumes can be restored.
- **Regional Groundwater Storage and Recovery Project.** The Groundwater Storage and Recovery (GSR) Project is a strategic partnership between SFPUC and three San Mateo County agencies – the California Water Service Company (serving South San Francisco and Colma), the City of Daly City, and the City of San Bruno – to conjunctively operate the South Westside Groundwater Basin. The project sustainably manages groundwater and surface water resources in a way that provides supplies during times of drought. During years of normal or heavy rainfall, the project would provide additional surface water to the partner agencies in San Mateo County in lieu of groundwater pumping. Over time, reduced pumping creates water storage through natural recharge of up to 20 billion gallons of new water supply available during dry years.

  The project's Final Environmental Impact Report (EIR) was certified in August 2014, and the project also received Commission approval that month. Phase 1 of this project consists of construction of thirteen well sites and is over 99% complete. Phase 2 of this project consists of completing construction of the well station at the South San Francisco Main site and some carryover work that has not been completed from Phase 1. Phase 2 design work began in December 2019.

- **2 MGD Dry-year Water Transfer.** In 2012, the dry-year transfer was proposed between the Modesto Irrigation District and the SFPUC. Negotiations were terminated because an agreement could not be reached. Subsequently, the SFPUC had discussions with the Oakdale Irrigation District for a one-year transfer agreement with the SFPUC for 2 MGD (2,240 AFY). No progress towards agreement on a transfer was made in 2019, but the irrigation districts recognize SFPUC's continued interest and SFPUC will continue to pursue transfers.

To achieve its target of meeting at least 80% of its customer demand during droughts with a system demand of 265 MGD (296,838 AFY), the SFPUC must successfully implement the dry-year water supply projects included in the WSIP.

Furthermore, the permitting obligations for the Calaveras Dam Replacement Project and the LCSD Improvements include a combined commitment of 12.8 MGD (14,338 AFY) for instream flows on average. When this is reduced for an assumed Alameda Creek Recapture Project recovery of 9.3 MGD (10,417 AFY), the net loss of water supply is 3.5 MGD (3,921 AFY).

## Alternative Water Supply Planning Program

The SFPUC is increasing and accelerating its efforts to acquire additional water supplies and explore other projects that would increase overall water supply resilience through the Alternative Water Supply Planning Program. The drivers for the program include: (1) the adoption of the Bay-Delta Plan and the resulting potential limitations to RWS supply during dry years, (2) the net supply shortfall following the implementation of WSIP, (3) San Francisco's perpetual obligation to supply 184 MGD to the Wholesale Customers, (4) adopted Level of Service Goals to limit rationing to no more than 20% system-wide during droughts, and (5) the potential need to identify water supplies that would be required to offer permanent status to interruptible customers. Developing additional supplies through this program would reduce water supply shortfalls and reduce rationing associated with such shortfalls. The planning priorities guiding the framework of the Alternative Water Supply Planning Program are as follows:

- Offset instream flow needs and meet regulatory requirements.
- Meet existing obligations to existing permanent customers.
- Make interruptible customers permanent.
- Meet increased demands of existing and interruptible customers.

In conjunction with these planning priorities, the SFPUC considers how the program fits within the LOS Goals and Objectives related to water supply and sustainability when considering new water supply opportunities. The key LOS Goals and Objectives relevant to this effort can be summarized as:

- Meet dry-year delivery needs while limiting rationing to a maximum of 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;
- Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat;

- Maintain operational flexibility (although this LOS Goal was not intended explicitly for the addition of new supplies, it is applicate here).

Together, the planning priorities and LOS Goals and Objectives provide a lens through which the SFPUC considers water supply options and opportunities to meet all foreseeable water supply needs.

In addition to the Daly City Recycled Water Expansion project, which was a potential project identified in the 2015 UWMP and had committed funding at that time, the SFPUC has taken action to fund the study of potential additional water supply projects. Capital projects under consideration to develop additional water supplies include surface water storage expansion, recycled water expansion, water transfers, desalination, and potable reuse. A more detailed list and descriptions of these efforts are provided below.

The capital projects that are under consideration would be costly and are still in the early feasibility or conceptual planning stages. Because these water supply projects would take 10 to 30 years to implement, and because required environmental permitting negotiations may reduce the amount of water that can be developed, the yield from these projects are not currently incorporated into SFPUC's supply projections. State and federal grants and other financing opportunities would be pursued for eligible projects, to the extent feasible, to offset costs borne by ratepayers.

- **Daly City Recycled Water Expansion** (Regional, Normal- and Dry-Year Supply): This project can produce up to 3 MGD of tertiary recycled water during the irrigation season (~7 months). On an average annual basis, this is equivalent to 1.25 MGD or 1,400 AFY. The project is envisioned to provide recycled water to 13 cemeteries and other smaller irrigation customers, offsetting existing groundwater pumping from the South Westside Groundwater Basin; this will free up groundwater, enhancing the reliability of the Basin. The project is a regional partnership between the SFPUC and Daly City. The irrigation customers are located largely within California Water Service's (Cal Water's) service area. RWS customers will benefit from the increased reliability of the South Westside Basin for additional drinking water supply during droughts. In this way, this project supports the GSR Project, which is under construction.
- **ACWD-USD Purified Water Partnership** (Regional, Normal- and Dry-Year Supply): This project could provide a new purified water supply utilizing Union Sanitary District's (USD) treated wastewater. Purified water produced by advanced water treatment at USD could be transmitted to the Quarry Lakes Groundwater Recharge Area to supplement recharge into the Niles Cone Groundwater Basin or put to other uses in Alameda County Water District's (ACWD) service area. With the additional water supply to ACWD, an in-lieu exchange with the SFPUC would result in more water left in the RWS. Additional water supply could also be directly transmitted to the SFPUC through a new intertie between ACWD and the SFPUC.
- **Crystal Springs Purified Water** (Regional, Normal- and Dry-Year Supply): The Crystal Springs Purified Water (PREP) Project is a purified water project that could provide 6-12 MGD of water supply through reservoir water augmentation at Crystal Springs Reservoir, which is a facility of the RWS. Treated wastewater from Silicon Valley Clean Water (SVCW) and/or the City of San Mateo would go through an advanced water treatment plant to produce purified water that meets state and federal drinking water quality standards. The purified water would then be transmitted 10-20 miles (depending on the alignment) to Crystal Springs Reservoir, blended with regional surface water supplies and treated again at Harry Tracy Water Treatment Plant. Project partners include the SFPUC, BAWSCA, SVCW, Cal Water,

Redwood City, Foster City, and the City of San Mateo. Partner agencies are contributing financial and staff resources towards the work effort.

- **Los Vaqueros Reservoir Expansion** (Regional, Dry Year Supply): The Los Vaqueros Reservoir Expansion (LVE) Project is a storage project that will enlarge the existing reservoir located in northeastern Contra Costa County from 160,000 AF to 275,000 AF. While the existing reservoir is owned and operated by the Contra Costa Water District (CCWD), the expansion will have regional benefits and will be managed by a Joint Powers Authority (JPA) that will be set up prior to construction. Meanwhile, CCWD is leading the planning, design, and environmental review efforts. CCWD's Board certified the EIS/EIR and approved the LVE Project on May 13, 2020. The additional storage capacity from the LVE Project would provide a dry year water supply benefit to the SFPUC. BAWSCA is working in concert with the SFPUC to support their work effort on the LVE project.
    - **Conveyance Alternatives:** The SFPUC is considering two main pathways to move water from storage in a prospective LVE Project to the SFPUC's service area, either directly to RWS facilities or indirectly via an exchange with partner agencies. The SFPUC is evaluating potential alignments for conveyance.
    - **Bay Area Regional Reliability Shared Water Access Program (BARR SWAP):** As part of the BARR Partnership, a consortium of 8 Bay Area water utilities (including ACWD, BAWSCA, CCWD, EBMUD, Marin Municipal Water District (MMWD), SFPUC, Valley Water, and Zone 7 Water Agency) are exploring opportunities to move water across the region as efficiently as possible, particularly during times of drought and emergencies. The BARR agencies are proposing two separate pilot projects in 2020-2021 through the Shared Water Access Program (SWAP) to test conveyance pathways and identify potential hurdles to better prepare for sharing water during a future drought or emergency. A strategy report identifying opportunities and considerations will accompany these pilot transfers and will be completed in 2021.
- **Bay Area Brackish Water Desalination** (Regional, Normal- and Dry-Year Supply): The Bay Area Brackish Water Desalination (Regional Desalination) Project is a partnership between CCWD, the SFPUC, Valley Water, and Zone 7 Water Agency. East Bay Municipal Utilities District (EBMUD) and ACWD may also participate in the project. The project could provide a new drinking water supply to the region by treating brackish water from CCWD's existing Mallard Slough intake in Contra Costa County. While this project has independent utility as a water supply project, for the current planning effort the SFPUC is considering it as a source of supply for storage in LVE. While the allocations remain to be determined among partners, the SFPUC is considering a water supply benefit of between 5 and 15 MGD during drought conditions when combined with storage at LVE.
- **Calaveras Reservoir Expansion** (Regional, Dry Year Supply): Calaveras Reservoir would be expanded to create 289,000 AF additional capacity to store excess RWS supplies or other source water in wet and normal years. In addition to reservoir enlargement, the project would involve infrastructure to pump water to the reservoir, such as pump stations and transmission facilities.
- **Groundwater Banking:** Groundwater banking in the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) service areas could be used to provide some additional water supply to meet instream releases in dry years reducing water supply impacts to the SFPUC service area. For example, additional surface water could be provided to irrigators in wet years, which would offset the use of groundwater, thereby allowing the groundwater to remain in the basin rather than be consumptively used. The groundwater that remains in the basin

can then be used in a subsequent dry year for irrigation, freeing up surface water that would have otherwise been delivered to irrigators to meet instream flow requirements.

A feasibility study of this option is included in the proposed Tuolumne River Voluntary Agreement. Progress on this potential water supply option will depend on the negotiations of the Voluntary Agreement.

- **Inter-Basin Collaborations:** Inter-Basin Collaborations could provide net water supply benefits in dry years by sharing responsibility for in-stream flows in the San Joaquin River and Delta more broadly among several tributary reservoir systems. One mechanism by which this could be accomplished would be to establish a partnership between interests on the Tuolumne River and those on the Stanislaus River, which would allow responsibility for streamflow to be assigned variably based on the annual hydrology.

  As is the case with Groundwater Banking, feasibility of this option is included in the proposed Tuolumne River Voluntary Agreement.

If all the projects identified through the current planning process can be implemented, there would still be a supply shortfall to meet projected needs. Furthermore, each of the supply options being considered has its own inherent challenges and uncertainties that may affect the SFPUC's ability to implement it.

Given the limited availability of water supply alternatives - unless the supply risks are significantly reduced or our needs change significantly - the SFPUC will continue to plan, develop, and implement all project opportunities that can help bridge the anticipated water supply gaps during droughts. In 2019, the SFPUC completed a survey among water and wastewater agencies within the service area to identify additional opportunities for purified water. Such opportunities remain limited, but the SFPUC continues to pursue all possibilities.

**Regional Water Demand and Conservation Projections**

In June 2020, BAWSCA completed the Regional Water Demand and Conservation Projections Report (Demand Study). The goal of the Demand Study was to develop transparent, defensible, and uniform demand and conservation savings projections for each Wholesale Customer using a common methodology to support both regional and individual agency planning efforts and compliance with the new statewide water efficiency targets required by AB 1668 and SB 606.

Through the Demand Study process, BAWSCA and the wholesale customers:

- Quantified the total average-year water demand for each BAWSCA member agency through 2045,
- Quantified passive and active conservation water savings potential for each individual wholesale customer through 2045, and
- Identified 24 conservation programs with high water savings potential and/or member agency interest. Implementation of these conservation measures, along with passive conservation, is anticipated to yield an additional 37.3 MGD of water savings by 2045.

Based on the revised water demand projections, the identified water conservation savings, increased development and use of other local supplies by the Wholesale Customers, and other actions, the collective purchases of the BAWSCA member agencies from the SFPUC are projected to stay below 184 MGD through 2045.

As part of the Demand Study, each Wholesale Customer was provided with a demand model that can be used to support ongoing demand and conservation planning efforts, including UWMP preparation.

**BAWSCA's Long Term Reliable Water Supply Strategy**

BAWSCA's Long-Term Reliable Water Supply Strategy (Strategy), completed in February 2015, quantified the water supply reliability needs of the BAWSCA member agencies through 2040, identified the water supply management projects and/or programs (projects) that could be developed to meet those needs, and prepared an implementation plan for the Strategy's recommendations.

When the 2015 Demand Study concluded it was determined that while there is no longer a regional normal year supply shortfall, there was a regional drought year supply shortfall of up to 43 MGD (48,166 AFY). In addition, key findings from the Strategy's project evaluation analysis included:

- Water transfers represent a high priority element of the Strategy.
- Desalination potentially provides substantial yield, but its high effective costs and intensive permitting requirements make it a less attractive drought year supply alternative.
- Other potential regional projects provide tangible, though limited, benefit in reducing dry-year shortfalls given the small average yields in drought years.

Since 2015, BAWSCA has completed a comprehensive update of demand projections and engaged in significant efforts to improve regional reliability and reduce the dry-year water supply shortfall.

- **Water Transfers.** BAWSCA successfully facilitated two transfers of portions of ISG between BAWSCA agencies in 2017 and 2018. Such transfers benefit all BAWSCA agencies by maximizing use of existing supplies. BAWSCA is currently working on an amendment to the Water Supply Agreement between the SFPUC and BAWSCA agencies to establish a mechanism by which member agencies that have an ISG may participate in expedited transfers of a portion of ISG and a portion of a Minimum Annual Purchase Requirement. In 2019, BAWSCA participated in a pilot water transfer that, while ultimately unsuccessful, surfaced important lessons learned and produced interagency agreements that will serve as a foundation for future transfers. BAWSCA is currently engaged in the Bay Area Regional Reliability Partnership (BARR), a partnership among eight Bay Area water utilities (including the SFPUC, Alameda County Water District, BAWSCA, Contra Costa Water District, Valley Water) to identify opportunities to move water across the region as efficiently as possible, particularly during times of drought and emergencies (https://www.bayareareliability.com/).
- **Regional Projects.** Since 2015, BAWSCA has coordinated with local and State agencies on regional projects with potential dry-year water supply benefits for BAWSCA's agencies. These efforts include storage projects, indirect/direct water reuse projects, and studies to evaluate the capacity and potential for various conveyance systems to bring new supplies to the region.

  BAWSCA continues to implement the Strategy recommendations in coordination with BAWSCA member agencies. Strategy implementation will be adaptively managed to account for changing conditions and to ensure that the goals of the Strategy are met in an efficient and cost-effective manner. On an annual basis, BAWSCA will reevaluate Strategy recommendations and results in conjunction with development of the BAWSCA's FY 2021-22

Work Plan. In this way, actions can be modified to accommodate changing conditions and new developments.

**Making Conservation a Way of Life Strategic Plan**

Following the 2014-2016 drought, the State developed the "Making Water Conservation a California Way of Life" framework to address the long-term water use efficiency requirements called for in executive orders issued by Governor Brown. In May of 2018, AB 1668 and SB 606 (collectively referred to as the efficiency legislation) went into effect, which built upon the executive orders implementing new urban water use objectives for urban retail water suppliers.

BAWSCA led its member agencies in a multi-year effort to develop and implement a strategy to meet these new legislative requirements. BAWSCA's Making Conservation a Way of Life Strategic Plan (Strategic Plan) provided a detailed roadmap for member agencies to improve water efficiency. BAWSCA implementing the following elements of the Strategic Plan:

- Assessed the agencies' current practices and water industry best practices for three components of the efficiency legislation that, based on a preliminary review, present the greatest level of uncertainty and potential risk to the BAWSCA agencies. The three components were:
  - Development of outdoor water use budgets in a manner that incorporates landscape area, local climate, and new satellite imagery data.
  - Commercial, Industrial, and Institutional water use performance measures.
  - Water loss requirements.
- Organized an Advanced Metering Infrastructure symposium to enable information exchange, including case studies, implementation strategies, and data analysis techniques.
- Initiated a regional CII audit pilot program, which BAWSCA aims to complete in 2021. Efforts on the CII audit pilot program stalled in March 2020 due to the COVID 19 pandemic and related shelter-in-place orders.
- Implemented a regional program for water loss control to help BAWSCA agencies comply with regulatory requirements and implement cost-effective water loss interventions.
- Engaged with the SFPUC to audit meter testing and calibration practices for SFPUC's meters at BAWSCA agency turnouts.

Finally, BAWSCA's Demand Study developed water demand and conservation projections through 2045 for each BAWSCA agency. These projects are designed to provide valuable insights on long-term water demand patterns and conservation savings potential to support regional efforts, such as implementation of BAWSCA's Long-Term Reliable Water Supply Strategy.

**SFPUC's Efforts to Develop of Alternative Water Supplies**

With the adoption of the Bay-Delta Plan Phase 1 (Bay-Delta Plan) by the State Water Resources Control Board in December of 2018, coupled with the uncertainties associated with litigation and the development of Voluntary Agreements that, if successful, would provide an alternative to the 40% unimpaired flow requirement that is required by the Bay-Delta Plan, BAWSCA redoubled its efforts to ensure that the SFPUC took necessary action to develop alternative water supplies such that they would be in place to fill any potential gap in supply by implementation of the Bay-Delta Plan and that the SFPUC would be able to meet its legal and contractual obligations to its Wholesale Customers.

In 2019, BAWSCA held numerous meetings with the SFPUC encouraging them to develop a division within their organization whose chief mission was to spearhead alternative water supply development. On June 25, 2019, BAWSCA provided a written and oral statement to the Commissioners urging the SFPUC to focus on developing new sources of supply in a manner similar to how it addressed the implementation of the Water System Improvement Program (WSIP). BAWSCA urged that a new water supply program was called for, with clear objectives, persistent focus, a dedicated team, adequate funding, and a plan for successful execution. The SFPUC Commission supported BAWSCA's recommendation and directed staff to undertake such an approach.

In early 2020, the SFPUC began implementation of the Alternative Water Supply Planning Program (AWSP), a program designed to investigate and plan for new water supplies to address future long-term water supply reliability challenges and vulnerabilities on the RWS.

Included in the AWSP is a suite of diverse, non-traditional supply projects that, to a great degree, leverage regional partnerships and are designed to meet the water supply needs of the SFPUC Retail and Wholesale Customers through 2045. As of the most recent Alternative Water Supply Planning Quarterly Update, SFPUC has budgeted $264 million over the next ten years to fund water supply projects. BAWSCA is heavily engaged with the SFPUC on its AWSS efforts.

### 7.2.2 Valley Water

To maintain water supply reliability and flexibility, Valley Water's water supply includes a variety of sources including natural groundwater recharge, local surface water, imported water from the State and Federal projects, and recycled and purified water. Valley Water has an active conjunctive water management program to optimize the use of groundwater and surface water, and to prevent groundwater overdraft and land subsidence.

Several factors have the potential to negatively impact reliability including hydrologic variability; climate change; invasive species; infrastructure failure; regulatory actions; as well as institutional, political, and other uncertainties. Hydrologic uncertainties influence the projections of both local and imported water supplies and the anticipated reliability of those supplies. Supply analyses performed by Valley Water are based on historical patterns of precipitation. The development of Valley Water projects and programs to meet future needs takes hydrologic variability into account.

Under any climate change scenario, Valley Water may need to consider additional treatment options to respond to water quality impacts associated with increased salinity in the Delta. Valley Water may also need to consider additional storage to take advantage of more wet-season water, long-term implementation of indirect potable reuse, additional supplies to replace reduced water supply from existing sources, and additional water transfers (depending on water market impacts).

In determining the long-range availability of water, consideration must be given to the vulnerability of imported supplies to the effects of prolonged state-wide drought and environmental impacts. Reductions by DWR or the U.S. Bureau of Reclamation (USBR) to Valley Water allocations of SWP or CVP – San Felipe Division water may result in a temporary supply shortfall for the City and other Valley Water retailers. Water demands could be met with groundwater, additional imported water supply, water conservation measures, and with expanded recycled water use.

Valley Water obtains its local and imported water supplies from a variety of sources to maintain maximum efficiency, flexibility, and reliability. Valley Water augments natural groundwater recharge with a managed recharge program to offset groundwater pumping, sustain storage reserves, and minimize the risk of land subsidence. Through these recharge activities, Valley Water works to keep groundwater basins "full" to protect against drought. Storing surplus water in the groundwater basins enables part of the supply to be carried over from wet years to dry years. Valley Water also has a contract for 100,000 AFY from the SWP, and 152,500 AFY from the CVP. However, the actual amount of water delivered is typically significantly less than these contractual amounts and depends on hydrology, conveyance limitations, and environmental regulations, including regulatory constraints to protect water quality as well as aquatic wildlife. Valley Water routinely acquires supplemental imported water to meet the county's needs from the water transfer market, water exchanges, and groundwater banking activities. Valley Water also stores some of its imported water in the Semitropic Groundwater Bank in the Central Valley for withdrawal during dry periods or as otherwise needed.

Valley Water's basic water supply strategy to compensate for supply variability is to store excess wet year supplies in the groundwater basin, local reservoirs, San Luis Reservoir, and/or Semitropic Groundwater Bank, and draw on these reserve supplies during dry years to help meet demands. These reserves, along with existing and planned future projects in the 2040 WSMP, help Valley Water meet demands during a prolonged drought. Valley Water's Board updated its long-term water supply reliability level of service goal in January 2019. The goal is to develop supplies to meet 100% of annual water demand during non-drought years and at least 80% of annual water demand in drought years. Future projects and programs recommended in the 2040 WSMP, including additional long-term water conservation savings, water reuse, recharge capacity, storm water capture and reuse, and banking and storage, were developed in accordance with this policy to minimize the need to call for water use reductions greater than 20%. The 2040 WSMP's recommended projects exceeded Valley Water's level of service goal to be prudent given future uncertainties with demands and supplies, but also because these projects were developed with a significant higher (approximately 14%) demand projection. As part of the on-going master planning process to address future uncertainties with demands, existing supplies, and proposed projects, Valley Water now conducts annual evaluation of 2040 WSMP projects through Valley Water's Monitoring and Assessment Program (MAP) process to determine which projects should continue to be invested in to meet the level of service goal and potentially for other benefits such as operational flexibility, supply diversification, and resiliency to future uncertainties.

### 7.2.3 Groundwater

The City's water supply includes groundwater pumped from a conjunctively managed groundwater basin. The groundwater basins in Santa Clara County span nearly 400 square miles, with thousands of well users pumping groundwater for beneficial use. Protecting the local groundwater basins is critical to maintaining water supply reliability in the County of Santa Clara.

The City relies on Valley Water activities to maintain sustainable supplies, including managed groundwater recharge and in-lieu groundwater recharge (e.g., treated surface water deliveries, demand management programs, and SFPUC supply). Valley Water's 2040 WSMP ensures that local groundwater resources are sustained and protected. Groundwater management encompasses activities and programs that identify and mitigate contamination threats to the groundwater basin, replenish and recharge groundwater supplies, prevent groundwater overdraft and land subsidence, and sustain storage reserves. Valley Water programs to sustain and protect groundwater resources are described in detail in their 2040 WSMP.

## 7.3 Year Type Characterization

There are three year-types included in the water service reliability assessment. These include:

**Average/Normal Year**

The "normal" year for the purposes of this Plan, is a year in the historical sequence that most closely represents median runoff levels and patterns. 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 their customers.

Valley Water used the Water Evaluation and Planning (WEAP) model developed by Stockholm Environment Institute to assess their water service reliability and determine base years for all year types. Valley Water's WEAP water supply planning model operates on a monthly time-step that simulates the water supply and demand over 94 years, using the historic hydrologic sequence of 1922 through 2015. Valley Water used the average annual supply over the 94 modeled years to represent the average year condition.

The City selected the average of the period from 1922-2015 as a representation of a "normal" or "average" water year to stay consistent with the average year determined by Valley Water.

**Single Dry Year**

The single dry year supply is defined as the year with the minimum usable supply. The hydrology of 1977 represents the minimum total supply that has been observed in the historical record, according to Valley Water.

The City selected 1977 as the single dry year since groundwater managed by Valley Water will be relied upon to make up any deficit from water wholesalers.

**Five-Consecutive-Year Drought (Multiple Dry Year)**

An analysis of a multiple dry year scenario is particularly useful in the evaluation of carryover storage. Evaluating the availability of the county's water supplies requires an understanding of the driest periods that can reasonably be expected to occur. The SFPUC combined historical data with a hypothetical drought more severe than what the RWS has historically experienced to assess reliability over a multi-year drought. The design drought sequence used by the SFPUC for reliability planning is an 8.5-year period comprised of:

- Historical hydrology from July 1986 to June 1992;
- A prospective drought that includes the 1976-77 drought (to represent a drought sequence worse than historical); and
- A system recovery period for the last six months of the design drought.

Valley Water's WEAP modeling results indicate that the county's water supply system is more vulnerable to successive dry years, such as those that occurred in 1988 through 1992 and in 2012 through 2016. Multiple dry year periods deplete water storage reserves in local and imported supply reservoirs and in the groundwater subbasins. Although the supply in each year may be greater than in a single very dry year, as drought lingers, storage reserves are relied on more.

Imported water allocations to Valley Water are provided in the draft 2019 DWR State Water Project Delivery Capability Report (DCR), which does not include projected future regulations nor the hydrologic sequence for the most recent 2012 to 2016 drought. Since imported water allocations were not available from DWR DCR 2019 for the 2012 to 2016 drought, Valley Water chose the period from 1988 to 1992 as their five dry-year base period. The period from 1988 to 1992 represents an extended drought within historic record and WEAP modeling period.

The City chose 1988 to 1992 as the five-year drought base period to match the period used by Valley Water and SFPUC.

**Table 7-4** presents the base years for each of the three conditions described above as well as the corresponding percentages of average water supply available during each year under these conditions.

**Table 7-4: Basis of Water Year Data**

| Year Type | Base Year[1] | Available Supplies if Year Type Repeats[2] |
|---|---|---|
| Average Year | 1922-2015 | 100% |
| Single-Dry Year | 1977 | 88% |
| Five Consecutive Dry Years 1st Year | 1988 | 89% |
| Five Consecutive Dry Years 2nd Year | 1989 | 89% |
| Five Consecutive Dry Years 3rd Year | 1990 | 73% |
| Five Consecutive Dry Years 4th Year | 1991 | 74% |
| Five Consecutive Dry Years 5th Year | 1992 | 74% |

Notes:
1. All base years are consistent with Valley Water.
2. Available supplies reflect all City sources.

### 7.3.1 Supply and Demand Comparison

This section utilizes the water demand projections presented in **Section 4** and water supply projections presented in **Section 6** to assess the City's water service reliability in all scenarios outlined in **Table 7-4**. The reliability analysis assumes reduced supply from SFPUC from the implementation of the Bay-Delta Plan, described above in **Section 7.1.1**. The Bay-Delta Plan, currently in negotiation, would require 30-50% unimpaired flow beginning in 2023. The SFPUC has conducted an analysis of the RWS supply reliability under both conditions, with and without 40% unimpaired flow. The SFPUC also modeled two separate cutback scenarios: one based on the actual projected wholesale demands through 2045 and another scenario based on the wholesale contract amount of 184 MGD. The City is reporting the modeled scenario based on Bay-Delta Plan implementation in 2023 and projected demands for consistency with the SFPUC UWMP; however, the SFPUC has acknowledged the contractual obligation to supply 184 MGD to the wholesale customers during non-drought years and thus has retained the second modeled scenario for planning purposes. Both SFPUC modeled scenarios are provided in **Appendix H**.

Valley Water's supply reliability analysis is based on historic hydrology, as described in the previous section. Projected supplies are based on Valley Water's 2040 WSMP recommended projects per Board direction, which include Transfer Bethany Pipeline (2025); Anderson Dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation. Valley Water modeled data is provided in **Appendix H**.

Recycled water is a drought-proof source of supply and is assumed to have equal supply and demand in all scenarios, thus not affecting potable water. Note that the total groundwater availability is shown in all year types; however, the actual production will only supplement wholesaler supplies as needed and for water quality/maintenance purposes.

## Normal Year

**Table 7-5** presents the water service supply reliability assessment for a normal water year based on water supply and demand projections. During normal water years, water supplies are adequate to meet projected demands despite expected cutbacks for Bay-Delta Plan implementation by both Valley Water and SFPUC.

**Table 7-5: Normal Year Supply and Demand Comparison (AFY)**

| | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|
| Supply Totals | 32,211 | 32,448 | 34,446 | 35,255 |
| Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| **Difference** | **12,028** | **11,799** | **10,425** | **9,637** |

Notes:
1. Projected demands include passive conservation.
2. Includes potable and recycled water.
3. Includes total groundwater well capacity.

## Single Dry Year

The SFPUC has indicated that during a single critical dry year it will follow the Tier Two reduction plan. The SFPUC is expecting 30% cutbacks to supply in a single critical dry year from 2025 through 2040. This translates to slightly deeper cutbacks for retailers and the City can expect up to a 37% cutback.

Valley Water supplies are projected to be sufficient to meet demands during a single dry year through 2045. This assumes that reserves are at healthy levels at the beginning of the year and that the projects and programs identified in Valley Water's 2040 WSMP are implemented. As such, the City assumed no reduction in supply from Valley Water during a single dry year. It is noted that there may be voluntary cutbacks in dry years that the City would actively promote to customers in the interest of overall water conservation efforts. Valley Water has acknowledged that if projects produce fewer benefits than currently projected, up to 20% cutbacks may be required.

In the case of a single dry year, the City projects no reduction in supply availability from groundwater. The resulting analysis of available supplies shows no projected shortfalls (**Table 7-6**).

**Table 7-6: Single Dry Year Supply and Demand Comparison (AFY)**

| Parameter | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|
| Supply Totals | 27,135 | 27,372 | 29,370 | 30,038 |
| Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| **Difference** | **6,952** | **6,723** | **5,349** | **4,420** |

Notes:
1. Includes interruption from SFPUC due to Bay-Delta Plan in 2023 and Tier Two reduction plan.
2. Projected demands include passive conservation.
3. Includes total groundwater well capacity.

## Multiple Dry Year

The SFPUC has indicated that during multiple dry years the RWS can expect cutbacks as high as 47% of normal SFPUC supplies by the fourth year of a five-year drought beginning in 2040. This translates to a 52% cutback for retailers. SFPUC supply and retail cutbacks are detailed in **Appendix H**.

Valley Water indicated in their 2020 UWMP that with existing and planned projects' supplies, Valley Water's diverse water supplies are sufficient to meet demands throughout the full five-year drought in all demand years without having to call for short-term water use reductions. Although Valley Water does not project any shortage in supply in the event of a five dry-year period, the City would actively participate in any voluntary cutbacks in support of local water conservation messaging. Valley Water has acknowledged that if projects produce fewer benefits than currently projected, up to 20% cutbacks may be required.

The City does not anticipate any reduction in groundwater availability during a five-year drought. As such, the City would be able to increase the amount of groundwater pumped to meet reasonably anticipated deficiencies from other sources, thus supply is projected to be sufficient to meet demand through 2040. The City's groundwater basin is not adjudicated, which means the right to pump groundwater from the basin has not been given by judgment of a court or board. During a critical five dry year event, voluntary and mandatory conservation measures would be expected to reduce potable water demand and therefore, reduce the amount of groundwater needed to supplement supply.

**Table 7-7** details the results of the multiple dry year analysis.

**Table 7-7: Multiple Dry Years Supply and Demand Comparison (AFY)**

| Year | Parameter | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| First year | Supply totals | 27,135 | 27,372 | 29,370 | 30,038 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **6,952** | **6,723** | **5,349** | **4,420** |
| Second year | Supply totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **3,151** |
| Third year | Supply totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **3,151** |
| Fourth year | Supply totals | 25,866 | 26,103 | 27,960 | 27,923 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **2,305** |
| Fifth year | Supply totals | 25,866 | 26,103 | 27,396 | 27,923 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,375** | **2,305** |

Notes:
1. Includes interruption from SFPUC due to Bay-Delta Plan in 2023 and Tier Two reduction plan.
2. Projected demands include passive conservation.
3. Includes total groundwater well capacity.

Actual availability of each supply during any given year depends on hydrology, groundwater recharge operations and conditions, and other factors. Below is a description of limitations associated with the water service reliability assessment.

Valley Water's analysis assumes groundwater can be drawn down to the severe stage of Valley Water's Water Shortage Contingency Plan. This does not represent a sustainable long-term groundwater condition, but these supplies represent water that may be needed to get through a prolonged drought. Imported water allocations to Valley Water are provided by DWR in their DCR 2019, which does not include any projected changes to future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. The 2012-2016 drought was more severe than the 1987-1992 drought; for comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200 AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF.

However, through Valley Water's Monitoring and Assessment Program (MAP), Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Valley Water acknowledges that there is uncertainty associated with projected project benefits – some 2040 WSMP projects and/or their yields may not be realized as currently expected and Valley Water is still evaluating impacts of climate change to local supplies and those analyses are not included in the UWMP. The DCR 2019 dataset does not include future regulations, which Valley Water expects will result in up to a 25% or more reduction in imported water deliveries. Projected demands are based on the 2020 Monitoring and Assessment Program (MAP) projection, which are significantly lower than what was used in previous UWMPs and the 2040 WSMP. Valley Water's demands are within 1- 5% difference with retailer demands from 2025 to 2040, and 10% for 2045. For both the 2040 WSMP and MAP, Valley Water used a dataset with significantly reduced Delta supplies (25% less imported water) and plans to continue to use that dataset in the 2021 MAP. If some 2040 WSMP projects are not implemented or provide fewer benefits than currently expected and imported supplies are reduced by 25%, then Valley Water does expect to have drought shortages of up to 20% in the future.

The water supply available to individual retailers will ultimately be determined by Valley Water and SFPUC. The City will work closely with Valley Water, SFPUC, and other water retail agencies to implement any stages of action to reduce the demand for water during water shortages. Any supply deficit would be compensated for by increased conservation levels through marketing and implementation of Demand Management Measures (DMMs) (see **Section 9**) and restrictions in consumption dictated by the City's Water Shortage Contingency Plan (see **Section 8**).

## 7.4 Drought Risk Assessment

As a new provision of the Water Code, beginning in 2020, Suppliers are required to prepare a Drought Risk Assessment (DRA). The DRA compares total water supply sources available to projected water use to assess the City's water service reliability and risk. The following section describes the City's DRA under a drought period lasting for the next five consecutive years. The DRA is intended to be a stand-alone section of the UWMP and thus, information regarding supply and demand are duplicated herein.

### 7.4.1 Data, Methods, and Basis for Water Shortage Condition

**DRA Data**

The DRA was based on the five driest consecutive years on record. The City chose to use 1988 to 1992 as the base period for the DRA based on Valley Water's WEAP modeling analysis. This period represents an extended drought within historic record and WEAP modeling period. The DRA assumes those driest years occur over the next five years, from 2021 through 2025.

The DRA evaluation was developed using data and modeling provided by SFPUC and Valley Water for a five-year consecutive drought. The DRA can be updated as needed, based on updated supply and demand data and unforeseen regulatory changes.

The expected gross water use (potable and recycled) for the next five years is based on a linear interpolation between 2020 actual water use and projected 2025 water use. Actual gross water use within the City's service area in 2020 is approximately 19,906 AF. The potable water use projection for 2025 was based on the BAWSCA Regional Water Demand and Conservation Projections (Demand Study). The Demand Study used the DSS Model developed by Maddaus Water Management, Inc. for long-term projections. The projections from the DSS Model used in this DRA considered expected service area population and economic growth as well as passive conservation from plumbing codes. The data collected to develop the model included monthly water demand from 1995 through 2018, historical conservation, weather data, unemployment, and several other water use factors. The full description of the DSS Model is included in the Demand Study (**Appendix C**). Projected recycled water use is based on anticipated recycled water development. The City's projected gross water use in 2025 is 20,183 AF.

The City has three sources of potable water supply: purchased surface water from SFPUC, purchased treated surface water from Valley Water, and groundwater from six City-owned and operated wells. The breakdown of total potable supply by source is outlined in **Section 6.8, Table 6-8**, and was determined using the City's contractual agreements with each wholesaler and historical production trends. The City's contractual agreement with SFPUC is 14,100 AFY. Supply projections from Valley Water are based on projected demands and historical production trends. The City can purchase additional available water from Valley Water during non-dry years when water is available. Groundwater supply is based on the City's sustainable yield of 8,000 AFY.

Recycled water (non-potable) is supplied by the City's Water Pollution Control Plant. Recycled water is a drought-proof source of supply and is assumed to have equal supply and demand in all scenarios, thus not affecting potable water.

**DRA Methods**

The percentage of water supply volume available during a five-year consecutive drought was based on the information provided by the SFPUC and Valley Water, found in **Appendix H**. The percent reduction of average year supplies and projected deliveries from SFPUC during a five-year consecutive drought were provided by SPFUC and shown below in **Table 7-8**. Reduction in supplies based on implementation of the Bay-Delta Plan are also included for supplies from Valley Water and SFPUC; however, the no cutbacks are expected by Valley Water. The Bay-Delta Plan is discussed in more detail in **Section 7.1.1**. For SFPUC and Valley Water supplies it was assumed the Bay-Delta Plan was in effect beginning in 2023.

**Table 7-8: Anticipated Percent Supply Reduction from Wholesale Suppliers**

| Wholesale Supplier | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|
| Valley Water | 0% | 0% | 0% | 0% | 0% |
| SFPUC | 0% | 0% | 47% | 47% | 47% |

The City's groundwater supply is not expected to be limited by climate effects; as such, the City will consistently be able to pump groundwater up to the sustainable yield of 8,000 AFY.

**Basis for Water Shortage Conditions**

The City's updated Water Shortage Contingency Plan (WSCP) is detailed in **Section 8**. Sunnyvale staff, in anticipation of 10%, 20%, 50%, and greater than 50% supply reductions, developed a water shortage contingency plan adopted in March of 1989, and amended in June 2016, that includes mandatory (and voluntary) water use restrictions, rate block adjustment, and approaches for enforcement associated with each stage of anticipated reduction. The WSCP amends the stages to correlate with the six stages prescribed by statute. The City initiates the stage based on the Assessment described in **Section 8.2** which includes coordination with the wholesalers' declaration of shortages and restrictions.

### 7.4.2 Water Source Reliability

**Reliability of Treated Surface Water from SFPUC**

San Francisco has a perpetual commitment (Supply Assurance) to deliver 184 MGD (206,107 AFY) to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco. Sunnyvale's ISG is 14,100 AFY.

**Tier One Drought Allocations**

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the WSA, which includes a WSAP that describes the method for allocating water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. The following table shows the SFPUC (i.e., Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

**Table 7-9: SFPUC Tier One Drought Allocations**

| Level of System-Wide Reduction in Water Use Required | Share of Available Water | |
|---|---|---|
| | SFPUC Share | Wholesale Customers Share |
| 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% |

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail) then the excess percentage would be re-allocated to the Wholesale Customers' share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

**Tier Two Drought Allocations**

The Wholesale Customers have negotiated and adopted the Tier Two Plan, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that considers multiple factors for each Wholesale Customer including:

- ISG;
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer's Allocation Basis, expressed in MGD, which in turn is the weighted average of two components. The first component is the Wholesale Customer's ISG, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain wholesale customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers' Allocation Bases to determine each Wholesale Customer's Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers' collectively under the Tier One Plan, by the Wholesale Customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

Per WSA Section 3.11, the Tier One and Tier Two Plans will be used to allocate water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. For RWS shortages more than 20%, San Francisco shall (a) follow the Tier One Shortage Plan allocations up to the 20% reduction, (b) meet and discuss how to implement incremental reductions above 20% with the Wholesale Customers, and (c) make a final determination of allocations above the 20% reduction. After the SFPUC has made the final allocation decision, the Wholesale Customers shall be free to challenge the allocation on any applicable legal or equitable basis. For purposes of the 2020 UWMPs, for RWS shortages more than 20%, the allocations among the Wholesale Customers is assumed to be equivalent among them and to equal the drought cutback to Wholesale Customer by the SFPUC.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

**Reliability of Treated Surface Water from Valley Water**

Current Valley Water supply and demand projections show that there are no anticipated shortages under a five-year consecutive drought. Valley Water's basic water supply strategy to compensate for supply variability is to store excess wet year supplies in the groundwater basin, local reservoirs, San Luis Reservoir, and/or Semitropic Groundwater Bank, and draw on these reserve supplies during dry years to help meet demands. These reserves, along with existing and planned future projects in the 2040 WSMP, help Valley Water meet demands during a prolonged drought. Current modeling incorporates projects identified in the 2040 WSMP to improve water supply reliability and to meet increasing demands through 2045.

**Reliability of Groundwater**

The City's water supply includes groundwater pumped from a conjunctively managed groundwater basin. The groundwater basins in Santa Clara County span nearly 400 square miles, with thousands of well users pumping groundwater for beneficial use. Protecting the local groundwater basins is critical to maintaining water supply reliability in the County of Santa Clara.

The City relies on Valley Water activities to maintain sustainable supplies, including managed groundwater recharge and in-lieu groundwater recharge (e.g., treated surface water deliveries, demand management programs, and SFPUC supply). Valley Water's 2040 WSMP ensures that local groundwater resources are sustained and protected. Groundwater management encompasses activities and programs that identify and mitigate contamination threats to the groundwater basin, replenish and recharge groundwater supplies, prevent groundwater overdraft and land subsidence, and sustain storage reserves. Valley Water programs to sustain and protect groundwater resources are described in detail in the 2040 WSMP.

The allowable withdrawal of groundwater by the City depends on multiple factors, including withdrawals by other water agencies, the quantity of water recharged, and carry-over storage from the previous year. The City has six active wells that can produce up to 8,000 AF annually. In the case of a drought, groundwater is expected to supplement purchased surface water from wholesalers to meet system demands.

**Reliability of Recycled Water**

Recycled water is not vulnerable to seasonal or climatic shortage. Therefore, recycled water is assumed to be a drought-proof water supply.

### 7.4.3 Total Water Supply and Use Comparison

The DRA total water supply and use comparison is presented in **Table 7-10**. The DRA evaluates the implementation of the WSCP shortage response actions for varying levels of water shortage based on the supply and demand projections and presents the estimated savings due to these actions.

**Table 7-10: Five-Year Drought Risk Assessment**

| | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|
| Gross water use | 19,952 | 19,998 | 20,045 | 20,091 | 20,183 |
| Total supplies | 27,248 | 27,470 | 22,605 | 22,715 | 22,825 |
| Surplus/shortfall w/o WSCP action | 7,296 | 7,472 | 2,561 | 2,625 | 2,642 |
| Planned WSCP actions (use reduction and supply augmentation) | | | | | |
| WSCP – use reduction savings benefit | 0 | 0 | 0 | 0 | 0 |
| WSCP – supply augmentation benefit | 0 | 0 | 0 | 0 | 0 |
| Revised surplus/(shortfall) | 7,296 | 7,472 | 2,561 | 2,625 | 2,642 |
| Resulting % use reduction from WSCP action | 0% | 0% | 0% | 0% | 0% |

The DRA indicates that the City will be able to meet demands in the event of a five-year drought. Although the results indicate no shortfalls, the City will work closely with SFPUC, Valley Water, and other water retail agencies to implement any stages of action to reduce the demand for water during water shortages. In the event of a decrease of local supplies, the City would respond by pursuing demand reduction programs (see **Section 9**) in accordance with the severity of the supply shortage. Any supply deficit would be compensated for by increased conservation levels and restrictions in consumption.

# SECTION 8 – WATER SHORTAGE CONTINGENCY PLANNING

A water shortage is defined as a case where the available water supply is insufficient to meet normally expected customer water use. A water shortage contingency plan (WSCP) is a detailed proposal for how a Supplier intends to act in the case of an actual water shortage condition. This plan is essential to a sound drought policy even if a Supplier appears to have low risk of water supply shortage conditions.

As required by §10632(a) of the Water Code, this chapter presents the City's WSCP including:

- A summary of the City's water supply reliability analysis presented in **Section 7**;
- The City's procedure for conducting and submitting its annual water supply and demand assessment beginning in 2022;
- The legal authority that the City has for implementation and enforcement of its WSCP;
- The water shortage levels of the WSCP and the demand reduction measures, supply augmentation measures, and/or operational changes implemented in each stage as it relates to the six stages required by the Water Code;
- The methods for monitoring and reporting a water shortage condition and water use reductions;
- The methods for ensuring compliance and enforcing demand reduction measures;
- The protocols for communicating a water shortage condition and the measures implemented;
- The financial consequences of implementing the WSCP and methods for mitigating revenue losses; and
- A summary of the WSCP adoption, submittal, and refinement procedures.

Beginning in the 2020 UWMP reporting period, each Supplier is now required to adopt its WSCP as part of its Urban Water Management Plan (UWMP) and as a standalone document that can be refined and updated outside of the five-year UWMP planning cycle. For this reason, some of the information summarized in this chapter of the UWMP is duplicated from previous chapters for clarity such that the chapter can serve as the standalone document.

## 8.1 Water Supply Reliability Analysis

The analysis of water supply reliability assessment is based on three different analyses: annual, near-term (5 years), and long-term (20 years). The following summarizes the analyses that were included in **Sections 4, 6, and 7**. It is a summary of:

- The methods for projecting water demands (**Section 4**),
- The methods for projecting water supply (**Section 6**), and
- The results of the water service reliability assessment (**Section 7**).

### 8.1.1 Demand Projections

The potable water use projections were developed using the Demand Side Management Least Cost Planning Decision Support System model (DSS Model) developed by Maddaus Water Management, Inc. for long-term projections. The DSS Model considered expected service area population and economic growth as well as passive conservation from plumbing codes. The data collected to develop the model included monthly water demand from 1995 through 2018, historical conservation, weather data, unemployment, and several other water use factors. The full description of the DSS Model is included in the Demand Study (**Appendix C)**.

Projected City potable water use is summarized by customer classification in **Table 8-1**. Because the City is largely built-out, it is expected that water use will continue to rise in future years primarily due to increasing population.

**Table 8-1: Projected Potable Water Use by Customer Type (AFY)**

| Customer Type | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|
| Single Family Residential | 5,884 | 5,939 | 7,234 | 7,805 |
| Multi-Family Residential | 5,301 | 5,295 | 6,379 | 6,835 |
| Commercial/Industrial (combined) | 4,111 | 4,257 | 4,583 | 4,770 |
| Institutional | 280 | 289 | 362 | 395 |
| Irrigation (potable) | 2,346 | 2,471 | 2,702 | 2,843 |
| Other (Firelines) | 7 | 7 | 9 | 9 |
| System Losses[1] | 1,358 | 1,381 | 1,632 | 1,729 |
| **Total Potable** | **19,287** | **19,639** | **22,901** | **24,386** |

Notes:
1. Projected system losses are 7% of projected potable demand.
2. Projected demand from DSS Model with passive conservation categorized by customer use type.

### 8.1.2 Supply Projections

The City relies on four water supply sources; surface water from San Francisco Public Utilities Commission (SFPUC), treated surface water from Santa Clara Valley Water District (Valley Water), groundwater, and recycled water. Surface water from the two wholesalers, SFPUC and Valley Water, provides most of the City's water supply, averaging about 97% since 2015. City owned- and operated-wells provide less than 1% and approximately 3% comes from recycled water. Since most of the City's water supply is reliant on SFPUC and Valley Water, the City is directly affected by the water supply conditions faced by each wholesaler.

**SFPUC Supply**

The City receives surface water from the City and County of San Francisco's Regional Water System (RWS), operated by SFPUC. This supply is predominantly from the Tuolumne River watershed in the Sierra Nevada Mountains, delivered through the Hetch-Hetchy aqueduct, but also includes treated water produced by SFPUC from local watersheds and facilities in Alameda and Santa Clara counties. The Alameda watershed, located in Alameda county, is designed to capture local runoff.

The amount of imported water available to SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River. Due to these constraints, SFPUC is dependent on reservoir storage to ensure ongoing water supply.

The business relationship between the SFPUC and its wholesale customers is largely defined by the "Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County and Santa Clara County" (WSA), effective since July 2009. This 25-year WSA replaced the Settlement Agreement and Master Water Sales Contract that expired in June 2009. The WSA addresses the rate-making methodology used by the SFPUC in setting wholesale water rates for its customers in addition to addressing water supply and water shortages for the RWS.

The WSA is supplemented by an individual Water Supply Contract between SFPUC and each individual retailer, also active since July 2009. These contracts expire in 25 years. The City has an Individual Supply Guarantee (ISG) of 12.58 MGD (approximately 14,100 AFY). Although the WSA and accompanying Water Supply Contract expire in 2034, the ISG (which quantifies San Francisco's obligation to supply water to its individual wholesale customers) surpasses their expiration and continues indefinitely. The City's contract also includes a minimum purchase amount of 8.93 MGD (10,003 AFY), which Sunnyvale agrees to buy, regardless of whether sales drop below this level.

The WSA provides for a 184 MGD (expressed on an annual average basis) Supply Assurance to the SFPUC's wholesale customers. This Assurance is subject to reduction, to the extent and for the period made necessary by reason of water shortage, due to drought, emergencies, or by malfunctioning or rehabilitation of the RWS. The WSA does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of the 184 MGD Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on Attachment C to the WSA.

Additional information regarding SFPUC supply reliability can be found below in the summary of SFPUC's WSCP. For more detailed information, please refer to SPFUC's current UWMP and/or WSCP.

## Valley Water Supply

Valley Water supplies the City with treated surface water through an entitlement of imported water that is Delta-conveyed from the Central Valley Project (CVP) and State Water Project (SWP), as well as surface water from local reservoirs. The City has a 75-year contractual agreement with Valley Water, effective 1976 to 2051.

Valley Water's imported water is conveyed through the Sacramento-San Joaquin Delta and pumped and delivered to the county through three main pipelines: the South Bay Aqueduct, which carries water from the SWP, and the Santa Clara Conduit and Pacheco Conduit, which convey water from the federal CVP. More than 70% of this supply is delivered to treatment plants and almost 30% is used for recharge. Any excess Delta-conveyed supplies is stored in the local Anderson and Calero Reservoirs or the Semitropic Groundwater Bank and San Luis Reservoir in the Central Valley (Valley Water 2040 WSMP, 2019).

Valley Water has a contract for 100,000 AFY from the SWP and 152,500 AFY from the CVP. However, the actual amount of water delivered is typically less than these contractual amounts and depends on hydrology, conveyance limitations, and environmental regulations. Nearly all the imported water supply is used for municipal and industrial needs. Valley Water expects average allocations of Delta-conveyed water to decline over time due to climate change and regulatory requirements, averaging around 133,000 AFY in 2040 (2040 WSMP, 2019). However, over the years, Valley Water has attempted to sustain overall existing supplies by participating in projects that would offset the predicted decline of Delta-conveyed imported water supplies. In October 2019, Valley Water voted to support the Delta Conveyance Project, which is a proposed plan to improve the infrastructure that conveys water through the Sacramento-San Joaquin Delta. This plan would potentially increase the average available Delta-conveyed imported supply from 133,000 AFY to 170,000 AFY.

Local runoff is captured in local reservoirs for recharge into the groundwater basin or treatment at one of Valley Water's three water treatment plants. The total storage capacity of the ten Valley Water operated reservoirs in Santa Clara County is approximately 170,000 AF without the California Division of Safety of Dams (DSOD) restrictions. Water stored in local reservoirs provides up to 25% of Santa Clara County's water supply. Reservoir operations are coordinated with imported Bay-Delta water received from the SWP and the CVP.

For more detailed information regarding Valley Water's supply reliability, please refer to Valley Water's current UWMP and/or WSCP.

## Groundwater

The City owns and operates six active wells and one well on stand-by for emergencies. Groundwater makes up a small percentage of the City's total water supply and is used to supplement imported SFPUC and Valley Water supply.

Valley Water provides basin-wide groundwater and conservation planning. Local groundwater supplies up to half of the county's water supply during normal years and is crucial to the region's future water supply reliability. Valley Water uses conjunctive use management, a practice by which the groundwater basin is pumped more in drier years and then replenished (or recharged) during wet and average years, to ensure the sustainability of groundwater basins. Groundwater is replenished naturally from rainfall and augmented by Valley Water-operated recharge.

Conjunctive use helps to protect the groundwater basin from overdraft, land subsidence, and saltwater intrusion, and provides critical groundwater storage reserves.

## Recycled Water

The City's current recycled water system consists of the Recycled Water Pump Station located at the WPCP, the Sunnyvale Golf Course pump station, the San Lucar Tank and Pump Station, the Wolfe Road Pump Station (WRPS), and approximately 18 miles of recycled water pipelines ranging in diameter from 6- to 36-inches. The WRPS was completed in 2018 as part of the Wolfe Road Pipeline Extension Project, which added approximately 13,000 feet of pipeline to extend the recycled water system along Wolfe Road, reaching the Apple® Campus 2. Both the WRPS and the pipeline extension are owned by Valley Water and maintained by the City's Water and Sewer Services Division. In 2018 the City completed a Capital Improvement Project to facilitate parallel production of recycled water and NPDES discharge, thereby providing enhanced production and delivery reliability.

Supply availability projections for the City's four sources of potable and non-potable water provide a basis for assessing water supply reliability. The breakdown of total supply by source was determined using the City's contractual agreements with each wholesaler and historical production trends. Current and projected water supply is listed by source in **Table 8-2**.

**Table 8-2: Projected Water Supplies (AFY)**

| Water Supply | Additional Detail on Water Supply | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Purchased Water | SFPUC | 11,052 | 14,100 | 14,100 | 14,100 | 14,100 |
| Purchased Water | Valley Water | 8,665 | 9,215 | 9,338 | 11,226 | 11,923 |
| Groundwater | Wells | 87 | 8,000 | 8,000 | 8,000 | 8,000 |
| Recycled Water[1] | Recycled Water | 383 | 896 | 1,010 | 1,120 | 1,232 |
| **Total** | | **20,187**[2] | **32,211** | **32,448** | **34,446** | **35,255** |

Notes:

1. The City can purchase additional available water from Valley Water during non-dry years when water is available.
2. Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2).

In the event of a decrease in wholesaler supplies, the City would increase the use of groundwater supplies and respond by pursuing demand reduction programs in accordance with the severity of the supply shortage. Any supply deficit would be compensated for by increased groundwater supply, conservation levels, and restrictions in consumption.

### 8.1.3 Water Supply Reliability Assessment

The water service reliability assessment requires the comparison of supply and demand projections for three scenarios: (1) a normal year, (2) a single dry year, and (3) five consecutive dry years. The percent of total annual supply available for each scenario is based on the historical hydrology identified by Valley Water and cutbacks determined by the City's wholesalers (**Appendix H**). The City has elected to use the base years used by Valley Water for consistency, since groundwater managed by Valley Water will be relied upon to make up any deficit from water wholesalers. Because allowable groundwater pumping is based only on the sustainable yield, groundwater supply availability is not expected to decrease during dry years. Additionally, recycled water is not dependent on climatic effects and is assumed to be unaffected by any drought conditions.

**Table 8-3**: Basis of Water Year Data presents the base years for each of the three conditions described above as well as the corresponding percentages of average water supply available during each year under these conditions.

**Table 8-3: Basis of Water Year Data**

| Year Type | Base Year[1] | Available Supplies if Year Type Repeats[2] |
|---|---|---|
| Average Year | 1922-2015 | 100% |
| Single-Dry Year | 1977 | 88% |
| Five Consecutive Dry Years 1st Year | 1988 | 89% |
| Five Consecutive Dry Years 2nd Year | 1989 | 89% |
| Five Consecutive Dry Years 3rd Year | 1990 | 73% |
| Five Consecutive Dry Years 4th Year | 1991 | 74% |
| Five Consecutive Dry Years 5th Year | 1992 | 74% |

Notes:
1. All base years are consistent with Valley Water.
2. Available supplies reflect all City sources.

Using the water supply and demand projections and the portion of supplies available during normal year, single dry year, and five consecutive dry year conditions summarized above, this section presents the comparison between projected supply and projected demand for each condition in five-year increments through 2040. It is noted that the effects of climate change were not explicitly addressed in this water service reliability assessment but are considered in the subsequent DRA.

**Table 8-4** presents the service supply reliability assessment for each condition.

**Table 8-4: Water Service Reliability Supply and Demand Comparison**

| | | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| **Normal Year** | | | | | |
| Supply Totals | | 32,211 | 32,448 | 34,446 | 35,255 |
| Demand Totals | | 20,183 | 20,649 | 24,021 | 25,618 |
| **Difference** | | **12,028** | **11,799** | **10,425** | **9,637** |
| **% Shortage** | | **0%** | **0%** | **0%** | **0%** |
| **Single Dry Year** | | | | | |
| Supply Totals | | 27,135 | 27,372 | 29,370 | 30,038 |
| Demand Totals | | 20,183 | 20,649 | 24,021 | 25,618 |
| **Difference** | | **6,952** | **6,723** | **5,349** | **4,420** |
| **% Shortage** | | **0%** | **0%** | **0%** | **0%** |
| **Five Consecutive Dry Years** | | | | | |
| First Year | Supply Totals | 27,135 | 27,372 | 29,370 | 30,038 |
| | Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **6,952** | **6,723** | **5,349** | **4,420** |
| | **% Shortage** | **0%** | **0%** | **0%** | **0%** |
| Second Year | Supply Totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **3,151** |
| | **% Shortage** | **0%** | **0%** | **0%** | **0%** |
| Third Year | Supply Totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **3,151** |
| | **% Shortage** | **0%** | **0%** | **0%** | **0%** |
| Fourth Year | Supply Totals | 25,866 | 26,103 | 27,960 | 27,923 |
| | Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,939** | **2,305** |
| | **% Shortage** | **0%** | **0%** | **0%** | **0%** |
| Fifth Year | Supply Totals | 25,866 | 26,103 | 27,396 | 27,923 |
| | Demand Totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | **Difference** | **5,683** | **5,454** | **3,375** | **2,305** |
| | **% Shortage** | **0%** | **0%** | **0%** | **0%** |

Given the supply and demand comparison presented in **Table 8-4**, the results of the supply reliability assessment can be summarized as follows:

- **Normal Year** – The City can anticipate meeting all water demands through 2040 under normal year supply conditions given the stated assumptions.
- **Single Dry Year** – The City can anticipate meeting all water demands through 2040 under single dry year supply conditions given the stated assumptions.
- **Five Consecutive Dry Years** – The City can anticipate meeting all water demands through 2040 under consecutive five dry-year supply conditions given the stated assumptions.

As shown in the tables above, Sunnyvale would be able to increase the amount of groundwater pumped to meet reasonably anticipated deficiencies from other sources, thus supply is projected to be sufficient to meet demand out to 2040. The Sunnyvale groundwater basin is not adjudicated, which means the right to pump groundwater from the basin has not been given by judgment of a court or board.

For each of the five-year increments presented above, the five-year dry period indicates that supplies will be able to meet demands through increased groundwater pumping and implementation of drought conservation programs. The City will be able to address the projected demands without rationing.

### 8.1.4 Drought Risk Assessment

For the near-term water supply reliability, the DRA requires the analysis of five consecutive dry years beginning in 2021 including the consideration of climate change effects and any potential regulatory or other locally applicable conditions in conjunction with WSCP implementation. For this assessment, the same procedures described above were used to develop supply and demand projections for the next five years (2021-2025). The percentages of average supply summarized in **Table 8-3** were also used for the DRA.

The projected demands used in this analysis were based on the DSS model, which accounts for potential effects of climate change. Background data for the Demand Study model is sourced from International Panel on Climate Change (IPCC) climate change scenarios, which are referred to as Representative Concentration Pathways (RCP). These scenarios provide estimates of global temperature based on $CO_2$ emissions under a variety of mitigation conditions. Under a "business as usual" condition, which represents minimal mitigation and higher emissions, the Demand Study estimated an annual mean temperature increase of 1.7 degrees Fahrenheit for the 2019-2045 period. This temperature increase was incorporated into all water use projections. The Demand Study is included as **Appendix C**.

The DRA total water supply and use comparison is presented in **Table 8-5**.

**Table 8-5: Five-Year Drought Risk Assessment**

| | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|
| Gross water use | 19,952 | 19,998 | 20,045 | 20,091 | 20,183 |
| Total supplies | 27,248 | 27,470 | 22,605 | 22,715 | 22,825 |
| Surplus/shortfall w/o WSCP action | 7,296 | 7,472 | 2,561 | 2,625 | 2,642 |
| Planned WSCP actions (use reduction and supply augmentation) | | | | | |
| WSCP – use reduction savings benefit | 0 | 0 | 0 | 0 | 0 |
| WSCP – supply augmentation benefit | 0 | 0 | 0 | 0 | 0 |
| Revised surplus/(shortfall) | 7,296 | 7,472 | 2,561 | 2,625 | 2,642 |
| Resulting % use reduction from WSCP action | 0% | 0% | 0% | 0% | 0% |

The DRA indicates that the City will be able to meet demands in the event of a five-year drought. Although the results indicate no shortfalls, the City will work closely with SFPUC, Valley Water, and other water retail agencies to implement any stages of action to reduce the demand for water during water shortages. In the event of a decrease of local supplies, the City would respond by pursuing demand reduction programs (see **Section 9**) in accordance with the severity of the supply shortage. Any supply deficit would be compensated for by increased conservation levels and restrictions in consumption.

## 8.2 Annual Water Supply and Demand Assessment Procedures

In accordance with Water Code §10632.1, beginning in 2022, every Supplier is required to conduct an annual water supply and demand assessment (Assessment) and submit an Assessment Report to DWR on or before July 1st of each year. The purpose of the Assessment is to evaluate the reliability of the water supplier's water supply system on a short-term basis. This will aid the Supplier in identifying near-term (yearly or monthly) water shortages and implement the appropriate shortage response actions as laid out in the WSCP. The Assessment will also allow the City to determine the effectiveness of the WSCP and update the plan accordingly.

The Assessment will be based on the previous year's available supply and measured demand. First, the anticipated unconstrained demand for the current year will be developed. Then, any anticipated climatic variations, population growth, demographic changes, current and/or proposed development, State or local regulations, and existing infrastructure capabilities will be considered in altering the unconstrained demand. Considering each of these factors and how they may affect anticipated supply and/or demand, a supply and demand comparison will be completed for the current year under normal hydrologic conditions and under dry conditions. This comparison will allow the City to identify any potential water shortages and obtain City Council approval to activate the appropriate WSCP stage.

### 8.2.1 Decision-Making Process

On an annual basis, the Water and Sewer Division of the City will perform the Assessment once data has been received from the wholesalers, SFPUC and Valley Water in mid-April. The wholesalers will inform the City if they will be able to meet water supply commitments for the City or if they will be requesting voluntary or mandatory reductions. If the projected unconstrained demands can be met by the City, then approval of the Assessment by City Council will not be required. When water supply shortfalls trigger the need for demand reduction, then approval of the Assessment by City Council shall be obtained no later than May 31st. City Council approval of the Assessment which shall include the recommended stage for cutbacks as described in **Section 8.3** below, will allow implementation of the recommended stage and no additional approval shall be required. Removal or elevation of the stages will require City Council approval.

For example, data from wholesalers for Fiscal Year (FY) 2021-2022 will be received by April 15, 2021. The Assessment will be prepared by the Water and Sewer Division of the Environmental Services Department to determine if the supply for the projected demand for FY 2021-2022 will trigger the need for shortage response actions as identified in **Section 8.3,** Stages 1 – 6 will require City Council approval by May 31, 2021 for it to be effective by July 1, 2021 through June 30, 2022. The Assessment Report will be finalized and submitted to DWR on or before July 1st on an annual basis.

### 8.2.2 Data and Methodology

The methodology that will be used by the City to determine water demands for the Assessment year will be similar to the Econometric Model and the DSS Model as described in the BAWSCA 2020 Demand Study completed in June 2020 and amended in 2021 (**Appendix C**). The Econometric Model and DSS Model (the Model) projects future demands based on historical post-drought recovery considering each agency's unique factors such as economy, rate increases, conservation activity, and weather. The Model was used to forecast the City's baseline demand through 2023 as part of the Demand Study. The Model used in the Demand Study and current demands will be used to calibrate, evaluate, and accurately estimate the demands for the next year under normal and dry hydrological conditions.

Supply data from Valley Water and SFPUC will also be used to determine the reliability of the water supply system. The City will use the projected demand and supplies to assess whether shortfalls will exist under normal and dry hydrological conditions due to unanticipated changes not projected in the 2020 UWMP. The shortfalls will be quantified and correlated with the appropriate WSCP stages to identify the shortage level response action that will be triggered to offset the shortage in water supplies and determine if other actions are necessary (i.e., increase groundwater pumping or other water conservation measures).

Using a report template to be developed for the purposes of this Assessment, the City will draft a report presenting the data available and detailing the processes used to project the supplies and demands for the current year and complete the analysis. The report will identify any anticipated water supply shortfalls and the corresponding WSCP stage along with any WSCP actions proposed to mitigate the supply shortfalls. This report will be presented at a City Council meeting in or before June of each year if implementation of a WSCP stage is required and any WSCP actions will be implemented beginning by or before July. The report will then be submitted to DWR no later than July 1st.

Based on the processes described above, **Table 8-6** presents the timeline the City will adhere to for the process of completing the annual Assessment and submitting the Assessment Report.

**Table 8-6: Assessment Completion Timeline**

| Month | Activities | Completed By |
|---|---|---|
| February | Obtain monthly water use data by customer type from Finance Department for previous year. | Water and Sewer Division |
| February | Determine monthly water production data (surface water, potable groundwater, recycled water) for previous year. | Water and Sewer Division |
| February | Obtain population estimates for previous year from DOF (https://www.dof.ca.gov/Forecasting/Demographics/Estimates/). | Water and Sewer Division |
| March | Complete analysis for previous year (supply and demand comparison, hydrologic and regulatory conditions, infrastructure constraints, etc.). | Water and Sewer Division |
| March | Calculate projected unconstrained demand for current year and identify/describe projection methods (projected population growth, etc.). | Water and Sewer Division |
| April | Identify projected hydrologic conditions for current year and obtain any anticipated surface water supply constraints from wholesalers for current year. | Water and Sewer Division |
| April | Determine current conditions of groundwater supply and groundwater table to anticipate any groundwater supply constraints for current year. | Water and Sewer Division |
| April | Complete analysis for current year based on a “dry year.” Determine the anticipated monthly water supply reliability for the current year using calculation spreadsheet. | Water and Sewer Division |
| April | Determine if/when water supply shortages will occur and what WSCP stage the shortage will fall into. Determine what (if any) WSCP actions will need to be implemented to mitigate supply shortage. | Water and Sewer Division |
| May | Prepare Assessment Report presenting the findings of the Assessment and WSCP actions to be implemented. | Water and Sewer Division |
| May/ June | Present findings and Assessment Report to City Council. | Water and Sewer Division |
| by July | Implement the WSCP actions as approved by City Council. | Water and Sewer Division |
| July | Submit final Assessment Report to DWR by July 1st. | Water and Sewer Division |

Note: Months are approximate and can be adjusted as needed.

## 8.3 Standard Water Shortage Stages

In response to the severe drought of 2012-2016, new legislation in 2018 created a WSCP mandate replacing the water shortage contingency analysis under former law. Suppliers are authorized to continue using their own water shortage levels that may have been included in past WSCPs provided the Supplier includes a narrative or graphic describing the Supplier’s water shortage levels in relationship to the six standard water shortage levels prescribed by statute - six standard water shortage levels corresponding to progressive ranges of up to 10%, 20%, 30%, 40%, 50%, and greater than 50% shortage.

This section provides a general description of the WSCP for each of the water wholesalers and a detailed description of the City's water shortage stages. For more information regarding each wholesaler's response to water shortage, please refer to the wholesaler's most current WSCP.

### 8.3.1 SFPUC Water Shortage Allocation Plan

In July 2009, San Francisco and its Wholesale Customers in Alameda County, Santa Clara County, and San Mateo County (Wholesale Customers) adopted the WSA, which includes a Water Shortage Allocation Plan (WSAP) that describes the method for allocating water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated WSA.

The SFPUC allocates water under the Tier One Plan when it determines that the projected available water supply is up to 20% less than projected system-wide water purchases. **Table 8-7** shows the SFPUC (i.e., Retail Customers) share and the Wholesale Customers' share of the annual water supply available during shortages depending on the level of system-wide reduction in water use that is required. The Wholesale Customers' share will be apportioned among the individual Wholesale Customers based on a separate methodology adopted by the Wholesale Customers, known as the Tier Two Plan, discussed further below.

**Table 8-7: Allocation of Water between SFPUC and Wholesale Customers**

| Level of System-Wide Reduction in Water Use Required | Share of Available Water | |
|---|---|---|
| | SFPUC Share | Wholesale Customers Share |
| 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% |

The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any Wholesale Customer as well as between Wholesale Customers themselves. In addition, water "banked" by a Wholesale Customer, through reductions in usage greater than required, may also be transferred.

As amended in 2018, the Tier One Plan requires Retail Customers to conserve a minimum of 5% during droughts. If Retail Customer demands are lower than the Retail Customer allocation (resulting in a "positive allocation" to Retail) then the excess percentage would be re-allocated to the Wholesale Customers' share. The additional water conserved by Retail Customers up to the minimum 5% level is deemed to remain in storage for allocation in future successive dry years.

The Tier One Plan will expire at the end of the term of the WSA in 2034, unless mutually extended by San Francisco and the Wholesale Customers.

The Tier One Plan applies only when the SFPUC determines that a system-wide water shortage exists and issues a declaration of a water shortage emergency under California Water Code Section 350. Separate from a declaration of a water shortage emergency, the SFPUC may opt to request voluntary cutbacks from its Retail and Wholesale Customers to achieve necessary water use reductions during drought periods.

**Tier Two Drought Allocations**

The Wholesale Customers have negotiated and adopted the Tier Two Plan, referenced above, which allocates the collective Wholesale Customer share from the Tier One Plan among each of the 26 Wholesale Customers. These Tier Two allocations are based on a formula that considers multiple factors for each Wholesale Customer including:

- Individual Supply Guarantee;
- Seasonal use of all available water supplies; and
- Residential per capita use.

The water made available to the Wholesale Customers collectively will be allocated among them in proportion to each Wholesale Customer's Allocation Basis, expressed in millions of gallons per day (MGD), which in turn is the weighted average of two components. The first component is the Wholesale Customer's Individual Supply Guarantee, as stated in the WSA, and is fixed. The second component, the Base/Seasonal Component, is variable and is calculated using the monthly water use for three consecutive years prior to the onset of the drought for each of the Wholesale Customers for all available water supplies. The second component is accorded twice the weight of the first, fixed component in calculating the Allocation Basis. Minor adjustments to the Allocation Basis are then made to ensure a minimum cutback level, a maximum cutback level, and a sufficient supply for certain Wholesale Customers.

The Allocation Basis is used in a fraction, as numerator, over the sum of all Wholesale Customers' Allocation Bases to determine each wholesale customer's Allocation Factor. The final shortage allocation for each Wholesale Customer is determined by multiplying the amount of water available to the Wholesale Customers' collectively under the Tier One Plan, by the Wholesale Customer's Allocation Factor.

The Tier Two Plan requires that the Allocation Factors be calculated by BAWSCA each year in preparation for a potential water shortage emergency. As the Wholesale Customers change their water use characteristics (e.g., increases or decreases in SFPUC purchases and use of other water sources, changes in monthly water use patterns, or changes in residential per capita water use), the Allocation Factor for each Wholesale Customer will also change. However, for long-term planning purposes, each Wholesale Customer shall use as its Allocation Factor, the value identified in the Tier Two Plan when adopted.

Per WSA Section 3.11, the Tier One and Tier Two Plans will be used to allocate water from the RWS between Retail and Wholesale Customers during system-wide shortages of 20% or less. For RWS shortages greater than 20%, San Francisco shall (a) follow the Tier 1 Shortage Plan allocations up to the 20% reduction, (b) meet and discuss how to implement incremental reductions above 20% with the Wholesale Customers, and (c) make a final determination of allocations above the 20% reduction. After the SFPUC has made the final allocation decision, the Wholesale Customers shall be free to challenge the allocation on any applicable legal or equitable basis. For purposes of the 2020 UWMPs, for San Francisco RWS shortages more than 20%, the allocations among the Wholesale Customers are assumed to be equivalent among them and to equal the drought cutback to Wholesale Customer by the SFPUC.

The Tier Two Plan, which initially expired in 2018, has been extended by the BAWSCA Board of Directors every year since for one additional calendar year. In November 2020, the BAWSCA Board voted to extend the Tier Two Plan through the end of 2021.

**Individual Supply Guarantee**

San Francisco has a perpetual commitment (Supply Assurance) to deliver 184 MGD to the 24 permanent Wholesale Customers collectively. San Jose and Santa Clara are not included in the Supply Assurance commitment and each has temporary and interruptible water supply contracts with San Francisco. The Supply Assurance is allocated among the 24 permanent Wholesale Customers through ISGs, which represent each Wholesale Customer's allocation of the 184 MGD Supply Assurance. Sunnyvale's ISG is 12.58 MGD.

### 8.3.2 Factors Impacting Supply Reliability

**Adoption of the 2018 Bay-Delta Plan**

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted Bay-Delta Plan was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The Bay-Delta Plan requires the release of 30-50% of the "unimpaired flow" on the three tributaries from February through June in every year type. "Unimpaired flow" represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds (Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, December 12, 2018). In SFPUC modeling of the new flow standard, it is assumed that the required release is 40% of unimpaired flow.

If the Bay-Delta Plan is implemented, the SFPUC will be able to meet the projected water demands presented in this UWMP in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20% system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges – both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

The SWRCB has stated that it intends to implement the Bay-Delta Plan on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. But implementation of the Plan Amendment is uncertain for multiple reasons.

First, since adoption of the Bay-Delta Plan, over a dozen lawsuits have been filed in both state and federal courts, challenging the SWRCB's adoption of the Bay-Delta Plan, including a legal challenge filed by the federal government, at the request of the U.S. Department of Interior, Bureau of Reclamation. This litigation is in the early stages and there have been no dispositive court rulings as of this date.

Second, the Bay-Delta Plan is not self-implementing and does not automatically allocate responsibility for meeting its new flow requirements to the SFPUC or any other water rights holders. Rather, the Bay-Delta Plan merely provides a regulatory framework for flow allocation, which must be accomplished by other regulatory and/or adjudicatory proceedings, such as a comprehensive water rights adjudication or, in the case of the Tuolumne River, may be implemented through the water quality certification process set forth in section 401 of the Clean Water Act as part of the Federal Energy Regulatory Commission's licensing proceedings for the Don Pedro and La Grange hydroelectric projects. It is currently unclear when the license amendment process is expected to be completed. This process and the other regulatory and/or adjudicatory proceedings would likely face legal challenges and have lengthy timelines, and quite possibly could result in a different assignment of flow responsibility (and therefore a different water supply impact on the SFPUC).

Third, in recognition of the obstacles to implementation of the Bay-Delta Plan, the SWRCB Resolution No. 2018-0059 adopting the Bay-Delta Plan directed staff to help complete a "Delta watershed-wide agreement, including potential flow measures for the Tuolumne River" by March 1, 2019, and to incorporate such agreements as an "alternative" for a future amendment to the Bay-Delta Plan to be presented to the SWRCB "as early as possible after December 1, 2019." In accordance with the SWRCB's instruction, on March 1, 2019, SFPUC, in partnership with other key stakeholders, submitted a proposed project description for the Tuolumne River that could be the basis for a voluntary substitute agreement with the SWRCB ("March 1st Proposed Voluntary Agreement"). On March 26, 2019, the Commission adopted Resolution No. 19-0057 to support the SFPUC's participation in the Voluntary Agreement negotiation process. To date, those negotiations are ongoing under the California Natural Resources Agency and the leadership of the Newsom administration (Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds, available at https://files.resources.ca.gov/voluntary-agreements/).

Because of the uncertainty surrounding implementation of the Bay-Delta Plan, the SFPUC conducted water service reliability assessment that includes: (1) a scenario in which the Bay-Delta Plan is fully implemented in 2023, and (2) a scenario that considers the SFPUC system's current situation without the Bay-Delta Plan. The two scenarios provide a bookend for the possible future scenarios regarding RWS supplies. The standardized tables associated with the SFPUC's UWMP contain the future scenario that assumes implementation of the Bay-Delta Plan starting in 2023.

**Bay-Delta Plan Implementation Starting Year**

Because of the uncertainty surrounding implementation of the Bay-Delta Plan, the water service reliability assessment presented in the SFPUC's draft UWMP looks at two future supply scenarios, both with and without implementation of the Bay-Delta Plan.

Although the SWRCB has stated it intends to implement the Bay-Delta Plan on the Tuolumne River by the year 2022, given the current level of uncertainty, it is assumed for the purposes of the SFPUC's draft UWMP that the Bay-Delta Plan will be fully implemented starting in 2023.

**SFPUC's Decision to Present Both Modeling Results in its UWMP**

The SFPUC used the Hetch Hetchy and Local Simulation Model (HHLSM) to perform the water supply analyses for the supply reliability assessment and the drought risk assessment. HHLSM combines a historical record of hydrology from 1920 through 2017 with a current representation of SFPUC RWS infrastructure and operations. A key input for the HHLSM model is the anticipated level of demand on the RWS. Supply modeling results presented in the text of the SFPUC's UWMP reflect an input of projected demands on the RWS consisting of (1) projected retail demands on the RWS (total retail demands minus local groundwater and recycled water supplies), and (2) projected Wholesale Customer purchases. The SFPUC has a Level of Service objective of meeting average annual water demand of 265 MGD from the SFPUC watersheds for retail and Wholesale Customers during non-drought years, as well as a contractual obligation to supply 184 MGD to the Wholesale Customers. Therefore, the SFPUC has also conducted modeling based on a demand of 265 MGD to facilitate planning that supports meeting this Level of Service goal and their contractual obligations.

**SFPUC's Efforts to Develop of Alternative Water Supplies**

With the adoption of the Bay-Delta Plan Phase 1 (Bay-Delta Plan) by the State Water Resources Control Board in December of 2018, coupled with the uncertainties associated with litigation and the development of Voluntary Agreements that, if successful, would provide an alternative to the 40% unimpaired flow requirement that is required by the Bay-Delta Plan, BAWSCA redoubled its efforts to ensure that the SFPUC took necessary action to develop alternative water supplies such that they would be in place to fill any potential gap in supply by implementation of the Bay-Delta Plan and that the SFPUC would be able to meet its legal and contractual obligations to its Wholesale Customers.

In 2019, BAWSCA held numerous meetings with the SFPUC encouraging them to develop a division within their organization whose chief mission was to spearhead alternative water supply development. On June 25, 2019, BAWSCA provided a written and oral statement to the Commissioners urging the SFPUC to focus on developing new sources of supply in a manner similar to how it addressed the implementation of the Water System Improvement Program (WSIP). BAWSCA urged that a new water supply program was called for, with clear objectives, persistent focus, a dedicated team, adequate funding, and a plan for successful execution. The SFPUC Commission supported BAWSCA's recommendation and directed staff to undertake such an approach.

In early 2020, the SFPUC began implementation of the Alternative Water Supply Planning Program (AWSP), a program designed to investigate and plan for new water supplies to address future long-term water supply reliability challenges and vulnerabilities on the RWS.

Included in the AWSP is a suite of diverse, non-traditional supply projects that, to a great degree, leverage regional partnerships and are designed to meet the water supply needs of the SFPUC Retail and Wholesale Customers through 2045. As of the most recent Alternative Water Supply Planning Quarterly Update, SFPUC has budgeted $264 million over the next ten years to fund water supply projects. BAWSCA is heavily engaged with the SFPUC on its AWSS efforts.

**Rate Impacts of Water Shortages**

The SFPUC includes a variable component to water rates for most customer classes. As a result, as sales decrease, revenues are lost on a per unit basis. Because the marginal cost of water production is relatively small, as production is reduced, the cost of service remains the same. For both retail and wholesale customers, a reduction in water purchases – whether voluntary or mandated – would require the SFPUC to raise rates, cut costs, or use existing fund balance reserves to cover its expenses. The financial planning and rate setting process is complex and iterative. While major impacts of a water shortage on rates are described below, the full process, especially for large water shortages, would incorporate significant stakeholder discussion about tradeoffs and financial impacts.

The SFPUC's current retail water rates have a provision for a "drought surcharge" that automatically increases adopted rates in the event of a declared water shortage. The drought surcharge is calculated so that, accounting for the expected reduction in retail water usage, total revenues are equal to what they would have been without the reduction. The drought surcharge protects the SFPUC's financial stability during water shortages and provides customers an incentive to meet conservation targets.

For wholesale customers, the rate setting process is governed by the terms of the WSA, which provides that, in the event of a water shortage emergency, the Commission may adjust wholesale rates in an expedited way concurrently with the imposition of drought surcharges on retail customers. Beyond drought rate setting and emergency rate setting, rates are set annually in coordination with the SFPUC annual budget process and are based on the forecasted wholesale share of RWS expenditures and total purchases. If wholesale customer usage is expected to decrease – either voluntarily, or due to shortages – this would be incorporated into the wholesale rate forecast, and rates may increase.

### 8.3.3 Valley Water's Water Shortage Contingency Plan

Valley Water's basic water supply strategy to compensate for supply variability is to store excess wet year supplies in the groundwater subbasins, local reservoirs, San Luis Reservoir, and Semitropic Groundwater Bank, then to draw on these stored supplies during dry years to help meet demands. Based on projected demands, and Valley Water's existing and planned sources of supply, Valley Water will be able to meet countywide demands through 2045 under normal, a single dry, and five consecutive dry year conditions.

The DRA indicates that if a five-year drought were to occur under existing conditions, Valley Water will need to employ a range of response actions, including using supplies stored in the local groundwater, local reservoirs, and Semitropic groundwater bank, as well as augmenting supplies with supplemental sources such as water transfers and exchanges, to meet potential shortage.

Valley Water uses five stages to categorize its water supply shortage. The stages are based on projected countywide end-of-year groundwater storage and include a normal stage and four progressive levels of water shortage. **Table 8-8** below, describes how the stage correspond to DWR's six standard water shortage levels.

**Table 8-8: Crosswalk between Valley Water's WSCP Stages and Standard Stages**

| Valley Water WSCP: | | | | | Six Standard Stages: | |
|---|---|---|---|---|---|---|
| Stage | Title | Projected End-of-Year Groundwater Storage (AF) | Short-term reduction in water use | Corresponding Relationship ("crosswalk") | Stage | DWR 6 standard water shortage levels |
| 1 | Normal | > 300,000 | None | | | |
| 2 | Alert | < 300,000 | 0-10% | → | 1 | Up to 10% |
| 3 | Severe | < 250,000 | 10-20% | → | 2 | 10 to 20% |
| 4 | Critical | < 200,000 | 20-40% | → | 3 | 20 to 30% |
| 5 | Emergency | < 150,000 | Over 40% | → | 4 | 30 to 40% |
| | | | | → | 5 | 40 to 50% |
| | | | | → | 6 | Greater than 50% |

- Stage 1 is normal water supply availability when groundwater storage is substantially full, and no water shortage actions are necessary.
- Stage 2 is the alert stage that is meant to warn the public that current water use is tapping groundwater reserves. This stage is triggered when groundwater storage is projected to drop below 300,000 AF and the Board may request the public and retailers reduce water use by up to 10%.
- Stage 3 is the severe stage. Shortage conditions are worsening, requiring close coordination with retailers and cities to enact ordinances and water use restrictions. This stage is triggered when groundwater storage falls below 250,000 AF. The Board may pass a resolution that requests the public and retailers to reduce water use by 20%.
- Stage 4 represents critical conditions. This is typically the most severe stage in a multi-year drought. This stage is triggered when groundwater storage is projected to fall below 200,000 AF. The Board may increase the demand reduction request up to 40%.
- Stage 5 is for emergency situations. It is meant to address an immediate crisis such as a major infrastructure failure when water supply may only be available to meet health and safety needs. Stage 5 can also be triggered in a deep drought when groundwater levels are projected to fall below 150,000 AF. Water reduction may need to exceed 40%.

Water supply shortages can occur for a variety of reasons including droughts; loss in ability to capture, divert, store, or utilize local supplies; and/or facility outages. As a wholesale agency, Valley Water does not have direct authority over retail customer water use or retail rates and generally does not employ staff to enforce water restrictions. Therefore, Valley Water's water shortage response actions are focused mainly on public education and coordination with municipalities and retailers in the County. During droughts or shortages, Valley Water considers all available tools including balancing demands for treatment plants and recharge facilities, incentives or requests for retailers to use either groundwater or treated water, and community outreach to maximize the use of available supplies. The collective response actions between Valley Water, municipalities, and retailers preceding and during a water supply shortage are described below (**Table 8-9**).

**Table 8-9: Water Shortage Response Actions**

| Stage | Requested Short-Term Water Use Reduction | Actions |
|---|---|---|
| Stage 1 Normal | None | Valley Water continues ongoing outreach strategies aimed toward achieving long-term water conservation targets. Messages in this stage focus on services and rebate programs Valley Water provides to facilitate water use efficiency for residents, agriculture, and business. While other stages are more urgent, successful outcomes in Stage 1 are vital to long-term water supply reliability. |
| Stage 2 Alert | 0 – 10% | This stage is meant to warn customers that current water use is tapping groundwater reserves. Work begins to coordinate ordinances with cities and prepare for Stage 3. Additional communication tools are employed to augment Stage 1 efforts, promote immediate behavioral changes, and set the tone for the onset of shortages. Specific implementation plans are developed in preparation of a drought deepening such as identifying supplemental funding to augment budgeted efforts and initiation of discussions with local, state, and federal agencies to call on previously negotiated options, transfers, and exchanges. |
| Stage 3 Severe | 10 – 20% | Shortage conditions are worsening, requiring close coordination with retailers and cities to enact ordinances and water use restrictions. Significant behavioral change is requested of water users. The intensity of communication efforts increases with the severity of the shortage. Messages are modified to reflect more dire circumstances. Water supplies are augmented through the implementation of options, transfers, exchanges, and withdrawals from groundwater banks. |
| Stage 4 Critical | 20 – 40% | This is generally the most severe stage in a multi-year drought. Stage 3 activities are expanded, and Valley Water will encourage retailers and cities to increase enforcement of their water shortage contingency plans, which could include fines for repeated violations. |
| Stage 5 Emergency | 40 to 50% | Stage 5 is meant to address an immediate crisis such as a major infrastructure failure but may also be needed in exceptional multi-year drought. Water supply may only be available to meet health and safety needs. Valley Water activates its Emergency Operations Center, coordinates closely with municipalities and retailers, and provides daily updates on conditions. |

## Factors Impacting Supply Reliability

Several factors have the potential to negatively impact Valley Water supply reliability including hydrologic variability; climate change; invasive species; infrastructure failure; regulatory actions; as well as institutional, political, and other uncertainties. Hydrologic uncertainties influence the projections of both local and imported water supplies and the anticipated reliability of those supplies. Supply analyses performed by Valley Water are based on historical patterns of precipitation. The development of Valley Water projects and programs to meet future needs takes hydrologic variability into account.

Under any climate change scenario, Valley Water may need to consider additional treatment options to respond to water quality impacts associated with increased salinity in the Delta. Valley Water may also need to consider additional storage to take advantage of more wet-season water, long-term implementation of indirect potable reuse, additional supplies to replace reduced water supply from existing sources, and additional water transfers (depending on water market impacts).

In determining the long-range availability of water, consideration must be given to the vulnerability of imported supplies to the effects of prolonged state-wide drought and environmental impacts.

Reductions by DWR or the U.S. Bureau of Reclamation (USBR) to Valley Water allocations of SWP or CVP – San Felipe Division water may result in a temporary supply shortfall for the City and other Valley Water retailers. Water demands could be met with groundwater, additional imported water supply, water conservation measures, and with expanded recycled water use.

### 8.3.4 Sunnyvale's Shortage Stages of Action

Sunnyvale staff, in anticipation of 10%, 20%, 50%, and greater than 50% supply reductions developed a WSCP adopted in March of 1989, and amended in June 2016, that includes mandatory (and voluntary) water use restrictions, rate block adjustment, and approaches for enforcement associated with each stage of anticipated reduction. This WSCP amends the stages to correlate with the six stages prescribed by statute.

The following **Table 8-10** describes the six standard water shortage levels. The City initiates the stage based on the Assessment as described in **Section 8.2** which includes coordination with the wholesalers' declaration of shortages and restrictions.

**Table 8-10: Water Shortage Contingency Plan Levels**

| 2020 WSCP Mandated Shortage Levels | | 2015 WSCP Water Shortage Levels | | Water Shortage Condition | Shortage Response Actions Narrative Description |
|---|---|---|---|---|---|
| Shortage Level | % Shortage Range | Stage | % Shortage Range | | |
| 1 | ≤ 10% | 0 | None | Alert | • Increase public information campaigning<br>• Increase educational programs |
| 2 | 10-20% | 1 | Up to 15% | Moderate | • Voluntary conservation<br>• Reduce irrigation |
| 3 | 20-30% | 2 | Up to 30% | Severe | • Allocations and mandatory conservation<br>• Required reductions<br>• Drought surcharges and increased rates<br>• Flow restrictors<br>• Increase production monitoring |
| 4 | 30-40% | 3 | Up to 45% | Critical | • Require additional reductions<br>• Additional drought surcharges<br>• Reduce system flushing<br>• Repair leaks immediately<br>• Increase production monitoring |
| 5 | 40-50% | 4 | Greater than 45% | Catastrophic | • No new landscaping or building permits<br>• Restrict landscape irrigation<br>• 24-hour leak repair<br>• Increase use of non-potable water |
| 6 | > 50% | | | | |

Note: One Stage in the WSCP must address a water shortage of 50%.

## 8.4 Shortage Response Actions

The Water Code requires documentation of the specific actions to be undertaken during a water shortage. The City has developed a set of demand reduction measures, as well as supply augmentation options and operational changes, to be undertaken in response to each shortage level identified in **Table 8-10**. The WSCP information presented herein is based on the City's response to the 2012-2016 drought conditions and can be updated, as necessary.

City Council must approve the activation of the City's WSCP, and it is prepared to act in a timely manner to impose any water use restrictions and regulations deemed necessary in a water supply shortage emergency. Before imposing mandatory water use restrictions, the water shortage would be assessed based on the relative severity of the current drought/water shortage condition and the implementation of any State mandated water use cutbacks. A water shortage level would be recommended by the Environmental Services Director and approved by the City Council based on the levels listed in **Table 8-10**, and a water shortage declaration would be issued by the City Council. City Council would then determine the overall strategy and specific mix of voluntary and mandatory water consumption reduction measures to be implemented. Customers would be notified in accordance with standard Brown Act notification requirements.

The steps required to activate and implement the City's WSCP are summarized as follows:

- **STEP 1:** The City identifies that water shortage conditions exist (due to supply shortfalls, state cutbacks, or emergency conditions).
- **STEP 2:** The City identifies the appropriate water shortage response measures to be considered in response to the water shortage level in the following three categories of demand management:
  - **Voluntary Conservation Measures** – The City authorizes implementation of voluntary demand reduction measures – implemented in Stages 1 and 2.
  - **Mandatory Conservation Measures –** The City authorizes implementation of mandatory demand reduction measures, including enforcement actions and fines – implemented in Stages 3-6.
  - **Allocation/Rate-Based Measures** – The City authorizes implementation of water allocation and/or drought surcharge-based measures as deemed necessary to meet water shortage demand reduction targets while maintaining adequate water system revenues to operate the water system – implemented in Stages 3-6.

    Actual demand management measures may be adjusted based on activation of any supply augmentation measures in parallel with demand reduction measures as well as the need to meet water system revenue requirements that are not being met due to the water shortage condition.
- **STEP 3:** City Council approves activation of the City's WSCP and the suite of voluntary, mandatory, and/or allocation/rate-based measures to be implemented in response to a given water shortage level. The City must request approval of additional demand reduction measures as necessary to meet shortage level water use reduction targets.
- **STEP 4:** City Council deactivates or downgrades the implemented WSCP measures as water shortage levels decrease or the need no longer exists.

The actions to be undertaken during each stage cannot be implemented until necessary City Council approvals have been executed.

The types of measures that may be implemented in each stage are described below. These measures may be updated/altered based on City Council direction and approval, state policy directives, emergency conditions, and/or to improve customer response. This six-stage response approach provides the City with the flexibility to address any given water shortage as it comes, as conditions are constantly changing.

**Table 8-11** details the use restrictions for each stage of reduction declared by the City and outlines the penalties and charges associated with water use violations.

**Table 8-11: Demand Reduction Actions**

| Shortage Level | Demand Reduction Actions | Reduction in Shortage Gap (%) | Penalty, Charge, or Enforcement |
|---|---|---|---|
| Normal | *Permanent water use prohibitions please refer to City's Municipal Code 12.34.020*<br>• Allowing plumbing fixtures to leak<br>• Using potable water in a manner where it floods premises and runoff into the street<br>• Using a hose to wash vehicles without shut off valve.<br>• Using a hose to wash driveways, sidewalks (except for health and safety).<br>• Service of water to restaurants patrons without being requested.<br>• Installation of single pass cooling process in new construction<br>• Sprinkler irrigation between the hours of 9 AM – 6 PM when daylight savings is in effect.<br>• Irrigating for more than 15 minutes per day each station.<br>• Irrigation with potable water during and within 48 hours after measurable rainfall is prohibited.<br>• Irrigation with potable water of ornamental turf on public street medians.<br>• Operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily.<br>• Use of decorative fountains[1] without recirculation | ≤ 10% | No |
| Stage 1 up to 10% | • All the above<br>• Expand public information campaign which includes water use surveys and promoting available rebate programs such as turf replacement, water use efficiency devices, or conversion to recycled water if available<br>• Enforcement of permanent water use restriction Ordinance (Muni Code 12.34.020)<br>• Decrease hydrant/line flushing (unless for public health or safety) | 10% | No |

| Shortage Level | Demand Reduction Actions | Reduction in Shortage Gap (%) | Penalty, Charge, or Enforcement |
|---|---|---|---|
| Stage 2 up to 20% | • All the above<br>• Increase water waste patrols and enforcement of permanent water use restriction Ordinance (Muni Code 12.34.020)<br>• Reduce System Water Loss | 20% | • 1st and 2nd violation: $0 – written warning<br>• 3rd violation: $250<br>• 4th violation: $500 |
| Stage 3 up to 30% | • All the above<br>• Irrigation of ornamental landscapes with potable water more than two days per week is prohibited.<br>• Washing vehicles with potable water except at commercial vehicle washing facility<br>• Implement or modify drought rate structure or surcharge<br>• Increase frequency of meter reading | 30% | • Fine for non-essential water uses as described in City ordinance: Not to exceed $1,000<br>• Cost recovery for Installation and removal of flow restricting valves: $100 |
| Stage 4 up to 40% | • All the above<br>• Water allocation may be imposed<br>• New installations of lawns.<br>• Irrigating with potable water of golf courses except for tees and greens<br>• Use of decorative fountains[1]<br>• New swimming pool or pond construction<br>• Filling or refilling swimming pools | 40% | • Fine for non-essential water uses and those listed in demand reduction action: Not to exceed $1,000<br>• Cost recovery for Installation and removal of flow restricting valves: $100 |
| Stage 5 Up to 50% | • All the above<br>• Moratorium or net zero demand increase on new connections<br>• New swimming pool or pond construction<br>• Filling or refilling swimming pools<br>• Outdoor watering December through March.<br>• Watering turf, grass or dichondra lawns (can provide minimal water for sports playing fields) | 50% | • Fine for non-essential water uses and those listed in demand reduction action: Not to exceed $1,000<br>• Cost recovery for Installation and removal of flow restricting valves: $100 |
| Stage 6 Greater than 50% | • All the above<br>• Landscape irrigation with potable water of any City-owned premises or businesses where recycled water is available for connection.<br>• Irrigation of ornamental landscapes with potable water<br>• Watering turf, grass or dichondra lawns with potable water including sports and playing fields and tees and greens for golf courses. | >50% | • Fine for non-essential water uses and those listed in demand reduction action: Not to exceed $1,000<br>• Cost recovery for Installation and removal of flow restricting valves: $100 |

Notes:
1. "Decorative fountains" are considered ornamental water features that are artificially supplied with water and include ponds, lakes, waterfalls, and fountains. These facilities are considered ornamental and not for recreation.

In addition to the demand reduction actions noted in **Table 8-11**, the City may consider implementing the following supply augmentation methods detailed in **Table 8-12** to meet demands.

**Table 8-12: Supply Augmentation and Other Actions**

| Shortage Level | Supply Augmentation Methods and Other Actions by Water Supplier | Reduction in shortage gap? (%) |
|---|---|---|
| Stage 1 | Increase groundwater use if needed | 10% |
| Stage 2 | Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient | 20% |
| Stage 3 | Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient | 30% |
| Stage 4 | Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient | 40% |
| Stage 5 | Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient | 50% |
| Stage 6 | Increase groundwater use, SFPUC, and/or Valley Water to supplement supply that is deficient | 60% |

## 8.5 Consumption Reduction Methods

There are several methods actively implemented by the City to encourage consumption reduction, which are described below.

### 8.5.1 Public Outreach/Rebates

The City participates in public information campaigns and available water conservation rebates managed by each wholesaler encouraging water conservation. During dry periods, the City notifies the public of water conservation programs available through bill stuffers and direct mailing.

### 8.5.2 Water Rate Structure for Conservation

A major part of Sunnyvale's strategy for water conservation developed in 1989 is a block rate pricing structure involving a lifeline rate set at 15% above the existing rates, a conservation block rate set at a multiple of two times usage in applicable existing rate blocks, and a high impact/high use category at a multiple of 3.5 times the existing rate blocks. The lifeline category exists for all categories of users whereas the conservation and high use rates are applied to recognize the greatest opportunities and needs for reduction and to be sensitive to the importance of manufacturing production and commercial needs. The same approach would be used should the City move to other shortage levels or stages. However, the multipliers would escalate.

Separate metering systems have been set up for fire and landscape uses with potable water utilized for landscaping purposes at a different rate than domestic water.

### 8.5.3 Enforcement Approach

The thrust of enforcement of Sunnyvale's conservation program is to solicit cooperation from water users who are unaware of the restrictions or have failed to comply with the provisions of the ordinance. Every effort is made to inform these users of the need for conserving water. If discussions with the user are unsuccessful in obtaining compliance, enforcement mechanisms are available.

The Environmental Services Department and Public Safety cooperate on the responsibility for enforcement of the City's conservation plan. Computerized systems track complaints throughout the enforcement process. The process involves first establishing contact with the individual who may be in violation; giving the individual information about code requirements; and verbally requesting that the user comply with these requirements. If a complaint has been registered with Neighborhood Preservation, the complainant is contacted and notified of the results of the preliminary investigation. The complainant is kept informed at each step of the process. Upon receipt of a second violation complaint, the violator will receive a written notice to comply and a warning that the next violation may result in a citation and/or the installation of a flow restricting device at the water meter. This flow restricting device would reduce the flow of water to a trickle, thereby allowing the occupant only enough water for health and sanitation purposes. If there are further complaints and a citation is to be issued, the Department of Public Safety is called to issue the citation.

A "hot line" telephone number is established for drought information and to register complaints. Trained staff is available to provide information and to respond to complaints.

## 8.6 Water Use Monitoring Procedure

Water Code §10632(a)(9) requires the description of the monitoring and reporting procedures that will ensure data is collected, tracked, and analyzed for purposes of monitoring customer compliance with, and effectiveness of, WSCP measures implemented during a drought/water shortage. During normal conditions, the City can monitor long-term water use through regular meter readings, allowing them to flag exceptionally high usage for verification of water loss or abuse. Additional and more frequent monitoring may be undertaken to improve the precision of water use data to meet specific water use reduction targets, depending on water shortage conditions.

**Table 8-13** lists the mechanisms available for the City to monitor water use and determine actual reductions in water use, as well as the type and quality of data expected.

**Table 8-13: Water Use Monitoring Mechanisms**

| Mechanisms for Determining Actual Reductions | Type and Quality of Data Expected |
|---|---|
| Customer meter readings | Hourly/daily/monthly water consumption data for a specific user depending on frequency of readings |
| Production meter readings | Hourly/daily/monthly water production data depending on frequency of readings; includes customer water use plus system losses |

During a drought/water shortage, these data would be analyzed with increased frequency as the water shortage condition worsens, and any concerns would be brought to City Council to support the need for implementation of additional water conservation measures as needed.

### 8.6.1 Determining Water Shortage Reductions

As customers begin to comply with water reduction measures the overall water use will decrease. The City continuously monitors water usage each month from billed consumption through water meters and will be able to determine the amount of water reductions compared to previous years. The City's billing system provides the capability for the City to evaluate water consumption from customer types. In stages 3 and higher, the City would expect to see large reductions from the dedicated landscape meters and residential customers due to mandatory restrictions on outdoor irrigation.

## 8.7 Analysis of Revenue Impacts of Reduced Sales during Shortages

In the event of a water shortage scenario, water fund revenues may decrease from the implementation of conservation measures and corresponding reduction in water sales. Conversely, expenses will increase because of the implementation and enforcement of water conservation measures. Expenditures will also rise on a per-unit basis, as wholesalers increase their per-unit price to compensate for the loss of revenue from wholesale sales.

The City has several options to address financial issues during a water shortage. First, the City retains two significant reserves, one for operating contingencies (Contingency Reserve) such as water shortages that is set at 25% of operations and purchased water costs, and a second for the purpose of stabilizing rates over time (Rate Stabilization Reserve). Each will help the City balance the Water Supply and Distribution fund during supply shortages. Finally, the City has four sources of supply and the ability to move most of its supply from any one point to any other point (the exception being recycled water). In the event of a water shortage, especially in the short term, the City has multiple supply options that should contribute to a more-stable revenue base than if the City were under very limited wholesale supplies.

## 8.8 Emergency Response Plan

Water Code §10632(a)(3)(A) specifies that WSCP shortage levels shall also apply to other catastrophic interruptions of water supplies including, but not limited to, a regional power outage, an earthquake, or other potential emergency event.

### 8.8.1 Sunnyvale Emergency Response Plan

America's Water Infrastructure Act of 2018 §2013(b) also requires community water systems serving populations greater than 3,300 to develop or update an Emergency Response Plan (ERP) that describes strategies, resources, and procedures that the utility can use to prepare for and respond to an incident, natural or man-made, that threatens life, property, or the environment. In accordance, the City's ERP was last updated in 2020.

The ERP coordinates the overall City response to disasters of various types in its service area. In addition, the ERP requires the City to have a local disaster plan that coordinates emergency responses with other agencies in the area. The ERP provides a detailed set of actions to be undertaken during specific catastrophic events, and **Table 8-14** provides a summary of actions for three of the most common possible catastrophic events: regional power outages, earthquakes, and malevolent acts.

In addition to the specific actions listed in **Table 8-14**, the City performs regular maintenance activities – such as annual inspections – for earthquake safety and budgets for emergency items – such as auxiliary generators – to prepare for potential catastrophic events and protect the local surface water and groundwater resources.

**Table 8-14: Summary of Actions for Catastrophic Events**

| Event | Summary of Actions |
|---|---|
| Regional power outage | • Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water.<br>• Establish water distribution points and ration water if necessary.<br>• If water service is restricted, attempt to provide potable water tankers or bottled water to the area.<br>• Make arrangements to conduct bacteriological tests, to determine possible contamination.<br>• Utilize backup power supply to operate pumps in conjunction with elevated storage.<br>• Manually reset wells that experience a power surge due to the restoration of power. |
| Earthquake | • Assess the condition of the water supply system.<br>• Complete the damage assessment checklist for reservoirs, water treatment plants, wells and boosters, system transmission and distribution.<br>• Coordinate with California Emergency Management Agency (Cal EMA) utilities group or fire district to identify immediate firefighting needs.<br>• Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water.<br>• Prepare report of findings, report assessed damages, advise as to materials of immediate need, and identify priorities including hospitals, schools, and other emergency operation centers.<br>• Take actions to preserve storage.<br>• Determine any health hazard of the water supply and issue any “Boil Water Order” or “Unsafe Water Alert” notification to the customers, if necessary.<br>• Cancel the order or alert information after completing comprehensive water quality testing.<br>• Make arrangements to conduct bacteriological tests, to identify possible contamination. |
| Malevolent acts | • Assess threat or actual intentional contamination of the water system.<br>• Notify local law enforcement to investigate the validity of the threat.<br>• Get notification from public health officials if potential water contamination.<br>• Determine any health hazard of the water supply and issue any “Boil Water Order” or “Unsafe Water Alert” notification to the customers, if necessary.<br>• Assess any structural damage from an intentional act.<br>• Isolate areas that will take the longest to repair and or present a public health threat. Arrange to provide emergency water. |

### 8.8.2 SFPUC Emergency Preparedness Plan

Following the 1989 Loma Prieta Earthquake, the SFPUC created a departmental Emergency Operations Plan (EOP). The SFPUC EOP was originally released in 1992 and has been updated as necessary ever since. Most recently, the SFPUC developed a Water System Emergency Response Plan (Water ERP) to comply with the America's Water Infrastructure Act (AWIA) passed in 2018. The Water ERP acts as a unifying document, integrating and referencing common components of SFPUC plans and programs that have been developed to date. The Water ERP is intended to address water transmission and distribution systems and identify the Enterprises, Divisions, and Bureaus with direct roles and responsibilities. The Water ERP integrates directly into, and functions as an annex to, the SFPUC EOP. The SFPUC EOP addresses a broad range of potential emergency situations that may affect the SFPUC and supplements the City's Emergency Response Plan, which was prepared by the Department of Emergency Management and most recently updated in 2017. 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 each have their own Division Emergency Operations Plans (DEOP) (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 DEOPs 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. DEOP 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.

The SFPUC EOP functions as a front end for the SFPUC's DEOPs, covering emergency response at the Department level; while each DEOP covers Division-specific information on the Division's emergency organization and response procedures specific to Division responsibilities, assets, technical scope, and operations. The types of events affecting SFPUC that may require emergency plans include but are not limited to:

- Major earthquake
- Loss of power
- Loss of water supply
- Major fire
- Hazardous material release that threatens water supply or environment
- Major pipeline breaks
- Dam break
- Significant outage of SFPUC services
- Man-made or intentional acts of terrorism resulting in damage to the system or interruption in service

**SFPUC Emergency Drinking Water Planning**

In February 2005, the SFPUC published a 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. The report addresses immediate response after a major disaster. Since the publication of this report, the SFPUC has implemented several 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;
- 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;
- Constructed six wells as part of the San Francisco Groundwater Supply Project, two of which also serve as emergency drinking water supplies, including a distribution system to fill emergency water tankers;
- Purchase and engineering of emergency related equipment including water bladders and water bagging machines to help with water distribution post disaster; and
- Coordinated planning with City Departments, neighboring jurisdictions, and other public and private partners to maximize resources and supplies for emergency response

The SFPUC has also prepared the RWS Water Quality Notifications and Communications Plan. This plan, which was first prepared in 1996 and was most recently updated in 2017, provides contact information, procedures, and guidelines to be implemented by several SFPUC divisions, wholesale customers, and BAWSCA in the event of water quality impacts. The plan treats water quality issues as potential or actual supply problems, which fall under the emergency response structure of the SFPUC ERP.

**Power Outage Preparedness and Response by SFPUC**

SFPUC's water transmission system is primarily gravity fed, from the Hetch Hetchy Reservoir to the City and County of San Francisco. 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 disinfection 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. Additionally, both the Sunol Valley Water Treatment Plant and the San Antonio Pump Station would not be impacted by a failure of the regional power grid because it runs off the SFPUC hydropower generated by the RWS.
- 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.
- The SFPUC has an emergency water supply connection with Valley Water. Valley Water intertie, which also has back-up generators in place.
- 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 and other emergency situations.

### 8.8.3 Valley Water Catastrophic Interruption Planning

**Infrastructure Reliability Plan**

Valley Water completed its first Infrastructure Reliability Plan (IRP) in 2005 and updated it in 2016. The IRP analyzes several outage scenarios for Valley Water's system, including an earthquake, extreme storm, Delta outage, and power outage. Valley Water and retailers agreed on a reliability target during an emergency that Valley Water should be able to restore treated water deliveries to meet the equivalent of a winter month's demand (i.e., February) within 30 days after a major disaster event. Modeling and analyses estimated service restoration time of Valley Water's existing system for minimum winter demands in each of the outage scenarios.

The worst-case outage scenario was a magnitude 7.9 earthquake on the San Andreas fault, which would result in an estimated 30-day outage time before Valley Water can provide minimum treated water demands to retailers. In the Delta outage scenario, modeling demonstrated Valley Water can continue limited service (at an assumed 20% demand reduction) for a 24-month period with no imported water supplies if it occurred in a normal hydrologic year and started with normal groundwater supplies. In a regional power outage, Valley Water can operate facilities on backup fuel storage for an estimated 3 to 10 days, or longer given regular external fuel deliveries.

The 2016 IRP recommends efficient and targeted opportunities to improve system reliability and performance by either shortening Valley Water system outage time following an event or strengthening retailer capability to withstand Valley Water system outages. Important concepts that were incorporated into the identification of project opportunities and the analysis methodology are:

1. *Incorporate recent operational knowledge*: Planned and unplanned maintenance outages of Valley Water pipelines and treatment plants have allowed retailers to learn how to operate their systems without Valley Water treated water supplies. Retailers have operated with Valley Water treated water supply interruptions for up to eight weeks in some cases.
2. *Account for backup supply redundancy*: Most retailer service areas have adequate groundwater pumping capacity to serve as a backup to treated water deliveries and may not require large investments in additional reliability.
3. *Consider raw water and treated water system interdependencies*: Strengthening Valley Water's treated water pipeline system alone may not dramatically improve reliability in scenarios where raw water pipelines fail. The opposite also applies, as strengthening Valley Water's raw water pipeline system alone may not dramatically improve reliability in cases where treated water pipelines fail. Strengthening key portions of both the raw and treated water pipeline systems is needed to provide improved reliability. These improvements are being planned and recommended through the development of a distribution system master plan.

4. *Leverage existing investments*: Where possible and beneficial, leveraging existing assets is preferred, as Valley Water, retailers, and SFPUC have made significant investments in increasing system reliability and operational flexibility since the 2005 IRP.
5. *Favor frequently used assets*: Assets, particularly groundwater wells, which can be used more frequently to enhance daily operations or periodic maintenance operations, are preferred over assets that would be designated as standby for infrequent use only during major emergencies.
6. *Address specific vulnerable areas*: There are specific retailer service areas that are more vulnerable to outages of Valley Water treated water or managed recharge. Focusing on localized solutions to improve reliability in these specific areas may be more effective, with lower costs, than major infrastructure improvements.

Ultimately, Valley Water and retailers determined that targeting specific vulnerable areas for improvement will effectively address identified reliability needs. A total of 20 projects are identified in the 2016 IRP to improve reliability in these specific areas. Some projects were identified for retailer implementation, some for Valley Water implementation, and others for joint implementation. Valley Water has been working to complete the identified projects since 2016.

**Emergency Operations Center**

Valley Water's Emergency Services and Security Unit (ESSU) coordinates emergency response and recovery for Valley Water. During any emergency, Valley Water continues the primary missions of providing clean, safe water and flood protection to the people of Santa Clara County. ESSU maintains a full-time professional emergency management staff trained and equipped to respond quickly to support Valley Water's Emergency Operations Center (EOC) and field responders. The ESSU ensures that critical services are maintained, and emergency response is centralized.

The EOC is connected to other agencies and jurisdictions by an array of telecommunications, two-way radio, satellite telephone, and wireless messaging systems. In addition, two response vehicles with many of the same communications capabilities of the EOC enable staff to establish mobile emergency command posts just about anywhere field operations may require. Office of Emergency Services (OES) maintains communications with local, state, and national emergency management organizations and allied disaster preparedness and response agencies.

**Milpitas Intertie**

During an emergency, in addition to retailers relying on groundwater and their own supplies, Valley Water has a 40-MGD intertie with the SFPUC located in the City of Milpitas, which allows the SFPUC and the East Pipeline systems to exchange water during emergencies and planned maintenance.

**Delta-Conveyed Supply Interruption**

A strategy was developed by DWR, the Army Corps of Engineers (Corps), Bureau of Reclamation, California Office of Emergency Services (Cal OES), and the State Water Contractors to provide water supply protections that would enable resumption of at least partial deliveries from the Delta in less than six months in the event of an outage.

Valley Water analyzed the impacts of a six-month Delta outage to determine the effect on service. The analysis assumed that all local infrastructure remains intact, as an earthquake or flood in the

Delta is unlikely to badly damage local infrastructure. The analysis also assumed normal hydrologic conditions and starting storage conditions, rather than stacking disaster upon disaster (i.e., earthquake plus drought, etc.), access to SFPUC supplies, and implementation of water use reductions of 20 percent. The impacts of such an outage are largely operational as retailers would be required to use groundwater instead of their usual treated water supplies and Valley Water would actively manage the groundwater recharge program to meet countywide needs. Even with increased pumping, groundwater storage is estimated to remain in the normal (Stage 1) range. Thus, the impacts of a six-month Delta outage are manageable assuming a normal starting position. Valley Water would potentially need to call for more aggressive water use reductions if a Delta outage were to occur during or immediately following a drought.

The Delta Flood Emergency Management Plan (DWR, 2018) provides strategies for responses to Delta levee failures, including earthquake-induced numerous levee failures during dry conditions with multiple flooded islands and extensive saltwater intrusion, resulting in curtailment of export operations. Under these severe conditions, an emergency freshwater pathway would be established from the central Delta along Middle River and Victoria Canal to the export pumps in the south Delta. The plan includes the pre-positioning of emergency construction materials at stockpile and warehouse sites in the Delta, and development of tactical modeling tools (DWR Emergency Response Tool) to predict levee repair logistics, timelines of levee repair, and suitable water quality to restore exports. Using pre-positioned materials, multiple earthquake-generated levee breaches and levee slumping along the freshwater pathway can be repaired in less than six months. Significant improvements to the central and south Delta levee systems along the emergency freshwater pathway began in 2010 and are continuing. Continued efforts under analysis strive to mitigate not only flood and earthquake risk but also meet future sea-level rise risk.

## 8.9 Seismic Risk Assessment and Mitigation Plan

### 8.9.1 Sunnyvale Seismic Risk Assessment and Mitigation Plan

The City completed a Water System Seismic Vulnerability Assessment in 2004, which has been included as **Appendix I**.

### 8.9.2 SFPUC Seismic Risk Assessment and Mitigation Plan

As part of the Facilities Reliability Program and the WSIP, the SFPUC performed an extensive multi-year evaluation of seismic risks to its water system that resulted in major capital improvements to increase seismic reliability. The goals of WSIP include enhancing the ability of the SFPUC water system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply. One of the original goals of WSIP was to limit rationing to no more than 20% on a system-wide basis; the WSIP was developed to reduce the likelihood of shortages, thereby reducing the likelihood of needing to implement the WSCP.

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 RWS to address both seismic reliability and overall system reliability. As of August 2018, the WSIP is over 96%

complete. Local San Francisco projects are 100% complete as of June 2020. The current forecasted date to complete the overall WSIP is December 2021.

WSIP seismic levels of service (LOS) informed development of capital projects and guided program implementation. The LOS established post-earthquake delivery and recovery objectives under the following seismic scenarios:

- Magnitude 7.9 event on the San Andreas fault
- Magnitude 7.3 event on the Hayward fault
- Magnitude 6.9 event on the Calaveras fault

An assessment of seismic risk and resilience is contained in the body of analysis performed to support the WSIP. The risks associated with the seismic scenarios considered are reflected in the delivery objectives established in the LOS, specifically:

- Delivery of winter month demand 24 hours after a major earthquake, and
- Delivery of average day demand 30 days after a major earthquake

In addition to the improvements that have or will come from the WSIP, the City has already constructed system interties for use during catastrophic emergencies, short-term facility maintenance and upgrade activities, and times of water shortages. These are listed below:

- A 35 MGD intertie with the EBMUD allowing EBMUD to serve the City of Hayward’s demand and/or supply the SFPUC directly (and vice versa);
- A 40-MGD system intertie between the SFPUC and Valley Water; 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 also includes projects related to standby power facilities at various locations. These projects provide for standby electrical power at six critical facilities to keep them in operation during power outages and other emergency situations. Permanent engine generators are located at four locations (San Pedro Valve Lot, Millbrae Facility, Alameda West, and HTWTP), while hookups for portable engine generators are at two locations (San Antonio Reservoir and Calaveras Reservoir).The City of San Francisco also has a Hazard Mitigation Plan which was last updated in June 2014 and includes sections describing earthquakes hazards and mitigation for assets within the City’s boundary, including state-regulated reservoirs (Sutro, Sunset North and South, and University Mound North and South).

### 8.9.3 Valley Water Local Hazard Mitigation Plan

Valley Water’s 2017 Local Hazard Mitigation Plan (2017 LHMP) identifies capabilities, resources, information, and strategies for building resilience and reducing physical and social vulnerabilities to disasters. It also coordinates mitigation actions, providing essential guidance for Valley Water to reduce its vulnerability to disasters. Valley Water developed the 2017 LHMP to be consistent with current legislation, conditions, and best available science. This ensures that hazards are accurately profiled; policies are consistent with current Valley Water standards and relevant federal, state, or regional regulations; and Valley Water has an updated LHMP consistent with

Federal Emergency Management Agency (FEMA) ERP requirements. The 2017 LHMP also includes strategies to reduce vulnerability to disaster through education and outreach programs, foster the development of partnerships, and implement risk reduction activities.

## 8.10 Legal Authority

The City regulates water use under Sunnyvale's Municipal Code Chapter 12. With the approval of City Council, the City has the authority to establish a WSCP to prepare a set of actions to respond to water supply restrictions caused by drought conditions, supply disruptions, and/or any other unforeseen emergencies. Typically, City Council reviews and approves all WSCP policies and programs as part of the UWMP planning process before they can be implemented and placed into practice. However, because the WSCP is a standalone document, it can be modified and updated as a separate process as described further in this section.

When a water shortage is suspected, the City will work with its wholesalers and other regional partners to discuss the possible proclamation of a local emergency per the California Government Code, California Emergency Services Act (Article 2, §8558). The City's Environmental Services Director will identify and recommend a water shortage level to be acknowledged, and upon approval, City Council shall declare a water shortage emergency, in accordance with Water Code Division 1, §350.

## 8.11 Plan Adoption, Submittal, and Availability

As part of the 2020 UWMP planning cycle, the City's 2020 WSCP was adopted together with the 2020 UWMP. However, because the Water Code now requires that the WSCP be adopted as a standalone plan, the WSCP can be amended or updated as necessary outside of the five-year UWMP planning cycle. This section describes the steps taken by the City to meet the requirements of the Water Code pertaining to public availability, adoption, submittal, and availability of the 2020 WSCP as well as the steps needed to amend the WSCP. The resolution approving the 2020 WSCP for the City is included in **Appendix L**.

### 8.11.1 60-Day Notification

Notifications indicating preparation of the City's 2020 WSCP were provided to the cities and counties listed in **Table 8-15** at least 60 days in advance of the public hearing as required by the Water Code; a copy of the notice is included in **Appendix A.**

### 8.11.2 Notice to Cities and Counties

The public hearing notice for the 2020 UWMP and WSCP was sent to the cities and counties listed in **Table 8-15** and prior to the public hearing. Three notices were posted in the Sunnyvale Sun to inform the public of the upcoming public hearing. The notices include the time and place of the hearing, as well as locations where the plans were made available for public inspection. The first notice was published on May 21, 2021, the second on May 28, 2021, and the third on June 4, 2021. A copy of the notice is included in **Appendix A**.

**Table 8-15: Notification to Cities and Counties**

| City Name | 60 Day Notice | Notice of Public Hearing |
|---|---|---|
| City of Hayward | ☑ | ☑ |
| City of Milpitas | ☑ | ☑ |
| City of Mountain View | ☑ | ☑ |
| City of Palo Alto | ☑ | ☑ |
| City of Santa Clara | ☑ | ☑ |
| City of Brisbane | ☑ | ☑ |
| City of Burlingame | ☑ | ☑ |
| City of Daly City | ☑ | ☑ |
| City of Menlo Park | ☑ | ☑ |
| City of Millbrae | ☑ | ☑ |
| City of Redwood City | ☑ | ☑ |
| City of San Bruno | ☑ | ☑ |
| City of East Palo Alto | ☑ | ☑ |
| City of San Jose | ☑ | ☑ |
| City of Foster City | ☑ | ☑ |
| **County Name** | **60 Day Notice** | **Notice of Public Hearing** |
| Alameda County | ☑ | ☑ |
| Santa Clara County | ☑ | ☑ |

The draft plans were made available for the community and posted on the City's website (www.sunnyvale.ca.gov) on May 13, 2021. Copies of all public notices of the hearing are included in **Appendix A**.

### 8.11.3 Public Hearing and Adoption

The public hearing for consideration and adoption of the 2020 UWMP and WSCP by the City Council took place on June 29, 2021 during a normal City Council session. The session began with the public hearing to allow community input prior to the formal adoption of both plans by City Council. All public input received was considered before final adoption of both documents. The adopted resolution is included in **Appendix L**.

### 8.11.4 Plan Submittal

Upon adoption of the 2020 UWMP and WSCP by City Council, implementation took place as identified in this document. Submission of the adopted plans to DWR was done electronically within 30 days from the date of adoption, and no later than July 1, 2021.

### 8.11.5 Public Availability

The adopted UWMP and WSCP were posted on the City's website (www.sunnyvale.ca.gov) within 30 days of submission to DWR and were submitted to the California State Library.

### 8.11.6 Amending an Adopted WSCP

This WSCP has been developed to act as a set of guidelines for steps to take during a drought/water shortage. Given the variable nature of water and the climate and the intersection of many different factors, no two drought situations will be identical, and therefore, there must be room for improvement/alteration in the way that the City responds to each individual water shortage condition as it is encountered. This WSCP is an adaptive framework that is based on the City's response to the 2012-2016 drought, but it is open to refinement and amendment as the effectiveness of current practices is evaluated, new and different conditions are experienced, and new options for drought mitigation measures (demand management, supply augmentation, etc.) become available.

Based on the results of monitoring and reporting processes described in **Section 8.6**, the City can amend the procedures outlined in this WSCP pending the approval of City Council. The City's 2020 WSCP will only be modified following notification, public hearing, adoption, and submittal as prescribed in the Water Code.

# SECTION 9 – DEMAND MANAGEMENT MEASURES

The City of Sunnyvale has a commitment to water conservation and implementation of the Demand Management Measures (DMMs) identified by the State. DMMs can be water conservation programs, outreach, or monetary incentives offered to customers as well as institutional tools to help water purveyors reduce water use.

Many of the DMMs offered by the City to customers are programs run by or coordinated through the wholesaler Valley Water or BAWSCA. The programs are either funded through the wholesale water rates paid by the City or are directly reimbursed by the City. Additional program descriptions including implementation over the past five years and the nature and extent of each program component within a DMM are explained in this section.

The City, as a municipally owned water utility, has the legal authority to implement DMMs by ordinance or resolution of the City Council. This authority has been exercised through past implementation of DMM, fees, and penalties. This section describes the DMMs that are implemented within the City's service area to continue to encourage water conservation to support the City's supply reliability.

**Table 9-1** below lists current and planned program components implemented by the City for each measure and indicates who administers the program.

**Table 9-1: Demand Management Measures (DMMs)**

| Demand Management Measure | City Program | Valley Water Program | BAWSCA Program |
|---|---|---|---|
| Water Waste Prevention Ordinance | | | |
| Adopted water waste prohibition ordinance | X | | |
| Metering | | | |
| Fully metered service connections | X | | |
| Retrofit or replacement of aging meters | X | | |
| Submeter rebate program | | X | |
| Conservation Pricing | | | |
| Conservation rate structures | X | | |
| Public Education and Outreach | | | |
| Public information programs | X | X | |
| School education programs | X | X | |
| Programs to assess and manage distribution system real loss | | | |
| System water audits, leak detection, and repair | X | | |
| Water Conservation Program Coordination and Staffing Support | | | |
| Dedicated water conservation coordinator | X | | |

| Demand Management Measure | City Program | Valley Water Program | BAWSCA Program |
|---|---|---|---|
| Other Demand Management Measures | | | |
| Residential surveys and water use reports | | X | |
| Residential plumbing retrofit | | X | |
| Large landscape conservation programs and incentives | | X | |
| High-efficiency toilet rebate programs | | X | |
| Graywater landscape irrigation rebates and incentives | | X | |
| Rain barrel rebate program | X | | X |
| Conservation programs for residential, and Commercial, Industrial, Institutional (CII) customers | | X | |
| Regional Water Conservation Program | | | X |

## 9.1 Demand Management Measures for Wholesale Agencies

Both Valley Water and SFPUC implement DMMs to promote conservation and reduce demand on water supply through metering, public education and outreach, and water conservation program coordination.

## 9.2 Demand Management Measures for Retail Agencies

Below is a description of the various DMMs that are implemented within the City either by the City, Valley Water, or BAWSCA.

### 9.2.1 Water Waste Prevention Ordinances

**Implementation:** Drought and water conservation requirements are implemented by the City and will continue to be implemented by the City in the future.

**Description:** On May 2015, the City Council adopted a resolution and established a 30% water use reduction target from 2013 levels (increased from 15%) through June 2016 out of concern for drought conditions, groundwater depletion and land subsidence. The City's resolution instituted a two (2) day watering schedule, prohibits outside irrigation within 48 hours of rainfall, between 9 AM and 6 PM, and requires hotels to give patrons the option of having linens laundered daily. Prohibitions implemented by the City before this resolution include:

- Serving water in restaurants except upon request;
- The application of potable water to outdoor landscapes in a manner that causes runoff;
- The application of potable water to driveways and sidewalks;
- The use of potable water in a fountain or other decorative water features unless the water is part of a recirculating system;
- Landscape irrigation between the hours of 9 AM and 6 PM;

- Using a hose without a positive shutoff valve to wash cars, buses, boats, or trailers; and
- Water waste due to broken or defective plumbing, sprinkler, watering, or irrigation systems.

Violation of these provisions may escalate to installation of a flow restricting device upon the water service lines and cumulative fines. The Water Conservation Plan and Municipal Code are included as **Appendix G** and **Appendix J**, respectively.

### 9.2.2 Metering

**Implementation:** The City implements metering requirements within the service area and will continue to do so. Additionally, the City implements a program to retrofit and replace meters as they age. Through Valley Water, the City offers multi-family housing the opportunity to receive a rebate for installation of submeters.

**Description:** The City requires that all service connections within the service area are metered. All new service connections are metered and are billed by volume of water used. There are no known connections operating without a meter. Connections to the City are governed by Chapter 12.24 of the Sunnyvale Municipal Code, which is provided as **Appendix J**.

Sunnyvale encourages all new commercial, industrial, and multi-family developments to have dedicated water meters and separate accounts and meters for landscape irrigation. As older developments are replaced with newer ones, any customers without a dedicated landscape irrigation meter will be encouraged to acquire one.

**Valley Water's Submeter Rebate Program:** This program, which began as a pilot program in FY 2000-2001, gives a rebate of $150 for every water submeter installed at multi-family housing complexes, such as mobile home parks and condominium complexes. Water use records from participating mobile home parks showed an average water savings of 23% per mobile home.

### 9.2.3 Conservation Pricing

**Implementation:** Conservation pricing is implemented by the City and will continue to be implemented by the City in the future.

**Description:** In March 1989, in response to drought conditions, the City adopted a water conservation plan that required implementation of demand management measures such as an inverted rate structure, deterrents to water waste, landscaping restrictions and the institution of a recycled water program.

Prior to the 1976-1978 drought, the City had a traditional declining-rate block structure, which meant that the more water that was used by a customer, the lower the cost per unit. In 1977, a flat-rate block structure was established with costs fixed regardless of the quantity used. In the year following the drought, an inverted rate structure was adopted and is regularly modified to ensure water conservation and to adequately reflect the high cost of developing new water resources projects.

With the inverted rate structure, each user category has between one and seven rate blocks. The first-rate block, providing up to 600 cubic feet of water, represents the lifeline rate, which is a minimum rate for basic water requirements of customers. For the other rate blocks, rates increase with increased water usage to encourage water conservation.

Sunnyvale's Fiscal Year 2019/2020 Utility Fee Schedule is attached as **Appendix K**.

### 9.2.4 Public Education and Outreach

**City of Sunnyvale Public Information Campaigns**

**Implementation:** The City participates in developing and implementing public information programs. The City also implements outreach programs in the service area. The City will continue to implement public information programs in the future.

**Description:** The City has carried out various public information campaigns in the past and continues to do so. Multi-media advertising has covered topics such as water conservation, urban runoff pollution prevention, water quality, groundwater recharge, water supply, water recycling, watershed and flood protection, and stream stewardship. Efforts included paid advertising, public service announcements, bill inserts/brochures, targeted mailings, website development, social media, community outreach, school programs, and special events. One highlight was for a high efficiency washing machine, encouraging participation in rebate programs, and learning more about the City's conservation efforts. Campaigns have been carried out in various languages including English, Spanish, Vietnamese, and Chinese.

The City also participates by including inserts and information flyers in customer utility bills, and by distributing articles and information in newsletters and reports sent to City residents. All utility bills include a water usage chart comparing current year to previous year usage to help customers who have unknowingly increased their water consumption to check on the cause of the increase.

Sunnyvale also participates in public activities such as the Columbia Health and Safety Fair and Earth Day Celebration. Partnerships with the Public Safety and Community Services departments in activities sponsored by those departments (Pancake Breakfast, Summer Camp) provide more opportunities to reach youth and the public with a message extolling the virtue of water conservation.

The City maintains a water conservation website that provides information on water conservation program incentives and rebates, water conservation tips and tools, drought restrictions, and links to wholesaler water conservation programs or other informative websites.

**City of Sunnyvale School Education Programs**

**Implementation and Description:** The City also has a water pollution and conservation outreach program spearheaded by Sunnyvale's WPCP staff. This program offers tours of the plant, classroom presentations and a creek water education program. Plant tours teach youth about the function of wastewater treatment, water pollution prevention, and water conservation. Oftentimes, the tour is a supplement to a water study module in the classroom, and approximately 50% are repeat tours scheduled year after year by teachers.

The Creek Education program provides watershed, urban runoff, water pollution prevention, storm water, creek education, water conservation and wastewater information to Sunnyvale students at schools in the Cupertino & Sunnyvale school districts. Students take a yearly field trip to Stevens Creek at McClellan Ranch Park after studying water and structures of life courses in class.

Classroom presentations involve a watershed pollution demonstration designed to correlate with the State of California curriculum standards for earth sciences. Subjects covered include water cycle, groundwater, aquifers, water pollution and water conservation.

All City School Education Programs have been halted in 2020 due to the COVID-19 outbreak and in the interest of public health and safety.

**Valley Water Public Information Campaigns**

**Implementation and Description:** Valley Water participates in outreach activities which include multi-media marketing campaigns directed at the diverse county population, website development and maintenance, social media, publications, public meetings, staff participation at community events, interagency partnerships, corporate environmental fairs, professional trade shows, water conservation workshops and seminars, and a speaker's bureau. Outreach efforts focus on supporting customers and key stakeholders to minimize adverse impacts resulting from drought conditions, as well as advancing community knowledge, awareness, and understanding of the conservation and water supply services provided by Valley Water.

Valley Water implemented broad-based advertising programs, participated in community events, collaborated with water retailers to develop outreach materials, and reached non-English speaking residents to ensure they were informed about water issues. Valley Water's multi-ethnic outreach expanded beyond translating existing outreach materials to targeting media stories, coverage, and paid advertisements specifically to their communities.

Valley Water's public outreach efforts also include social media and updates to its water conservation program website (www.watersavings.org). The website is updated throughout the year to include the latest program information, new reports/studies, and updates on our workshops. In addition, Valley Water produced and distributed collateral material, including program flyers, free shower timers and other conservation devices, posters, yard and garden signs, restaurant signs for only serving water upon request, and hotel signs encouraging the occupant to reuse their linens.

The most recent outreach campaign that Valley Water promoted ("Yards Have Evolved") focused on encouraging residents to take out their high-water using plants and replace them with low water using plants. This campaign, which was developed in 2019, featured ads in English, Spanish, Vietnamese and Chinese and included print, online/mobile, social media, and radio ads.

In the spring of 2018, Valley Water embarked on an effort to establish a Community-Based Social Marketing strategy to supplement the Conservation campaign. Community-Based Social Marketing, or CBSM for short, is a strategy designed by behavioral scientists (sociologists, psychologists, etc.) to obtain behavior change by removing barriers and establishing social norms. CBSM was initially designed to enhance sustainable and environmentally conscious behaviors. Valley Water's Conservation CBSM Campaign had two objectives: to increase the number of participants in the Landscape Rebate Program (discussed below) and specifically increase lawn conversions; and to increase the number of Graywater Rebate Program (discussed below) participants. Valley Water employed a variety of outreach methods. An evaluation of these methods is expected to be completed in 2021.

- **Landscape Summit:** Starting in 2016, Valley Water has annually held the Landscape Summit, an event developed through Valley Water's Landscape Committee as a forum for landscape professionals to learn about water issues in the county and California as a whole, and how water relates to the landscaping industry. It is also an opportunity for Valley Water to get valuable feedback from landscape professionals, and for attendees to collaborate and exchange ideas. The 6th Annual Landscape Summit was held virtually on February 25, 2021.

- **Nursery Program:** To increase the public's awareness of water-efficient gardening techniques, Valley Water developed the Nursery Program in 1995. This program distributes, at least quarterly, a series of educational materials to nurseries, irrigation supply stores, and box store retailers throughout the county. To display the materials, the program includes literature racks offering free informational materials about water-wise gardening, efficient irrigation techniques, drought-resistant plants, drip irrigation, and Valley Water's water conservation programs. In future program years, the literature racks may ultimately be replaced or supplemented with digital resources that would not need to be replenished as regularly. The Nursery Program literature is currently being distributed to and displayed at more than 30 participating nurseries and vendors. The display, however, has been placed on a temporary hold due to COVID-19 restrictions.

- **Watershed Approach to Landscaping:** Valley Water is partnering with a vendor to develop a comprehensive sustainable landscaping guide, Watershed Approach to Landscaping, that is targeted toward residential audiences, landscapers, and irrigation professionals new to sustainable landscape practices. This guide will be ready in early 2021 and will cover how-to and best practice information on building a healthy living soil, selecting local, climate-appropriate, water-wise plants, upgrading to high-efficiency irrigation equipment, capturing rainwater, and reusing graywater.

- **Demonstration Gardens:** Demonstration gardens can inspire community members to incorporate sustainable, ecological, or water-wise plants and techniques into their landscaping. Valley Water has maintained a list of water-wise and California-native plant demonstration gardens to help guide community members in converting their own gardens to be more water-efficient. In 2017, Valley Water created an interactive map that is regularly maintained. This map allows anyone to find demonstration gardens near their home or work by entering an address.

  In 2013, Valley Water converted all rotors and sprinklers to in-line drip as part of an on-site demonstration garden on Valley Water's campus. This garden includes plant signs informing the public of the species name and water requirements of the plants on campus. An interactive map, which geotags the labeled plants, was also created for Valley Water's demonstration garden. Visitors can use the interactive map while doing a self-guided walking tour of Valley Water's campus. In the future, Valley Water plans to launch an upgrade of its current demonstration garden to emphasize water-wise, California-native plants and rainwater capture techniques, in addition to efficient irrigation on site.

- **Workshops:** Over the last five years, Valley Water promoted water conservation through workshops and trainings throughout the community. Examples of these include Graywater Laundry to Landscape workshops (discussed below) and presentations to schools, local universities, industry association gatherings, nursery staff, community gardens, native plant society members, corporate events, local Master Gardeners, PG&E's Water Conservation Showcase, and many more. On average, Valley Water conservation staff give about thirty presentations each year.

  Because so many sustainable landscaping events take place throughout Santa Clara County and are sponsored by multiple agencies, Valley Water was instrumental in developing and administering the South Bay Green Gardens website (www.southbaygreengardens.org). This site was started as a place where all the public agencies and organizations in the county could promote their events, workshops, etc. The page has become a one-stop shop for information not just on these events but on all aspects of sustainable landscaping such as pest management, rainwater management, soils and composting, and much more. Valley Water helps fund this site and co-chairs the committee which manages it. The committee includes information about multiple benefits in the site, such as pesticide reduction, water conservation, waste reduction through composting, and stormwater management, to show integration of these issues. Additionally, Valley Water staff update the site and make sure the events pages are current.

- **Bay Area Qualified Water Efficient Landscaper Trainings:** In 2019, Valley Water joined with other Bay Area water agencies and the California Water Efficiency Partnership (CalWEP) to create the Bay Area Qualified Water Efficient Landscaper Training (BayQWEL). This regional effort is a professional certification program designed for landscape designers, landscape supervisors, maintenance and irrigation technicians, and park maintenance staff with a focus on water-saving sustainable landscaping techniques. The trainings were initially offered in-person from 2019 to early 2020 in English and Spanish, then adapted to an online curriculum following COVID-19 Shelter-in-Place restrictions later in 2020. Those who become QWEL certified by passing the exam and completing the irrigation audit will be listed as an industry pro on the QWEL website. A total of four online trainings have been offered in 2020, with two more scheduled for early 2021. Additional classes will be scheduled throughout 2021, including the first online Spanish version in March.
- **Going Native Garden Tour:** To showcase exemplary native plant gardens, Valley Water has been a sponsor of the Going Native Garden Tour every spring since 2003. Each year, thousands of participants visit upwards of 60 gardens. These native plant gardens demonstrate the beauty and efficiency of well-maintained native gardens to residents of Santa Clara and San Mateo counties. In addition to showcasing native plants, at least one garden offers native plants for sale each year. In 2020, the tour went completely online, with live garden tours which subsequently were posted as videos online.
- **Community Events:** Each year, Valley Water staffs education booths and activities at public events, libraries, and STEAM (Science, Technology, Engineering, the Arts and Mathematics) fairs, providing water education to over 12,800 members of the public. During 2020, Valley Water's Education Outreach program developed a series of virtual presentations and transformed ten hands-on programs into distance-learning presentations. This has enabled Valley Water to continue to engage with public audiences and deliver water education during the COVID-19 pandemic.

<u>**Valley Water School Education Programs**</u>

**Implementation and Description:** Valley Water's Education Outreach (EO) program was established in 1995 and has a team of two full-time and 4 part-time staff and student interns that develop and implement water education programs. EO provides free grade-level appropriate classroom presentations, puppet shows, and tours of Valley Water facilities to schools, visitor groups and residents within Santa Clara County. The objective is to educate pre-school through college students and residents about water with a focus on water conservation, water supply, watershed stewardship, pollution reduction, flood preparedness, and careers in the water field. EO also provides free education materials to educators, including workbooks and videos, as well as providing hands-on water education training. These educator trainings include both Project

WET (Water Education for Teachers) and EO programs that enable educators to lead their own classroom activities to inform their students on water-related topics.

Over the last five years, Valley Water's EO program has reached an average of 15,000 students per year, engaging a total of 75,698 students between 2016 – 2020. EO has supported over 2,900 educators through classroom presentations and tours and provided 20 educator trainings that focus on hands-on water-based science. Students from over 2,300 classrooms have participated in hands-on, Next Generation Science Standards-aligned programs and tours of Valley Water's Outdoor Classrooms and facilities. Examples include lessons using puppet shows and storytelling for pre-K and early elementary students and using hands-on science activities and career development information for middle school, high school, and college students.

### 9.2.5 Programs to Assess and Manage Distribution System Real Loss

**Implementation:** The City continuously implements water audits and leak detection and repair for the water distribution system. In addition to City staff continuously monitoring the water distribution system through SCADA technology and field inspections, the City also implements a leak detection program. The City expects this to be an ongoing program.

**Description:** To fulfill this measure, all accounts within the City service area are metered. The City also offers help to its residential customers in determining if a leak exists at the property. Water Meter Readers report leaky meters or water meters running when a residence does not appear to be occupied so that a technician can be dispatched to investigate and make repairs as needed.

Additionally, a leak detection company conducts annual inspections of distribution pipeline. The length of pipe inspected annually is a determined by the City. The leak detection contractor generates a condition assessment report for the inspected pipeline, and reported leaks are promptly remediated by City staff or a hired contractor. These programs have helped the City attain lower-than-average system losses.

### 9.2.6 Water Conservation Program Coordination and Staffing Support

**Implementation and Description:** Since 1999, the City's regular staffing has included an Environmental Programs Specialist position (formerly Environmental Outreach Coordinator) whose scope has included education, outreach, and implementation of programs for water conservation. The current Environmental Programs Specialist's information is provided below. It is expected that there will continue to be a staff member whose scope includes water conservation programs.

**Environmental Programs Specialist:**

Name: Elizabeth Greenfield
Title: Environmental Programs Specialist, Environmental Services Department
Address: City of Sunnyvale
Sunnyvale Office Center (SOC)
505 W. Olive Ave., Suite 115
Sunnyvale, CA 94086
Phone: (408) 730-7728
Email: egreenfield@sunnyvale.ca.gov

### 9.2.7 Other Demand Management Measures

**Residential Programs**

**Implementation and Description:** The Water Wise House Call Program was first implemented in July of 1998 as a pilot program. Since then, there have been multiple residential programs administered by Valley Water to meet the region's long-term water conservation goals. The City shares the cost to support these programs. The implementation of each program is described below:

- **Water Use Reports:** Water use reports have been shown to be effective at encouraging residents to save water and when combined with Advanced Metering Infrastructure, can inform residents about water leaks quickly. In Fiscal Year 2013-14, Valley Water started a program to share costs with the local water retailers City of Palo Alto Utilities Department, City of Santa Clara Water Department, City of Morgan Hill, Gilroy Community Services Department, and San José Municipal Water System on home water use reports. Since the start of this cost sharing program, over 620,000 sites have received water use reports. Valley Water plans to continue to share in the cost of various programs that benefit customers.
- **Water Wise House Call Program:** Valley Water is the administrator for the City and County residential Water Wise Survey Program, formerly known as the Water Wise House Call Program. As the administrator of this program, Valley Water developed and implemented a strategy to target and market water-use surveys to single-family and multi-family residential customers throughout most of Santa Clara County including the City. Between 1998 and 2017, Valley Water performed more than 46,456 residential audits through the Water Wise House Call Program.

  Valley Water's program included educating the customer on how to read a water meter; checking flow rates of showerheads, faucet aerators, and toilets; installing low-flow showerheads, faucet aerators and toilet flappers if necessary; checking for leaks; checking the irrigation system for efficiency (including leaks); measuring landscaped area; developing an efficient irrigation schedule for different seasons; and providing the customer with evaluation results, water savings recommendations, and other educational materials. In 2004, Valley Water began programming a homeowner's controllers as well (i.e., if allowed by the homeowner, the surveyor will input the recommended schedules into the controller). Valley Water increased program efficiency and participation by using landscape measurements from this program as an initial qualifying step for the Landscape Rebate Program, for those who chose to participate in both programs.

In 2017, Valley Water's free water audit program was replaced by a two-part program, the Water Wise Survey Program. The two-part program offers in-person Water Wise Outdoor Surveys and Do-It-Yourself (DIY) Water Wise Indoor Surveys, as described below.

- **Water Wise Survey Program:** The outdoor portion of the Water Wise Survey Program is similar in concept to the Water Wise House Call Program's outdoor water audit. Water Wise Outdoor Survey Program offers a free, comprehensive consultation from a trained irrigation professional to single-family and small multi-family sites (under ½ acre of landscape area) in Santa Clara County, including the City, with a working irrigation system. The consultation includes evaluating the irrigation system, flagging issues onsite, identifying rebate programs for which participants may also qualify, and creating a custom report detailing the survey findings. Since it launched in 2017, Valley Water performed more than 650 residential Water Wise Outdoor Surveys.

  The DIY Water Wise Indoor Surveys Program offers free showerheads, aerators, and toilet flappers to anyone who completes a companion survey form. A physical kit is available in English, Spanish, Chinese, and Vietnamese; additionally, a virtual kit is available. Companion videos are offered to guide customers through the DIY survey steps. Customers must first share their current fixtures that are high water use before Valley Water sends them a free low-flow device. Due to low response rates, Valley Water may cease this requirement to encourage greater participation in this program. The DIY kits are available to single-family and multi-family residential properties throughout Santa Clara County, including the City. More than 1,430 kits have been distributed by Valley Water since 2017.

- **Fixture Distribution:** Valley Water also distributes high-quality, low-flow showerheads and faucet aerators to community members through water retailers, including the City, and public events. Since program inception in 1992, more than 375,000 low-flow showerheads and aerators have been distributed throughout the county, including over 35,000 in the last five years.

  Valley Water plans to continue offering free showerheads and aerators through its DIY Water Wise Indoor Surveys, its water retailers, and various outreach events to meet the region's long-term water conservation goals.

**Residential Plumbing Retrofit**

**Implementation:** This program was first implemented in 1992. It is an active program administered by Valley Water. The City also implements the program and shares the cost to support this program. The City plans to continue offering free showerheads and aerators both directly and through the District's Water-Wise House Call Program.

**Description:** The City and Valley Water distribute high-quality, low-flow showerheads and faucet aerators to single-family and multi-family residents as the implementation of the residential plumbing retrofits program. The City makes low-flow showerheads and aerators available to residents free of charge and to date has directly distributed thousands of units to interested parties.

**Large Landscape Conservation Programs and Incentives**

**Implementation and Description:** Large landscape conservation programs are administered by Valley Water. All programs described below are currently active and are expected to continue to be implemented in the future.

- **Large Landscape Program:** The Large Landscape Program (formerly known as the Landscape Water Use Evaluation Program or LWUEP) launched in May 2014. All sites enrolled in the program receive a monthly water usage report. The reports provide an objective evaluation of a site's water use "at a glance" for every billing period. Various data inputs, including irrigated area, vegetation types, type of irrigation system, and daily weather (evapotranspiration minus effective rainfall) are included in a detailed calculation to develop the water budgets. Sites are encouraged to share the monthly reports with everyone involved in landscape decision making at the site, including the bill payer, site manager, landscape contractor and board members. Sites are also eligible to receive a complimentary on-site landscape field survey by an irrigation expert and receive a thorough investigation of the site's irrigation issues.

  A total of 557 sites were enrolled in the program at its outset from the following water retailer service areas: Cities of Gilroy, Mountain View, Palo Alto, Sunnyvale, and Santa Clara. By the end of mid-2015, 1,050 sites were active in this program. In 2020, there are 3,000 active sites that include both potable and recycled water landscapes. Representing 91% of Valley Water's service area, the full list of participating water retailers includes the original five service areas mentioned above as well as the Cities of Milpitas and Morgan Hill, San José Municipal Water, and San Jose Water. Nearly 122,000 water-use reports and monthly budgets have been distributed. Valley Water's vendor works closely with participating water retailers to market and leverage the services offered through this program for participating sites.

  As of the end of 2019, the sites enrolled in Valley Water program were saving 31% on irrigation usage compared to 2013 usage. Valley Water will continue to offer and expand this program in the future to reach the region's long-term water conservation goals, particularly with regards to opportunities for this program to assist compliance with elements of AB 1668/SB 606.

- **Large Landscape Surveys:** Analogous to Water Wise Outdoor Surveys offered through the landscape portion of the Water Wise Survey Program, Valley Water has offered and provided large landscape water surveys in the county since 1994. Landscape managers have been provided water-use analyses, scheduling information, in-depth irrigation evaluation, a site-specific water budget, and recommendations for affordable irrigation upgrades. Each site received a detailed report upon completion of the survey. An annual report is produced to recap the previous year's efforts. Previously a stand-alone program, starting in 2015 the program was offered through the Large Landscape Program.

  This highly successful and well-received program has conducted nearly 1,820 surveys through 2020. Participants from this program are encouraged to participate in the Landscape Rebate Program (discussed below). Valley Water plans to continue to offer and expand this program in the future to reach the region's long-term water conservation goals.

- **Landscape Rebate Program:** Valley Water began to focus on water efficient landscapes by launching a version of the program in early 2005. The original program offered rebates to residential and commercial sites for the replacement of approved high-water using landscape with low water use plants, mulch, and permeable hardscape. Participants could receive up to $0.75 per square foot of irrigated turf grass with a maximum rebate of $1,000 and $10,000 for residential and commercial sites, respectively. To expedite program participation, Valley

Water's Board approved doubling the maximum rebate from $1,000 to $2,000 for residents and from $10,000 to $20,000 for commercial sites in March 2009. The rebate cap for commercial, institutional, and multi-family (5 or more units) sites was then increased to $50,000 on January 1, 2020. Cost sharing agreements increase the rate per square foot and rebate cap in some areas.

Currently, any qualified property in Santa Clara County with qualifying high-water using landscape can receive rebates for converting to qualifying low water using landscape with a minimum of 50% qualifying plant coverage; 2 to 3 inches of mulch; and a conversion from overhead irrigation to drip, micro spray, bubbler, or no irrigation. In January 2014, the Landscape Conversion rebate was increased from $0.75 per square foot (sq ft.) to $1.00 per sq ft. However, in April of 2014 in direct response to the drought, Valley Water's Board approved adding funding to the program to support a rebate of $2.00 per sq ft. with no maximum rebate. On July 1, 2016, the rebate rate returned to $1/sq ft. and the rebate caps were reinstituted.

Valley Water continued to experience unprecedented increases in terms of rebate amounts as well as participation and interest from the community through the end of the drought and into FY2020. From July 2015 to June 2020, over $14.3 million dollars was rebated for approximately 8.3 million square feet of conversion. Through June 2020, Valley Water has rebated for over 12.7 million square feet of landscape conversion. Valley Water plans to continue to offer this rebate in the future to reach the region's long-term water conservation goals.

In January of 2019, Valley Water added Rainwater Capture Rebates to the Landscape Rebate Program. Customers now can receive rebates for the installation of rain barrels, cisterns, and rain gardens. Since the start of the Rainwater Capture Rebates, rainwater has been diverted from nearly 20,000 square feet of roof area into qualifying rain gardens, 165 rain barrels have been installed, and cisterns with a total combined capacity of over 33,000 gallons have received a rebate.

- **Lawn Busters Program:** In September 2015, Valley Water executed an Agreement with Our City Forest (OCF), a local non-profit organization, to provide $340,000 to fund OCF's Lawn Conversion Program (Lawn Busters Program). Lawn Busters Program is designed to provide a low cost, expedient option for low-income, elderly, disabled or veteran homeowners and institutions within disadvantaged communities throughout Santa Clara County who wish to convert their lawns to low-water using landscape. In targeting these hard-to-reach sectors, the Lawn Busters Program is intended to help Valley Water meet its short-term drought response goals as well as its long-term water conservation goals. By partnering with OCF, Valley Water combines resources and implements the program more cost-effectively than would be possible otherwise.

  Since the start of the Lawn Busters Program, Valley Water added $110,000 to the contract, for a total of $450,000, and OCF has converted roughly 200,000 square feet of lawn to low-water using landscape.

- **Landscape Maintenance Consultation Program:** The Landscape Maintenance Consultation Program, started in May of 2018 by Valley Water, was developed based on recommendations from Valley Water's Landscape Committee to help Landscape Rebate Program participants learn how to properly maintain their newly converted low water use gardens. To date, 715 residential rebate customers have participated in the program. During the free, one-hour consultation, the customer has an opportunity to walk through their garden with a landscape professional, reviewing site specific recommendations for plant maintenance and pruning, soil health, pest management, and irrigation scheduling and maintenance. The

Landscape Maintenance Consultation Program will continue to be offered to new rebate program participants whose gardens are at least one year established.

The City also issued Ordinance No. 19.37 regulating conservation in landscaping. This ordinance applies to all new and rehabilitated landscaping for public agency projects and private development projects that require a permit, as well as developer-installed landscaping in single-family and multi-family projects. A copy of this ordinance is included in **Appendix J**.

**High Efficiency Toilet Rebate Program**

**Implementation:** This program was first implemented by Valley Water in 1992 and was active through 2003. Beginning in 2004, Valley Water began implementing a High Efficiency Toilet (HET) program as described below. The program was phased out in 2016 to reprioritize funds to other programs with greater opportunities for water savings.

**Description:** Between 2004 (the first year of the program) and 2013, Valley Water rebated approximately 16,000 HETs. In response to the State of California's new requirement that all toilets sold or installed in the state flush at 1.28 gallons per flush (gpf) or less, January 2014 marked the beginning of Valley Water's strictest standard yet for HETs to qualify for the rebate program - only Premium HETs would qualify for the $125 rebate. Premium HETs save nearly 15% more water than the state standard of 1.28 gpf by using only 1.1 gpf with superior flush performance (at least 600 grams per flush as evaluated by an independent group under standardized conditions).

Between 2004 and 2016, Valley Water issued over 26,400 HET rebates in total since this iteration of Valley Water's high-efficiency toilet rebate began in 2004.

**Graywater Landscape Irrigation Rebates and Incentives**

**Implementation:** This program has been active since 2014 and is offered to residential customers interested in using graywater from laundry machines to irrigation landscape at their homes.

**Description:** In the last five years, Valley Water issued 40 graywater rebates (launched in 2014) and funded the direct installation of 71 graywater systems (launched in 2019). Since the program launched, 124 total graywater systems have been installed.

Valley Water's Graywater Laundry to Landscape (L2L) Rebate Program rebate amount started at $100 in 2014, and in response to the drought, increased to $200 a few months later. In addition to providing a rebate for properly connecting a clothes washer to a laundry-to-landscape system, the graywater program also provides information, resources, and workshops on graywater. Resources include maintenance steps, detergent information, finding contractors, increasing awareness of local nonprofit organizations that specialize in graywater, and educating constituents on important factors to consider with more complicated graywater systems (e.g., branched-drain graywater and whole house graywater systems) even though rebates for those options are not currently offered.

Graywater use in irrigated landscapes decreases potable water use by approximately 17 gallons per person per day or 14,565 gallons per household (on average), depending on the site and system design. California Plumbing Code (CPC) does not require a permit for installing an L2L system. However, the CPC is specific as to how L2L systems can be installed, and Valley Water's rebate's eligibility requirements are framed to meet those specifications. Additionally, to protect public health and safety, prior to giving project approval, Valley Water checks each applicant's property's depth to groundwater. At post inspections, applicants must demonstrate adherence to the CPC's specifications to help ensure graywater does not pool or drain to their neighbors' properties.

In 2019, Valley Water in partnership with a local non-profit organization, Ecology Action, launched a training program for landscape professionals and a Graywater Direct Installation Program for underserved community members, including low-income individuals, people 60 years or older, US veterans, and people with disabilities. The Green Gardener Graywater Installer Certification Program trained 20 professionals to install L2L graywater systems. Between June 2019 and June 2020, the direct installation service assessed 307 properties and installed 71 L2L graywater systems. Over 31,660 square feet of medium- and high-water use landscapes were converted from potable irrigation to graywater.

<u>**Rain Barrel Rebate Program**</u>

**Implementation:** This program began in October 2014 in partnership with BAWSCA to offer rebates to user of rain barrel as part of encouraging using alternative water sources for landscaping water needs.

**Description:** Sunnyvale will offer $50 rebates per barrel up to two barrels per household or four for commercial properties. Owners are responsible for installing the barrels according to program guidelines including screening to prevent mosquito breeding.

<u>**Conservation Programs for Commercial, Industrial, and Institutional (CII) accounts**</u>

**Implementation and Description:** Since 1992, Valley Water has implemented various programs targeting CII customers for water efficiency outreach and education. Both the City and Valley Water expect to continue the programs in the future, with the potential for minor changes based on technological advancements. The initiatives and programs implemented to increase water efficiency in the CII sectors are described below.

- **Commercial Toilet and Urinal Programs:** Valley Water has been replacing inefficient toilets in CII sites since 1994. The CII toilet rebate programs have frequently been offered in tandem with various iterations of high-efficiency urinal (HEU) programs, HET and HEU direct install programs, and retrofit programs for urinal valve installation. Since July 2015, over 7,300 HETs were installed or rebated. Additionally, since 2005, Valley Water has had a program to replace urinal flush valves of old, inefficient 1.0 gpf or more urinals with a flush valve that uses only a 0.5 gallon per flush. Since the program was started, approximately 2,580 urinals had been retrofitted or rebated, with 464 installed in the last five years.

  To increase efficiency and cost effectiveness, Valley Water created a successful pilot program in 2020 which replaced 59 higher (1.6) gpf toilets with 0.8 gpf toilets in a low-income apartment complex. This pilot will serve as the basis for a new Fixture Replacement Program to launch in 2021 to replace or retrofit toilets, urinals, and more for multi-family residences and commercial, industrial, and institutional properties.

- **Pre-Rinse Spray Valve (PRSV) Retrofit Program:** Pre-rinse spray valves are designed to remove food waste from dishes prior to dishwashing and are often used in commercial kitchens. In previous years, Valley Water partnered with other agencies to offer a direct installation program for high-efficiency pre-rinse spray valves (PRSVs). In 2010 Valley Water purchased a quantity of PRSVs with a flow rate of 1.15 gallons per minute for distribution to commercial sites, especially those identified through Valley Water's previous CII Water Survey Program. Since July 2015, nearly 360 pre-rinse spray valves were retrofitted, and nearly 4,950 have been installed since Valley Water began promoting these devices in 2003. Valley Water plans to continue distributing these devices to meet the region's long-term water conservation goals.

- **Commercial Faucet Aerator Program:** Since 2010, Valley Water has offered free 0.5 gallon per minute faucet aerators to qualifying businesses and schools. Nearly 26,800 faucet aerators have been distributed through this program, with 18,143 being distributed during the last five years. Much of the recent distribution is due to a direct distribution program called WaterLink, discussed below.
- **WaterLink Program:** In collaboration with Ecology Action, Valley Water funded a program called WaterLink, a water/energy savings program that provided turnkey water/energy upgrades to residents, businesses, schools, and public agencies throughout Santa Clara County. Efforts were focused within Disadvantaged Community Census tracts (defined by scoring 76% and above using California Environmental Screening Tools version 2.0). To achieve significant water and energy savings, the WaterLink program delivered a suite of direct installation projects that produced persistent water/energy savings and tangible economic benefits by reducing utility bills. Direct installation equipment included efficient showerheads and aerators, clothes washers, pre-rinse spray valves, and ozone laundry systems. Additionally, the program included replacing turfgrass with low water using landscape. The WaterLink program has concluded.
- **Water Efficient Technology Rebate Program:** The Water Efficient Technology Rebate (WET Rebate or WET Program; formerly known as the Custom/Measured Rebate Program) provides rebates for process, technology, and equipment retrofits that save water. To encourage all commercial and industrial businesses to implement permanent water reduction measures, unique projects that meet program requirements are eligible for a rebate of either $4 per hundred cubic feet (CCF) of water saved or 50% of equipment costs excluding taxes and labor, whichever is less, up to $50,000. Projects must save at least 100 cubic feet of water annually. Examples of such projects are generally unique to specific industries such as ozone laundry systems or technologies to reduce potable water use when maintaining ice rinks, with myriad other examples. In January 2014, these rebates were temporarily increased to $8 per CCF to promote participation during the drought before returning to $4/CCF. Cost sharing agreements increase the rate and maximum rebate in some areas.

  To date, Valley Water has funded 110 projects, saving approximately 680,663 CCF/year (1,563 AFY). Since 2015, the WET Rebate has helped save over 28,440 CCF per year from 12 completed projects. In 2021, Valley Water will adjust the program so that the rebate will be based on either the lesser of $4/CCF or up to 100% of equipment costs excluding taxes and labor, up to $100,000. This doubles the potential proportion of equipment costs covered by the rebate in addition to doubling the maximum rebate. The WET Rebate continues to be one of Valley Water's most cost-effective programs in meeting the region's long-term water conservation goals.

**Regional Water Conservation Program**

BAWSCA manages a Regional Water Conservation Program comprised of several programs and initiatives that support and augment member agencies and customers' efforts to use water more efficiently. These efforts extend limited water supplies that are available to meet both current and future water needs; increase drought reliability of the existing water system; and save money for both the member agencies and their customers.

The implementation of the Regional Water Conservation Program builds upon both the Water Conservation Implementation Plan (WCIP, completed in September 2009) and the Regional Demand and Conservation Projections Project (Demand Study, completed in June of 2020). These efforts include both Core Programs (implemented regionally throughout the BAWSCA service area) and Subscription Programs (funded by individual member agencies that elect to participate and implement them within their respective service areas).

BAWSCA's Core Conservation Programs include organizing classes open to the public on topics such as water efficient landscape education and water-wise gardening, assistance related to automated metering infrastructure, and other associated programs that work to promote smart water use and practices. BAWSCA's Subscription Programs include numerous rebate programs, educational programs that can be offered to area schools, technical assistance to member agencies in evaluating water loss, and programs to train and certify contractors employed to install water efficient landscape. In total, BAWSCA offers 22 programs to its member agencies and that number continues to grow over time.

Each fiscal year, BAWSCA prepares an Annual Water Conservation Report that documents how all BAWSCA's 26 member agencies have benefitted from the Core Conservation Programs. Additionally, the report highlights how all 26 member agencies participate in one or more of the Subscription Programs offered by BAWSCA, such as rebates, water loss management and large landscape audits. The Demand Study indicates that through a combination of active and passive conservation, 37.3 MGD will be conserved by BAWSCA's member agencies by 2045.

## 9.3 Reporting Implementation

### 9.3.1 Planned DMM Implementation

The City plans to continue to offer the current DMM suite of programs over next five years to achieve water use targets. Every year the City evaluates programs for cost effectiveness and may discontinue certain rebate or incentive programs to be replaced with new programs to target certain water savings. The City may promote programs based on popularity or demand, for example the rain barrel rebate program will likely be promoted until funds are exhausted.

### 9.3.2 Evaluation of Effectiveness

Evaluating the effectiveness of a single DMM is difficult and generally not cost-effective for the City, so each program is not necessarily monitored separately for effectiveness and water savings. Evaluating the effectiveness of all DMMs collectively provides a better representation and can be translated into overall water conservation savings. The City will use countywide water savings tracked by Valley Water to evaluate the effectiveness of overall implementation efforts by both the City and Valley Water.

## 9.4 Water Use Objectives (Future Requirements)

In 2018, California legislature and Governor Brown passed into law SB 606 (Hertzberg) and AB 1668 (Friedman) which were attributed from the Making Water Conservation a Way of Life Executive Order from 2016. The purpose of these bills was to improve water conservation and drought planning through the development of new standards for indoor residential water use; outdoor residential water use; commercial, industrial, and institutional water use for landscape irrigation with dedicated meters; and water loss. These standards are currently in development by the DWR and SWRCB, and retail water suppliers will be required to stay within annual water budgets based on the standards for their service area.

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# SECTION 10 – PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

This 2020 UWMP and WSCP were prepared in 2020-2021 in accordance with the Guidebook. Both plans were adopted on June 29, 2021 by City Council. This section describes the steps taken by the City to meet the requirements of the Water Code pertaining to public availability, adoption, submittal, and implementation of the 2020 UWMP and WSCP.

## 10.1 Inclusion of All 2020 Data

The 2020 UWMP and WSCP include all data for water use and planning for the calendar year of 2020.

## 10.2 60-Day Notification

The Water Code states that cities and counties must be notified that the Supplier will be reviewing the UWMP and considering amendments to the Plan. This notice must be sent at least 60 days prior to the public hearing. The City provided notices to the agencies listed below in **Table 10-1**.

A copy of the notification is included in **Appendix A.**

## 10.3 Notice of Public Hearing

The public hearing notice for the 2020 UWMP and WSCP was sent to the cities and counties listed in **Table 10-1** and prior to the public hearing. Three notices were posted in the Sunnyvale Sun to inform the public of the upcoming public hearing. The notices include the time and place of the hearing, as well as locations where the plans were made available for public inspection. The first notice was published on May 21, 2021, the second on May 28, 2021, and the third on June 4, 2021. A copy of the notice is included in **Appendix A**.

**Table 10-1: Notification to Cities and Counties**

| City Name | 60 Day Notice | Notice of Public Hearing |
|---|---|---|
| City of Hayward | ☑ | ☑ |
| City of Milpitas | ☑ | ☑ |
| City of Mountain View | ☑ | ☑ |
| City of Palo Alto | ☑ | ☑ |
| City of Santa Clara | ☑ | ☑ |
| City of Brisbane | ☑ | ☑ |
| City of Burlingame | ☑ | ☑ |
| City of Daly City | ☑ | ☑ |
| City of Menlo Park | ☑ | ☑ |
| City of Millbrae | ☑ | ☑ |
| City of Redwood City | ☑ | ☑ |
| City of San Bruno | ☑ | ☑ |
| City of East Palo Alto | ☑ | ☑ |
| City of San Jose | ☑ | ☑ |
| City of Foster City | ☑ | ☑ |
| **County Name** | **60 Day Notice** | **Notice of Public Hearing** |
| Alameda County | ☑ | ☑ |
| Santa Clara County | ☑ | ☑ |

The draft plans were made available for the community and posted on the City's website (www.sunnyvale.ca.gov) on May 13, 2021. Copies of all public notices of the hearing are included in **Appendix A**.

## 10.4 Public Hearing and Adoption

The public hearing for consideration and adoption of the 2020 UWMP and WSCP by the City Council took place on June 29, 2021 during a normal City Council session. The session began with the public hearing to allow community input prior to the formal adoption of both plans by City Council. All public input received was considered before final adoption of both documents. The adopted resolution is included in **Appendix L**.

## 10.5 Plan Submittal

Upon adoption of the 2020 UWMP and WSCP by City Council, implementation took place as identified in this document. Submission of the adopted plans to DWR was done electronically within 30 days from the date of adoption, and no later than July 1, 2021.

## 10.6 Public Availability

The adopted UWMP and WSCP were posted on the City's website (www.sunnyvale.ca.gov) within 30 days of submission to DWR and were submitted to the California State Library.

## 10.7 Amending an Adopted UWMP and WSCP

The City's 2020 UWMP and WSCP will only be modified following notification, public hearing, adoption, and submittal as prescribed in the Water Code.

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**APPENDIX A**

City of Sunnyvale

2020 Urban Water Management Plan

Postings and Notifications for UWMP and WSCP Preparation

**From:** Mansour Nasser <MNasser@sunnyvale.ca.gov>
**Sent:** Tuesday, February 2, 2021 11:18 AM
**To:** leonard.ash@acwd.com; laura.hidas@acwd.com; jflanagan@ci.brisbane.ca.us; rbreault@ci.brisbane.ca.us; tmcauliffe@burlingame.org; amorimoto@burlingame.org; kjenkins@calwater.com; dsmithson@calwater.com; rmoilan@calwater.com; cbrennan@coastsidewater.org; mrogren@coastsidewater.org; gkrauss@dalycity.org; wdonnelly@dalycity.org; pheisinger@cityofepa.org; NDORAIS@fostercity.org; alex.ameri@hayward-ca.gov; pwillis@hillsborough.net; phlowe@menlopark.org; TammyR@midpeninsulawater.org; klim@ci.millbrae.ca.us; tndah@ci.milpitas.ca.gov; Lisa.Au@mountainview.gov; acarr@nccwd.com; philw@purissimawater.org; watermanager@redwoodcity.org; jtan@sanbruno.ca.gov; Jeffrey.provenzano@sanjoseca.gov; gwelling@santaclaraca.gov; Aaron Baker <ABaker@valleywater.org>; Angela Singer <asinger@hydroscience.com>; JuliaNN@stanford.edu; dbarrow@westboroughwater.com; nsandkulla@bawsca.org; sritchie@sfwater.org; aakastama@sfwater.org; jasneet.sharma@ceo.scccgov.org; striolo@sfwater.org; kfallaha@cityofepa.org; asmith@fostercity.org; Cheryl.Munoz@hayward-ca.gov; ecooney@hillsborough.net; ctlamm@menlopark.org; rramirez@midpeninsulawater.org; SReider@ci.millbrae.ca.us; Elizabeth.flegel@mountainview.gov; samv@purissimawater.org; jchapel@redwoodcity.org; MReinhardt@sanbruno.ca.gov; henry.louie@sanjoseca.gov; smehta@SantaClaraCA.gov; Bmanning@stanford.edu; Ramana Chinnakotla <RChinnakotla@sunnyvale.ca.gov>; ctang@bawsca.org; aschutte@hansonbridgett.com; kramey@bawsca.org; nashoori@bawsca.org; dmcpherson@bawsca.org; tfrancis@bawsca.org; Enderby, Christine <Christine.Enderby@CityofPaloAlto.org>; Joseph DeLaCruz <JDeLaCruz@sunnyvale.ca.gov>
**Subject:** City of Sunnyvale-Notice of Preparation of the 2020 Urban Water Management Plan

Sunnyvale

February 2, 2021

**Re: Notice of Preparation of City of Sunnyvale's 2020 Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP)**

The Urban Water Management Plan Act (California Water Code §10608-10565) requires the City of Sunnyvale to update its UWMP every 5-years. The City is currently reviewing its UWMP and WSCP, which were both last updated in 2016 and is considering revisions separately to each plan. The purpose of this notice is to formally invite your Agency to participate in this process.

A draft of the 2020 UWMP and WSCP will be made available for public review shortly and a public hearing will be held later this year to officially adopt both the UWMP and WSCP plans once finalized. In the meantime, if you would like more information on our 2020 UWMP or WSCP, the schedule for preparing these reports or have additional questions please contact me.

Sincerely,

**Mansour Nasser P.E.**
Water & Sewer Division Manager
City of Sunnyvale
221 Commercial Street
Sunnyvale, Ca 94088-3707
Direct: 408-730-7578
*mnasser@sunnyvale.ca.gov*

**PUBLIC NOTICE**

**URBAN WATER MANAGEMENT PLAN AND WATER SHORTAGE CONTINGENCY PLAN**

The City of Sunnyvale is in the process of updating the 2015 Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP) for 2020. City Council will conduct a public hearing and consider adoption of the 2020 UWMP and WSCP at their regularly scheduled meeting on:

**Tuesday, June 29, 2021, at 7 P.M. or shortly thereafter.**
**City Council Chambers − Sunnyvale City Hall**
**456 W. Olive Ave.**

Beginning in Mid-May of 2021, an electronic copy of the draft 2020 UWMP and WSCP will be available for review online at the City's website at *www.sunnyvale.ca.gov*. A public hearing will be held with members of City staff at the beginning of the meeting on June 29, 2021, to answer questions and gather ideas from residents and interested stakeholders regarding the contents of the final plan.

The final 2020 UWMP and WSCP will be posted on the City's website (www.sunnyvale.ca.gov) and submitted to the California State Library. To request a copy of the 2020 UWMP and WSCP upon their completion, or if you have any questions or comments, please contact:

**Mansour Nasser**
**P.O. Box 3707**
**Sunnyvale, CA 94088-3707**
**(408) 730-7578**
***MNasser@sunnyvale.ca.gov***

Please note that parties requesting paper copies of the plan may incur associated printing costs.

Mansour Nasser P.E.
Water & Sewer Systems Division Manager

cc: City Council
Department Directors

# The Sunnyvale Sun

c/o Bay Area News Group
4 N. 2nd Street, Suite 700
San Jose, CA 95113

2083317

CITY OF SUNNYVALE
CITY OF SUNNYVALE
ACCOUNT PAYABLE DEPT
PO BOX 3707
SUNNYVALE, CA 94088

**PROOF OF PUBLICATION**
**State of California**
**County of Santa Clara**

**FILE NO. BL007177:J.Badieri-Hearing 2015 UWMP for 2020**

I am a citizen of the United States. I am over the age of eighteen years and I am not a party to or interested in the above entitled matter. I am the Legal Advertising Clerk of the printer and publisher of the Sunnyvale Sun, a newspaper published in the English language in the City of Sunnyvale, County of Santa Clara, State of California.

I declare that the Sunnyvale Sun is a newspaper of general circulation as defined by the laws of the State of California as determined by court decree dated September 22, 1994, Case Number CV742853. Said decree states that the Sunnyvale Sun is adjudged to be a newspaper of general circulation for the City of Sunnyvale, County of Santa Clara and State of California. Said order has not been revoked.

I declare that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

**05/21/2021, 05/28/2021, 06/04/2021**

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated: June 4, 2021

Public Notice Advertising Clerk

Legal No. **0006576175**

**CITY OF SUNNYVALE**

**NOTICE OF PUBLIC HEARING**

The City of Sunnyvale is in the process of updating the 2015 Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP) for 2020. City Council will conduct a public hearing and consider adoption of the 2020 UWMP and WSCP at their regularly scheduled meeting on:

**Tuesday, June 29, 2021, at 7 P.M. or shortly thereafter.**

You may provide audio public comment by connecting to the teleconference meeting online or by telephone. Use the Raise Hand feature to request to speak (*9 on a telephone):

Meeting online link: https://sunnyvale-ca-gov.zoom.us/j/96111580540

Meeting call-in telephone number: 833-548-0276 |
Meeting ID: 961 1158 0540

An electronic copy of the draft 2020 UWMP and WSCP is available for review online at the City's website at www.sunnyvale.ca.gov. A public hearing will be held with members of City staff on June 29, 2021, to answer questions regarding the contents of the final plan.

The final 2020 plan will be posted on the City's website (www.sunnyvale.ca.gov) and submitted to the California State Library. To request a copy of the 2020 UWMP and WSCP upon their completion, or if you have any questions or comments on the draft plan, please contact:

**Mansour Nasser**
**Water & Sewer Systems Division Manager**
**P.O. Box 3707**
**Sunnyvale, CA 94088-3707**
**(408) 730-7578**
**MNasser@sunnyvale.ca.gov**

Please note that parties requesting paper copies of the plan may incur associated printing costs.
**SV#6576175; May 21,28,June 4, 2021**

**APPENDIX B**

City of Sunnyvale

2020 Urban Water Management Plan

City of Sunnyvale Detailed Demographic Data

# American Community Survey

Data Profiles
Narrative Profiles
Geographic Comparison Tables
Subject Tables
Ranking Tables
Supplemental Tables
Data.census.gov
More ACS Tools & Apps
Back to Data Tables & Tools

## 2015—2019 ACS 5-Year Narrative Profile
## Sunnyvale City, California

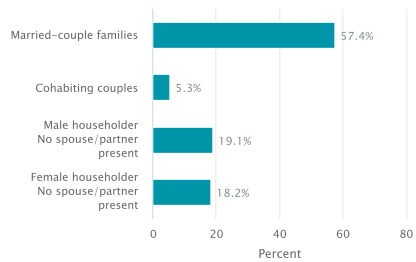
### Households and Families

In 2015-2019, there were 56,103 households in Sunnyvale city, California. The average household size was 2.71 people.

Married-couple households made up 57.4 percent of the households in Sunnyvale city, California while cohabiting couple households made up 5.3 percent of households. Female householder families with no spouse or partner present and own children under 18 years were 1.8 percent of all households, while 0.8 percent of households were male householder families with no spouse or partner present and own children under 18 years. Of people living alone, 11.5 percent were male householders, and 10.2 percent were female householders, for a total of 21.7 percent of all households.

In Sunnyvale city, California, 33.9 percent of all households have one or more people under the age of 18; 21.5 percent of all households have one or more people 65 years and over.

**Types of Households in Sunnyvale city, California in 2015-2019**




**Marital status**

Among persons 15 and older, 56.8 percent of males and 59.6 percent of females are currently married.

| Population 15 years and over | Males | Females |
|---|---|---|
| Never married | 36.1 | 25.4 |
| Now married, except separated | 56.8 | 59.6 |
| Separated | 1.0 | 1.3 |
| Widowed | 1.4 | 5.8 |
| Divorced | 4.8 | 7.9 |

**Grandparents and grandchildren**

In Sunnyvale city, California, 2,812 grandparents lived with their grandchildren under 18 years old. Of those grandparents, 9.4 percent were responsible for the basic needs of their grandchildren.

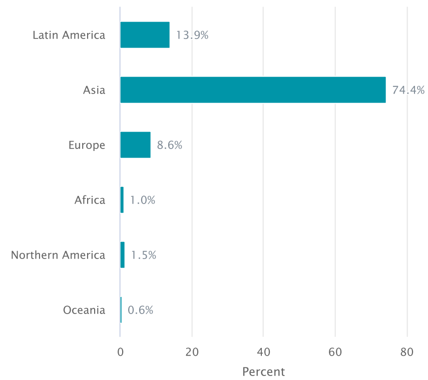
## Nativity and Foreign Born

In 2015-2019, an estimated 51.4 percent of the people living in Sunnyvale city, California were U.S. natives. 34.4 percent of the Sunnyvale city, California population were living in the state where they were born.

Approximately 48.6 percent of Sunnyvale city, California residents in 2015-2019 were foreign-born. 37.5 percent of foreign born were naturalized U.S. citizens and an estimated 60.8 percent entered the country before the year 2010.

Foreign-born residents of Sunnyvale city, California come from different parts of the world. The bar graph below displays the percentage of foreign born from each world region of birth in 2015-2019 for Sunnyvale city, California.

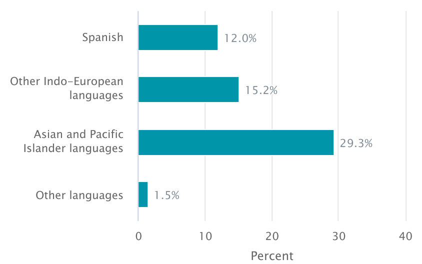
**Region of Birth for the Foreign-Born Population in Sunnyvale city, California in 2015-2019**




## Language

Among people at least five years old living in Sunnyvale city, California in 2015-2019, 58.1 percent spoke a language other than English at home. Spanish was spoken by 12.0 percent of people at least five years old; 18.6 percent reported that they did not speak English "very well."

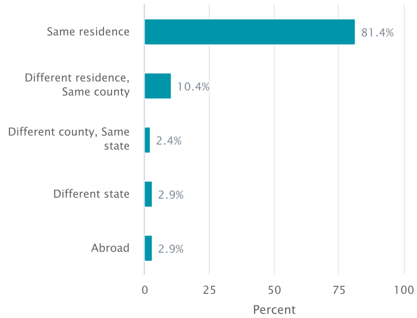
**Percent of the Population 5 years and over who Speak a Language other than English in Sunnyvale city, California in 2015-2019**



## Geographic Mobility

In 2015-2019, 81.4 percent of the people at least one year old living in Sunnyvale city, California were living in the same residence one year earlier.

#### Geographic Mobility of Residents of Sunnyvale city, California in 2015-2019

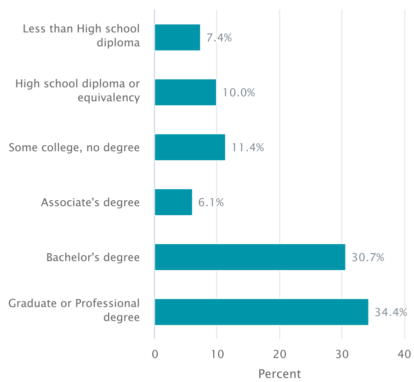



## Education

In 2015-2019, 92.6 percent of people 25 years and over had at least graduated from high school and 65.1 percent had a bachelor's degree or higher. An estimated 7.4 percent did not complete high school.

The total school enrollment in Sunnyvale city, California was 33,199 in 2015-2019. Nursery school enrollment was 3,713 and kindergarten through 12th grade enrollment was 20,523. College or graduate school enrollment was 8,963.

#### Educational Attainment of People in Sunnyvale city, California in 2015-2019



## Disability

In Sunnyvale city, California, among the civilian noninstitutionalized population in 2015-2019, 6.6 percent reported a disability. The likelihood of having a disability varied by age - from 1.2 percent of people under 18 years old, to 3.8 percent of people 18 to 64 years old, and to 32.0 percent of those 65 and over.

## Employment Status and Type of Employer

In Sunnyvale city, California, 68.6 percent of the population 16 and over were employed; 28.6 percent were not currently in the labor force.

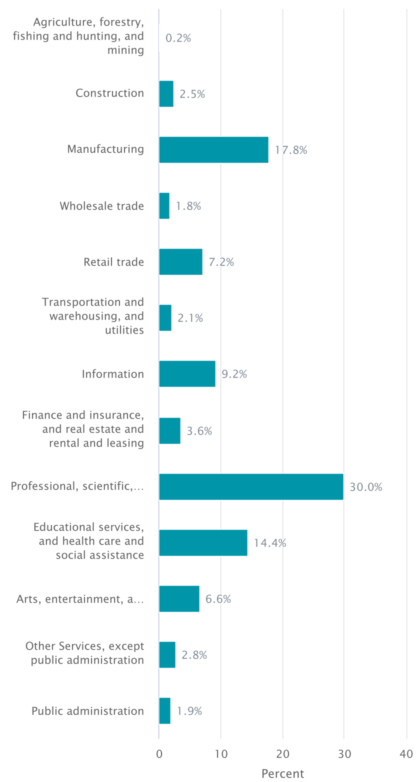
An estimated 90.2 percent of the people employed were private wage and salary workers; 5.9 percent were federal, state, or local government workers; and 3.8 percent were self-employed in their own (not incorporated) business.

| Class of worker | Number | Percent |
|---|---|---|
| Private wage and salary workers | 76,323 | 90.2 |
| Federal, state, or local government workers | 4,967 | 5.9 |
| Self-employed workers in own not incorporated business | 3,176 | 3.8 |

## Industries

In 2015-2019, the civilian employed population 16 years and older in Sunnyvale city, California worked in the following industries:

**Percent by Industry in Sunnyvale city, California in 2015-2019**



## Occupations

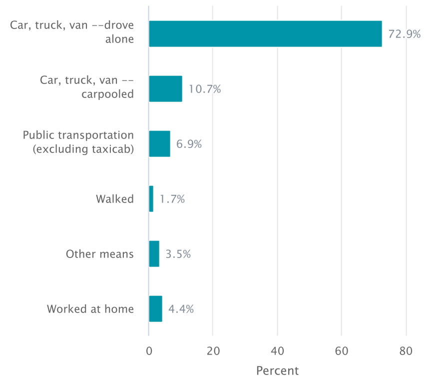
**Occupations for the Civilian Employed Population 16 Years and over in Sunnyvale city, California in 2015-2019**

| Civilian employed population 16 years and over | Number | Percent |
|---|---|---|
| Management, business, sciences, and arts occupations | 56,769 | 67.1 |
| Service occupations | 9,385 | 11.1 |
| Sales and office occupations | 10,458 | 12.4 |
| Natural resources, construction, and maintenance occupations | 3,057 | 3.6 |
| Production, transportation, and material moving occupations | 4,956 | 5.9 |

## Commuting to Work

An estimated 72.9 percent of Sunnyvale city, California workers drove to work alone in 2015-2019, and 10.7 percent carpooled. Among those who commuted to work, it took them on average 24.6 minutes to get to work.

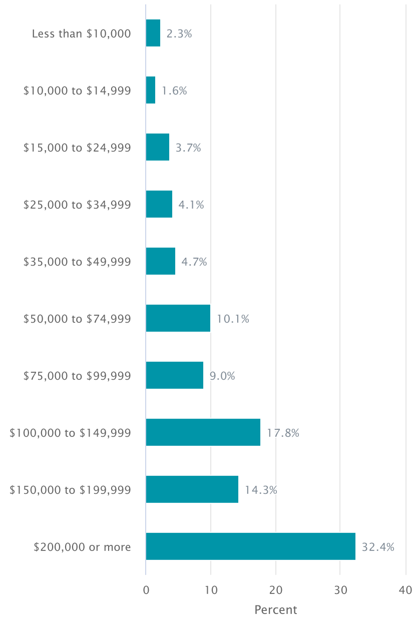
**Percent of Workers 16 and over Commuting by Mode in Sunnyvale city, California in 2015-2019**




## Income

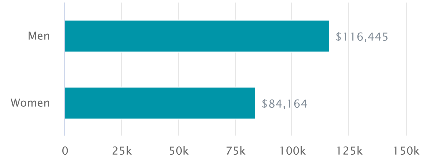
The median income of households in Sunnyvale city, California was $140,631. An estimated 2.3 percent of households had income below $10,000 a year and 32.4 percent had income over $200,000 or more.

**Household Income in Sunnyvale city, California in 2015-2019**



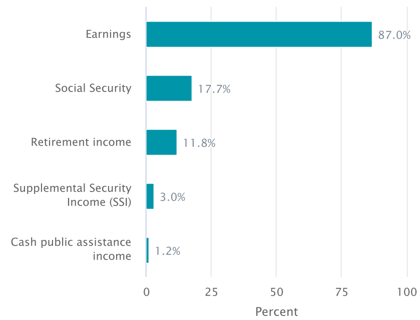
Median earnings for full-time year-round workers was $103,390. Male full-time year-round workers had median earnings of $116,445. Female full-time year-round workers had median earnings of $84,164.

**Median Earnings for Full-Time Year-Round Workers by Sex in Sunnyvale city, California in 2015-2019**




An estimated 87.0 percent of households received earnings. An estimated 17.7 percent of households received Social Security and an estimated 11.8 percent of households received retirement income other than Social Security. The average income from Social Security was $22,006. These income sources are not mutually exclusive; that is, some households received income from more than one source.

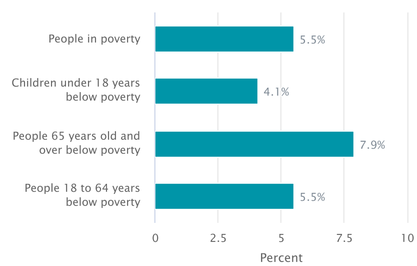
**Proportion of Households with Various Income Sources in Sunnyvale city, California in 2015-2019**




## Poverty and Participation in Government Programs

In 2015-2019, 5.5 percent of people were in poverty. An estimated 4.1 percent of children under 18 were below the poverty level, compared with 7.9 percent of people 65 years old and over. An estimated 5.5 percent of people 18 to 64 years were below the poverty level.

**Poverty Rates in Sunnyvale city, California in 2015-2019**




In 2015-2019, 2.4 percent of households received SNAP (the Supplemental Nutrition Assistance Program). An estimated 49.1 percent of households that received SNAP had children under 18, and 41.1 percent of households that received SNAP had one or more people 60 years and over. An estimated 32.0 percent of all households receiving SNAP were families with a female householder and no husband present. An estimated 33.7 percent of households receiving SNAP had two or more workers in the past 12 months.

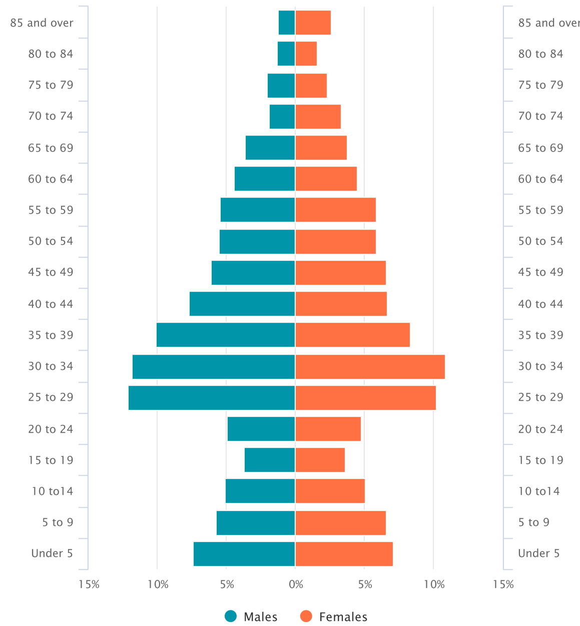
## Health Insurance

Among the civilian noninstitutionalized population in Sunnyvale city, California in 2015-2019, 96.4 percent had health insurance coverage and 3.6 percent did not have health insurance coverage. Private coverage was 83.5 percent and government coverage was 20.5 percent, respectively. The percentage of children under the age of 19 with no health insurance coverage was 0.9 percent.

## Population

In 2015-2019, Sunnyvale city, California had a total population of 152,770 – 73,485 (48.1 percent) females and 79,285 (51.9 percent) males. The median age was 35.3 years. An estimated 21.0 percent of the population was under 18 years, 45.1 percent was 18 to 44 years, 22.2 percent was 45 to 64 years, and 11.8 percent was 65 years and older.

**Population by Age and Sex for Sunnyvale city, California in 2015-2019**



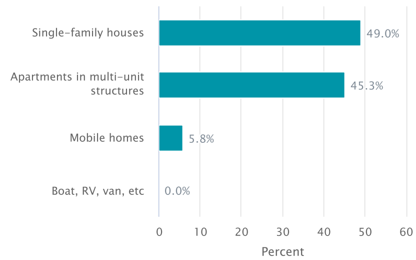

### Race and Hispanic origin

For people reporting one race alone, 39.8 percent were White; 1.6 percent were Black or African American; 0.5 percent were American Indian and Alaska Native; 46.7 percent were Asian; 0.3 percent were Native Hawaiian and Other Pacific Islander, and 6.2 percent were some other race. An estimated 4.9 percent reported two or more races. An estimated 16.5 percent of the people in Sunnyvale city, California were Hispanic. An estimated 30.7 percent of the people in Sunnyvale city, California were White non-Hispanic. People of Hispanic origin may be of any race.

## Housing Inventory Characteristics

In 2015-2019, Sunnyvale city, California had a total of 59,024 housing units. Of these housing units, 49.0 percent were single-family houses either not attached to any other structure or attached to one or more structures (commonly referred to as “townhouses” or “row houses”). 45.3 percent of the housing units were located in multi-unit structures, or those buildings that contained two or more apartments. 5.8 percent were mobile homes, while any remaining housing units were classified as “other,” which included boats, recreational vehicles, vans, etc.

**Types of Housing Units in Sunnyvale city, California in 2015-2019**




6.5 percent of the housing inventory was comprised of houses built since 2010, while 1.8 percent of the houses were first built in 1939 or earlier. The median number of rooms in all housing units in Sunnyvale city, California was 4.5 rooms, and of these housing units 47.5 percent had three or more bedrooms.

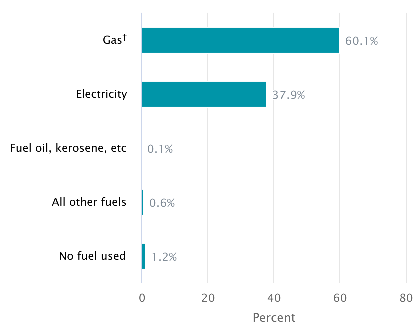
## Occupied Housing Characteristics

In 2015-2019, Sunnyvale city, California had 56,103 housing units that were occupied or had people living in them, while the remaining 2,921 were vacant. Of the occupied housing units, the percentage of these houses occupied by owners (also known as the homeownership rate) was 45.4 percent while renters occupied 54.6 percent. The average household size of owner-occupied houses was 2.81 and in renter-occupied houses it was 2.62.

33.1 percent of householders of these occupied houses had moved into their house since 2015, while 11.2 percent moved into their house in 1989 or earlier. Households without a vehicle available for personal use comprised 5.9 percent and another 17.9 percent had three or more vehicles available for use.

The following chart provides the primary fuel used to heat houses in Sunnyvale city, California:

**House Heating Fuel Used in Sunnyvale city, California in 2015-2019**




†This category includes utility, bottled, tank, or LP gas.

## Financial Characteristics and Housing Costs

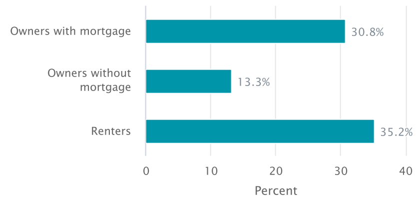
In 2015-2019, the median property value for owner-occupied houses in Sunnyvale city, California was $1,223,600.

Of the owner-occupied households, 63.4 percent had a mortgage. 36.6 percent owned their houses “free and clear,” that is without a mortgage or loan on the house. The median monthly housing costs for owners with a mortgage was $3,499 and for owners without a mortgage it was $797.

For renter-occupied houses, the median gross rent for Sunnyvale city, California was $2,508. Gross rent includes the monthly contract rent and any monthly payments made for electricity, gas, water and sewer, and any other fuels to heat the house.

Households that pay thirty percent or more of their income on housing costs are considered cost-burdened. In 2015-2019, cost-burdened households in Sunnyvale city, California accounted for 30.8 percent of owners with a mortgage, 13.3 percent of owners without a mortgage, and 35.2 percent of renters.

#### Households with a Housing Cost Burden in Sunnyvale city, California in 2015-2019

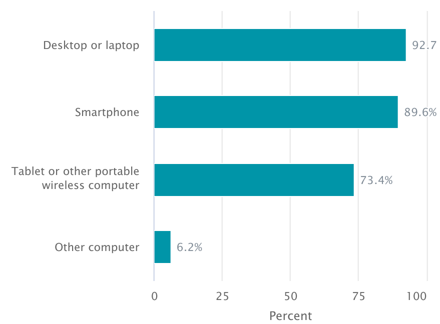



## Computer and Internet Use

In 2015-2019, 96.9 percent of households in Sunnyvale city, California had a computer, and 92.7 percent had a broadband internet subscription.

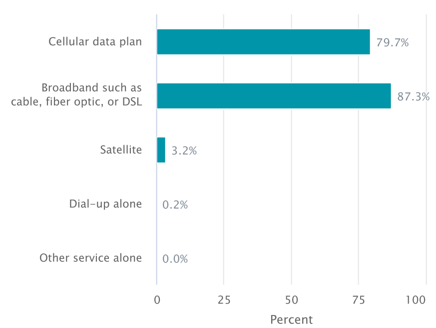
An estimated 92.7 percent of households had a desktop or laptop, 89.6 percent had a smartphone, 73.4 percent had a tablet or other portable wireless computer, and 6.2 percent had some other computer.

#### Types of Computers in Sunnyvale city, California in 2015-2019




Among all households, 79.7 percent had a cellular data plan; 87.3 percent had a broadband subscription such as cable, fiber optic, or DSL; 3.2 percent had a satellite internet subscription; 0.2 percent had dial-up alone; and 0.0 percent had some other service alone.

#### Types of Internet Subscriptions in Sunnyvale city, California in 2015-2019



**APPENDIX C**

City of Sunnyvale

2020 Urban Water Management Plan

BAWSCA's Regional Water Demand and Conservation Projections

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BAWSCA
Bay Area Water Supply & Conservation Agency

# Bay Area Water Supply & Conservation Agency's Regional Water Demand and Conservation Projections

**FINAL**

**June 26, 2020**

**PREPARED BY:**

Maddaus Water Management Inc.

**IN ASSOCIATION WITH:**

Brown and Caldwell

Western Policy Research

## TABLE OF CONTENTS PAGE

# LIST OF FIGURES

# LIST OF TABLES

# ACKNOWLEDGMENTS

The authors of this report would like to thank the participants for supporting the Regional Water Demand and Conservation Projections Project report. The project was developed as a partnership between BAWSCA staff, its member agencies and stakeholders, and Maddaus Water Management Inc.

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- Andree Johnson
- Negin Ashoori

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- CWS – Mid Peninsula District
- CWS – South San Francisco District
- Coastside County Water District
- Daly City, City of
- East Palo Alto, City of
- Estero MID/Foster City
- Hayward, City of
- Hillsborough, Town of
- Menlo Park, City of
- Mid-Peninsula Water District
- Millbrae, City of
- Milpitas, City of
- Mountain View, City of
- North Coast County Water District
- Palo Alto, City of
- Purissima Hills Water District
- Redwood City, City of
- San Bruno, City of
- San Jose, City of
- Santa Clara, City of
- Stanford University
- Sunnyvale, City of
- Westborough Water District

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- Tiffany Tran

## Stakeholder Workgroup Participants and Contributors

- Pacific Institute
- San Mateo County Office of Sustainability
- San Mateo Countywide Water Coordination Committee
- Sustainable Silicon Valley
- Tuolumne River Trust

# LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| 2014 Project | 2014 BAWSCA Regional Water Demand and Conservation Projections |
| AB | Assembly Bill |
| ABAG | Association of Bay Area Governments |
| acct | Account |
| AF | acre-feet |
| AFY | acre-feet per year |
| AMI | Advanced Metering Infrastructure |
| AWWA | American Water Works Association |
| AWWARF | American Water Works Association Research Foundation |
| BAM | Bay Area Management |
| BAWSCA | Bay Area Water Supply and Conservation Agency |
| BC | Brown and Caldwell |
| CalWEP | California Water Efficiency Partnership |
| CEC | California Energy Commission |
| COM | Commercial |
| CI | Commercial Institutional |
| CII | Commercial, Industrial, and Institutional |
| CUWCC | California Urban Water Conservation Council |
| CWS | California Water Service |
| DOF | Department of Finance |
| DSS Model | Demand Side Management Least Cost Planning Decision Support System |
| DWR | California Department of Water Resources |
| EO | Executive Order |
| ETo | Evapotranspiration |
| GPCD | gallons per capita per day |
| gpd | gallons per day |
| gpf | gallons per flush |
| gpm | gallons per minute |
| GVMID | Guadalupe Valley Municipal Improvement District |
| HET | high efficiency toilet |
| HEU | high efficiency urinal |
| HEW | high efficiency commercial washer |
| ILI | Infrastructure Leakage Index |
| INS | institutional |
| IPCC | International Panel on Climate Change |
| IRR | irrigation |
| MAF | million acre-feet |
| MF | multifamily |
| MID | Municipal Improvement District |
| MUR | Multi-Unit Residential |
| MWELO | Model Water Efficient Landscape Ordinance |
| MWM | Maddaus Water Management |
| N/A | not applicable |
| NOAA | National Oceanic and Atmospheric Administration |
| NRW | non-revenue water |
| OTH | Other |
| PPIC | Public Policy Institute of California |
| psi | pounds per square inch |
| R-GPCD | Residential gallons per capita per day |
| $R^2$ | R-Squared |
| RCP | Representative Concentration Pathways |
| SB | Senate Bill |
| SB X7-7 | Water Conservation Act of 2009 |
| SF | Single Family |
| SFPUC | San Francisco Public Utilities Commission |
| SFR | Single Family Residential |
| SWP | State Water Project |
| SWRCB | State Water Resources Control Board |
| TM | technical memorandum |
| ULFT | ultra-low flush toilet |
| UWMP | Urban Water Management Plan |
| Valley Water | Santa Clara Valley Water District |
| WCDB | Water Conservation Database |
| WCIP | Water Conservation Implementation Plan |
| WSA | Water Supply Assessment |
| WUE | Water Use Efficiency |

# EXECUTIVE SUMMARY

The Regional Water Demand and Conservation Projections Project (Demand Study) developed water demand and conservation projections through 2045 for each Bay Area Water Supply and Conservation Agency (BAWSCA) member agency and the region overall. The purpose of the Demand Study is to provide valuable insights on long-term water demand patterns and conservation savings potential for the BAWSCA agencies to support regional efforts, such as implementation of BAWSCA's Long-Term Reliable Water Supply Strategy. In addition, the intent of the Demand Study is to provide necessary information to support individual agency efforts, such as compliance with the new state water efficiency requirements and completion of Urban Water Management Plans (UWMPs). The results will support agencies in preparing to comply with new statewide water use efficiency requirements as required by Assembly Bill (AB) 1668 and Senate Bill (SB) 606 (herein collectively referred to as "legislation"[1]).

## Background

BAWSCA actively works with its member agencies to develop comprehensive water demand projections for the region. Most recently, in 2014, BAWSCA completed the *BAWSCA Regional Water Demand and Conservation Projections* report (2014 Project) to support the development of its Long-Term Reliable Water Supply Strategy. The 2014 Project developed long-term demand projections through 2040 as well as short-term demand projections accounting for rebound in water demand associated with economic recovery from the 2008-2013 recession.

After the 2014 Project completion, the local Bay Area economy continued to recover. However, beginning in 2014, the state experienced a major drought that significantly decreased water demand for all BAWSCA member agencies. The impact of the drought reduced overall water use among the BAWSCA agencies by 27% below 2013 demand levels in 2015, the worst year of the drought. BAWSCA initiated the Demand Study in January 2019 to update water demand and conservation projections for each BAWSCA agency given the significant change in conditions following the 2014 Project. The results of the Demand Study will be used to support the 2020 Urban Water Management Plans through the 25-year planning horizon, considering the impacts of the recent drought on short-term and long-term water demand and BAWSCA's Long-Term Reliable Water Supply Strategy implementation.

The Demand Study was completed as a collaborative effort between the BAWSCA and its BAWSCA member agencies. Valley Water also provided input on assumptions associated with the conservation analysis, given its role as the wholesale water agency to eight of the BAWSCA member agencies in Santa Clara County. In addition, an external Stakeholder Workgroup consisting of representatives from 5 organizations and entities provided feedback on the conservation measure selection and analysis components of the Demand Study. Over the course of the Demand Study, input was solicited from the aforementioned groups through multiple forums, including workshops, stakeholder engagement, one-on-one communication, and web-based meetings.

## Demand and Conservation Projections Development Process

The Demand Side Management Least Cost Planning Decision Support System (DSS Model), in combination with an Econometric Model, was used to determine short-term and long-term demand projections for each BAWSCA agency. The Econometric Model projected short-term demands (through 2025) based upon historical water use patterns and the projected future rebound in water demand associated with forecasts for drought recovery. The

[1] An AB 1668/SB 606 primer document explaining the legislation is available on the Department of Water Resources website: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/

DSS Model projected long-term demand (through 2045) based upon expected service area growth for both population and employment.

The data collection for this Demand Study was conducted through the use of a Data Collection and Verification File (Data Workbook), a quantitative data intensive multi-spreadsheet MS Excel file. This workbook was an update to the Data Collection and Verification File developed during the 2014 Project. The data collected included monthly water demand and water conservation from 1995 through 2018, unemployment, water rates, historical conservation and more items as described in Section 2.

## Service Area Population and Employment Growth Projections

The total BAWSCA service area population and employment projections are presented in Table ES-1. These projections are based upon each member agency's population and employment projections, using Association of Bay Area Governments (ABAG) Plan Bay Area 2040 data, including projections released in 2017, or other adopted data sources.

**Table ES-1. Total BAWSCA Service Area Population and Employment Projections**

| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Population | 1,858,392 | 1,941,725 | 2,032,304 | 2,187,849 | 2,311,562 | 2,438,515 |
| Employment | 1,156,613 | 1,209,770 | 1,270,096 | 1,329,806 | 1,379,449 | 1,430,112 |

## Demand Projections

Demand forecasts were developed for each agency to account for conservation from passive (i.e., from codes/standards) and active conservation programs. Based upon this analysis, water demands are projected to increase 25% from 2020 to 2045 after accounting for the effects of the existing plumbing code, future active conservation savings, and climate change. These results are shown in Table ES-2. By comparison, the population and employment projections noted in Table ES-1 above show growth rates of 31% and 24% respectively between 2020 and 2045.

**Table ES-2. Total BAWSCA Demand Projections**

| Demand Forecast (MGD) | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Total Demand without Plumbing Code Savings | 210.8 | 240.3 | 251.1 | 266.7 | 280.0 | 293.6 |
| Total Demand with Plumbing Code Savings | 205.6 | 228.9 | 234.3 | 244.3 | 253.1 | 262.4 |
| Total Demand with Active Measure Savings | 204.3 | 225.1 | 229.2 | 238.8 | 247.0 | 256.3 |

*Note: Total water demand accounts for the total projected demand in a service area water system regardless of source, which could be from San Francisco Public Utilities Commission (SFPUC), groundwater, surface water, recycled water, desalination, State Water Project (SWP), or Valley Water.*

## Potential New Conservation Measures

Through this analysis, 24 conservation measures with high water savings potential and/or member agency interest were identified. BAWSCA further evaluated these measures for potential future implementation and incorporated feedback from a Stakeholder Workgroup feedback, including ideas for measure implementation and co-benefits described in Section 4. Implementation of these conservation measures, along with passive conservation, is anticipated to yield an additional 37.3 MGD of water savings by 2045 beyond what has already been achieved.

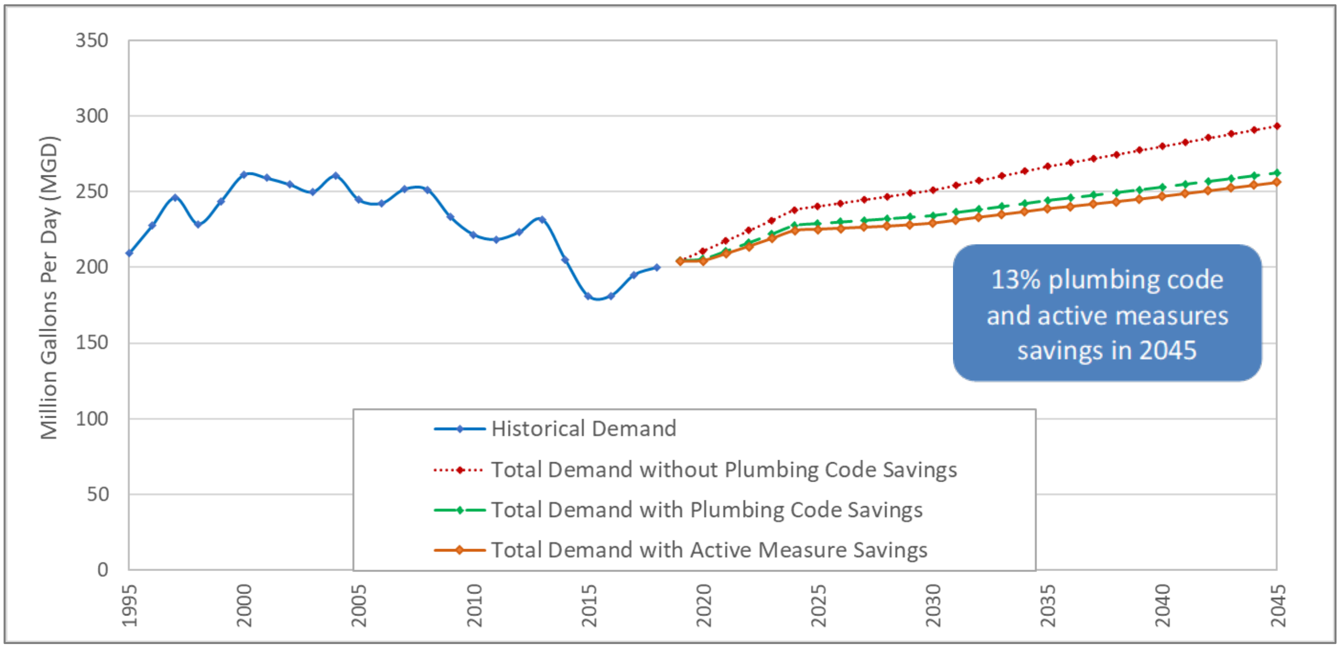
**Figure ES-1. Potential Conservation Measures**

## BAWSCA Planned Conservation Measure Implementation

| Measure Name | # of Agencies Planning to Implement |
|---|---|
| Commercial | |
| CII Water Survey | 13 |
| CII Water Efficient Technology (WET) Rebate | 10 |
| School Building Retrofit | 6 |
| Fixture Retrofit on Resale or Water Account Change (Commercial) | 2 |
| Irrigation | |
| Residential Outdoor Water Surveys | 16 |
| Large Landscape Outdoor Water Surveys | 20 |
| Large Landscape (Waterfluence) Program | 14 |
| Lawn Be Gone! and Rainwater Capture Rebates | 19 |
| Financial Incentives for Irrigation and Landscape Upgrades | 14 |
| Landscape Irrigation and Codes | 10 |
| Residential | |
| Residential Indoor Water Surveys | 9 |
| Residential Water-Savings Devices Giveaway | 20 |
| Flowmeter Rebate | 7 |
| Leak Repair and Plumbing Emergency Assistance | 9 |
| Multifamily HET Direct Install | 2 |
| Multifamily Submetering for Existing Accounts | 5 |
| New Development Submetering | 8 |
| New Development Hot Water On Demand | 4 |
| Low Impact New and Remodeled Development | 3 |
| Fixture Retrofit on Resale or Water Account Change (Residential) | 2 |
| Community & Education | |
| Public and School Education | 22 |
| Billing Report Educational Tool Non-AMI | 10 |
| AMI Customer Portal | 14 |
| System Water Loss | |
| Water Loss | 20 |

Figure ES-2 presents the combined BAWSCA region-wide water demand projections with and without passive and active conservation. Total water demand is defined as total water consumption plus non-revenue water. Water consumption is defined as water delivered to individual customers for use. Figure ES-3 compares historical and projected water use and population. Figure ES-4 presents historical and projected gross per capita water use and residential per capita water use in the BAWSCA region through 2045.

**Figure ES-2. BAWSCA Region-Wide Demands with Active Conservation Savings to 2045***




* *Water demands are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic and does not incorporate any of the new changes in water use profiles, population, employment, or vacancies as the data was not yet available and was outside the scope of the current project. However, it is recognized that the water demands may need review or modification depending on the impact of recent events.*

**Figure ES-3. Historical and Projected Population and Demand**

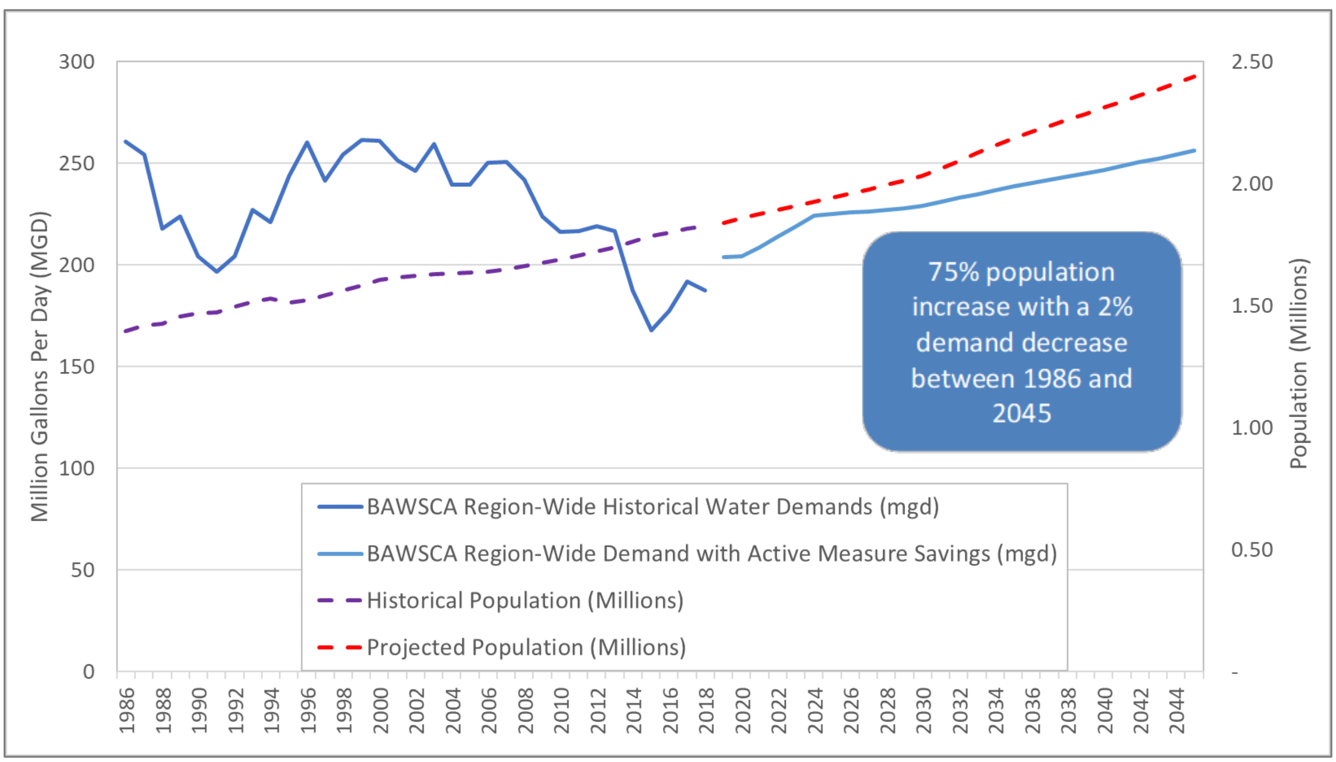
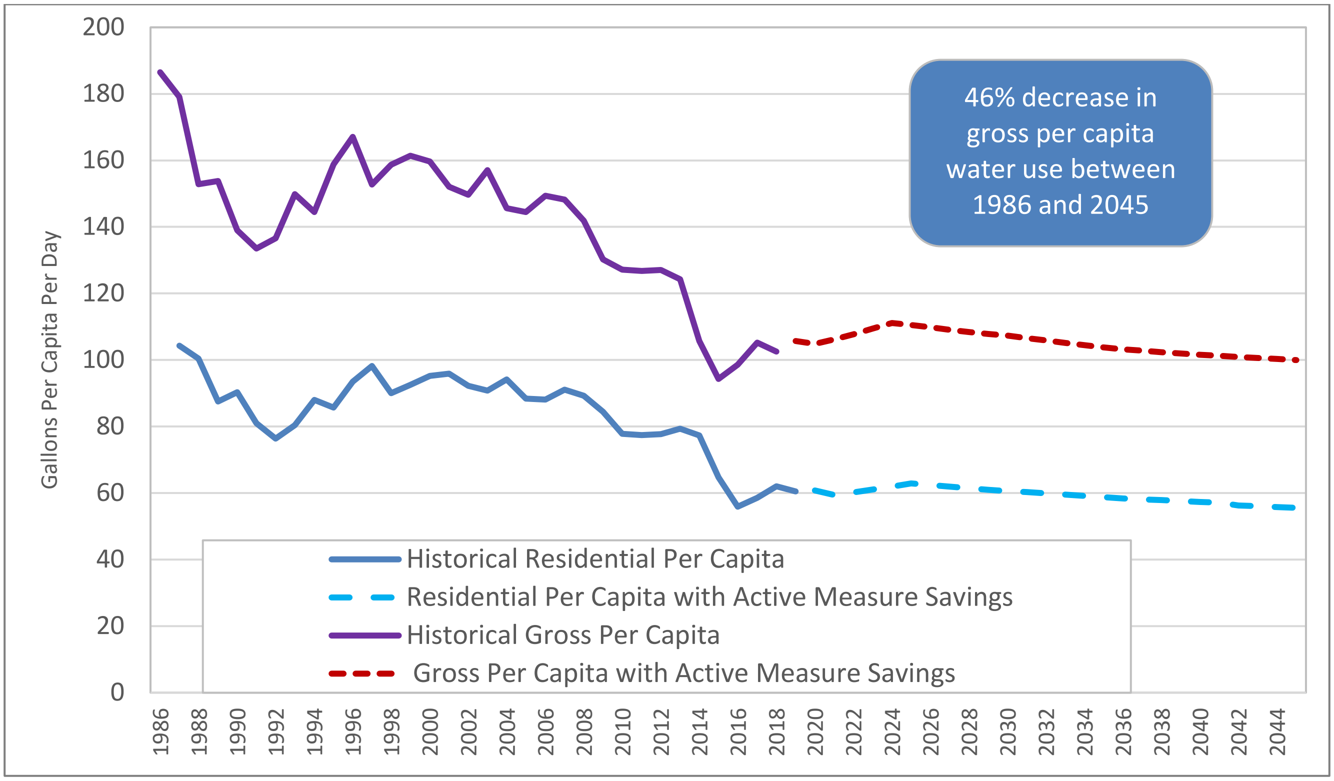


**Figure ES-4. Gross and Residential Per Capita Water Use**




*Note: To be consistent with the BAWSCA methodology for the BAWSCA Annual Survey, recycled water has been removed from the per capita calculations. Therefore, the above information is a potable-only per capita value. Note that residential water use includes some irrigation as not all agencies have dedicated irrigation meters.*

## Recommendations and Next Steps

The majority of the BAWSCA member agencies meet the definition of an urban water supplier[2] and therefore are required to prepare 2020 UWMPs, which must be submitted to the California Department of Water Resources (DWR) by July 1, 2021. Member agencies may elect to utilize the demand and conservation savings projections developed through this Demand Study to support their UWMP development. Member agencies may also update the individual DSS Models for the upcoming UWMP submissions, if necessary, to incorporate new information for their respective service areas. It is anticipated that agencies will be formally adopting updated demand projections as part of the 2020 UWMP process.

California state laws, AB 1668 and SB 606, passed in May 2018, require each urban retail water supplier to calculate and report an urban water use objective no later than November 1, 2023, and by November 1 every year thereafter, and to compare its actual urban water use to the objective. The urban water use objectives will be calculated using individual efficiency standards set by the state for indoor residential water use, outdoor residential water use, dedicated irrigation, and water loss. In addition, the urban water suppliers may be required to implement specific performance measures for commercial, industrial and institutional (CII) water use. When more information on the state standards becomes available, BAWSCA and the member agencies may

[2] The requirements for UWMPs and definition of urban water supplier are found in two sections of the California Water Code, §10610-10656 and §10608. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually.

need to review demand projections and conservation targets to prepare for compliance with the urban water use objectives.

In addition, BAWSCA will work with the member agencies to further evaluate for regional implementation the identified conservation programs that have high water savings potential and agency interest. BAWSCA recognizes that actual implementation of water conservation is needed to achieve the identified water savings goals in support of member agencies meeting their future water use objectives. BAWSCA and its member agencies' conservation programs must be managed in concert with one another and in a very adaptive fashion. Small and large program changes will need to be made over time and, where applicable, to align with pending state regulations currently being developed in connection with AB 1668 and SB 606.

The Demand Study was initiated in January 2019 and was completed through June 2020. Given the project timeline, recent changes to water consumption patterns, population, employment, and vacancies due to the COVID-19 pandemic have not been incorporated into the analysis or demand projections. BAWSCA will continue to monitor the effects of COVID-19 response actions on water use within the region and may consider future updates to this study to reflect these changes.

# 1 INTRODUCTION

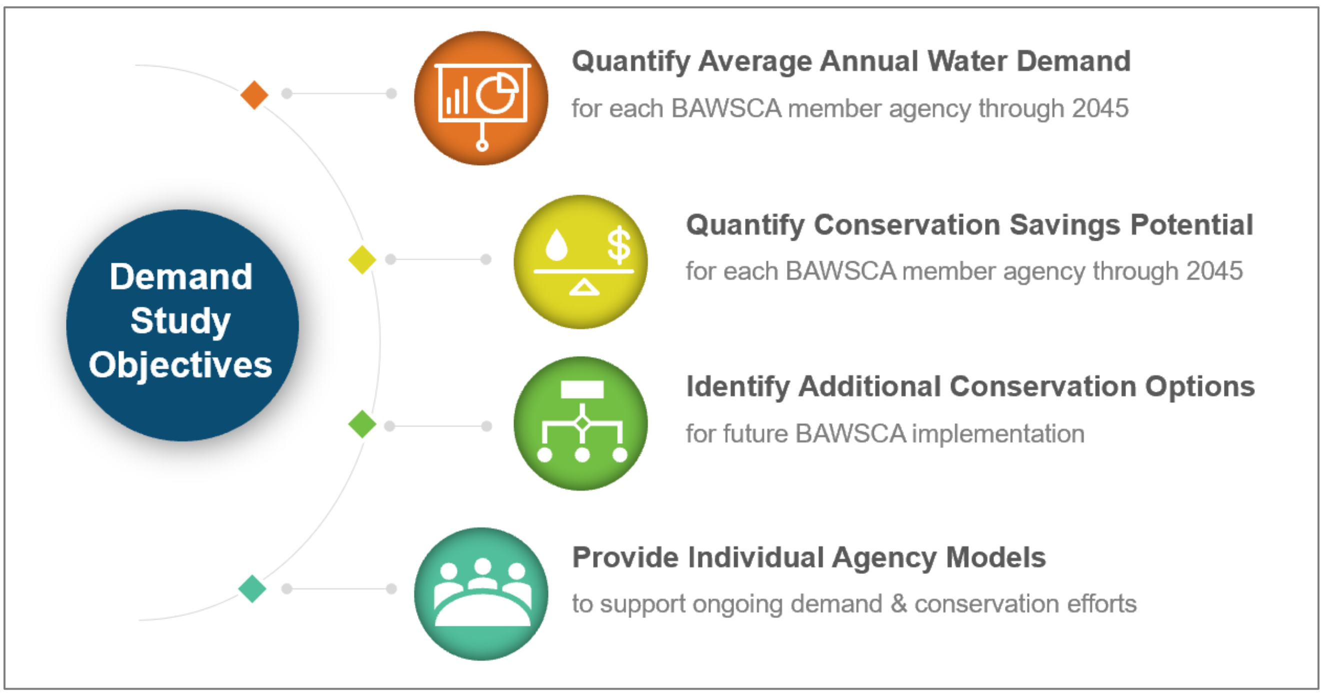
This Regional Water Demand and Conservation Projections Project (Demand Study) Final Report summarizes the water demand and conservation savings projections for each individual BAWSCA member agency and for the BAWSCA region as a whole.

## 1.1 Goals and Objectives

Recently, a substantial shift in the challenges and drivers for water management has occurred – in part because of the recent drought, water supply conditions, and the need to comply with pending water conservation regulations. This Demand Study will allow BAWSCA to implement additional water use conservation measures in line with current conditions regarding water sustainability and reliability. The Demand Study considers best management practices consistent with current regulations and best practices in the industry. It also considers the capabilities and practices of the BAWSCA agencies and how they may need to be further developed in relation to the new legislation.

The overall goal of the Demand Study was to develop transparent, defensible, and uniform demand and conservation projections for each BAWSCA member agency, using a common methodology that could be implemented to support regional planning efforts as well as individual agency work. Pursuant to this goal, specific objectives were developed as detailed in the following figure.

**Figure 1-1. BAWSCA Demand Study Objectives**




## 1.2 Approach and Methodology

To accomplish the above goal and objectives, each BAWSCA member agency's water demands and conservation savings were forecasted through 2045 using a combination of two different models – an Econometric Model and the DSS Model developed by Maddaus Water Management (MWM). The purpose of using two tools is to leverage the strengths of each tool to obtain the best forecast through 2045. The Econometric Modeling was initially done outside of the DSS Model then incorporated as a feature in each member agency's individual DSS Model.

Econometric Modeling is a statistical approach used to determine the impact of factors such as economic conditions, weather, rates, and conservation on water demands. The Econometric Model is used to project, based upon historical patterns, the future rebound in water demand associated with short term effects (i.e. economic recovery, drought conditions, etc.) while also taking into account other factors such as water rate increases and weather. The Econometric Model was used to forecast each agency's baseline demand through 2023.

The DSS Model prepares long-range, detailed water demand and conservation savings projections to enable a more accurate assessment of the impact of water efficiency programs on demand. The DSS Model can use either a statistical approach to forecast demands (e.g., an Econometric Model), or it can use forecasted increases in population and employment to evaluate future demands. Furthermore, the DSS Model evaluates conservation measures using benefit-cost analysis with the present value of the cost of water saved and benefit-to-cost ratio as economic indicators. The analysis is performed from various perspectives including the utility and community. The DSS Model also was used to forecast demands for the BAWSCA member agencies in prior planning efforts in 2004, 2009, and 2014.

## 1.3 Project Partners

The Demand Study was completed as a collaborative effort between BAWSCA staff, BAWSCA member agencies, and the Project Team, which was led by Maddaus Water Management in association with Brown and Caldwell and Western Policy Research. Over the course of the Demand Study, input was solicited from the aforementioned groups through multiple forums, including workshops, online surveys using SurveyMonkey, one-on-one communication, and web-based meetings.

Maddaus Water Management, BAWSCA staff, Valley Water, San Francisco Public Utilities Commission, and individual agencies collaborated to compile and review information, which led to the development of design parameters. Valley Water also provided input on assumptions associated with the conservation analysis, given its role as the wholesale water agency to eight of the BAWSCA member agencies located in Santa Clara County.

Each BAWSCA member agency held a critical role in the development of its individual demand and conservation projections. BAWSCA member agencies' roles in the Demand Study included the submission of technical information for use in individual agency DSS Models and the review and sign-off of interim work products. More details on the involvement of the member agencies in the completion of each Demand Study task are included in this report.

### Stakeholder Workgroup

In addition to coordination with the BAWSCA agencies, BAWSCA formed a Stakeholder Workgroup to seek input from external stakeholders. Based on suggestions provided by the BAWSCA agencies, a total of twelve organizations were invited to participate in the Stakeholder Workgroup. Five organizations accepted the invitation to participate, including the Pacific Institute, San Mateo County Office of Sustainability, San Mateo Countywide Water Coordination Committee, Sustainable Silicon Valley, and the Tuolumne River Trust.

The Stakeholder Workgroup held two meetings in January and May 2020 to provide input on the conservation projections portion of the Demand Study. In particular, the Stakeholder Workgroup shared insights and perspectives on topics such as:

- Types of conservation measures BAWSCA should be considering for future implementation in the region;
- Co-benefits or secondary impacts some conservation measures have that should be considered in BAWSCA's implementation decisions;
- Opportunities for partnership and collaboration on water conservation initiatives;
- Ways to support social equity in the water conservation measure implementation; and
- New or innovative technologies to explore for conservation savings potential.

The stakeholder comments on multiple co-benefits of the conservation measures were considered during measure selection as described in Section 4.

## 1.4 Relationship to Other Planning Efforts

In September 2018, the BAWSCA Board unanimously approved the Strategic Plan Phase 1[3] recommendations, including the recommendation to update the water demand and conservation projections for the BAWSCA member agencies using a common methodology.

In addition to providing a critical input for the strategy, the updated demand estimates may be used by individual BAWSCA member agencies in the development of their 2020 Urban Water Management Plans.

Prior efforts have developed regional demand and conservation projections for the BAWSCA region using the DSS Model, including:

- San Francisco Public Utilities Commission *Wholesale Customer Water Demand Projections* (URS Corp. and MWM, 2004);
- San Francisco Public Utilities Commission *Wholesale Customer Water Conservation Potential* (URS Corp., MWM, Jordan Jones & Goulding, 2004);
- *Projected Water Usage for BAWSCA Agencies* (Brown and Caldwell [BC], MWM, 2006);
- *BAWSCA Water Conservation Implementation Plan* (MWM, BC, 2009); and
- *BAWSCA Regional Water Demand and Conservation Projections* (MWM, Western Policy Research, 2014).

These prior efforts proved to be a robust means to support environmental documents like the Water System Improvement Program – Program Environmental Impact Report [SFPUC, 2006]); member agency UWMPs; conservation planning (e.g., the BAWSCA Regional Water Conservation Program and development of the BAWSCA Water Conservation Database [WCDB]); and development and implementation of BAWSCA's Long-Term Reliable Water Supply Strategy.

[3] Maddaus Water Management et al. (2018). *Bay Area Water Supply and Conservation Agency's "Making Conservation A Way of Life" Strategic Plan – Phase 1*.

# 2 DATA COLLECTION AND VERIFICATION PROCESS

This section documents the data collection and verification process for the Demand Study, which was critical to the modeling process to ensure that the best available information was used to develop each member agency's water demand and conservation savings projections. Described herein are the types of data that were collected for the Demand Study and the steps taken to obtain and verify the data.

## 2.1 Preliminary Survey

In April 2019, the member agencies participated in a survey as part of their Data Workbook completion tasks. The survey provided initial service-area background information, perspectives on future water demand trends, agency feedback on the desired project outcomes, and initial interest in different types of conservation measures. The survey responses also were used to identify data items to include in the Data Workbook. The following information was collected in the Data Workbook survey:

- Key contact information for each agency
- Each agency's desired objectives or results for the Demand Study
- Description of water use trends within the agency's service area in recent years
- Source of most recent water demand projections and methodology description
- Perspective on future growth and water demand trends
- Billing system components and capabilities, including any recent changes or upgrades
- Availability of water and sewer rate history by customer class
- Potable and non-potable water reuse planning
- Source and accuracy of service area water audit data in recent years
- Current and projected usage of mixed-use meters
- Plans for water source adjustment when water conservation is active
- Additional comments or questions on the project or planning process

See Appendix A for a complete list of the Data Workbook survey questions.

## 2.2 Types of Data Collected

The impetus for the types of data collected was the specific data needs for the Econometric Modeling and the DSS Model. The data collected can be classified into a few major categories as discussed below and listed in Figure 2-1.

**Service Area Data**
Data including water production by source as well as water and sewer rates were collected to show the impact of prices on historical water demands. The service area data were used for the econometric historical analysis, the demand forecast in the DSS Model, and the conservation analysis.

**Service Area Demographics**
Service area demographic data were collected regarding historical and projected population using previous DSS Models, 2015 UMWPs, and the ABAG 2040 Bay Area Plan Projections. These demographics were used for the econometric analysis of historical demand and for future demand forecasting.

**Economy**
Data from the U.S. Bureau of Labor Statistics[4] on historical employment and unemployment were collected for the individual service areas (at the city level) to attempt to capture the change in work force during the period from 1995 to 2018 to show historical and future growth in the service area. The economic data were used for the econometric analysis of historical water demand.

[4] U.S. Bureau of Labor Statistics. Local Area Unemployment Statistics web page: https://data.bls.gov/PDQWeb/la

**Weather**

Data from the local National Oceanic and Atmospheric Administration (NOAA) weather stations closest to each individual agency were collected.[5] Data types included temperature maximum, temperature minimum, temperature average, and precipitation for the years 1995 to 2018. The weather data were used for the econometric analysis of historical water demand.

**Conservation**

Select conservation data from the WCDB back to 2004 were incorporated into the Econometric Models. The conservation data were used for the historical demand analysis, for a review of future conservation program levels of saturation, and as a benchmark of reasonable levels of implementation for future conservation programs. Fiscal Year 2016-2017 and Fiscal Year 2017-2018 conservation programs participation data for CII Survey, Residential High Efficiency Fixture Giveaway, Residential Indoor Water Surveys, Landscape Water Budget/Monitoring, and Lawn Be Gone! Turf Removal were utilized to calculate levels of saturation.

**Other**

Each agency was asked to provide any new information, such as new development ordinances or comments received from DWR regarding the agency's 2015 UWMP (if one was filed). These data were used for background information when analyzing each individual water agency's service area.

The individual data elements that were collected are listed categorically in the following figure.

**Figure 2-1. Data Collected from Member Agencies**

**Data Collected from BAWSCA Member Agencies**

**General Information**

- ☐ Agency Info
- ☐ Contact Info

**Service Area Data**

- ☐ Water Production by Supply Source
- ☐ Consumption and Accounts
- ☐ Top 200 CII Users
- ☐ Single Family Water Rates
- ☐ Commercial Water Rates
- ☐ Single Family Sewer Rates
- ☐ Abnormal Years
- ☐ Planning Documents
- ☐ Customer Classes

**Demographic Data**

- ☐ Service Area Population
- ☐ Projected Population

**Conservation**

- ☐ Conservation Goals
- ☐ Historical Conservation

**Economy**

- ☐ Service Area Employment
- ☐ Projected Jobs
- ☐ Unemployment Rates

**Weather**

- ☐ Historical Weather Data

**Other**

- ☐ Demand Analysis Survey
- ☐ New Development
- ☐ Ordinances
- ☐ DWR Comments on 2015 UWMP

[5] National Oceanic and Atmospheric Administration Climate Data Online Search web page: https://www.ncdc.noaa.gov/cdo-web/search

## 2.3 Data Collection Process Overview

The data collection for this Demand Study was done using the Data Workbook, which was an update to the one developed during the 2014 Project. Previously, parts of the 2014 workbook were refined for the 2017 BAWSCA "Making Conservation a Way of Life" Strategic Plan. This most recent effort initiated in 2019 was the next iteration in conservation program planning at the regional level to support the 2020 UWMPs and to guide BAWSCA and its member agencies for the next several years.

The Data Workbook was used to collect, organize, and verify the necessary input data for the econometric analysis and DSS model. The data required for the demand and conservation projections continues to be organized into individual Data Workbooks (one per BAWSCA member agency). This task was streamlined by populating the Data Workbook using a variety of existing data sources (as shown in Figure 2-1) prior to distributing the files to the individual agencies. The member agencies were then asked to verify that the information in the Data Workbook was accurate. A key source for existing data was the BAWSCA WCDB, which was specifically designed as a recommendation of the 2009 BAWSCA Water Conservation Implementation Plan (WCIP) to capture much of the required data. Other significant data sources included BAWSCA Annual Surveys, 2015 UWMPs, and the Association of Bay Area Governments (ABAG) Projections[6] (population and employment forecasts).

The Data Workbook was completed and verified by the member agencies through the following steps:

1. **Distribution of Data Workbook Files to Individual Agencies:** The files were distributed to the individual agencies in April 2019 via the BAWSCA WCDB.
2. **Instructional Webinar:** A webinar was held in April 2019 to disseminate information related to the data collection process to the member agencies. During the webinar, the Project Team reviewed the Data Workbook contents with the member agencies and provided instructions for completing the files.
3. **Data Workbook Completion by Agencies:** Each member agency reviewed and completed its individual Data Workbook, which required the following:
   - Verification of existing data that was remaining from the previous efforts as well as what was pre-populated in the file by the Project Team before distribution to the agencies
   - Data entry of missing information into the Data Workbook as needed
4. **Data Workbook Submission by Agencies:** Agencies submitted the files via the WCDB between April and mid-May 2019 after completing Step 3.
5. **Data Workbook Review and Refinement**: The Project Team reviewed the submitted individual Data Workbooks in the order submitted. If further data and refinement were required, the Project Team contacted the individual member agencies to obtain the necessary information.
6. **Data Workbook Validation through Technical Memorandum 1 (TM-1):** Each member agency reviewed and signed a confirmation letter attached to TM-1 that all the information in the data workbook was accurate and approved for use in the project analysis.

## 2.4 Agency Verification

The last step in the data collection process was the final agency verification of the data. Once all data had been collected and compiled, each agency received a copy of its Final Data Workbook, and the representative for that agency was asked to complete the BAWSCA Agency Population Projection Selection/Data Verification Signature Form. As part of this step, each member agency also was asked to identify an appropriate source for population and employment projections to use in the demand and conservation modeling.

[6] ABAG. Plan Bay Area 2040: http://2040.planbayarea.org/reports.

# 3 DEMAND PROJECTIONS

This section documents the demand projections developed for the Demand Study. This section describes: 1) the demand projection analysis methodology; 2) the demand analysis results including each BAWSCA member agency demand projections through 2045; and 3) the projections verification process to be completed and signed by each member agency.

## 3.1 Demand Methodology Overview

The demand projection update for each BAWSCA member agency used a combination of two different analytic models – the Econometric Model and the Demand Side Management Least Cost Planning Decision Support System (DSS Model). The purpose of using two tools was to leverage the strengths of each tool to obtain a suite of demand recovery scenarios through the year 2045.

The Econometric Model estimated the impact of various conditions on service area water demand. The model used historical patterns to project the future rebound in demand associated with post-drought recovery, while considering other factors such as economy, rate increases, conservation activity, and weather. Since the Econometric Model was calibrated using historical data, its reliability depended on the historical relationship between water demand and its influencing factors remaining constant from the calibration period to the forecasting period. Further into the future, changes in demographics, living patterns, housing stock, and industrial structure can alter the historical relationship with water demand.

The data collected for the Demand Study was used to forecast each agency's water demands and conservation savings through 2045, using the DSS Model. The model prepares long-range, detailed water demand and conservation savings projections to enable a more accurate assessment of the impact of water efficiency programs on demand. It also evaluates potential conservation measures using benefit-cost analysis with the present value of the cost of water saved ($/Million Gallons) and benefit-to-cost ratio as economic indicators. The analysis is performed from various perspectives including the utility and community (utility plus customer). This rigorous modeling approach is especially important if the projections are to be included in a document that will undergo regulatory or environmental review.

Previously, the DSS Model was used to forecast demands in the 2004 SFPUC Wholesale Demand and Conservation Analysis (URS, MWM 2004), the 2009 *BAWSCA Water Conservation Implementation Plan*, and the 2014 BAWSCA Regional Water Demand and Conservation Projections Project (2014 Project). The DSS Model has been peer reviewed by the California Urban Water Conservation Council (now known as the California Water Efficiency Partnership) and endorsed by the organization since 2006.

The DSS Model can accommodate historic service agency data and projected information; this information reflects how future service area and water use characteristics may differ from the past in each BAWSCA member service area. To accommodate all these considerations, several scenarios were generated to model the post-drought demand recovery, including a scenario generated by each agency's respective Econometric Model.

The DSS Model also has a conservation component that quantifies savings from plumbing codes and active conservation programs. In this Demand Study, only the DSS Model's estimates of future savings from plumbing codes were incorporated into the demand projections. The intent of this was to facilitate each agency's evaluation of its future water demand before implementation of active conservation programs between 2019 and 2045. Quantification of savings from active conservation programs is discussed in Section 5.

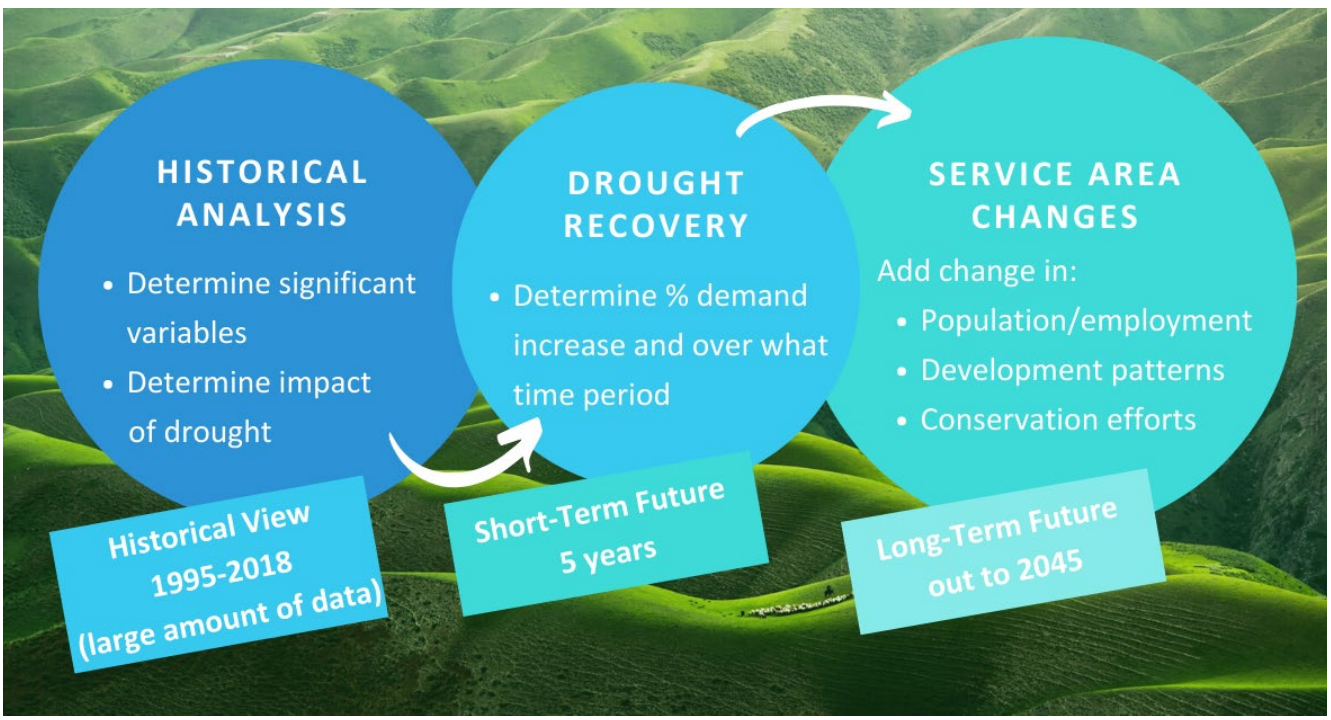
The demand analysis for each agency had three distinct parts (Figure 3-1):

1. **Historical Analysis** – This was an analysis of updated historical data between 1995 and 2018 (or a shorter window if an agency could not provide complete data back to 1995). The purpose of this analysis was to identify the impacts of factors such as water rates, economic conditions, weather, water conservation, and drought reductions on water demands. Data analyzed included historical system production,

population, water rates, weather (rainfall and temperature), unemployment rate, and drought restrictions. See Figure 2-1 for a list of the data used for this analysis.

2. **Short-Term Forecast (Post-Drought Demand Recovery)** – Forecast of demands from 2019 through 2023 was weather normalized, assumed normal economic conditions, and incorporated climate change predictions as well as population growth. Normal weather is defined as the average temperature and rainfall between 1995 and 2006. At the time the analysis was conducted in November 2019, the U.S. economy was operating at an unemployment rate that was below the historical norm. The model assumes there will be a return to the historical norm while developing a model-generated drought recovery estimate. The unemployment rate differs considerably across member agencies at any given point in time. However, movements in this metric for an agency over time parallels movement in the national unemployment rate quite well. To account for the unique conditions that exist within each member agency, it is assumed that each member agency will reach an unemployment rate that reflects the average during the 1993-2000 period, a time period that best captures normal economic conditions. Projections of population and employment growth that fed into these short-term forecasts came from the same sources as those used for the long-term forecasts. These data sources were discussed previously in Section 2.
3. **Long-Term Future** – Long-term water demand (2024-2045) was forecasted using the DSS Model, which estimated increases in each agency's demand by customer category based upon forecasted changes in population and employment. In addition, the long-term forecast incorporated climate change predictions as further detailed in Section 3.6.

**Figure 3-1. Demand Forecasting**




## 3.2 Econometric Analysis Methodology

As noted above, the Demand Study used Econometric Models to project post-drought demand recovery in the Partial Rebound – Normal Economy, Weather Normalized scenario (as described in Section 3.7). This tool was incorporated into the demand analysis to estimate the relationship between per capita water demand and factors that cause it to vary over time. Some factors are cyclical in nature and can cause per capita demand to increase or decrease over a period of time. Such factors include weather, economic conditions, and temporary drought restrictions. Other factors put one-way downward pressure on per capita demand over time. The intensity of pressure may vary from year to year, but the effects are not cyclical. Examples of such factors include water rate increases, plumbing codes, appliance efficiency standards, and active conservation programs. Relying on knowledge of past historical relationships and assuming that they continue in the near-term, this analysis provided insights into questions associated with demand such as:

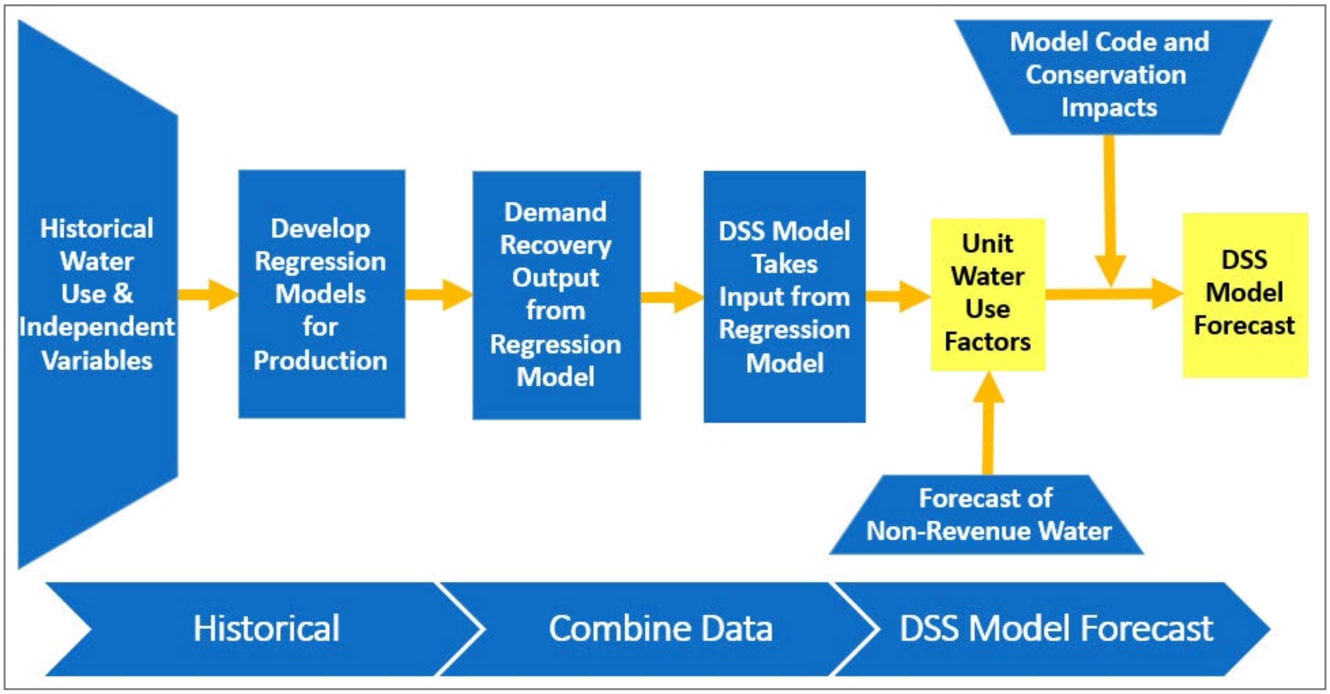
- What was the effect of drought restrictions on demand during the time period for which they were in effect (2014-2017)? Since the removal of these restrictions, demand started to increase – how much more will it rise in the future?
- How have economic conditions impacted demand in the past? Under normal economic conditions, what would fully recovered demand be?
- How has weather impacted demand in the past? Under normal weather conditions, what would fully recovered demand be? Or, under future climate conditions when the average temperature is, for example, two degrees hotter than normal, what would future demand be?

An Econometric Model of water demand was developed for each BAWSCA member agency using up to 24 years of monthly production data (where available, data from 1995 through 2018 were used). Each BAWSCA member agency's Econometric Model utilized agency-specific data to depict economic conditions, retail water rates, population, and impact of drought restrictions implemented during the 2014-2017 period. The models also included a trend variable, if necessary, to capture the long-term decline in per capita demand as a result of historical active and passive conservation. Weather data were assigned to each agency from the closest of the NOAA stations located throughout the San Francisco Bay Area. These data were submitted and verified by each BAWSCA member agency through the data collection process described in Section 2.

After development, the Econometric Model for each BAWSCA member agency was used to generate water demand forecasts to 2023. The Econometric Model assumed that temporary behavioral changes encouraged during the drought returned close to pre-drought norms. The post-drought recovery behaviors were further documented in the Alliance for Water Efficiency 2020 study titled Use and Effectiveness of Municipal Irrigation Restrictions.[7] BAWSCA helped to fund the project and was a contributing project participant which included an in-depth analysis of drought behavior changes. However, the water savings emanating from historical water rate increases and active conservation programs (e.g., non-behavior-based programs such as rebates) achieved through 2018 were assumed to be permanent and therefore did not rebound. The model assumed that the predicted demand recovery would occur gradually over an additional five years (2019-2023), based on BAWSCA's historical experience of the 1987-1992 drought. The estimated gallons per capita per day (GPCD) drought recovery was incorporated into the 27 member agency DSS Models and is further described in Appendix B. This information was reviewed and calibrated with the DSS Model to capture and reflect previous knowledge of the service area from the 2004, 2008, and 2014 BAWSCA forecasting projects. This process generated one complete model for each agency with data between 2020 and 2045 as shown in the following figure.

[7] Alliance for Water Efficiency. (2016). *The Status of Legislation, Regulation, Codes & Standards on Indoor Plumbing Water Efficiency*. http://www.allianceforwaterefficiency.org/Codes-Standards-White-Paper.aspx

**Figure 3-2. BAWSCA Demand Model Flow Diagram**



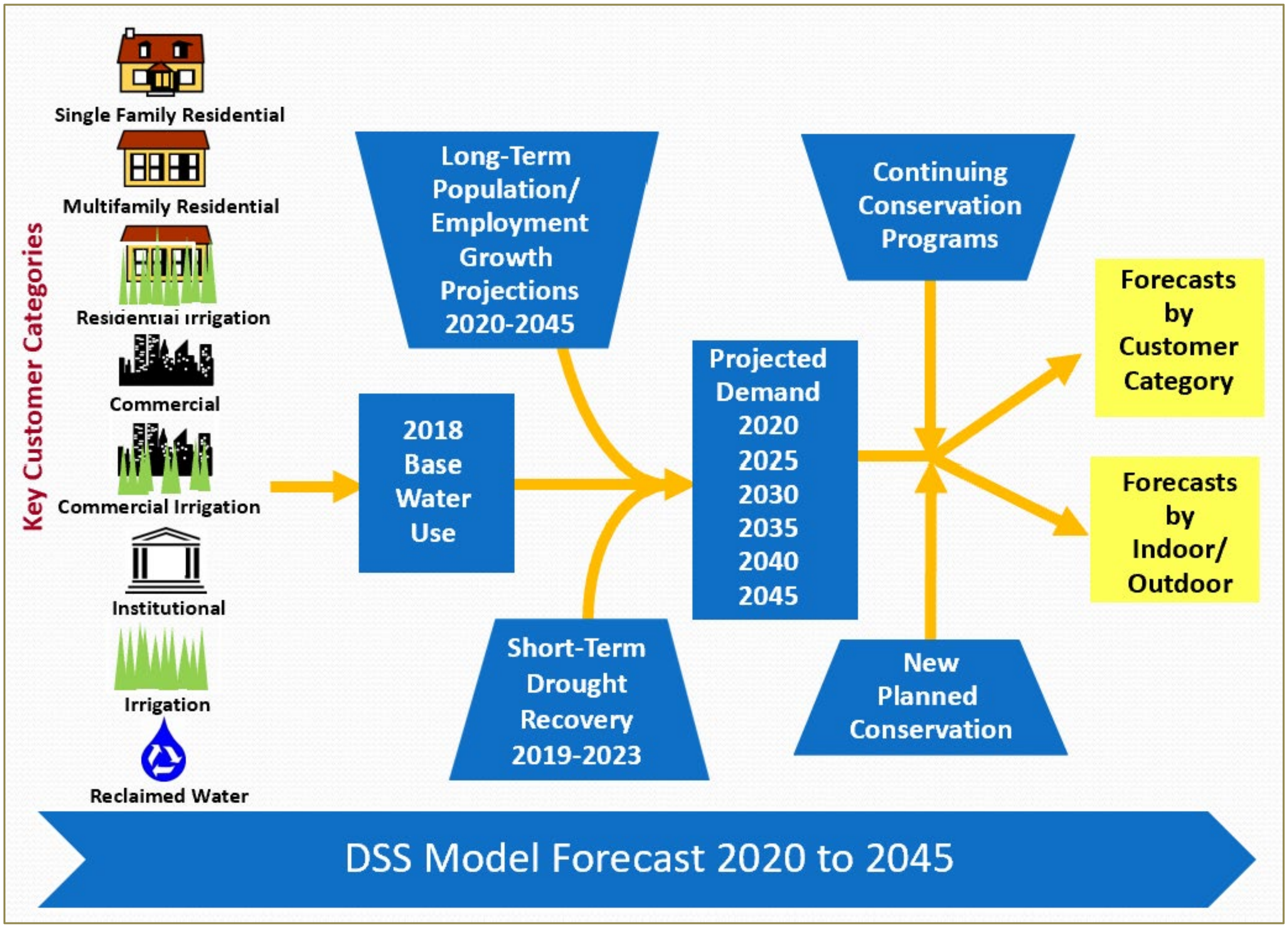

**For each BAWSCA member agency, the econometric analysis estimated the relative impact of various factors on water demand. These results have been provided in Appendix C (**In Table C-1 and in Figure C-1 the BAWSCA region-wide demand projections are shown with passive savings. Active conservation has not been incorporated into any of the four scenarios. These values are intended to be used for general comparison of ranges in potential future water demands if no active conservation was implemented.

Table C-1). A more detailed description of the Econometric Modeling framework can be found in Appendix B.

## 3.3 DSS Model Methodology

For the long-term projections (2019-2045), the DSS Model was used to generate demand forecasts for each BAWSCA member agency. The DSS Model also included a conservation component that quantified savings from passive conservation (e.g., plumbing codes) and active conservation programs. The DSS Model's conservation component covers the entire forecast period of 2019-2045. Quantification of savings from active conservation programs is covered in Section 5. Only the DSS Model's estimates of savings from plumbing codes were provided to enable each agency to evaluate what its future demand likely would be absent any active conservation programs from 2020 to 2045.

**Figure 3-3. BAWSCA Demand and Conservation DSS Model Flow Diagram**




As illustrated above in Figure 3-3, the first step for forecasting water demands using the DSS Model was to gather customer category billing data (e.g., single family residential, multifamily residential, commercial, institutional, etc.) from each BAWSCA member agency. The next step was to calibrate the model by comparing water use data with available demographic data to characterize water usage for each customer category in terms of number of users per account and per capita water use. During the model calibration process, data were further analyzed to approximate the indoor/outdoor split by customer category. The indoor/outdoor water usage was further divided into typical end uses for each customer category. Published data on average per capita indoor water use and average per capita end use were combined with the number of water users to calibrate the volume of water allocated to specific end uses in each customer category. In other words, the DSS Model reflects social norms from end-use studies on water use behavior (e.g., flushes per person per day).

Following the model calibration, the future population and employment projections were incorporated. Each BAWSCA member agency selected its own projection forecasts. These growth projections were used to develop a projected demand for 2019-2045.

As shown in Figure 4-2, the analyzed conservation measures were input into the DSS Model. These conservation measures were a combination of existing and new conservation measures selected by polling the BAWSCA member agencies via SurveyMonkey (an internet-based electronic survey platform). A list of the measures selected for the cost-effectiveness analysis based on this survey can be found in Appendix D.

## 3.4 Demand Projection – Agency Input and Review

As part of this Demand Study's collaborative approach, one instructional webinar conference call and one workshop were held to facilitate BAWSCA member agency understanding of, and involvement in, the development of the forecasting methodology and analysis. In addition, each member agency was provided with its individual results in written form and was asked to provide written approval of the results.

- **Instructional Webinar –** A webinar with the member agencies was held on April 18, 2019 to give an overview of the project, review the data collection workbook, and provide an overview of the DSS Modeling methodology. The webinar was recorded and offered to those who could not attend to maximize participation by the agencies.
- **Demand Workshop –** On November 18, 2019 a workshop was held for BAWSCA agencies to review the demand modeling approach and results and to answer agency questions. During the workshop, the methodology was reviewed using a real example with preliminary results from one of the BAWSCA agencies.
- **Agency Communication and Technical Memorandum 2 (TM-2) –** In December 2019, agencies were provided a copy of their individual results via TM-2. Agencies were able to email questions or set up virtual calls to review the demand analysis results and make any necessary modifications.
- **Written Approval of Demand Values –** In January 2020, individual agencies were asked to submit written approval that their demand values appeared reasonable. The active conservation analysis in the DSS Model did not proceed until all agencies approved their demand values in TM-2.

## 3.5 Future Population and Employment

Population and employment projections through 2045 were confirmed by each BAWSCA member agency through the data collection process described in Section 2. Population projections were obtained from one of the following sources:

- Association of Bay Area Governments 2040 Plan Bay Area
- 2015 Urban Water Management Plans
- Other publicly adopted sources as provided by each BAWSCA member agency

## 3.6 Weather and Climate Change Data

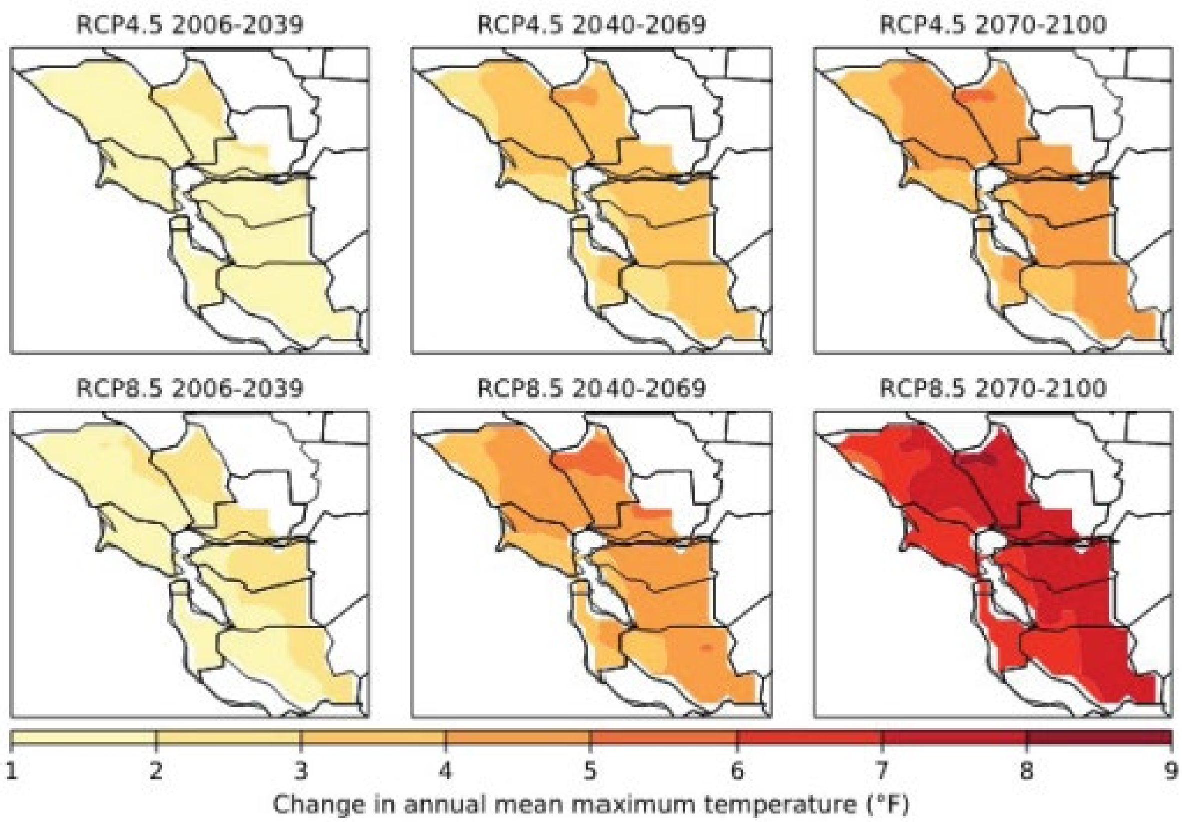
The Public Policy Institute of California has predicted that five climate pressures will impact the future of California's water management: warming temperatures, shrinking snowpack, shorter and more intense wet seasons, more variable precipitation, and rising seas.[8] As of 2019, some of these pressures are already apparent. The climate impact on water supply is predicted to significantly exceed the impact on water demand.

Precipitation in the Bay Area will continue to have high variability year to year, leading to very wet years sometimes and very dry years at other times. The largest winter storms in the Bay Area will likely become more powerful and potentially more damaging. Due to a predicted increase in temperature in the future, it is assumed that California and the Bay Area will experience longer and deeper droughts, which could impact the water supply.

The International Panel on Climate Change (IPCC) develops several future climate change scenarios referred to as Representative Concentration Pathways (RCP). RCP 4.5 represents a mitigation scenario where global $CO_2$ emissions peak by the year 2040. RCP 8.5 represents the business-as-usual scenario where $CO_2$ emissions continue to rise throughout the 21st century. The following figure shows the spatial changes in annual mean of maximum daily temperatures across nine Bay Area counties under RCP 4.5 and RCP 8.5.

[8] Public Policy Institute of California (PPIC). (2019). Priorities for California's Water, accessed online December 2019: https://www.ppic.org/publication/priorities-for-californias-water/

**Figure 3-4. Bay Area Historical and Projected Mean Maximum Temperatures**




Spatial patterns of projected model-average change in annual mean maximum temperature (unit: °F) under RCP4.5 and RCP8.5 for three time periods: 2006-2039 (early-21st century), 2040-2069 (mid-21st century), and 2070-2100 (late 21st-century). Unit is °F.

*Source: Ackerly, David, Andrew Jones, Mark Stacey, Bruce Riordan. (University of California, Berkeley), 2018.*

According to California's Fourth Climate Change Assessment San Francisco Bay Area Summary Report,[9] the Bay Area's historical temperature increased 1.7 degrees Fahrenheit from 1950 to 2005. It is predicted that annual mean maximum temperatures will increase by 1 to 2 degrees Fahrenheit in the early 21$^{st}$ century from the years 2006 to 2039, then will increase by an additional 3.3 degrees Fahrenheit in the mid-21$^{st}$ century from 2040 to 2069. This increment for the mid-21$^{st}$ century rises to 4.4 degrees Fahrenheit if the Bay Area remains under the high emissions scenario of "business-as-usual."

The above IPCC report temperature change is broken over two time periods (early-21st century and mid-21st century). For the BAWSCA Demand Study, the time period of focus was 2019-2045. Therefore, it was necessary to combine the two time periods to get an overall temperature change for the length of the BAWSCA Demand Study.

[9] Ackerly, David, Andrew Jones, Mark Stacey, Bruce Riordan (University of California, Berkeley). (2018.) *San Francisco Bay Area Summary Report.* California's Fourth Climate Change Assessment. Publication number: CCCA4-SUM-2018-005. Accessed online December 2019: https://www.energy.ca.gov/sites/default/files/2019-07/Reg%20Report-%20SUM-CCCA4-2018-005%20SanFranciscoBayArea.pdf

Following are the considerations and methodology used to calculate the average annual temperature change for each of the IPCC report time periods:

- Early 21st Century (2006-2039) had an estimated temperature increase of 1 to 2 degrees Fahrenheit that was averaged to 1.5 degrees Fahrenheit. For the 33-year time period, this equates to an average annual temperature increase of 0.045 degrees Fahrenheit.
- Mid-Century (2040-2069) was estimated to have a temperature increase of 3.3 degrees Fahrenheit. For the 29-year time period, this equates to an average annual temperature increase of 0.114 degrees Fahrenheit.

Calculating the increase within each time period for the BAWSCA Demand Study required three steps:

- Step 1: Calculate a value for the 20 years from 2019 to 2039, which equates to an estimated temperature change of 0.95 degrees Fahrenheit.
- Step 2: Calculate a value for the five years from 2040 to 2045, which equates to an estimated temperature change of 0.68 degrees Fahrenheit.
- Step 3: Finally, the two values from Step 1 and Step 2 were added together to get a total temperature increase of 1.7 degrees Fahrenheit (rounded) for 2019-2045.

In summary, for the BAWSCA Demand Study, the previously mentioned predicted annual mean temperature increase in the early 21st century of 1.7 degrees Fahrenheit[10] was incorporated into the demand forecast for all scenarios for the time period of 2019 to 2045.

## 3.7 Demand Projections Scenarios

The Econometric Model and DSS Model were used in conjunction to generate water demand projection scenarios for each BAWSCA member agency for four scenarios as noted in the table below.

**Table 3-1. Water Demand Recovery Scenarios**

| Scenario | Water Data Years | Normal Economy | Weather Normalized | Water Rates | Active Conservation | Passive Conservation Savings (Plumbing Codes) | Future Service Area Changes/ Growth Forecast |
|---|---|---|---|---|---|---|---|
| Pre-Recession and Pre-Drought Demand Level Recovery | 2000-2007 | | | | | ✓ | ✓ |
| Pre-Drought Demand Level Recovery | 2004-2013 | | | | | ✓ | ✓ |
| Partial Rebound – Normal Economy, Weather Normalized | 1995-2018 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Current Water Demand Profile – Normal Economy, Weather Normalized | 2018 | ✓ | ✓ | | | ✓ | ✓ |

[10] Ibid.

Each individual member agency's historical and projected water demands are shown in Appendix A (Figure A-1) of their respective TM-2s. Those TM-2 Appendix A figures, along with Table 3-1 and Figure 3-5 in this section, contain the following curves:

- Pre-Recession and Pre-Drought Demand Level Recovery – Demand projections based on years 2000-2007 water use profile, starting with 2018 demand levels and recovering from the drought in five years.
- Pre-Drought Demand Level Recovery – Demand projections based on years 2004-2013 water use profile, starting with 2018 demand levels and recovering from the drought in five years.
- Partial Rebound – Projections developed by the Econometric Model assuming: 1) normal weather, 2) normal economy, 3) price escalation projections that vary by agency, 4) historical active conservation efforts, 5) passive conservation plumbing codes, and 6) recovery from the drought in five years.
- Current Water Demand Profile – Assuming: 1) normal economy, and 2) weather normalized. This is water demand calculated from historical 2018 water production data submitted by each BAWSCA member agency. The 2018 data were weather normalized and assumed a normal economy. This scenario does not include any additional post-drought demand recovery.

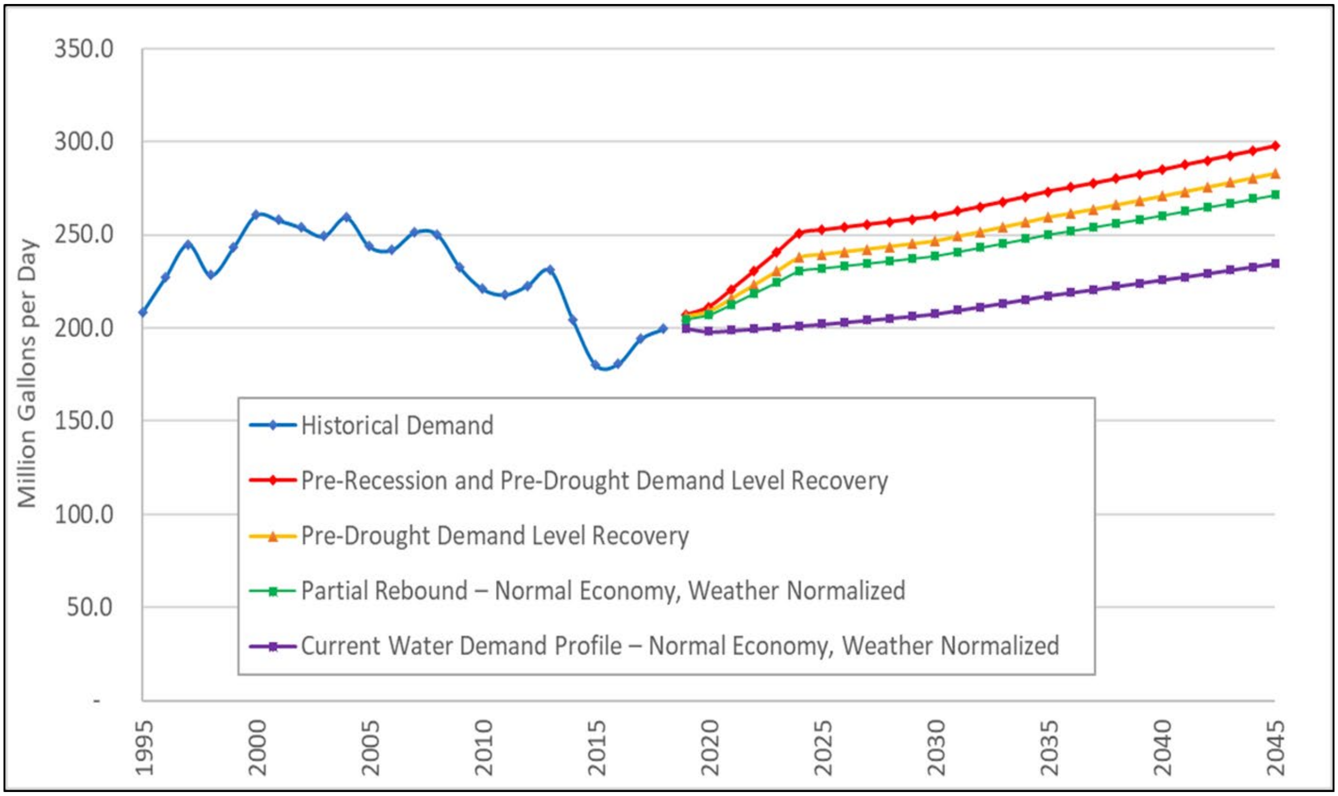
Savings from plumbing codes (also known as "passive conservation") is based on federal and state legislated efficiency standards pertaining to plumbing fixtures and appliances. The impact of codes quantified here include the Energy Policy Act of 1992, CALGreen Building Code, AB 715, and SB 407 (governs the types of fixtures available on the market for toilets, showers, washers, etc.). The plumbing code has been added into all four scenarios. Figure 3-5 presents a summary of the BAWSCA service area total demand projections through 2045 including passive conservation. These projections encompass all demands regardless of source, including non-potable water demands.

The Partial Rebound – Normal Economy, Weather Normalized scenario was used for the conservation analysis in the next phase of the BAWSCA project because it incorporated the longest time period of data (1995-2018), included weather normalization, and was adjusted for the change in water rates. The inclusion of these variables over a long time period using regression analysis was deemed by BAWSCA to be the most representative for a long-term forecast. In addition, analysis of BAWSCA data from prior droughts demonstrated that there was a significant rebound in per capita water use within seven years following the end of a drought.[11] Therefore, an assumption of a partial rebound to pre-drought demands is consistent with past experience. Taking a long-term viewpoint was found to be especially important since recent data included both recession and severe drought, as mentioned previously.

Furthermore, beginning in 2023, each urban water supplier in California, including 24 of the 27 BAWSCA member agencies, will be required to calculate and report to the State Water Resources Control Board (SWRCB) on an annual water use objective. The urban water use objective will be based upon standards of efficient water use for indoor residential, outdoor residential, and dedicated irrigation. The water efficiency standards have not been established yet by the SWRCB; however, it is anticipated that these standards, and resulting urban water use objectives, will become a key driver for water conservation planning for the BAWSCA region. Each agency's water conservation program will be designed to reduce its projected water use by, at a minimum, the amount needed to stay within its urban water use objective. To ensure that sufficient water conservation programming is planned and budgeted, it is prudent to plan and budget under the assumption that drought rebound will occur and to develop a robust water conservation program to enable agencies to meet their urban water use objectives in spite of that rebound.

[11] Analysis of residential per capita water use data from the BAWSCA *Annual Survey Fiscal Year 2018-19* (BAWSCA, 2020) for the 4 years prior to the 1987-1992 drought (1984-1988) and years 4-7 following the drought (1995-1998) showed a 23% increase in residential per capita water from the lowest drought year to the 4-year average from years 4-7 of the recovery period.

**Figure 3-5. BAWSCA Region-Wide Demands to 2045 with Passive Conservation***




* *Savings from plumbing codes (also known as "passive conservation") is based on federal and state legislated efficiency standards pertaining to plumbing fixtures and appliances.*

# 4 WATER CONSERVATION SAVINGS PROJECTIONS

This section documents the conservation savings projections for each BAWSCA member agency and for the BAWSCA region. In addition, the conservation analysis methodology and results are detailed.

## 4.1 Conservation Analysis Goals and Objectives

The Demand Study included two goals related to water conservation: 1) to define how much conservation can reasonably contribute to more supply reliability for all BAWSCA member agencies and 2) to incorporate projected conservation savings into the demand projections for each agency. Pursuant to this goal, the specific objectives of the conservation analysis for the Demand Study were:

- Assist BAWSCA member agencies in evaluating the potential water savings and cost-effectiveness associated with implementing a variety of existing and potential new water conservation measures;
- Determine the projected water savings from 2020 through 2045 associated with implementing a selected suite of new conservation measures; and
- Determine which entity (i.e., BAWSCA, the member agencies, or Valley Water) should implement each conservation measure or program and when the program should be implemented in order to achieve the specified water savings goals.

To develop demand forecasts for each agency that account for conservation from both passive (plumbing code and standards) and active conservation programs, the individual agency DSS Models were designed to achieve the following two objectives:

1. Account for passive conservation savings projected through 2045
2. Analyze potential savings from a variety of water use efficiency measures to facilitate the development of individual agency conservation savings estimates through 2045

Each BAWSCA member agency's individual conservation water savings goal, where applicable, was provided by the agency during the data collection process described in Section 2 and was used in the conservation analysis.

## 4.2 Conservation Analysis Methodology Overview

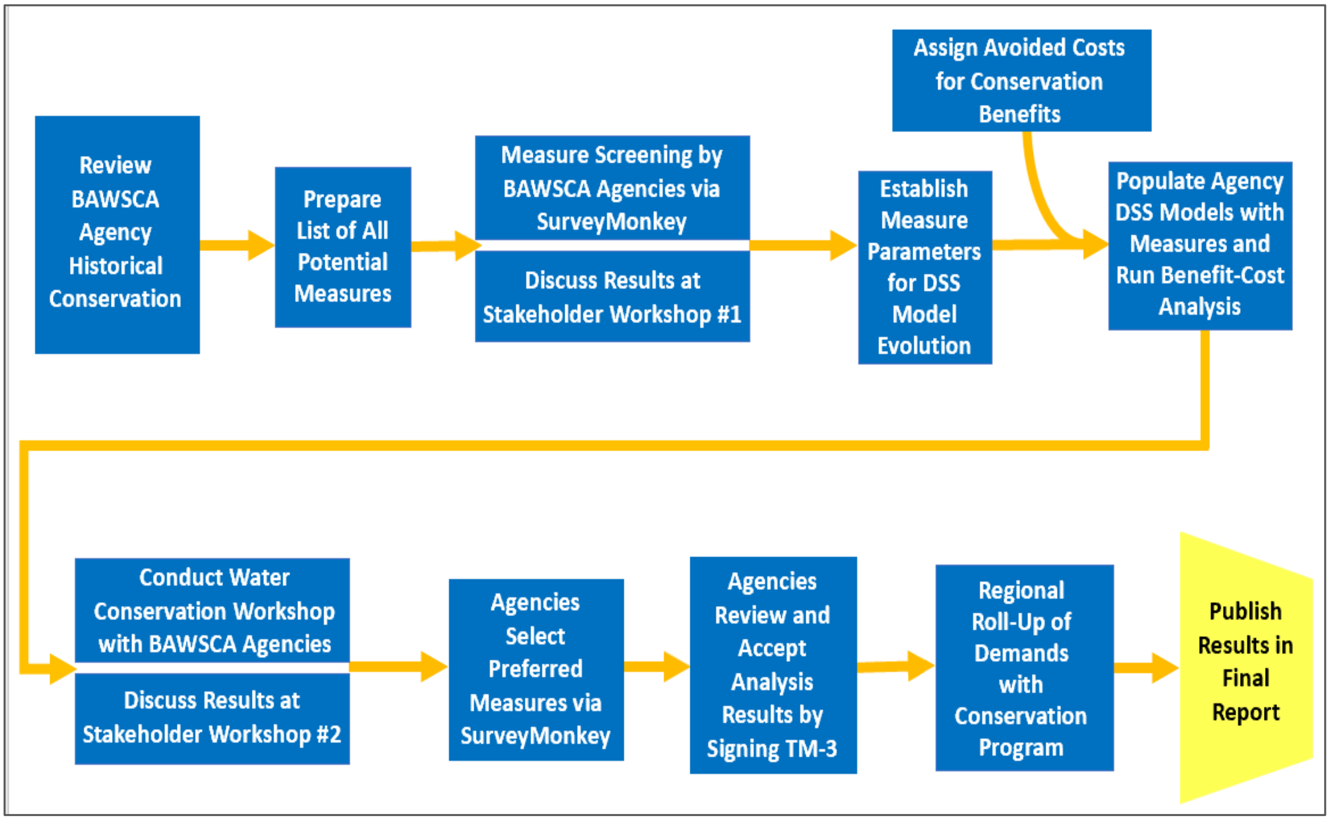
The conservation savings projections were developed through a 10-step process.

**Review of Historical BAWSCA Member Agency Conservation Programs and Savings**

The first step in the conservation analysis was to review historical BAWSCA member agency water conservation and savings. The purpose of this review was to look at historically successful programs, past penetration rates (activity levels) for individual measures, and the types of programs that were implemented (and for which customers – single family, multifamily, commercial, etc.) by each of the agencies since the 2014 Project. This information was reviewed on a regional and individual agency level. The participation rates were incorporated into the design of the activity levels for each of the conservation measures in the DSS Model analysis.

Figure 4-1 illustrates the 10-step conservation analysis process.

**Figure 4-1. BAWSCA 10-Step Conservation Analysis Process**




### Selection of Conservation Measures for Analysis

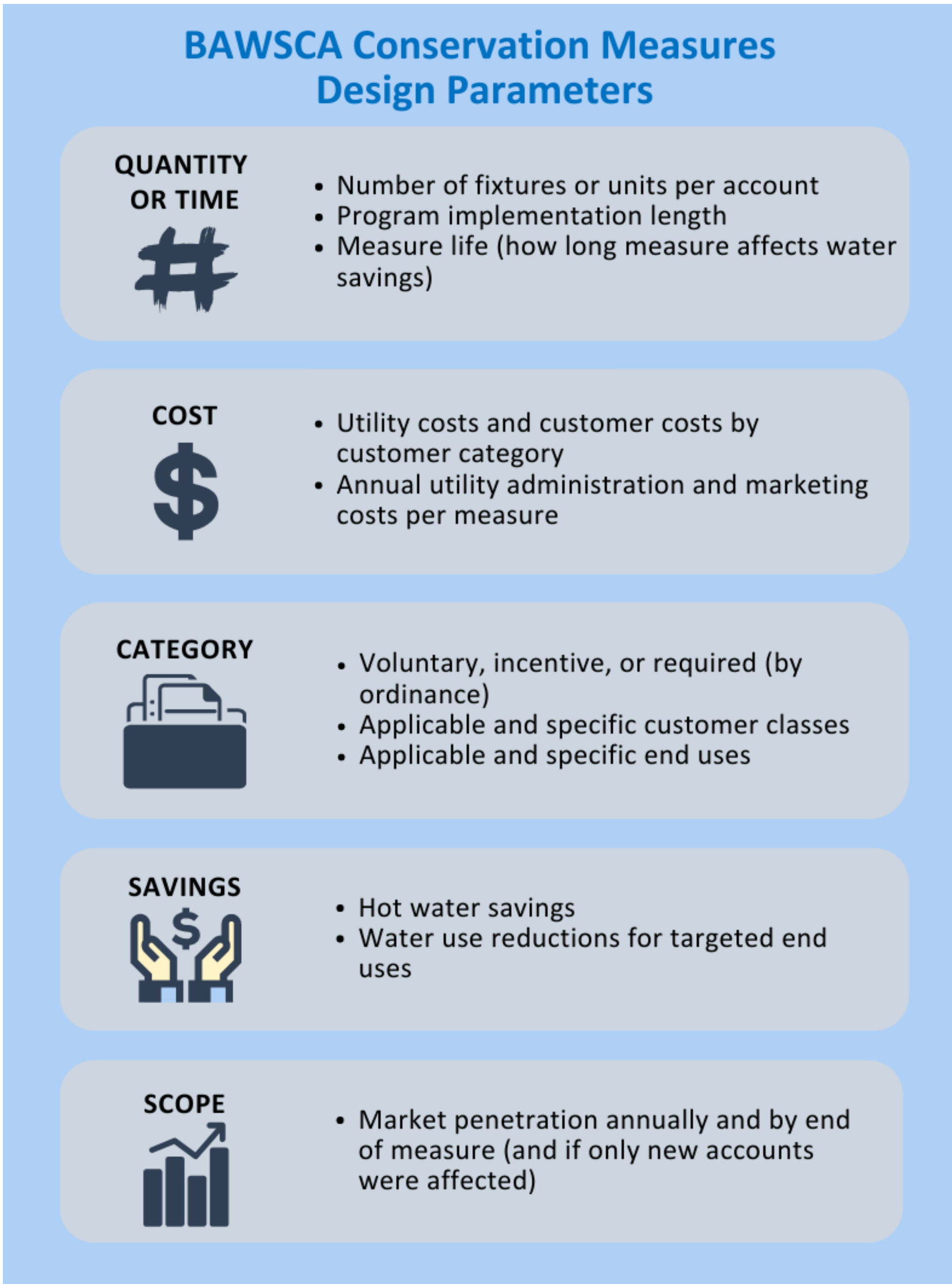
Following the review of the historical conservation efforts, a list of 40 potential conservation measures was selected by BAWSCA staff. Member agencies were then asked to complete an online survey through SurveyMonkey to assist in choosing 20-25 of the 40 potential conservation measures that should be considered for further evaluation in the DSS Model. This list of measures was screened by BAWSCA and the member agencies to identify those measures with the highest level of interest, importance, and potential for implementation within the BAWSCA service area independent of which entity (BAWSCA, Valley Water, or the individual agencies) would be best suited to implement each measure. The list was also reviewed by the Stakeholder Workgroup, who provided suggestions on measure ideas and design. Through this process, a total of 24 measures were selected for analysis in the individual agency DSS models. The 24 measures that were incorporated into the DSS Models are presented in Figure 4-2, with the screening process results and further details on each measure in Appendix D.

**Figure 4-2. BAWSCA Agency-Selected Water Use Efficiency Measures**

**Conservation Measure Design**

Following the selection of the 24 conservation measures for the DSS Model, design parameters for each measure were developed for inclusion in the model (see Figure 4-3). The design parameters were developed through a collaborative effort in which information was compiled and reviewed by participants from MWM, BAWSCA staff, Valley Water, SFPUC, and the individual agencies.

**Figure 4-3. Conservation Measures Design Parameters**



The following assumptions were used in designing the model parameters for each conservation measure:

- Historical BAWSCA data were used in cases when the measure was already in existence.
- Valley Water data were used to design BAWSCA-led measures in cases where Valley Water was running a comparable measure at the time of the analysis.
- Design of individual "agency measures" and their parameter values came from BAWSCA member agencies.
- Other industry data and knowledge was incorporated when local data was not available.
- New measures were designed with an implementation schedule reflecting dates sometime in the future when BAWSCA or its member agencies might begin such programs.

**Measure Analysis and Conservation Program Selection**

The 24 conservation measures were incorporated into each agency's DSS Model for benefit-cost analysis (described below) and selection of a conservation program to meet the agency's goals. Included in each agency's DSS Model was a list of measures selected by the individual member agency. The following four key items were taken into consideration during measure selection:

- Existing agency water use efficiency measures
- Programs run by BAWSCA (with consideration for Valley Water programs)
- Measures focused on the topic areas of new state regulations (residential indoor per capita use, water loss, landscape, commercial
- New and innovative measures

Each BAWSCA member agency's DSS Model presented estimated average per capita per day savings with the plumbing codes only. Plumbing code includes current state and federal standards (including CALGreen, Senate Bill 407 and Assembly Bill 715) for items such as toilets, showerheads, faucets, pre-rinse spray valves. SB 407 and AB 715 require the replacement of non-water conserving plumbing fixtures with water-conserving fixtures as described in Appendix E.

Each BAWSCA member agency was allowed to review the conservation program options, tailor the programs to meet its needs, and select the program that fit its individual water savings goals and budgets. The reasons that each member agency selected a particular suite of measures varied but included:

- Measure cost effectiveness
- Applicability to service area
- Amount of water savings generated
- Cost
- Ease of implementation and staffing requirements
- Which agency was running the measure (BAWSCA or Valley Water)
- Local preferences

## Perspectives on Benefits and Costs

The determination of the economic feasibility of water conservation programs involves comparing the costs of the programs to the benefits provided. This analysis was performed using the DSS Model developed by MWM, which calculates the cost effectiveness of conservation measure savings at the end-use level. For example, the model determines the amount of water a toilet rebate program saves in daily toilet usage for each single family account. Additional detail on the DSS Model and assumptions can be found in Appendix E.

Appendix F presents generic starting value measure assumptions used as a means for each BAWSCA member agency to tailor its DSS Model to evaluate the potential water use efficiency measures. The agencies had the option to select or unselect any measure for implementation. Assumptions were made for the following variables incorporated into the DSS Model:

- **Targeted Water User Group End Use –** Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use)
- **Utility Unit Cost –** Cost of rebates, incentives, and contractors hired by BAWSCA and BAWSCA member agencies to implement measures
- **Retail Customer Unit Cost –** Cost for implementing measures that is paid by retail customers (i.e., remainder of a measure's cost that is not covered by a rebate or incentive)
- **Utility Administration and Marketing Cost –** The cost to the utility for staff time, general expenses, and overhead needed to implement and administer the measure, including consultant contract administration, marketing, and participant tracking. The unit costs vary greatly according to the type of customer and implementation method. For example, a measure might cost a different amount for a single family account than a multifamily account. Rebate program costs are different than costs to develop and enforce an ordinance requirement or a direct installation program. Typically, water utilities incur increased costs with achieving higher market saturation, such as more surveys per year. The model calculates the annual costs based on the number of participants each year.

  The general formula for calculating annual utility costs is:

  *Annual Utility Cost = Annual market penetration rate x total accounts in category x unit cost per account x (1+administration and marketing markup percentage)*

  *Annual Customer Cost = Annual number of participants x unit customer cost*

  *Annual Community Cost = Annual utility cost + annual customer cost*

## Considering Co-Benefits of Water Conservation Measures

The DSS Model considers the costs and benefits of water conservation programs from a water utility perspective to determine economic feasibility. However, many of the water conservation programs evaluated through this study include additional benefits distinctly different from what a water utility would track. The value of those distinctly different impacts is not fully captured in this quantitative analysis. Examples of these co-benefits include the following items shown in Table 4-1.

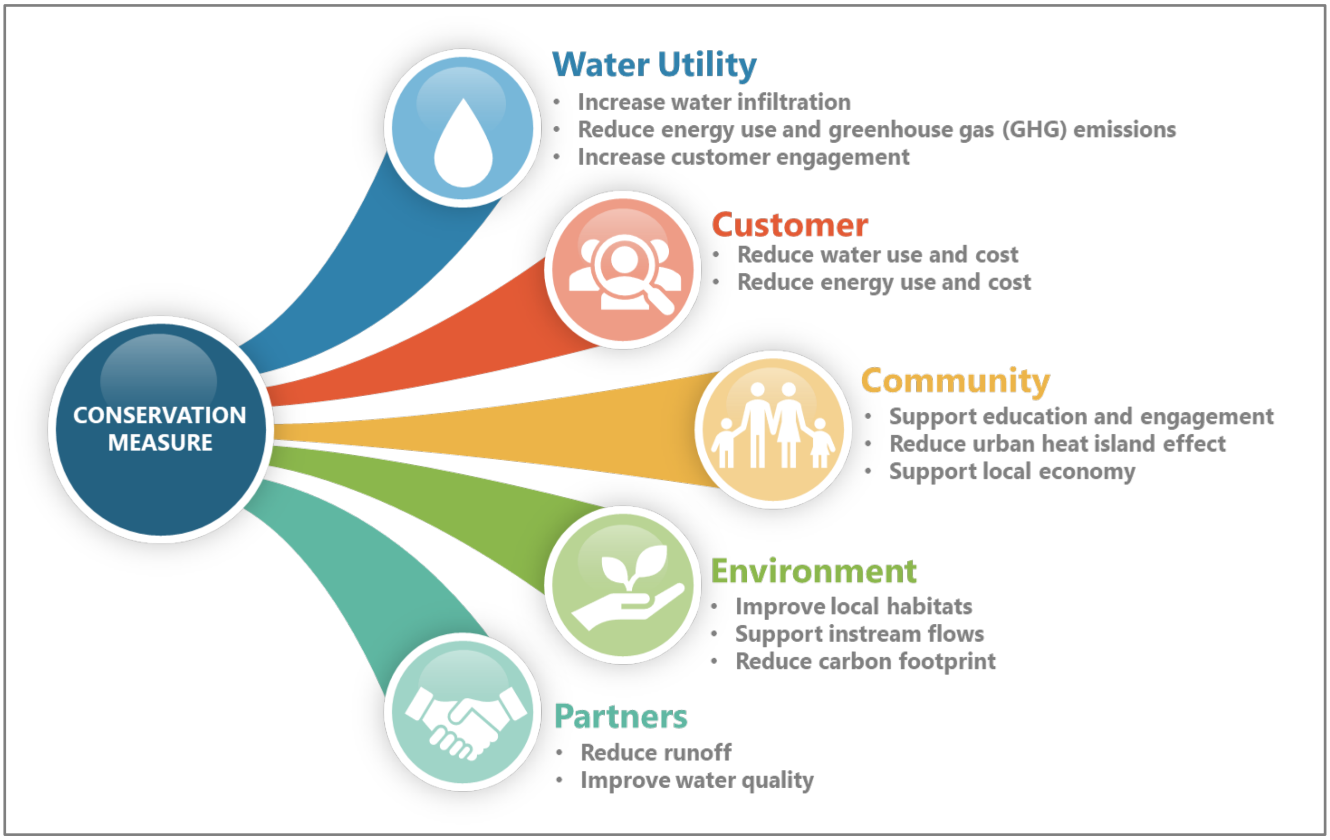
**Table 4-1. Co-Benefits from Conservation Measure Implementation***

| Beneficiary | Benefit |
|---|---|
| Utility | Reduce energy and GHG for pumping and treating water |
| Utility | Increase water infiltration (if groundwater basin) |
| Utility | Increase customer engagement |
| Partner | Reduce runoff and improve local water quality |
| Customer | Reduce water cost for customer |
| Customer | Reduce energy cost on-site |
| Environment | Improve local habitats |
| Environment | Reduce carbon footprint |
| Community | Reduce urban heat island effect |
| Community | Support education |
| Community | Build community cohesion and resilience |
| Community | Support local economy (local jobs and/or property values) |

** Adapted in collaboration with Pacific Institute from Diringer et al. (2020). Incorporating Multiple Benefits into Water Projects: A Guide for Water Managers. Pacific Institute. www.pacinst.org/multiplebenefits.*

Figure 4-4 presents key co-benefits that can be achieved from various conservation measure implementation. This information may support the development of partnerships and cost sharing opportunities for measure implementation to optimize the investment of time and resources. Potential partnership opportunities may include local municipalities with stormwater permit requirements, cities implementing Climate Action Plans, energy utilities, and regenerative landscaping organizations such as ReScape.

**Figure 4-4. Co-Benefits of Identified Conservation Measures**




*Note: Adapted in collaboration with Pacific Institute – Diringer et al. (2020). Incorporating Multiple Benefits into Water Projects: A Guide for Water Managers. Pacific Institute. [www.pacinst.org/multiplebenefits](www.pacinst.org/multiplebenefits).*

## 4.3 Conservation Measures – Agency Input and Review

As part of this Demand Study's collaborative approach, two instructional webinar conference calls were held to facilitate BAWSCA member agency understanding of and involvement in the review and selection of the conservation measures and savings analysis.

- **Instructional Webinar and Conservation Survey #1 –** A webinar with the member agencies was held on an initial webinar was held on December 19, 2019, to facilitate the selection of conservation measures for analysis in the DSS Model. The webinar was recorded and offered to those who could not attend to maximize participation by the agencies. This was followed by a survey conducted in January 2020 to solicit feedback on which conservation measures BAWSCA member agencies wanted to consider as part of the conservation analysis. Results from the January 2020 survey can be found in Appendix D.
- **Conservation Workshop (virtual) and Conservation Survey #2 –** A virtual workshop was held on April 1, 2020 to facilitate BAWSCA member agency understanding of and involvement in the conservation program analysis in the DSS Model**.** The originally planned in-person workshop was changed to a virtual workshop in response to the COVID 19 pandemic. This was followed by a survey conducted in April 2020 to solicit feedback on which conservation measures BAWSCA member agencies wanted to consider as part of the conservation analysis.
- **Agency Communication and Technical Memorandum 3 (TM-3) –** In April 2020, individual agencies were provided a copy of their individual conservation saving results via a Technical Memorandum (TM-3). Following the release of the TM-3 individual agencies were able send questions via email or set up virtual calls to review the conservation savings analysis results and make any necessary modifications.

- **Written Approval of Demand Values –** In May 2020, individual agencies were requested to submit a written approval that their demand values including passive and active conservation appeared reasonable. The report includes all the values that were signed off by the individual agencies.

## 4.4 Comparison of Individual Conservation Measures

MWM conducted an economic evaluation of each selected water conservation measure using the DSS Model. Appendix F presents detailed results with regard to how much water each measure will save through 2045; how much each will cost; and the cost of saved water per unit volume if the measure were to be implemented on a stand-alone basis (i.e., without interaction or overlap from other measures that might address the same end use or uses). Dollar savings from reduced water demand was quantified annually and based on avoided costs. Actual measure design parameter inputs can be found in Appendix F. While each measure was analyzed independently, it is important to note that very few measures operate independently. Savings from measures which address the same end use(s) are not directly additive. The model uses impact factors to avoid double counting in estimating the water savings from programs of measures (further details in Appendix E, Section E.4).

One of the objectives of the Demand Study was to identify conservation measures for further consideration for BAWSCA region-wide implementation. Figure 4-5 presents the number of BAWSCA member agencies that selected each measure as part of their planned conservation programs.

**Figure 4-5. Potential Conservation Measures**

## BAWSCA Planned Conservation Measure Implementation

| Measure Name | # of Agencies Planning to Implement |
|---|---|
| <u>Commercial</u> | |
| CII Water Survey | 13 |
| CII Water Efficient Technology (WET) Rebate | 10 |
| School Building Retrofit | 6 |
| Fixture Retrofit on Resale or Water Account Change (Commercial) | 2 |
| <u>Irrigation</u> | |
| Residential Outdoor Water Surveys | 16 |
| Large Landscape Outdoor Water Surveys | 20 |
| Large Landscape (Waterfluence) Program | 14 |
| Lawn Be Gone! and Rainwater Capture Rebates | 19 |
| Financial Incentives for Irrigation and Landscape Upgrades | 14 |
| Landscape Irrigation and Codes | 10 |
| <u>Residential</u> | |
| Residential Indoor Water Surveys | 9 |
| Residential Water-Savings Devices Giveaway | 20 |
| Flowmeter Rebate | 7 |
| Leak Repair and Plumbing Emergency Assistance | 9 |
| Multifamily HET Direct Install | 2 |
| Multifamily Submetering for Existing Accounts | 5 |
| New Development Submetering | 8 |
| New Development Hot Water On Demand | 4 |
| Low Impact New and Remodeled Development | 3 |
| Fixture Retrofit on Resale or Water Account Change (Residential) | 2 |
| <u>Community & Education</u> | |
| Public and School Education | 22 |
| Billing Report Educational Tool Non-AMI | 10 |
| AMI Customer Portal | 14 |
| <u>System Water Loss</u> | |
| Water Loss | 20 |

# 5 PROJECTED WATER DEMAND AND CONSERVATION SAVINGS RESULTS

This section presents the results of the water demand and conservation analysis for each individual BAWSCA member agency and for the BAWSCA region.

## 5.1 BAWSCA Regional Demand Projections

For the purposes of these regional projections, the demand projections for future planning are presented in Table 5-1. These demand projections were developed using the Partial Rebound demand scenario developed utilizing an Econometric Modeling approach, both of which are further described in Section 3. The Econometric Modeling approach assumed: 1) normal weather, 2) normal economy, 3) price escalation projections that vary by agency, 4) historical active conservation efforts, and 5) passive conservation plumbing codes.

Demand projections are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic Shelter in Place orders began in March 2020. Therefore, none of the new changes in water use profiles, population, employment, or vacancies resulting from the pandemic have been incorporated because the data was not yet available and was outside the scope of this project. It is recognized that, depending on the impact of recent events, the water demands may need to be reviewed and/or modified.

Table 5-1 presents the following:

- **Demand projections with no plumbing code savings** – previously verified by each member agency through the Technical Memorandum 2 signature form.
- **Demand projections with plumbing code savings** – previously verified by each member agency through the TM-2 signature form.
- **Demand projections with the plumbing code savings and active conservation program savings** – incorporates the member agency-selected active conservation program from the agency's DSS Model. The SurveyMonkey with the selected conservation program was returned to BAWSCA on April 30, 2020.

**Table 5-1. Demand Projections for Partial Rebound Scenario**

| Demand Forecast (MGD) | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Total Demand with No Plumbing Code Savings | 231.1 | 240.3 | 251.1 | 266.7 | 280.0 | 293.6 |
| Total Demand with Plumbing Code Savings | 222.0 | 228.9 | 234.3 | 244.3 | 253.1 | 262.4 |
| Total Demand with Active Measure Savings | 219.0 | 225.1 | 229.2 | 238.8 | 247.0 | 256.3 |

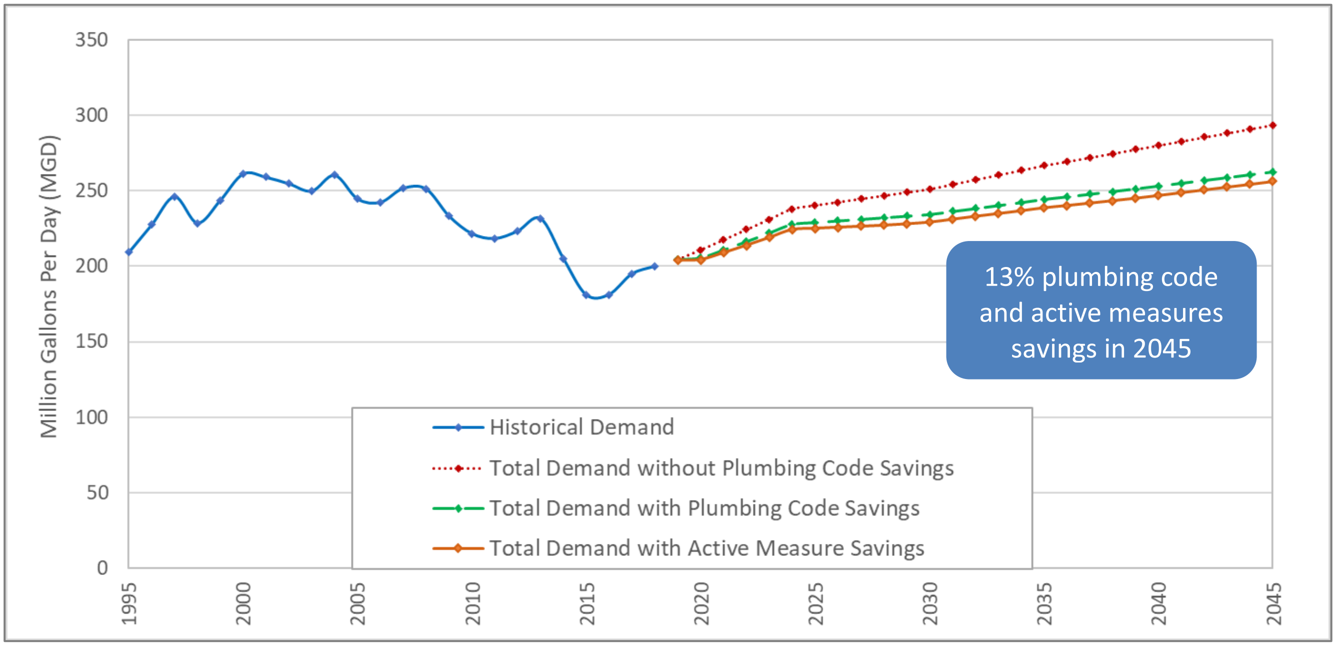
*Note: Total water demand accounts for the total projected demand in a service area water system regardless of source, which could be from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water. The basis for this demand scenario was discussed previously in Section 3. AB 1668 (Friedman) and SB 606 (Hertzberg) will begin to be enforced in 2023. Therefore, projections for that particular year are included since that is when the new conservation requirements begin to take effect.*

Figure 5-1 presents the combined BAWSCA region-wide water demand projections with and without passive conservation. Total water demand is defined as total water consumption plus non-revenue water. Water consumption is defined as water delivered to individual customers for use. As noted earlier in Section 3, the conservation analysis was based upon the Partial Rebound – Normal Economy, Weather Normalized scenario.

Figure 5-2 illustrates the projected 75% population increase with a 2% demand decrease between 1986 and 2045. The demand shown in this chart includes both plumbing code and active conservation measure savings.

Figure 5-3 represents the gross and residential per capita water use for BAWSCA. The gross per capita value is the total production including non-revenue water. Both the gross and residential per capita water use exclude recycled water.

**Figure 5-1. BAWSCA Region-Wide Demands with Active Conservation Savings to 2045***




* *Water demands are based on data provided from 1995 through 2018. This analysis was completed before the COVID-19 pandemic and does not incorporate any of the new changes in water use profiles, population, employment, or vacancies as the data was not yet available and was outside the scope of the current project. However, it is recognized that the water demands may need review or modification depending on the impact of recent events.*

**Figure 5-2. Historical and Projected Population and Demand**

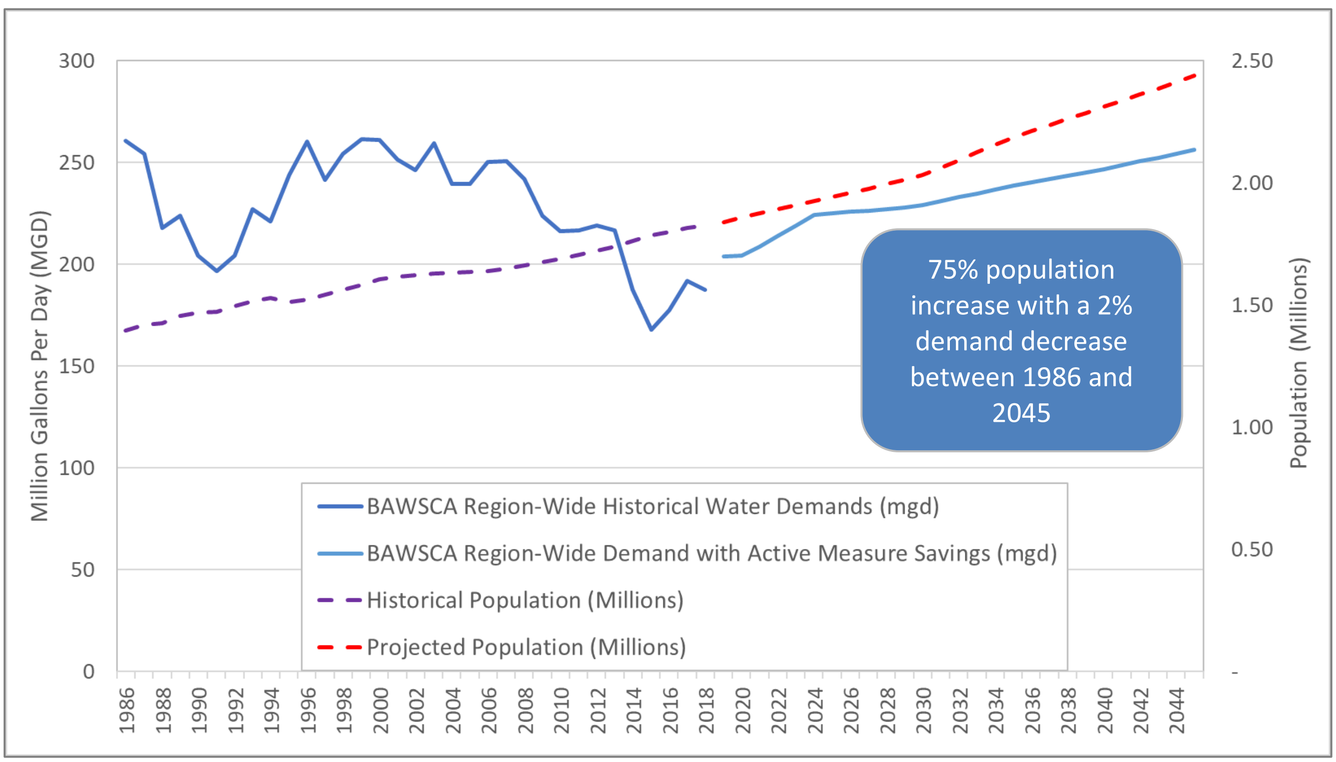
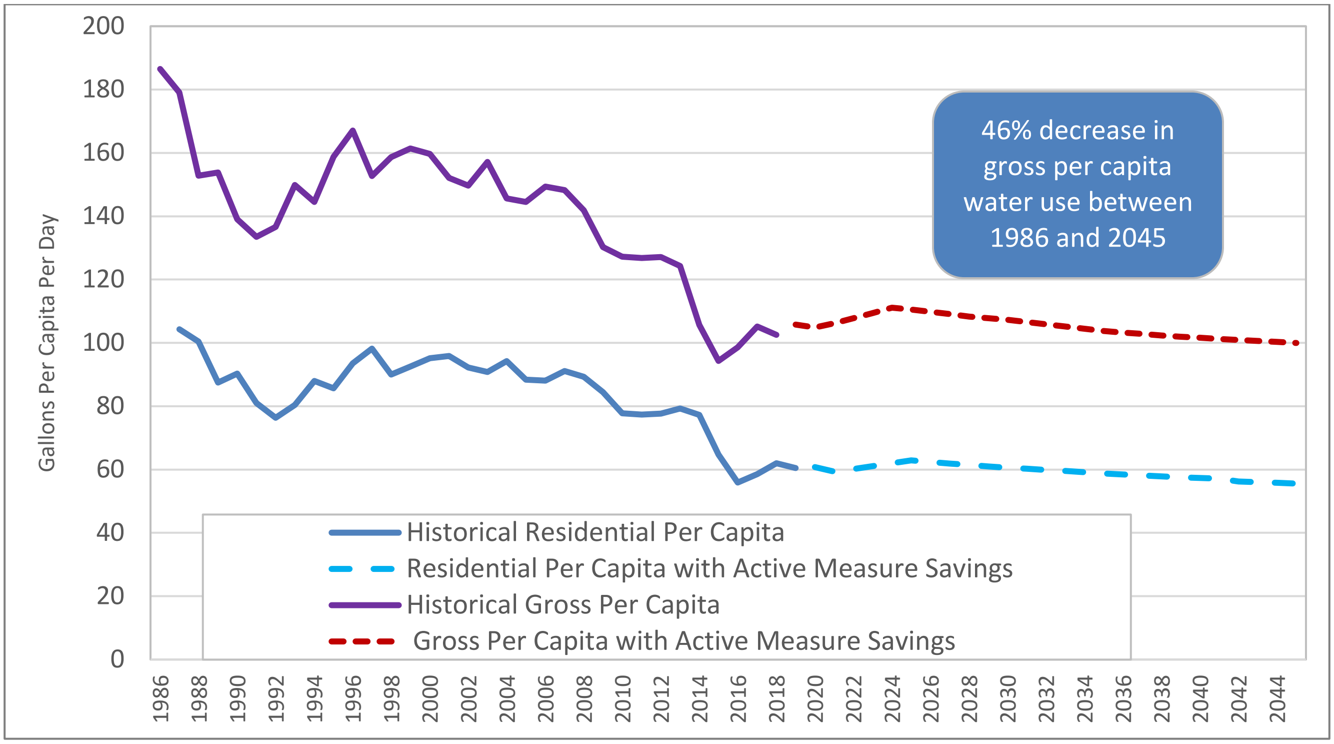


**Figure 5-3. Total BAWSCA Gross Per Capita Demands**




*Note: To be consistent with the BAWSCA methodology for the BAWSCA Annual Survey, recycled water has been removed from the per capita calculations. Therefore, the above information is a potable-only per capita value.*

## 5.2 Population and Employment Projections Summary

Table 5-2 presents the BAWSCA region-wide historical and projected population and employment.

**Table 5-2. BAWSCA Region-Wide Historical and Projected Population and Employment**

| Year | Population | Employment (Jobs) |
|---|---|---|
| 1995* | 1,511,254 | 1,044,179 |
| 2000* | 1,604,927 | 1,129,881 |
| 2005* | 1,636,600 | 1,064,347 |
| 2010* | 1,688,378 | 1,033,325 |
| 2015* | 1,785,787 | 1,072,024 |
| 2020 | 1,858,392 | 1,156,613 |
| 2025 | 1,941,725 | 1,209,770 |
| 2030 | 2,032,304 | 1,270,096 |
| 2035 | 2,187,849 | 1,329,806 |
| 2040 | 2,311,562 | 1,379,449 |
| 2045 | 2,438,515 | 1,430,112 |

** Historical population and employment based on BAWSCA records as reported by individual member agencies.*

Figure 5-4 presents the BAWSCA service area population and employment projections.

**Figure 5-4. Historical and Projected Population and Employment**

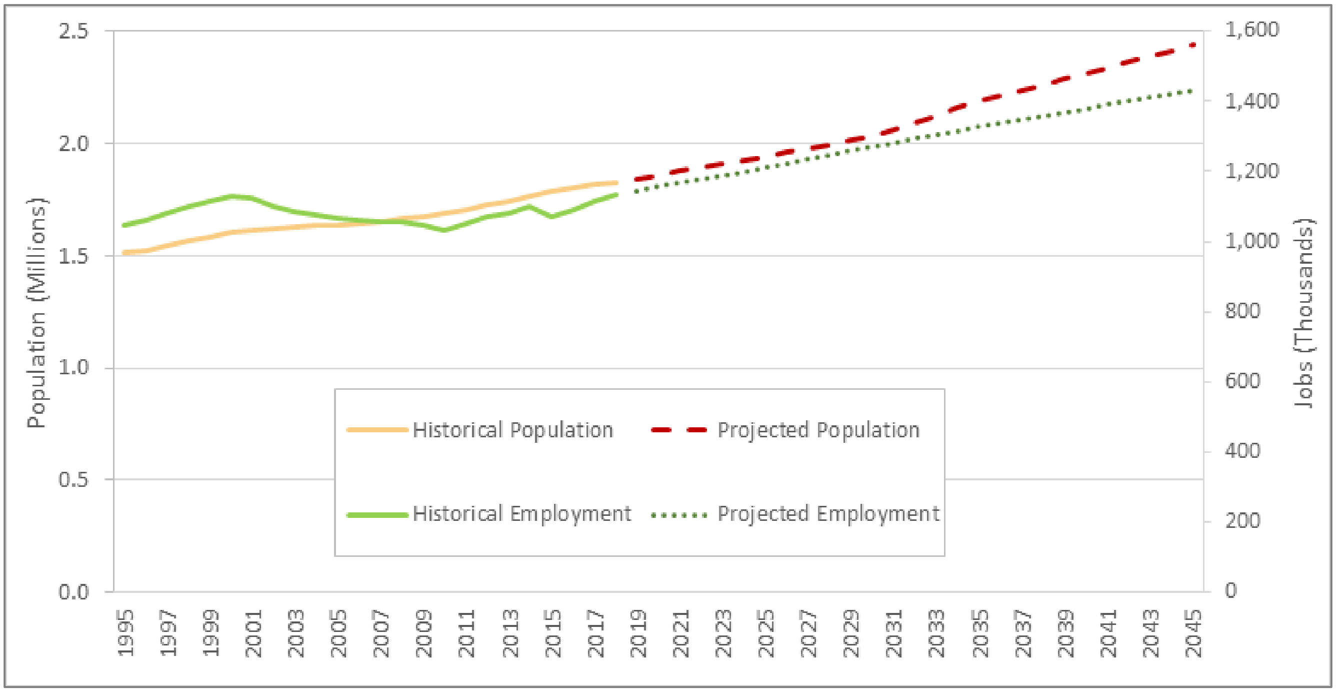



Table 5-3 presents individual BAWSCA member agency population projections. Each agency was given the ability to select the source they felt best represented their service area and other planning documents.

**Table 5-3. BAWSCA Member Agency Population Projections**

| Service Areas | Projection Source | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| Alameda County Water District | ACWD Forecast – California Department of Finance (DOF), ABAG, BAM[1] | 358,902 | 360,273 | 363,700 | 381,190 | 403,005 | 424,820 |
| Brisbane/GVMID | Previous DSS Model; model updated in 2018 for WSA | 4,583 | 4,632 | 4,761 | 4,906 | 5,056 | 5,206 |
| Burlingame, City of | 2015 UWMP | 33,804 | 34,477 | 36,162 | 37,846 | 39,530 | 41,214 |
| CWS – Bear Gulch District | CalWater Draft Demand Model | 61,257 | 61,329 | 61,697 | 62,243 | 62,780 | 63,327 |
| CWS – Mid Peninsula District | CalWater Draft Demand Model | 137,332 | 137,623 | 138,350 | 139,077 | 139,804 | 140,531 |
| CWS – South San Francisco District | CalWater Draft Demand Model | 63,225 | 63,381 | 63,890 | 64,633 | 66,990 | 69,458 |
| Coastside County Water District | Preliminary 2019 ABAG | 18,890 | 18,991 | 19,238 | 19,371 | 19,472 | 19,573 |
| Daly City, City of | Previous effort's DSS Model; based on ABAG 2013 subregional data; 1995 data from 2000 ABAG | 114,352 | 115,671 | 119,147 | 123,020 | 127,028 | 131,037 |
| East Palo Alto, City of | 2015 UWMP | 26,703 | 27,215 | 28,589 | 30,062 | 31,646 | 33,230 |
| Estero MID/ Foster City | Updated DSS Model in 2017 for WSA effort | 37,560 | 37,800 | 38,400 | 39,000 | 39,600 | 40,200 |
| Hayward, City of | DOF 2019 Population; growth based on flow projections in Hayward's Sewer Master Plan | 173,933 | 181,670 | 202,553 | 225,836 | 251,795 | 280,738 |
| Hillsborough, Town of | 2015 UWMP | 10,939 | 10,956 | 11,000 | 11,000 | 11,000 | 11,000 |
| Menlo Park, City of[2] | 2015 UWMP | 20,018 | 21,214 | 24,204 | 27,194 | 30,184 | 33,174 |
| Mid-Peninsula Water District | 2019 Preliminary ABAG | 28,851 | 29,711 | 30,008 | 31,010 | 31,961 | 32,912 |
| Millbrae, City of | 2019 Preliminary ABAG | 22,734 | 22,846 | 26,774 | 26,657 | 27,081 | 27,505 |

| Service Areas | Projection Source | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| **Milpitas, City of** | 2015 UWMP and 2019 Preliminary ABAG | 87,160 | 90,400 | 98,100 | 106,000 | 109,100 | 112,200 |
| **Mountain View, City of** | Provided by E. Anderson – General Plan Buildout | 85,247 | 88,125 | 95,318 | 102,512 | 109,706 | 116,900 |
| **North Coast County Water District** | Previous DSS Model | 41,080 | 41,400 | 42,000 | 42,400 | 42,800 | 43,200 |
| **Palo Alto, City of** | 2015 UWMP | 72,420 | 73,700 | 77,100 | 80,800 | 84,600 | 88,400 |
| **Purissima Hills Water District** | Preliminary 2019 ABAG | 6,827 | 6,833 | 6,898 | 7,025 | 7,112 | 7,199 |
| **Redwood City, City of** | 2015 UWMP | 92,466 | 93,765 | 97,128 | 100,614 | 104,247 | 107,947 |
| **San Bruno, City of** | Preliminary 2019 ABAG | 42,619 | 43,100 | 44,328 | 47,080 | 51,922 | 56,764 |
| **San Jose, City of[3]** | Preliminary 2019 ABAG | 32,139 | 35,530 | 49,100 | 72,283 | 80,111 | 87,939 |
| **Santa Clara, City of** | City of Santa Clara Community Development Department ABAG projections | 134,991 | 137,215 | 142,425 | 151,715 | 159,500 | 167,285 |
| **Stanford University** | Office of Institutional Research and Decision Support | 33,912 | 34,748 | 36,922 | 39,226 | 41,342 | 43,525 |
| **Sunnyvale, City of** | Preliminary 2019 ABAG | 153,134 | 156,020 | 161,100 | 201,428 | 220,169 | 238,910 |
| **Westborough Water District** | 2015 UWMP | 12,977 | 13,101 | 13,411 | 13,721 | 14,020 | 14,319 |
| **TOTAL** | | **1,908,054** | **1,941,725** | **2,032,304** | **2,187,849** | **2,311,562** | **2,438,515** |

*[1] California Department of Finance 2019 Population; 2020-2029 interpolation from 2019 DOF with 2017 ABAG/BAM 2030 projections; 2030-2040 from 2017 ABAG/BAM.*

*[2] Service area population was further reviewed and refined at the request of Menlo Park staff. Population minor update was made with support from the Project Team's analysis of census data with input from ABAG, which was then reviewed and approved by Menlo Park staff.*

*[3] Service area population estimates for San Jose represent San Jose Municipal Water System's northern San Jose service area, not the entire service area of the City of San Jose.*

## 5.3 Individual Agency Water Demands with and without Conservation

Table 5-5, and Table 5-6 present BAWSCA individual member agency water demand projections through 2045, including the following for the Partial Rebound – Normal Economy, Weather Normalized scenario:

- Demands before incorporating future passive conservation savings
- Demands including projected passive conservation savings
- Demands including projected passive and active conservation savings

**Table 5-4. Demand Projections Before Passive Conservation Savings (MGD)**

| Service Areas | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Alameda County Water District | 44.0 | 45.8 | 46.7 | 48.6 | 50.6 | 52.8 |
| Brisbane/GVMID | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 |
| Burlingame, City of | 4.6 | 4.7 | 4.9 | 5.2 | 5.4 | 5.6 |
| CWS - Bear Gulch District | 12.8 | 13.3 | 13.4 | 13.7 | 13.8 | 13.9 |
| CWS - Mid Peninsula District | 13.4 | 13.6 | 13.7 | 13.8 | 13.9 | 14.0 |
| CWS - South San Francisco District | 7.1 | 7.4 | 7.5 | 7.6 | 8.4 | 9.1 |
| Coastside County Water District | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Daly City, City of | 6.8 | 6.9 | 7.1 | 7.4 | 7.6 | 7.8 |
| East Palo Alto, City of | 1.9 | 2.1 | 2.2 | 2.4 | 2.9 | 3.4 |
| Estero MID/Foster City | 4.4 | 4.4 | 4.7 | 4.8 | 5.0 | 5.1 |
| Hayward, City of | 18.2 | 19.3 | 21.0 | 22.7 | 24.4 | 26.3 |
| Hillsborough, Town of | 3.2 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Menlo Park, City of | 3.9 | 4.2 | 4.7 | 5.2 | 5.6 | 6.1 |
| Mid-Peninsula Water District | 2.9 | 3.1 | 3.2 | 3.3 | 3.4 | 3.4 |
| Millbrae, City of | 2.4 | 2.4 | 2.7 | 2.7 | 3.2 | 3.6 |
| Milpitas, City of | 11.8 | 12.5 | 13.3 | 14.2 | 14.9 | 15.7 |
| Mountain View, City of | 10.6 | 11.3 | 12.0 | 12.7 | 13.5 | 14.2 |
| North Coast County Water District | 2.6 | 2.6 | 2.7 | 2.7 | 2.7 | 2.7 |
| Palo Alto, City of | 12.1 | 12.5 | 12.9 | 13.5 | 14.0 | 14.6 |
| Purissima Hills Water District | 2.0 | 2.1 | 2.1 | 2.2 | 2.2 | 2.2 |
| Redwood City, City of | 9.7 | 10.0 | 10.5 | 11.0 | 11.4 | 11.7 |
| San Bruno, City of | 3.5 | 3.6 | 3.7 | 3.9 | 4.2 | 4.5 |
| San Jose, City of | 6.0 | 6.3 | 7.2 | 9.0 | 10.0 | 11.0 |
| Santa Clara, City of | 21.9 | 22.5 | 24.1 | 25.2 | 25.9 | 26.6 |
| Stanford University | 3.0 | 3.2 | 3.4 | 3.6 | 3.9 | 4.1 |
| Sunnyvale, City of | 18.6 | 19.1 | 19.9 | 23.8 | 25.7 | 27.7 |
| Westborough Water District | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 |
| TOTAL* | 231.1 | 240.3 | 251.1 | 266.7 | 280.0 | 293.6 |

** Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

**Table 5-5. Demand Projections with Passive Conservation Savings (MGD)**

| Service Areas | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Alameda County Water District | 42.4 | 43.7 | 43.7 | 44.6 | 45.8 | 47.3 |
| Brisbane/GVMID | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Burlingame, City of | 4.4 | 4.5 | 4.6 | 4.7 | 4.8 | 4.9 |
| CWS - Bear Gulch District | 12.5 | 12.9 | 12.8 | 12.9 | 12.9 | 12.9 |
| CWS - Mid Peninsula District | 12.7 | 12.8 | 12.6 | 12.5 | 12.3 | 12.2 |
| CWS - South San Francisco District | 6.9 | 7.1 | 7.1 | 7.1 | 7.8 | 8.4 |
| Coastside County Water District | 1.9 | 1.9 | 1.9 | 1.9 | 1.8 | 1.8 |
| Daly City, City of | 6.4 | 6.4 | 6.3 | 6.4 | 6.4 | 6.5 |
| East Palo Alto, City of | 1.8 | 1.9 | 2.0 | 2.1 | 2.5 | 3.0 |
| Estero MID/Foster City | 4.2 | 4.2 | 4.4 | 4.4 | 4.5 | 4.6 |
| Hayward, City of | 17.2 | 18.1 | 19.1 | 20.2 | 21.3 | 22.6 |
| Hillsborough, Town of | 3.1 | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 |
| Menlo Park, City of | 3.7 | 4.0 | 4.4 | 4.8 | 5.1 | 5.5 |
| Mid-Peninsula Water District | 2.8 | 2.9 | 2.9 | 3.0 | 3.0 | 3.0 |
| Millbrae, City of | 2.3 | 2.3 | 2.6 | 2.5 | 2.9 | 3.3 |
| Milpitas, City of | 11.3 | 11.9 | 12.4 | 13.0 | 13.5 | 14.0 |
| Mountain View, City of | 10.2 | 10.8 | 11.2 | 11.7 | 12.1 | 12.6 |
| North Coast County Water District | 2.4 | 2.4 | 2.4 | 2.3 | 2.3 | 2.3 |
| Palo Alto, City of | 11.7 | 12.0 | 12.3 | 12.6 | 13.0 | 13.4 |
| Purissima Hills Water District | 2.0 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 |
| Redwood City, City of | 9.3 | 9.4 | 9.7 | 9.9 | 10.0 | 10.2 |
| San Bruno, City of | 3.3 | 3.4 | 3.4 | 3.5 | 3.7 | 3.9 |
| San Jose, City of | 5.7 | 5.9 | 6.6 | 7.9 | 8.7 | 9.4 |
| Santa Clara, City of | 21.3 | 21.8 | 23.0 | 23.8 | 24.2 | 24.6 |
| Stanford University | 2.9 | 3.1 | 3.3 | 3.5 | 3.7 | 4.0 |
| Sunnyvale, City of | 17.9 | 18.3 | 18.6 | 21.8 | 23.3 | 24.8 |
| Westborough Water District | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 |
| TOTAL* | 222.0 | 228.9 | 234.3 | 244.3 | 253.1 | 262.4 |

** Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

**Table 5-6. Demand Projections with Passive and Active Conservation Savings (MGD)**

| Service Areas | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Alameda County Water District | 41.6 | 42.7 | 42.5 | 43.3 | 44.5 | 46.0 |
| Brisbane/GVMID | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Burlingame, City of | 4.3 | 4.4 | 4.5 | 4.6 | 4.7 | 4.8 |
| CWS - Bear Gulch District | 12.3 | 12.7 | 12.6 | 12.8 | 12.7 | 12.7 |
| CWS - Mid Peninsula District | 12.5 | 12.5 | 12.4 | 12.2 | 12.0 | 11.9 |
| CWS - South San Francisco District | 6.8 | 7.0 | 7.0 | 7.0 | 7.6 | 8.2 |
| Coastside County Water District | 1.9 | 1.9 | 1.9 | 1.9 | 1.8 | 1.8 |
| Daly City, City of | 6.4 | 6.3 | 6.2 | 6.3 | 6.3 | 6.4 |
| East Palo Alto, City of | 1.8 | 1.9 | 1.9 | 2.1 | 2.5 | 2.9 |
| Estero MID/Foster City | 4.1 | 4.1 | 4.1 | 4.2 | 4.2 | 4.4 |
| Hayward, City of | 17.0 | 17.9 | 18.7 | 19.8 | 20.8 | 22.1 |
| Hillsborough, Town of | 3.1 | 3.3 | 3.3 | 3.2 | 3.2 | 3.2 |
| Menlo Park, City of | 3.7 | 4.0 | 4.3 | 4.7 | 5.1 | 5.5 |
| Mid-Peninsula Water District | 2.8 | 2.9 | 2.8 | 2.9 | 2.9 | 2.9 |
| Millbrae, City of | 2.3 | 2.3 | 2.5 | 2.5 | 2.9 | 3.2 |
| Milpitas, City of | 11.1 | 11.6 | 12.0 | 12.6 | 13.0 | 13.6 |
| Mountain View, City of | 10.0 | 10.5 | 10.9 | 11.2 | 11.5 | 11.9 |
| North Coast County Water District | 2.3 | 2.3 | 2.3 | 2.3 | 2.2 | 2.2 |
| Palo Alto, City of | 11.5 | 11.8 | 12.0 | 12.3 | 12.6 | 13.0 |
| Purissima Hills Water District | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.2 |
| Redwood City, City of | 9.1 | 9.2 | 9.3 | 9.5 | 9.6 | 9.8 |
| San Bruno, City of | 3.3 | 3.4 | 3.4 | 3.4 | 3.6 | 3.9 |
| San Jose, City of | 5.7 | 5.9 | 6.5 | 7.9 | 8.7 | 9.4 |
| Santa Clara, City of | 21.1 | 21.5 | 22.6 | 23.3 | 23.7 | 24.1 |
| Stanford University | 2.9 | 3.1 | 3.3 | 3.5 | 3.7 | 3.9 |
| Sunnyvale, City of | 17.9 | 18.2 | 18.5 | 21.6 | 23.0 | 24.5 |
| Westborough Water District | 0.8 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 |
| TOTAL* | 219.0 | 225.1 | 229.2 | 238.8 | 247.0 | 256.3 |

**Total projections account for the total projected water demand in a service area water system regardless of source. Sources include purchases from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*

# 6 RECOMMENDATIONS AND NEXT STEPS

BAWSCA will utilize the results of the Demand Study to support implementation of its Long-Term Reliable Water Supply Strategy. In particular, the Demand Study results will support decisions as to which new conservation measures to incorporate in BAWSCA's Regional Water Conservation Program.

This section also offers details on the California legislation regarding new water conservation requirements, the implementation schedule for the legislation, and how that relates to the recommended next steps for BAWSCA and its member agencies.

## 6.1 Recommendations

Recommendations to assist with future conservation program development and implementation include the following:

- Engage in the state processes to establish the requirements associated with implementation of the AB 1668 and SB 606 legislation.
- Prioritize measures for implementation with the highest priority given to those that contribute the most to meeting water saving targets, fulfill regulatory requirements, or provide opportunities for partnership. To launch implementation of a conservation program, BAWSCA may consider answering a series of key questions to determine the measures, budget and schedule. These questions include:
    - What level of support will be required from conservation staff to run the selected measures?
    - What other support (e.g., outsourced support or other sources of funding) is needed or wanted to run these programs?
- Form partnerships for cost-sharing and outreach. To identify partnership opportunities, consider co-benefits of measures prioritized for implementation and connect with organizations whose objectives are in alignment. Engage potential partners early in the design of measures. Apply for grants where appropriate.
- Consider opportunities for customer engagement to increase participation in conservation measures. Early partnership with community organizations may be beneficial in implementing measures in a manner that is accessible to customers and in effectively communicating the benefits of participation to attract customer interest.
- Continue to track and manage measure participation, cost, and other data to gauge successes and areas for improvement.
- Support BAWSCA agencies in taking steps to differentiate between residential and non-residential dedicated irrigation use in their billing systems in order to: 1) support compliance with the state requirements; and 2) improve future per capita water use forecasting.
- Continue to track the impact of the COVID-19 pandemic on employment and total water production. Revisit water demands as appropriate to incorporate recent events into planning efforts.

At this point, no formal commitment has been made at the BAWSCA region-wide or individual agency level to implement the new water conservation measures that were evaluated as part of the Demand Study. BAWSCA will work with the member agencies to further evaluate these programs and to implement new regional programs as appropriate. BAWSCA recognizes that actual implementation of water conservation to achieve the identified water savings goals must be managed in an adaptive fashion, making both small and large program changes as needed over time.

## 6.2 Adapting to the California Legislation and the Pending Regulations

On April 7, 2017, the California Department of Water Resources (DWR) released the "Making Water Conservation a California Way of Life, Implementing Executive Order B-37-16" Final Framework Report (California Department of Water Resources et al, 2017). The State Framework Report, which builds upon Governor Brown's call for new long-term water use efficiency requirements in Executive Order (EOs) B-37-16, provided the state's proposed approach for implementing new long-term water conservation requirements. A key element of the report was proposed new water use targets for urban water suppliers that go beyond existing Senate Bill X7-7 (SB X7-7; Steinberg)[12] requirements and are based on strengthened standards for indoor residential per capita use, outdoor irrigation, commercial, industrial and institutional water use (CII), and water loss.

On May 17, 2018, the California Legislature adopted AB 1668 (Friedman) and SB 606 (Hertzberg) to implement new long-term water use efficiency requirements, including new urban water use objectives for urban water suppliers. This legislation incorporated some key components of the State Framework Report, although some specific elements of the approach for implementing the new water use objectives were changed during the legislative process.

### Adopted Legislation and Regulatory Schedule

The California legislation accomplishes the following:

- Requires the SWRCB, in coordination with DWR, to adopt long-term standards for the efficient use of water.
- Establishes specified standards for per capita daily indoor residential use; in addition to performance measures for CII water use, and with stakeholder input, the SWRCB will adopt long-term efficiency standards for outdoor water use and water loss through leaks.
- Provides SWRCB with the option to adopt long-term efficiency standards for outdoor water use and water loss through leaks, in addition to performance measures for CII water use and with stakeholder input.
- Requires each urban retail water supplier to calculate and report an urban water use objective (which is an estimate of aggregate efficient water use for the previous year based on the adopted water use efficiency standards) and compare that objective to actual water use; to be reported initially by November 1, 2023, then by November 1st every year thereafter.
- Grants SWRCB the authority to enforce compliance with the urban water use objectives, with enforcement actions increasing over the first three years of implementation.
- Establishes a schedule for state agencies to develop the methodology for implementing the requirements, as presented in the following table.

As of June 2020, current regulatory implementation schedule and details of each element of the legislation is provide in Table 6-1.

[12] SB X7-7, also known as the Water Conservation Act of 2009, was a significant amendment introduced after the drought of 2007-2009 and because of the California governor's call for a statewide 20% reduction in urban water use by the year 2020. See the California Department of Water Resources website for more information: https://water.ca.gov/Programs/Water-Use-And-Efficiency/SB-X7-7

**Table 6-1. Implementation Schedule for AB 1668 and SB 606 Key Requirements**

| Date | AB 1668/SB 606 Key Requirement |
|---|---|
| January 1, 2021 | 1. DWR to recommend to CA Legislature standards for indoor residential water use. Defaults are:<br>• 55 GPCD until 2025<br>• 52.5 GPCD from 2025 until January 2030<br>• 50 GPCD beginning in 2030<br>2. DWR to provide each urban retail water supplier with data regarding irrigable lands at level of detail sufficient to verify accuracy at the parcel level |
| October 1, 2021 | 1. DWR to recommend standards for outdoor residential use for adoption by SWRCB:<br>• Incorporate Model Water Efficient Landscape Ordinance (MWELO) principles<br>• Applies to irrigable lands<br>• Include provisions for swimming pools, spas, etc.<br>2. DWR to recommend performance measures for CII water use including:<br>• CII classification system<br>• Minimum size thresholds for converting mixed CII meters to dedicated irrigation meters<br>• Recommendations for CII best management practices<br>3. DWR to recommend variance provisions for:<br>• Evaporative coolers<br>• Horses and livestock<br>• Seasonal populations<br>• Soil compaction/dust control<br>• Water to sustain wildlife<br>• Water for fire protection<br>4. DWR to recommend standards for outdoor irrigation of landscape areas with dedicated irrigation meters:<br>• Incorporate MWELO principles |
| June 30, 2022 | 1. SWRCB to adopt long-term standards for efficient water use:<br>• Outdoor residential<br>• Outdoor irrigation of landscape with dedicated irrigation meters at CII customer sites<br>• Water loss (consistent with Senate Bill 555)<br>2. SWRCB to adopt performance measures for CII water use |
| November 1, 2023 | 1. Urban water supplier shall calculate its urban water use objective and its actual water use for previous calendar or fiscal year:<br>• Efficient indoor residential water use, plus<br>• Efficient outdoor residential water use, plus<br>• Efficient outdoor water use through dedicated irrigation meters at CII customer sites, plus<br>• Efficient water loss, plus<br>• Variances as appropriate |

## 6.3 Next Steps

Most of the BAWSCA member agencies are required to prepare 2020 UWMPs, which are due to DWR by July 2021. Member agencies may elect to utilize the demand and conservation savings projections developed through this Demand Study in completion of their respective UWMPs. Member agencies may also update these demands for the 2020 UWMPs, if necessary, to incorporate new information for their respective service areas.

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# APPENDIX A. BAWSCA DEMAND ANALYSIS SURVEY QUESTIONS

Following are the April 2019 BAWSCA Demand Analysis Survey questions that were included in the Data Workbook. These are provided here for reference only. Individual agency responses are in each agency's Data Workbook file.

| | |
|---|---|
| **1.** | **Please provide the name and contact information for any individuals completing this survey (including outside consultants).** |
| **2.** | What is your agency's main objective or what results would your agency like to achieve as part of this project? |
| **3.** | Does your planning department have any projected growth by land use type and/or associated land use water demands that you would like considered as part of this effort? |
| **4.** | Would you like to provide building activity from any relevant Building Departments (number of permits, value of construction, etc.) to be considered in this analysis? |
| **5.** | Does your agency's 2015 Urban Water Management Plan (UWMP) include the most recent water demand projections prepared by or for your agency? Please identify any documents (other than your agency's 2015 UWMP) that describe your service area's existing demand projection methodology on the Planning Documents tab in this workbook. |
| **6.** | Does your agency intend to update demand projections independent of this project between now and 2020 for the 2020 UWMP or any other project (e.g., Water Supply Assessment)? If yes, when and for which projects? |
| **7.** | Please describe any notable water use trends within your service area over the last five years (i.e., a decline or increase). Does your agency have any specific knowledge of why the trend occurred (e.g., a large business closed or moved into service area, significant foreclosures or large development, recent economic recovery)? |
| **8.** | What is your agency's perspective on what future trends in water demands might be? Is your agency aware of any large developments or planned changes in the service area that would increase or decrease demands in the near or long-term future that are not reflected in the current demand forecast (i.e., published in your agency's 2015 UWMP)? |
| **9.** | Please describe any major account re-classifications or billing system upgrades that took place in your service area (i.e., multifamily accounts were reclassified from CII into a class of their own). Please include the specific type of change and when the change took place. |
| **10.** | Do sewer charges appear on your agency's customers' water bills? If "Yes," please provide sewer rate histories by customer class corresponding chronologically to the water rate histories. If "No," which sanitation district serves your agency's water service area (if separate agency)? Can you assist us in obtaining sewer rate data from that agency? |
| **11.** | Do you plan to expand potable water reuse before 2045? What volume do you plan to add? Will this volume offset current potable water use? |
| **12.** | Are you planning any non-potable reuse projects that might offset potable demand? |
| **13.** | Please confirm the service area's most recent water audit data can be found on DWR's WUE site here: https://wuedata.water.ca.gov/awwa_plans. Is this accurate and representative of your system's current water loss? |
| **14.** | Do you currently have combined mixed use meters/buildings? Do you project having mixed use meters/buildings in any future development? Can you provide us with any data for this? |
| **15.** | If you save water through conservation (or your demand is lower in a year), would the water source you would cut back on be SFPUC water supplies? |
| **16.** | Do you have any additional comments, questions or concerns about this project or planning process you would like to share? |

# APPENDIX B. ECONOMETRIC MODEL DESCRIPTION AND FRAMEWORK

This appendix describes the Econometric Modeling process, framework, and results.

## B.1 Introduction

In the past, BAWSCA has relied on projections of population and jobs to predict future baseline water demand. Residential demand was projected by multiplying per household use by population growth; Commercial, Institutional, and Industrial (CII) demand was prepared by multiplying per employee use by projected job growth. Then, these estimates of baseline demand were converted into estimates of net demand by subtracting likely savings from various plumbing codes and active conservation programs. While the simplicity of this methodology makes it appealing and easy to understand, econometric analysis studying historical data (assuming historical relationships remain valid) can provide helpful information for answering questions about changing demand patterns (i.e., How much will demand rebound as drought impacts recede and as economic and weather conditions return to normal?). To address such questions, econometric demand models have been developed for each agency to estimate the relationship between water demand and its key drivers, such as price, economic conditions, and weather (Equation 1).

Based on this analysis, the following best-fit equation was developed:

$$Ln(monthly\ GPCD) = \alpha + \beta Trend + \theta Ln(unemployment\ rate) + \delta Ln(marginal\ price) + \vartheta Temperature\ Deviation + \psi Rainfall\ Deviation + \pi monthly\ indicators + \phi drought\ restriction\ indicators + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots Eq. 1$$

Where,

Monthly production is measured in gallons per capita per day (GPCD)

$\alpha$ is a scaling constant. Trend is a variable that takes on a value of 0 in the first year, 1 in the second year, and so on

Unemployment rate is captured as an annual percent (for example, 7%)

Marginal price for single family customers is measured in dollars per hundred cubic feet deflated by the consumer price index

Temperature deviation is measured in degrees Fahrenheit (average maximum daily temperature in a given month minus average for the same month between 1995 and 2006)

Rainfall deviation is measured in total inches (total rainfall in a given month minus average total rainfall for same month between 1995 and 2006)

Monthly indicators are binary 0-1 variables, taking on a value of 1 for a given month in question, 0 otherwise

Drought restriction indicator variables for affected months during the 2014-2017 period

$\varepsilon$ denotes random statistical error

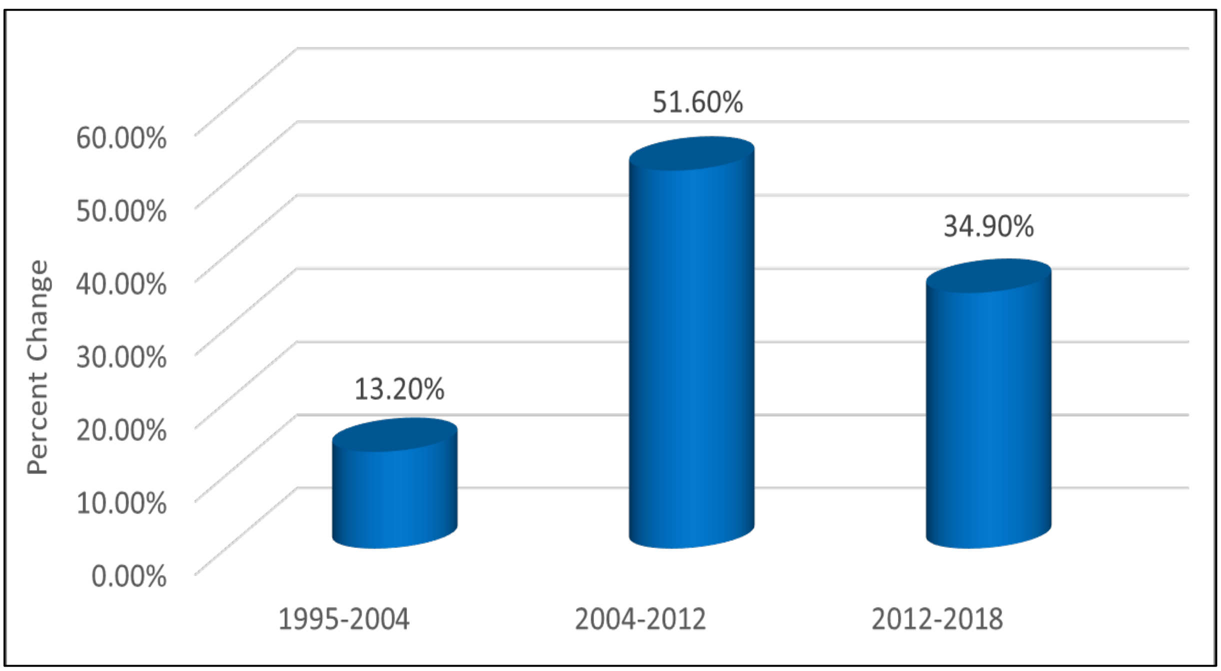
Sources for these data are indicated below:

Each variable on the right-hand side of the equation (independent variable) is preceded by a coefficient (e.g., $\beta$, etc.) that measures the strength of the impact of an independent variable on monthly demand. (The variable on the left-hand side of the equation is also known as the dependent variable.) A positive coefficient implies that increases in an independent variable will cause an increase in the dependent variable; a negative coefficient implies the opposite. The purpose of model development is both to select the elements of the equation and to estimate each independent variable's coefficient. Continuous variables, such as the marginal price and the unemployment rate, are logarithmically transformed so that their respective coefficients can be given a proportional interpretation. For example, the coefficient on logarithmically transformed marginal price becomes the price elasticity. The trend variable captures changes in GPCD over time not accounted for by price, unemployment rate, or weather.

Our basic model specification (Eq. 1) includes several features. First, agency-specific production data are modeled at a monthly, not annual, level. Estimating monthly level models allows for the impact of weather to vary by time of year. Prior research strongly indicates that abnormal temperature and abnormal rainfall do not have the same effect in January as, say, in May.[13] Working with monthly production data allows one to incorporate time-varying weather effects. Second, temperature and rainfall enter the model as deviations from their respective monthly averages, capturing directly how demand reacts to weather as it deviates from the average. Normal seasonality in monthly demand (i.e., July demand being much higher than January demand) is captured by the monthly indicator variables. Temperature and rainfall data were obtained from the closest NOAA stations throughout the San Francisco Bay Area. Third, economic conditions are captured by the unemployment rate obtained from the Bureau of Labor Statistics. This metric is available at a granular level and is useful for capturing economic cycles impacting water demand.

Finally, the models also include a measure of the marginal price of water in real terms (i.e., price deflated by the consumer price index published by the Bureau of Labor Statistics). Marginal price of water faced by the average single family customer in an agency has been used to depict price variation over time. By and large, CII and Single Family Residential (SFR) price trends appear similar. Figure B-1 shows price escalation faced by single family customers in the BAWSCA service area overall, calculated as a weighted average of each BAWSCA member agency's price data. The price and unemployment rate data are available at a water supplier level (the latter by town or city) so that these metrics can be tailored to each member agency's service area. In other words, each BAWSCA member agency has its own marginal price and unemployment rate metric, including a weather metric from the closest NOAA station.

**Figure B-1. BAWSCA Region-Wide Trends in Single Family Real Price of Water**




*Note: The increase in price represents the BAWSCA member agency share for funding the $4.6 billion Water System Improvement Program.*

[13] Bamezai, A. (2011). *GPCD Weather Normalization Methodology*, final report submitted to the California Urban Water Conservation Council.

## B.2 Model Results

As shown in Equation 1, a model was developed for each agency using its unique data. To illustrate the method in general, a monthly GPCD model also was developed for all BAWSCA agencies combined; results for this "rolled-up" region-wide model are shown in Table B-1. This type of model is known as a time-series, cross-sectional model. This region-wide model incorporates agency-level fixed effects, a correction for autocorrelation in the error term, and population weighting to account for different agency sizes. Agency-specific fixed effects capture the impact of agency characteristics that do not vary much over time, such as average household income and lot size, leading to a much more robust model specification than one without these fixed effects. In other words, the model captures the impact on GPCD of income, lot size, and other unobservable time-invariant differences across agencies implicitly through these fixed effects.

In addition to the fixed effects, each agency is allowed to have its own time trend, if necessary, to capture the impact of service area dynamics that influence water use but are not fully captured by price, unemployment rate, or weather. The normal seasonality in water use also is allowed to vary across agencies. The impact of weather deviations from normal weather is allowed to vary by season and across agencies by interacting these deviation variables with an agency's transformed seasonal peaking factor[14]. A greater summer-winter differential indicates a greater prevalence of weather-sensitive end uses, making the impact of non-normal weather correspondingly greater. The feasibility of using peaking factors to scale the impact of non-normal weather across agencies was demonstrated by the study cited earlier that was completed for the California Urban Water Conservation Council (Bamezai, 2011). Those concepts have been applied here as well.

An important goal of the Econometric Modeling is to forecast what water demand would have been in 2018 had the drought of 2014-2017 not occurred. The gap between actual 2018 demand and model-predicted demand then provides an estimate of potential rise in demand over the next several years (assumed to be 5 years: 2019-2023). This potential rise is down-corrected to account for the effect of plumbing codes and expected rate increases between 2018 and 2023 that will continue to place downward pressure on demand. The potential rise also is corrected to reflect normal weather and normal economic conditions, which then yields the expected demand for 2023 under these conditions.

It is important to test the stability of Eq. 1 by estimating it using only pre-drought data (1995-2013) excluding the drought restriction indicators; then doing so again using all the available data (1995-2018) including the drought restriction indicators. The estimated coefficients on the metrics used to capture variation in price, economic conditions, and weather should not change significantly between these two model specifications, implying that the pre-drought historical relationships are holding during the drought period. The models used here meet this stability condition. The effect of active conservation programs undertaken between 2019 and 2023 is yet to be layered into these forecasts because such layering will cause the demand forecast for the years 2019-2023 to decrease further. In addition, it will affect the post-2023 forecasts.

The estimated pre-drought region-wide model (Table B-1) has three columns: 1) the estimated coefficient, 2) the likely band of error surrounding this coefficient (referred to as standard error), and 3) the t-statistic. An independent variable's t-statistic is the ratio of the coefficient over its standard error. A t-statistic higher than 1.96 or lower than -1.96 indicates a statistically significant relationship at 5% level of significance between the dependent and independent variable; a t-statistic between -1.96 and 1.96 indicates that the data are not able to conclusively demonstrate a relationship. The latter finding may reflect the lack of any relationship, data errors, or other problems (e.g., two or more independent variables being highly correlated with one another). The model's R-Square value ($R^2$), which is indicative of the explanatory power of a statistical model, is shown at the

[14] Peaking factor is calculated by dividing maximum monthly summer demand by minimum winter monthly demand in any given year, then averaging these ratios across all years included during the baseline period. Transformed peaking factor is calculated as 1-(1/Peaking Factor).

bottom of Table B-1. It can vary between zero and a maximum of 1, with higher numbers indicating greater explanatory power.

The coefficients in Table B-1 have the following interpretations:

- A price elasticity of -0.2 indicates that a 10% real increase in the marginal price of water can be expected to reduce demand by 2%. BAWSCA's region-wide estimate of price elasticity compares well with the published literature on this topic.
- A 10% increase in the annual unemployment rate is likely to depress water demand by 0.05%, a statistically significant effect, but one weaker than price.
- All weather coefficients are significant and behave in expected ways. For an agency with a peaking factor of 2, or a transformed peaking factor of 0.5 (a typical agency peaking factor), an extra inch of rainfall per month during the spring reduces monthly demand by about 6.6%, while the same extra inch during the winter only depresses monthly demand by 0.5%.
- On the temperature dimension, if daily maximum temperature is 1 degree higher on average in a given month, monthly water demand is likely to increase by 1.0% during the spring, 0.5% during the summer, and 1.1% during late fall and winter. Lower than average temperatures would have the opposite effect.

The monthly dummy variables also exhibit the expected pattern with July showing the largest coefficient, indicating that July demand is greatest during the year. The coefficient reaches a minimum during January.

**Table B-1. BAWSCA Region-Wide Pre-Drought Model Results**

Dependent Variable: Ln(Monthly Baseline GPCD)

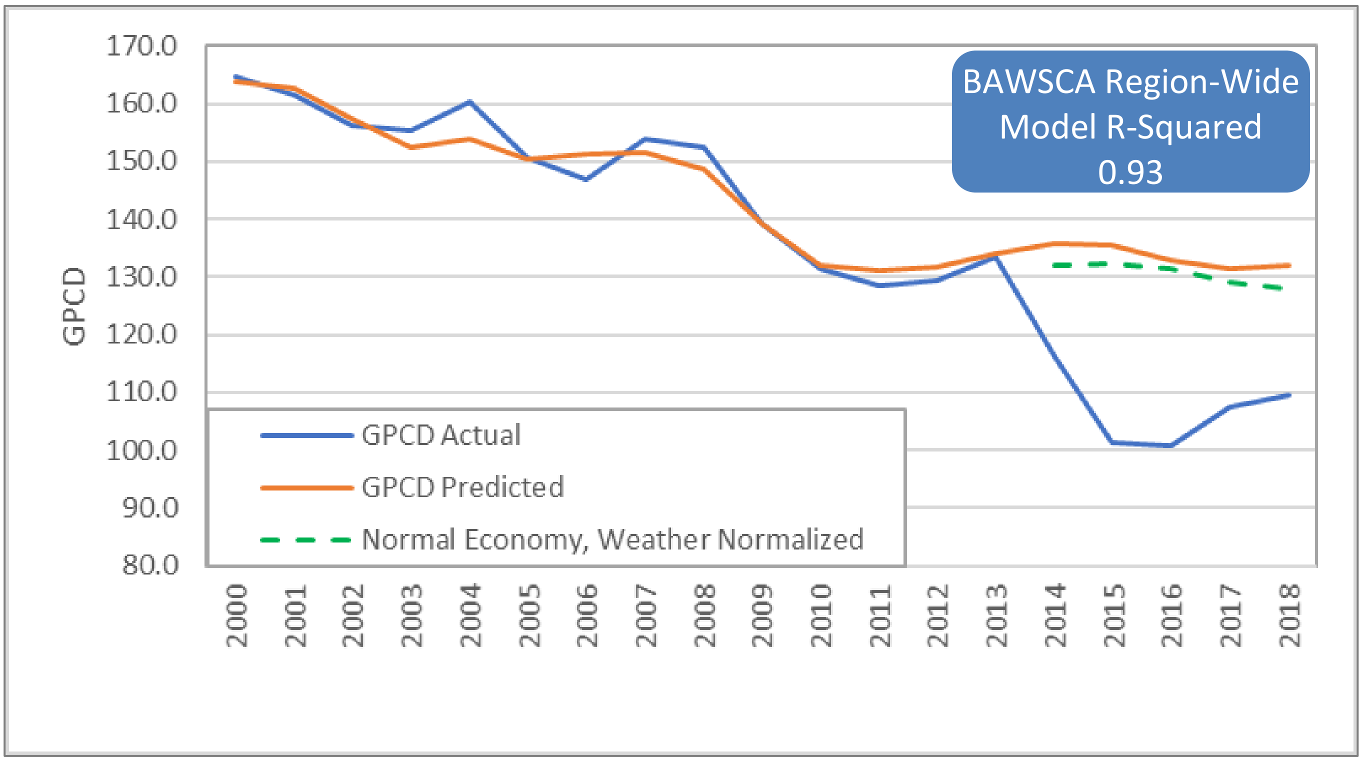
| Independent Variable | Coefficient | Standard Error | t-statistic |
|---|---|---|---|
| Ln(Marginal Price) | -0.200 | 0.015 | -13.1 |
| Ln(Unemployment Rate) | -0.052 | 0.007 | -7.8 |
| Temperature Deviation (Apr-Jun) x TPF[1] | 0.019 | 0.002 | 8.3 |
| Temperature Deviation (Jul-Oct) x TPF | 0.013 | 0.002 | 5.6 |
| Temperature Deviation (Nov-Mar) x TPF | 0.023 | 0.002 | 12.2 |
| Rain Deviation (Apr-Jun) x TPF | -0.137 | 0.008 | -17.6 |
| Rain Deviation (Jul-Oct) x TPF | -0.054 | 0.009 | -6.0 |
| Rain Deviation (Nov-Mar) x TPF | -0.01 | 0.002 | -5.7 |
| Feb Indicator | 0.017 | 0.014 | 1.2 |
| Mar | 0.104 | 0.016 | 6.5 |
| Apr | 0.271 | 0.017 | 16.0 |
| May | 0.478 | 0.017 | 27.7 |
| Jun | 0.641 | 0.017 | 36.8 |
| Jul | 0.690 | 0.017 | 39.5 |
| Aug | 0.680 | 0.017 | 39.1 |
| Sep | 0.612 | 0.017 | 35.4 |
| Oct | 0.436 | 0.017 | 25.7 |
| Nov | 0.169 | 0.016 | 10.5 |
| Dec | 0.035 | 0.014 | 2.5 |
| Constant | 4.899 | 0.016 | 311.6 |
| Agency-Specific Fixed Effects[2] | Included | | |
| Agency-Specific Trend Terms[2] | Included | | |
| Agency Interactions with Monthly Dummies[2] | Included | | |
| R-Square | 0.93 | | |

*[1] TPF denotes transformed peaking factor.*

*[2] For the sake of brevity, the large number of coefficients associated with the agency-specific fixed effects, agency-specific trend terms, and agency interactions with monthly dummies are not shown.*

Figure B-2 shows how the model prediction compares with BAWSCA's region-wide GPCD trend during the pre-drought period since that is the period from which the model is estimated. The resulting $R^2$ value of 0.93 shows that there is a high correlation between actual and predicted values. The model quite accurately captures the downturn in demand experienced during the Great Recession of 2008-2010 and subsequent recovery until 2013. Beyond 2013, the model is used to forecast what demand would have been without the drought, taking into account a strengthening economy tempered by ongoing rate increases and conservation. The dotted green line in Figure B-2 shows the Normal Economy, Weather Normalized model forecast. The gap between actual 2018 demand and the dotted green line provides an initial estimate of what fully rebounded demand should be. It is not logical to assume that actual demand will jump to the dotted green line within a shorter period of time (i.e., a year). Instead, it is assumed that actual demand will meet the declining dotted green line in 2023. The dotted green line's position in 2023 is calculated by factoring in the effect of plumbing codes and rate increases between 2018 and 2023.

**Figure B-2. BAWSCA Region-Wide Econometric Model Fit and Forecast**



# APPENDIX C. BAWSCA-WIDE DEMAND PROJECTIONS

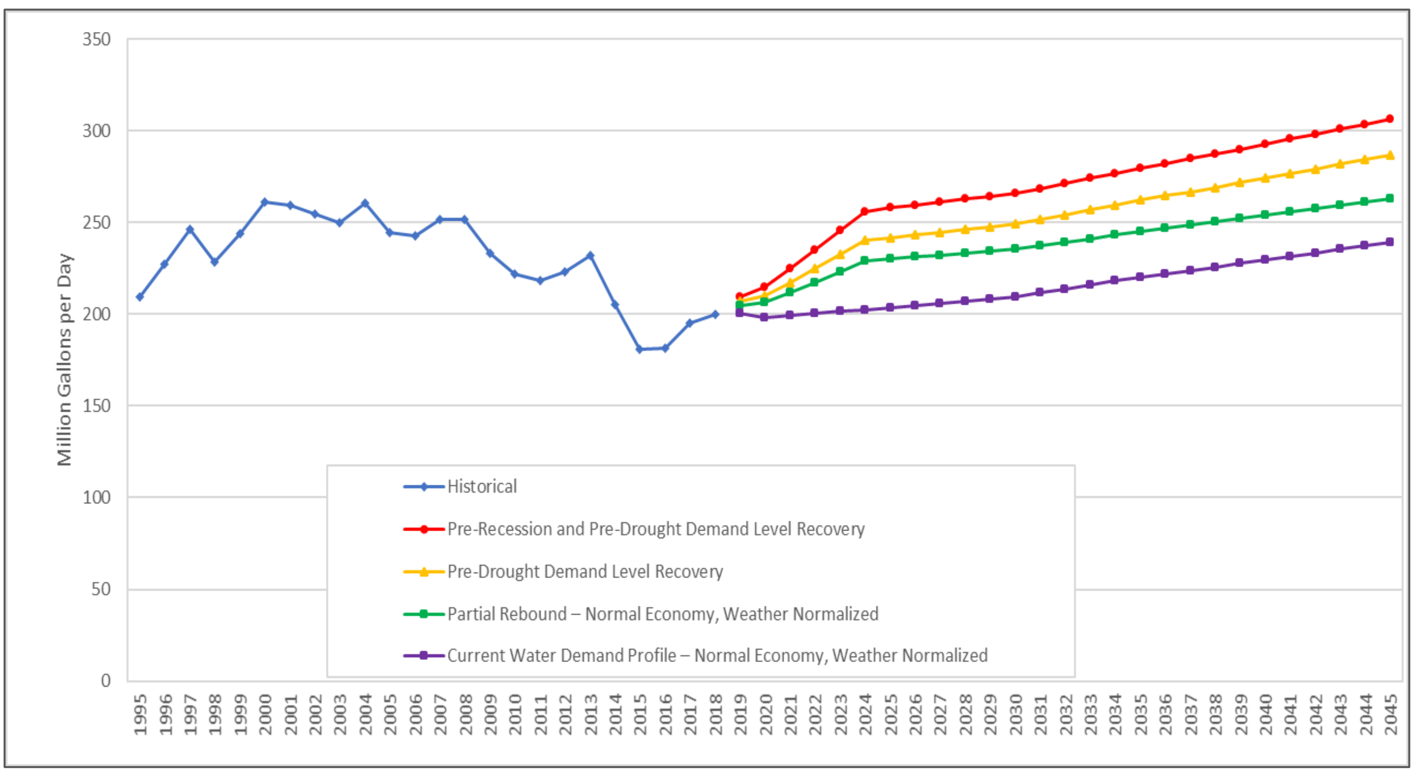
In Table C-1 and in Figure C-1 the BAWSCA region-wide demand projections are shown with passive savings. Active conservation has not been incorporated into any of the four scenarios. These values are intended to be used for general comparison of ranges in potential future water demands if no active conservation was implemented.

**Table C-1. BAWSCA Region-Wide Demand Projections Including Passive Savings[1] in MGD**

| Demand Forecast Scenarios | 2023 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Pre-Recession and Pre-Drought Demand Level Recovery | 245.4 | 257.9 | 265.8 | 279.7 | 292.5 | 306.3 |
| Pre-Drought Demand Level Recovery | 232.3 | 241.8 | 249.1 | 262.2 | 274.0 | 286.8 |
| Partial Rebound – Normal Economy, Weather Normalized[2] | 222.0 | 229.0 | 234.3 | 244.3 | 253.1 | 262.5 |
| Current Water Demand Profile – Normal Economy, Weather Normalized | 201.4 | 203.5 | 209.7 | 220.3 | 229.6 | 239.3 |

*[1] Total water demand accounts for the total projected demand in a service area water system regardless of source, which can be from SFPUC, groundwater, surface water, recycled water, desalination, SWP, or Valley Water.*
*[2] The Partial Rebound scenario was used for the active conservation analysis portion of the project, which was provided to all individual BAWSCA agencies for review in Technical Memorandum 3.*

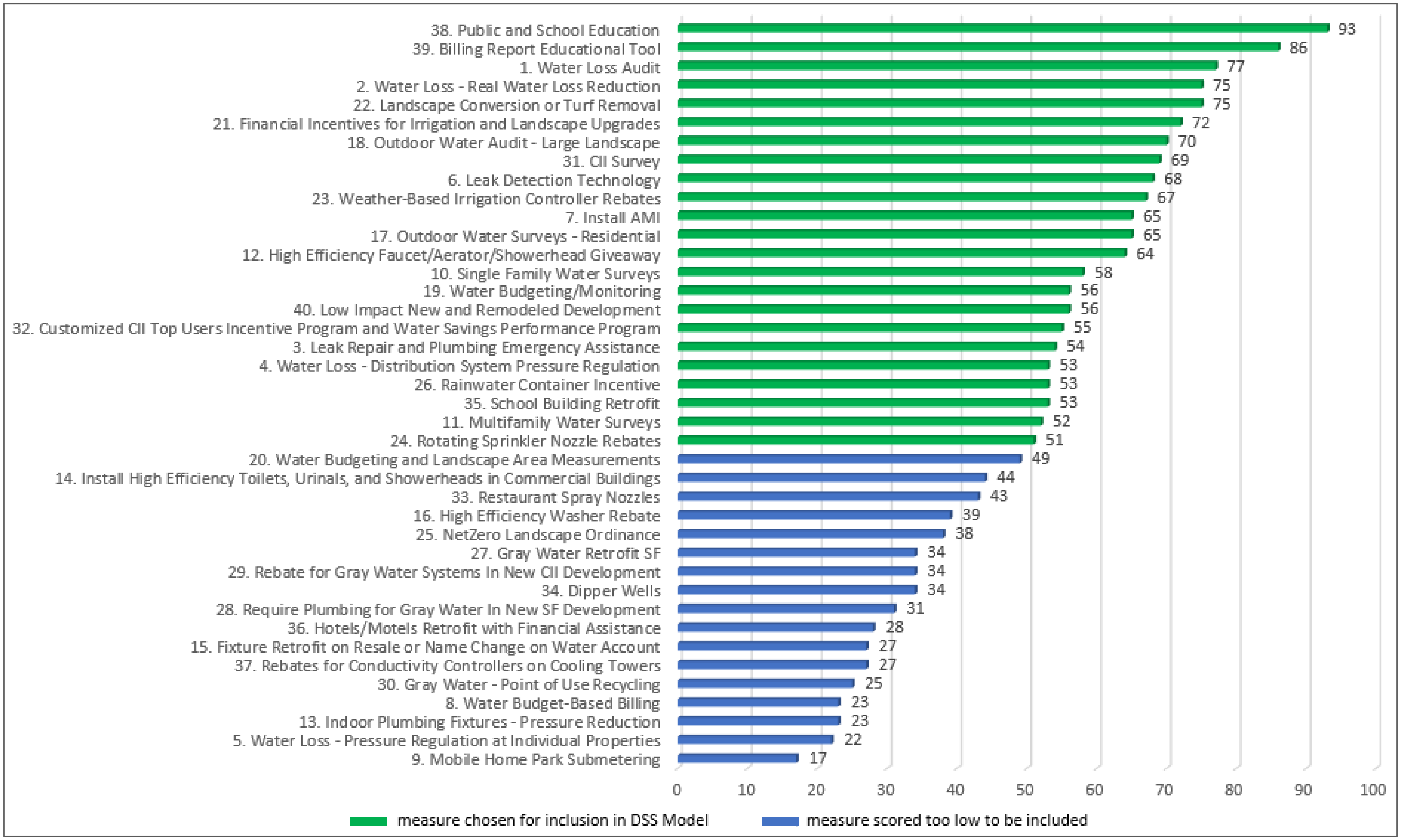
**Figure C-1. BAWSCA Region-Wide Demand Projection**



# APPENDIX D. CONSERVATION MEASURES SCREENING RESULTS

The following figure and table present the results of the January 2020 online survey conducted through SurveyMonkey that solicited BAWSCA member agency feedback on conservation measures that would be considered in the DSS Model analysis.

**Figure D-1. Summary of Online Survey Ranking of Water Use Efficiency Measures**




*Note: The number to the right of each measure color block is that particular measure's score based on BAWSCA member agency rankings where 5 points were given for "High Interest", 3 points were given for "Medium Interest", 1 point was given for "Low Interest", and no points were given for "No Interest" or "Not Applicable."*

**Table D-1. Water Use Efficiency Measure Descriptions**

| No. | Measure Name | Description |
|---|---|---|
| 1 | Water Loss Audit | Maintain a thorough annual accounting of water production, sales by customer class, and quantity of water produced but not sold (non-revenue water). This provides a picture of your system, including water usage patterns and trends needed to identify appropriate conservation activities. In conjunction with system accounting, include audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining non-revenue water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and non-revenue water every year by a pre-determined amount based on cost effectiveness. These programs typically pay for themselves based on savings in operational costs (and saved rate revenue can be directed more to system repairs/replacement and other costs). Continuously analyze billing data for system errors and mis-registering meters. Identify and quickly notify customers of apparent leaks. Address meter testing and repair/replacement to insure more accurate meter reads and revenue collection. Actions could include meter calibration and accelerated meter replacement. |
| 2 | Water Loss – Real Water Loss Reduction | Measure covers efforts to find and repair leaks in distribution system to reduce real water loss. Actions could include installation of data loggers and proactive leak detection. Leak repairs would be handled by existing crews at no extra cost. A ten-year program to reduce non-revenue water to a lower target level such as 10% of production or less could be proposed for a combination of this measure and actions to reduce apparent water losses. Specific goals and methods to be developed by the utility. |
| 3 | Leak Repair and Plumbing Emergency Assistance | Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving funds that are paid back through water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences. |
| 4 | Water Loss – Distribution System Pressure Regulation | Install additional pressure regulators in portions of distribution system to maintain pressure within limits so accounts do not receive excessive pressure. High correlation between high water usage and high pressure, due to higher leakage, atomization of sprinklers, and ease of using excessive water. |
| 5 | Water Loss – Pressure Regulation at Individual Properties | Install pressure regulators at properties where pressure is above a certain level and pressure regulation is found to be lacking or inadequate. Plumbing codes require installation of pressure regulation when pressure exceeds 80 psi. However, this does not always occur and/or regulators are installed improperly or in locations where they do not serve the irrigation system, resulting in significant waste. Utility could fund and facilitate appropriate installation of regulators, first targeting neighborhoods with the highest pressure. Utility may need to impose regulations to require that such installations are made and maintained thereafter. |

| No. | Measure Name | Description |
|---|---|---|
| 6 | Leak Detection Technology | Leak detection technology system that allows for remote shutoff with a smart phone interface. Might target second homes that are often vacant, which could leak for extensive periods while left unattended. Might require for new homes. Customer instant access to water use data by installing a flow sensor. Primarily residential. Can monitor indoor only, whole site meter use, and/or irrigation only use. Example products are listed online: www.gearbrain.com/smart-leak-and-flood-detectors-2563785823.html and www.robeau.tech/en/. |
| 7 | Install AMI | Retrofit system with AMI meters and associated network capable of providing continuous consumption data to the utility offices. Improved identification of system and customer leaks is major conservation benefit. Some costs for these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and those for opening and closing accounts are accomplished without need for physical or drive-by meter reading. Also enables enhanced billing options and ability to monitor unauthorized usage (such as use/tampering with closed accounts or irrigation if time of day or days per week are regulated). Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to usage which has been shown to improve accountability and reduce water use. A ten year change-out would be a reasonable objective. |
| 8 | Water Budget-Based Billing | Develop individualized monthly water budgets for all or selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget or decreases if they are below their budget. Budgets typically are based on such factors as the size of the irrigated area and often vary seasonally to reflect weather during the billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF reports). Would require rate study and capable billing software. Assume 10% of accounts receive new budgets per year and would be reviewed periodically to remain current. |
| 9 | Mobile Home Park Submetering | Require or provide a partial cost rebate to meter all sites within a mobile home park that is currently master metered. Pattern after Valley Water (Santa Clara Valley Water District) program. |
| 10 | Single Family Water Surveys | Indoor water surveys for existing single family residential customers. Target those with high water use and provide a customized report to owner. May include give away of efficient showerheads, aerators, toilet devices. Usually combined with outdoor surveys (See Irrigation Measures). |
| 11 | Multifamily Water Surveys | Indoor water surveys for existing multifamily residential customers (2 units or more). Target those with high water use and provide a customized report to owner. Usually combined with outdoor surveys (see Irrigation Measures) and sometimes with single family surveys. |
| 12 | High Efficiency Faucet/ Aerator/ Showerhead Giveaway | Utility would buy high efficiency showerheads and faucet aerators in bulk and give them away at the utility office or community events. |

| No. | Measure Name | Description |
|---|---|---|
| 13 | Indoor Plumbing Fixtures – Pressure Reduction | Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi. |
| 14 | Install High Efficiency Toilets, Urinals, and Showerheads in Commercial Buildings | Consider direct install program, rebates, or grants for installation of high efficiency fixtures in all or selected commercial or institutional buildings. Replacements would include high efficiency toilets, showerhead, and waterless or high efficiency urinals. |
| 15 | Fixture Retrofit on Resale or Name Change on Water Account | Work with the real estate industry to require submission of a certificate of compliance to the utility verifying that a plumber has inspected the property and efficient fixtures were either already there or were installed before close of escrow. This is an upgraded enforcement approach for implementing the existing code: Require Fixture Retrofit on Resale or Name Change on Water Account or Renovation. Pattern after Los Angeles, San Diego or Santa Cruz programs. |
| 16 | High Efficiency Washer Rebate | Provide a rebate for the installation of a high efficiency commercial washer (HEW). Rebate amounts would reflect the incremental purchase cost. Program would shorter-lived as it is intended to be a market transformation measure that eventually would be stopped as efficient units reach saturation. |
| 17 | Outdoor Water Surveys – Residential | Outdoor water surveys offered for existing customers. Normally those with high water use are targeted and provided a customized report on how to save water. Can be combined with indoor surveys or focused on certain customer classes. All single family and multifamily residential would be eligible for free landscape water surveys upon request. |
| 18 | Outdoor Water Audit - Large Landscape | Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program. |
| 19 | Water Budgeting/ Monitoring | Website that provides feedback on irrigation water use (budget vs. actual). Model after Municipal Water District of Orange County's Landscape Certification Program. Could be created by a consultant, agency, or customer on website. |
| 20 | Water Budgeting and Landscape Area Measurements | Require water budgets for targeted customer categories. Might tie water budgets to weather and/or rates. Conduct detailed landscape area measurements for targeted customer categories. Can use aerial imagery including Google Earth. Might conduct field verification. Might measure non-irrigated area that can potentially be irrigated (e.g., for water budgets or for planning and design of stormwater projects). |
| 21 | Financial Incentives for Irrigation and Landscape Upgrades | For SF, MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient equipment upgrades. Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch, and selected types of irrigation equipment upgrades. Rebate for residential accounts and up to 50% more for commercial customers. Landscape upgrades might include conversion of turf to lower-water-using turf varieties. |

| No. | Measure Name | Description |
|---|---|---|
| 22 | Landscape Conversion or Turf Removal | Provide a per-square-foot incentive to remove turf and replace with low-water-use plants or permeable hardscape. Landscape conversion could include conversion of turf to lower-water-use turf varieties. Rebate based on dollars per square foot removed and capped at an upper limit for single family residence, multifamily residence, and/or commercial account. |
| 23 | Weather-Based Irrigation Controller Rebates | Provide a per-station rebate for the purchase of a weather-based irrigation controller. These controllers have onsite weather sensors or rely on a signal from a central weather station that modifies irrigation times at least weekly. Requires local irrigation contractors who are competent with these products, so may require sponsoring a training program in association with this measure. |
| 24 | Rotating Sprinkler Nozzle Rebates | Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. Nozzles cost about $6 each, and rebates have been about $4 each with a minimum purchase of around 20 nozzles. |
| 25 | NetZero Landscape Ordinance | This measure is an aggressive local landscape ordinance that could be a step-up from California's Model Water Efficient Landscape Ordinance. Targeting new development only, this measure aims to achieve "net-zero" outdoor water use by any method including the use of native plants, weather-based irrigation controllers, gray water systems, cisterns, and rain barrels. Could design like AWE's Net Blue Supporting Water-Neutral Community Growth. More information is available online: www.allianceforwaterefficiency.org/net-blue.aspx. |
| 26 | Rainwater Container Incentive | Provide incentive for installation of rain barrels or large rainwater catchment systems. This could involve rebates, grants, bulk purchase and giveaways of rain barrels, and/or other cost-share methods. This may include workshops on proper installation and use of captured rainwater for landscape irrigation. Might require simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into the peak irrigation season. |
| 27 | Gray Water Retrofit SF | Provide a rebate to assist a certain percentage of single family homeowners per year to install gray water systems. |
| 28 | Require Plumbing for Gray Water in New SF Development | Provide a rebate or require builders of single family homes to provide plumbing for and/or install a gray water system in new homes. |
| 29 | Rebate for Gray Water Systems in New CII Development | Provide a rebate for gray water systems in new CII development. |
| 30 | Gray Water – Point of Use Recycling | Point of use water recycling will allow for toilet flushing and other possible uses with locally treated gray water. It could be considered for new homes to help shape the demand forecast curve down. Establish an ongoing maintenance and monitoring/follow-up program (back-flow device inspection). Ordinance or rebate. |

| No. | Measure Name | Description |
|---|---|---|
| 31 | CII Survey | CII water customers would be offered a free water survey that would evaluate ways for the business to save water and money. The surveys may target large accounts only (e.g., accounts that use more than 5,000 gallons of water per day), such as hotels, restaurants, stores, and schools. Emphasis may be on supporting the top 25 users for each individual water agency. |
| 32 | Customized CII Top Users Incentive Program and Water Savings Performance Program | After a free water use survey has been completed at the site, the utility will analyze recommendations on the findings report that is provided and determine if site qualifies for a financial incentive. Financial incentives will be provided after analyzing the benefit-cost ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of the Utility while funding lasts. Water districts, such as the Metropolitan Water District of Southern California, provide about $3 per 1,000 gallons saved to sites within their service area. Incentive is based on the potential for savings over 5 years. Eligible project costs include labor, hardware, and up to 1 year of water management fees. |
| 33 | Restaurant Spray Nozzles | Provide free 1.15 gpm (or lower) spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. Thousands have been replaced in California going door to door; very cost-effective because it saves hot water. U.S. Department of Energy requires nozzles to be less than 1.28 gpm. Fishnick recommends 1.15 gpm. |
| 34 | Dipper Wells | Provide a dipper well device incentive for relevant food service accounts. Devices save water and money using less than 600 gallons of water per year; they reduce bacteria using heated water held above 140$^{o}$F. There is a programmable timer option to ensure scheduled water changeouts. A rebate may cover the $500-$600 device, installation, and any permitting. Electricity access is needed. A ConserveWell drop-in model is estimated to use ~320 gal/well/restaurant/year: https://server-products.com/ConserveWell-notdipperwell. As reported in the *Dipper Well Replacement Field Evaluation Report,* Frontier Energy Report #50115-R0 (Frontier Energy, 2017), a Los Banos site saved 176,000 gal/year and a Madera site saved 116,000 gal/year: http://www.bewaterwise.com/assets/2015icp-dipperwellfrontierenergy.pdf. |
| 35 | School Building Retrofit | School retrofit program wherein school receives a grant to replace fixtures and upgrade irrigation systems. Might target university/college campuses. Pattern after Metropolitan Water District of Southern California program. |
| 36 | Hotels/Motels Retrofit with Financial Assistance | Following a free water audit, offer hotels/motels a rebate for equipment identified that would save water. Or, provide a rebate schedule for certain efficient equipment, such as air-cooled ice machines, that hotels/motels could apply for without an audit. Pattern after San Antonio, Texas program. |
| 37 | Rebates for Conductivity Controllers on Cooling Towers | Offer a rebate ($900-$1,200 depending on type) to buildings that install conductivity controllers to reduce bleed-off water of the facility cooling towers. Provide educational brochures and a phone contact of a knowledgeable person to provide conservation information. |

| No. | Measure Name | Description |
|---|---|---|
| 38 | Public and School Education | Use a range of printed materials to raise awareness of conservation measures available to customers, including incentive programs offered by utility, newsletters, bill stuffers, brochures (self-developed or purchased), working with local newspapers, signage at retailers, signs on public buses. Regional participation and development can help assure consistent message. Such programs would continue indefinitely. Provide variety of conservation information on city or utility website, distribution of "videos." Also consider social media options such as cell phone apps, Facebook, interactive kiosk with view screen, etc. Conduct presentations at various venues, from radio and TV to service organizations and focused groups. Have booths at relevant community events, participate in parades, etc. Suggest a general “Use Only What You Need” message like Denver Water's program or a “Beat the Peak” message media campaign like Cary, North Carolina or Tucson, Arizona: https://www.tucsonaz.gov/water/pete-the-beak. Also consider a program like the “Take Control of your Controller” campaign for a focused, social media-based campaign. Consider determining appropriate usage and media campaign message with marketing study/focus groups. Example: Water Smart Software with online and print billing consumptions to customers. Work with local school districts to develop classroom programs that they would embrace. Consider poster contests, etc. Some programs would require dedicated utility staff to assist and present. Utility would also offer, organize, and sponsor a series of educational workshops or other means for educating homeowners, landscapers, and contractors in efficient landscaping and irrigation principals. Utilize guest speakers, native demonstration gardens, and incentives (e.g., a nursery plant coupon). Utility would sponsor bilingual training for managers and workers in landscape maintenance methods that will save irrigation water. With some of these programs, names of businesses that have obtained training are included in utility publications and/or websites as an incentive to participate. Utility would also develop or support development of a Landscape Watering Calculator and Watering Index, and actively market these. Consider cell phone app with Watering Index, following up in-person with large landscape customers on a frequent basis to encourage use of Watering Index. |
| 39 | Billing Report Educational Tool | Have a customer portal available to show customer their individualized current and historical water use pattern to help customer see their data thereby encouraging them to be more efficient with their water use. Example: Water Smart Software with online and print billing consumptions to customers. |
| 40 | Low Impact New and Remodeled Development | Utility would require developers of new/remodeled sites to follow Low Impact Development concepts/standards/best management practices for stormwater and water conservation benefits. Encourage or require use of bio-retention facilities, rainwater cisterns, gray water plumbing, etc. |

# APPENDIX E. KEY ASSUMPTIONS FOR THE DSS MODEL

This section presents the methodology used to determine passive water savings, information regarding national and state plumbing codes, and key inputs and assumptions used in the DSS Model including fixture replacement and estimates.

## E.1 National Plumbing Code

The Energy Policy Act of 1992, as amended in 2005, mandates that only fixtures meeting the following standards can be installed in new buildings:

- Toilet – 1.6 gal/flush maximum
- Urinals – 1.0 gal/flush maximum
- Showerhead – 2.5 gal/min at 80 pounds per square inch (psi)
- Residential faucets – 2.2 gal/min at 60 psi
- Public restroom faucets – 0.5 gal/min at 60 psi
- Dishwashing pre-rinse spray valves – 1.6 gal/min at 60 psi

Replacement of fixtures in existing buildings is also governed by the Federal Energy Policy Act, which mandates that only devices with the specified level of efficiency (as shown above) can be sold as of 2006. The net result of the plumbing code is that new buildings will have more efficient fixtures and old inefficient fixtures will slowly be replaced with new, more efficient models. The national plumbing code is an important piece of legislation and must be carefully taken into consideration when analyzing the overall water efficiency of a service area.

In addition to the plumbing code, the U.S. Department of Energy regulates appliances, such as residential clothes washers, further reducing indoor water demands. Regulations to make these appliances more energy efficient have driven manufactures to dramatically reduce the amount of water these machines use. Generally, front loading washing machines use 30 to 50% less water than conventional models (which are still available).

In this analysis, the DSS Model forecasts a gradual transition to high efficiency clothes washers (using 12 gallons or less) so that by the year 2025 that will be the only type of machine available for purchase. In addition to the industry becoming more efficient, rebate programs for washers have been successful in encouraging customers to buy more water efficient models. Given that machines last about 10 years, eventually all machines on the market will be the more water efficient models. Energy Star washing machines have a water factor of 6.0 or less – the equivalent of using 3.1 cubic feet (or 23.2 gallons) of water per load. The maximum water factor for residential clothes washers under current federal standards is 9.5. The water factor equals the number of gallons used per cycle per cubic foot of capacity. Prior to the year 2000, the water factor for a typical new residential clothes washer was about 12. In March 2015, the federal standard reduced the maximum water factor for top- and front-loading machines to 8.4 and 4.7, respectively. In 2018, the maximum water factor for top-loading machines was further reduced to 6.5. For commercial washers, the maximum water factors were reduced in 2010 to 8.5 and 5.5 for top- and front-loading machines, respectively. Beginning in 2015, the maximum water factor for Energy Star certified washers was 3.7 for front-loading and 4.3 for top-loading machines. In 2011, the U.S. Environmental Protection Agency estimated that Energy Star washers comprised more that 60% of the residential market and 30% of the commercial market (Energy Star, 2011). A new Energy Star compliant washer uses about two-thirds less water per cycle than washers manufactured in the 1990s.

## E.2 State Plumbing Code

This section describes California state codes applicable to each member agency service area water use.

### California State Law – AB 715

Plumbing codes for toilets, urinals, showerheads, and faucets were initially adopted by California in 1991, mandating the sale and use of ultra-low flush toilets (ULFTs) using 1.6 gpf, urinals using 1 gpf, and low-flow showerheads and faucets. AB 715 led to an update to California Code of Regulations Title 20 (see below) mandating that all toilets and urinals sold and installed in California as of January 1, 2014 must be high efficiency versions having flush ratings that do not exceed 1.28 gpf (toilets) and 0.5 gpf (urinals).

### California State Laws – SB 407 and SB 837

SB 407 addresses plumbing fixture retrofits on resale or remodel. The DSS Model carefully considers the overlap with SB 407, the plumbing code (natural replacement), CALGreen, AB 715 and rebate programs (such as toilet rebates). SB 407 (enacted in 2009) requires that properties built prior to 1994 be fully retrofitted with water conserving fixtures by the year 2017 for single family residential houses and 2019 for multifamily and commercial properties. SB 407 program length is variable and continues until all the older high flush toilets have been replaced in the service area. The number of accounts with high flow fixtures is tracked to make sure that the situation of replacing more high flow fixtures than actually exist does not occur. Additionally, SB 407 conditions issuance of building permits for major improvements and renovations upon retrofit of non-compliant plumbing fixtures. SB 837 (enacted in 2011) requires that sellers of real estate property disclose on their Real Estate Transfer Disclosure Statement whether their property complies with these requirements. Both laws are intended to accelerate the replacement of older, low efficiency plumbing fixtures, and ensure that only high efficiency fixtures are installed in new residential and commercial buildings.

### 2019 CALGreen and 2015 CA Code of Regulations Title 20 Appliance Efficiency Regulations

Fixture characteristics in the DSS Model are tracked in new accounts, which are subject to the requirements of the 2019 California Green Building Code and 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the California Energy Commission (CEC) on September 1, 2015. The CEC 2015 appliance efficiency standards apply to the following new appliances, if they are sold in California: showerheads, lavatory faucets, kitchen faucets, metering faucets, replacement aerators, wash fountains, tub spout diverters, public lavatory faucets, commercial pre-rinse spray valves, urinals, and toilets. The DSS Model accounts for plumbing code savings due to the effects these standards have on showerheads, faucets, aerators, urinals, and toilets.

- Showerheads – July 2016: 2.0 gpm; July 2018: 1.8 gpm
- Wall Mounted Urinals – January 2016: 0.125 gpf (pint)
- Lavatory Faucets and Aerator – July 2016: 1.2 gpm at 60 psi
- Kitchen Faucets and Aerator – July 2016: 1.8 gpm with optional temporary flow of 2.2 gpm at 60 psi
- Public Lavatory Faucets – July 2016: 0.5 gpm at 60 psi

In summary, the controlling law for **toilets** is Assembly Bill 715. This bill requires high efficiency toilets (1.28 gpf) to be exclusively sold in California beginning January 1, 2014. The controlling law for wall-mounted urinals is the 2015 CEC efficiency regulations requiring that ultra-high efficiency pint **urinals** (0.125 gpf) be exclusively sold in California beginning January 1, 2016. This is an efficiency progression for urinals from AB 715's requirement of high efficiency (0.5 gpf) urinals starting in 2014.

Standards for **residential clothes washers** fall under the regulations of the U.S. Department of Energy. In 2018, the maximum water factor for standard top-loading machines was reduced to 6.5.

**Showerhead** flow rates are regulated under the 2015 California Code of Regulations Title 20 Appliance Efficiency Regulations adopted by the CEC, which requires the exclusive sale in California of 2.0 gpm showerheads at 80 psi as of July 1, 2016 and 1.8 gpm showerheads at 80 psi as of July 1, 2018. The WaterSense specification applies to showerheads that have a maximum flow rate of 2.0 gpm or less. This represents a 20% reduction in showerhead flow rate over the current federal standard of 2.5 gpm, as specified by the Energy Policy Act of 1992.

**Faucet** flow rates have likewise been recently regulated by the 2015 CEC Title 20 regulations. This standard requires that the residential faucets and aerators manufactured on or after July 1, 2016 be exclusively sold in California at 1.2 gpm at 60 psi; and public lavatory and kitchen faucets/aerators sold or offered for sale on or after July 1, 2016 be 0.5 gpm at 60 psi and 1.8 gpm at 60 psi (with optional temporary flow of 2.2 gpm), respectively. Previously, all faucets had been regulated by the 2010 California Green Building Code at 2.2 gpm at 60 psi.

## E.3 Key Baseline Potable Demand Inputs, Passive Savings Assumptions, and Resources

The following table presents the key assumptions and references that are used in the DSS Model in determining projected demands with plumbing code savings. The assumptions having the most dramatic effect on future demands are the natural replacement rate of fixtures; how residential or commercial future use is projected; and the percent of estimated real water losses.

**Table E-1. List of Key Assumptions**

| Parameter | Model Input Value, Assumptions, and Key References |
|---|---|
| **Model Start Year for Analysis** | 2019 |
| **Model End Year** | 2045 |
| **Non-Revenue Water** | Based on individual billing |
| **Population Projection Source** | Provided by and verified by individual agencies |
| **Employment Projection Source** | Provided by and verified by individual agencies |
| **Number of Water Accounts for Start Year** | Provided by and verified by individual agencies |
| **Avoided Cost of Water $/AF** | Provided by and verified by individual agencies |

**Table E-2. Key Assumptions Resources**

| Parameter | Resource |
|---|---|
| **Residential End Uses** | Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study," (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses) and AWWA Research Foundation (AWWARF) Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016).<br>Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances - 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition. 2013. http://www.map-testing.com/content/info/menu/perc.html<br>Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet. |
| **Non-Residential End Uses, percent** | Key Reference: AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use).<br>Santa Clara Valley Water District Water Use Efficiency Unit. "SCVWD CII Water Use and Baseline Study." February 2008.<br>Model Input Values are found in the "End Uses" section of the DSS Model on the "Breakdown" worksheet. |
| **Efficiency Residential Fixture Current Installation Rates** | U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any).<br>Key Reference: GMP Research, Inc. (2019). 2019 U.S. WaterSense Market Penetration Industry Report<br>Key Reference: Consortium for Efficient Energy (www.cee1.org).<br>Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures. |
| **Water Savings for Fixtures, gal/capita/day** | Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016).<br>Key Reference: CA DWR Report "California Single Family Water Use Efficiency Study" (DeOreo, 2011 – Page 28, Figure 3: Comparison of household end-uses).<br>WCWCD supplied data on costs and savings; professional judgment was made where no published data was available.<br>Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014.<br>Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model. |
| **Non-Residential Fixture Efficiency Current Installation Rates** | Key Reference: 2010 U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Assume commercial establishments built at same rate as housing, plus natural replacement.<br>California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014.<br>Santa Clara Valley Water District Water Use Efficiency Unit. "SCVWD CII Water Use and Baseline Study." February 2008.<br>Model Input Values are found in the "Codes and Standards" green section of the DSS Model by customer category fixtures. |

| Parameter | Resource |
|---|---|
| **Residential Frequency of Use Data, Toilets, Showers, Faucets, Washers, Uses/user/day** | Key Reference: AWWARF Report "Residential End Uses of Water, Version 2 - 4309" (DeOreo, 2016). Summary values can be found in the full report: http://www.waterrf.org/Pages/Projects.aspx?PID=4309<br>Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014.<br>Key Reference: Alliance for Water Efficiency, The Status of Legislation, Regulation, Codes & Standards on Indoor Plumbing Water Efficiency, January 2016.<br>Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category. |
| **Non-Residential Frequency of Use Data, Toilets, Urinals, and Faucets, Uses/user/day** | Key References: Estimated based on AWWARF Report "Commercial and Institutional End Uses of Water" (Dziegielewski, 2000 – Appendix D: Details of Commercial and Industrial Assumptions, by End Use).<br>Key Reference: California Energy Commission, Staff Analysis of Toilets, Urinals and Faucets, Report # CEC-400-2014-007-SD, 2014.<br>Fixture uses over a 5-day work week are prorated to 7 days.<br>Non-residential 0.5gpm faucet standards per Table 2-A. Water Consumption by Water-Using Plumbing Products and Appliances - 1980-2012. PERC Phase 1 Report. Plumbing Efficiency Research Coalition, 2012. http://www.map-testing.com/content/info/menu/perc.html<br>Model Input Values are found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model and confirmed in each "Service Area Calibration End Use" worksheet by customer category. |
| **Natural Replacement Rate of Fixtures (percent per year)** | Residential Toilets 2%-4% |
| | Non-Residential Toilets 2%-3% |
| | Residential Showers 4% (corresponds to 25-year life of a new fixture) |
| | Residential Clothes Washers 10% (based on 10-year washer life).<br>Key References: "Residential End Uses of Water" (DeOreo, 2016) and "Bern Clothes Washer Study, Final Report" (Oak Ridge National Laboratory, 1998). |
| | Residential Faucets 10% and Non-Residential Faucets 6.7% (every 15 years). CEC uses an average life of 10 years for faucet accessories (aerators). A similar assumption can be made for public lavatories, though no hard data exists and since CII fixtures are typically replaced less frequently than residential, 15 years is assumed. CEC, Analysis of Standards Proposal for Residential Faucets and Faucet Accessories, a report prepared under CEC's Codes and Standards Enhancement Initiative, Docket #12-AAER-2C, August 2013. |
| | Model Input Value is found in the "Codes and Standards" green section on the "Fixtures" worksheet of the DSS Model. |
| **Residential Future Water Use** | Increases Based on Population Growth and Demographic Forecast |
| **Non-Residential Future Water Use** | Increases Based on Employment Growth and Demographic Forecast |

## Fixture Estimates

Determining the current level of efficient fixtures in a service area while evaluating the passive savings in the DSS Model is part of the standard process and is called "initial fixture proportions." As described earlier in Section 2.2, MWM reconciled water efficient fixtures and devices installed within the BAWSCA service area and estimated the number of outstanding inefficient fixtures.

MWM used the DSS Model to perform a saturation analysis for toilets, urinals, showerheads, faucets, and clothes washers. The process included a review of age of buildings from census data, number of rebates per device, and assumed natural replacement rates. MWM presumed the fixtures that were nearing saturation and worth analysis would include residential toilets and residential clothes washers as both have been included in recommended conservation practices for over two decades.

In 2014, the Water Research Foundation updated its 1999 Residential End Uses of Water Study (DeOreo, 2016). Water utilities, industry regulators, and government planning agencies consider it the industry benchmark for single family home indoor water use. This Demand Study incorporates recent study results which reflect the change to the profile of water use in residential homes including adoption of more water efficient fixtures over the past 20 years (1999-2019). Residential End Uses of Water Study results were combined with BAWSCA historical rebate and billing data to enhance and verify assumptions made for all customer accounts, including saturation levels on the above-mentioned plumbing fixtures.

The DSS Model presents the estimated current and projected proportions of these fixtures by efficiency level within each member agency service area. These proportions were calculated by:

- Using standards in place at the time of building construction;
- Taking the initial proportions of homes by age (corresponding to fixture efficiency levels);
- Adding the net change due to natural replacement; and
- Adding the change due to rebate measure minus the "free rider effect[15]."

Further adjustments were made to initial proportions to account for the reduction in fixture use due to lower occupancy and based on field observations. The projected fixture proportions do **not** include any future active conservation measures implemented by member agencies. More information about the development of initial and projected fixture proportions can be found in the DSS Model "Codes and Standards" section.

The DSS Model is capable of modeling multiple types of fixtures, including fixtures with different designs. For example, currently toilets can be purchased that flush at a rate of 0.8 gallons per flush (gpf), 1.0 gpf or 1.28 gpf. The 1.6 gpf and higher toilets still exist but can no longer be purchased in California. Therefore, they cannot be used for replacement or new installation of a toilet. So, the DSS Model utilizes fixture replacement rates to determine what type of fixture should be used for a new construction installation or replacement. The replacement of the fixtures is listed as a percentage within the DSS Model. A value of 100% would indicate that all the toilets installed would be of one particular flush volume. A value of 75% means that three out of every four toilets installed would be of that particular flush volume. All the Fixture Model information and assumptions were carefully reviewed and accepted by BAWSCA staff.

The DSS Model provides inputs and analysis of the number, type and replacement rates of fixtures for each customer category (e.g., single family toilets, commercial toilets, residential clothes washing machines). For example, the DSS Model incorporates the effects of the 1992 Federal Energy Policy Act and AB 715 on toilet fixtures. A DSS Model feature determines the "saturation" of 1.6 gpf toilets as the 1992 Federal Energy Policy Act was in effect from 1992 to 2014 for 1.6 gpf toilet replacements. AB 715 now applies for the replacement of

[15] It is important to note that in water conservation program management the "free rider effect" occurs when a customer applies for and receives a rebate on a targeted high efficiency fixture that they would have purchased even without a rebate. In this case, the rebate was not the incentive for their purchase but a "bonus." Rebate measures are designed to target those customers needing financial incentive to install the more efficient fixture.

toilets at 1.28 gpf. Further consideration and adjustments were made to replacement rates to account for the reduction in fixture use and wear due to lower occupancy and based on field observations.

## E.4 Present Value Analysis and the Utility and Community Perspective

Present value analysis using present day dollars and a real discount rate of 3% is used to discount costs and benefits to the base year. From this analysis, benefit-cost ratios of each measure are computed. When measures are put together in programs, the model is set up to avoid double counting savings from multiple measures that act on the same end use of water. For example, multiple measures in a program may target toilet replacements. The model includes assumptions to apportion water savings between the multiple measures.

Economic analysis can be performed from several different perspectives, based on which party is affected. For planning water use efficiency programs for utilities, perspectives most commonly used for benefit-cost analyses are the “utility” perspective and the “community” perspective. The “utility” benefit-cost analysis is based on the benefits and costs to the water provider. The “community” benefit-cost analysis includes the utility benefit and costs together with account owner/customer benefits and costs. These include customer energy and other capital or operating cost benefits plus costs of implementing the measure, beyond what the utility pays.

The utility perspective offers two advantages. First, it considers only the program costs that will be directly borne by the utility. This enables the utility to fairly compare potential investments for saving versus supplying increased quantities of water. Second, revenue shifts are treated as transfer payments, which means program participants will have lower water bills and non-participants will have slightly higher water bills so that the utility’s revenue needs continue to be met. Therefore, the analysis is not complicated with uncertainties associated with long-term rate projections and retail rate design assumptions. It should be noted that there is a significant difference between the utility’s savings from the avoided cost of procurement and delivery of water and the reduction in retail revenue that results from reduced water sales due to water use efficiency. This budget impact occurs slowly and can be accounted for in water rate planning. Because it is the water provider’s role in developing a water use efficiency plan that is vital in this study, the utility perspective was primarily used to evaluate elements of this report.

The community perspective is defined to include the utility and the customer costs and benefits. Costs incurred by customers striving to save water while participating in water use efficiency programs are considered, as well as benefits received in terms of reduced energy bills (from water heating costs) and wastewater savings, among others. Water bill savings are not a customer benefit in aggregate for reasons described previously. Other factors external to the utility, such as environmental effects, are often difficult to quantify or are not necessarily under the control of the utility. They are therefore frequently excluded from economic analyses, including this one.

## E.5 Present Value Parameters

The time value of money is explicitly considered. Typically, the costs to save water occur early in the planning period whereas the benefits usually extend to the end of the planning period. A long planning period of over 30 years is often used because costs and benefits that occur beyond 50 years have very little influence on the total present value of the costs and benefits. The value of all future costs and benefits is discounted to the first year in the DSS Model (the base year), at the real interest rate of 3.01%. The DSS Model calculates this real interest rate, adjusting the current nominal interest rate (assumed to be approximately 6.1%) by the assumed rate of inflation (3.0%). The formula to calculate the real interest rate is: (nominal interest rate – assumed rate of inflation)/ (1 + assumed rate of inflation). Cash flows discounted in this manner are herein referred to as “Present Value” sums.

## E.6 Assumptions About Measure Costs

Appendix F presents the assumptions and inputs used in the DSS Model to evaluate each water conservation measure. Assumptions regarding the following variables were made for each measure:

- **Targeted Water User Group End Use –** Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use)
- **Utility Unit Cost –** Cost of rebates, incentives, and contractors hired by BAWSCA and BAWSCA member agencies to implement measures
- **Retail Customer Unit Cost –** Cost for implementing measures that is paid by retail customers (i.e., remainder of a measure's cost that is not covered by a rebate or incentive)
- **Utility Administration and Marketing Cost –** The cost to the utility for staff time, general expenses, and overhead needed to implement and administer the measure, including consultant contract administration, marketing, and participant tracking. The unit costs vary greatly according to the type of customer and implementation method. For example, a measure might cost a different amount for a single family account than a multifamily account. Rebate program costs are different than costs to develop and enforce an ordinance requirement or a direct installation program. Typically, water utilities incur increased costs with achieving higher market saturation, such as more surveys per year. The model calculates the annual costs based on the number of participants each year.

Costs are determined for each of the measures based on industry knowledge, past experience and data provided by BAWSCA staff, Valley Water, SFPUC staff and the member agencies. Costs may include incentive costs, usually determined on a per-participant basis; fixed costs, such as marketing; variable costs, such as the costs to staff the measures and to obtain and maintain equipment; and a one-time set-up cost. The set-up cost is for measure design by staff or consultants, any required pilot testing, and preparation of materials that are used in marketing the measure. Measure costs are estimated each year through 2045. Costs are spread over the time period depending on the length of the implementation period for the measure and estimated voluntary customer participation levels.

Lost revenue due to reduced water sales is not included as a cost because the water use conservation measures evaluated herein generally take effect over a long span of time that is sufficient to enable timely rate adjustments, if necessary, to meet fixed cost obligations and savings on variable costs such as energy and chemicals.

## E.7 Assumptions about Measure Savings

Data necessary to forecast water savings of measures include specific data on water use, demographics, market penetration, and unit water savings. Savings normally develop at a measured and predetermined pace, reaching full maturity after full market penetration is achieved. This may occur three to seven years after the start of implementation, depending upon the implementation schedule. For every water use efficiency activity or replacement with more efficient devices, there is a useful life. The useful life is called the "Measure Life" and is defined to be how long water use conservation measures stay in place and continue to save water. It is assumed that measures implemented because of codes, standards, or ordinances (e.g., toilets) would be "permanent" and not revert to an old inefficient level of water use if the device needed to be replaced. However, some measures that are primarily behavior-based, such as residential surveys, are assumed to need to be repeated on an ongoing basis to retain the water savings (e.g., homeowners move away, and the new homeowners may have less efficient water using practices). Surveys typically have a measure life on the order of five years.

## E.8 Assumptions about Avoided Costs

The estimated avoided cost of water was provided by BAWSCA staff and can be found in each BAWSCA member agency's specific DSS Model. The avoided cost of water or water production operational cost is $7.75/ccf as per information from Andree Johnson at BAWSCA on April 2, 2020 based on FY 2030-31 rates from SFPUC's Wholesale Rate Projections for the 10-year horizon. Given that there are no projections beyond the 2031 mark, the 2031 data value was selected.

# APPENDIX F. INDIVIDUAL CONSERVATION MEASURE DESIGN INPUTS AND RESULTS

The following figures present the DSS Model starting values for the conservation measures that were analyzed for possible inclusion into each BAWSCA member agency's conservation program.

## Measure 1: CII Water Survey

**Overview**

| | |
|---|---|
| Name | CII Water Survey |
| Abbr | 1 |
| Category | Default |
| Measure Type | Standard Measure |

**Time Period**

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

**Measure Life**

| | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

**Fixture Cost per Device**

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| COM | $1,000.00 | $500.00 | 1 |

**Administration Costs**

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 15% |

**Description**

Program provides free water surveys to CII customers to evaluate ways for the business to save water and money. The surveys may target large accounts (e.g., accounts that use more than 5,000 gallons of water per day) only such as hotels, restaurants, stores and schools. Emphasis may be on supporting the top 25 users for each individual water agency.

**Customer Classes**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| | ☐ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | | ☑ | | | | | | |
| Urinals | | | ☑ | | | | | | |
| Lavatory Faucets | | | ☑ | | | | | | |
| Showers | | | ☑ | | | | | | |
| Dishwashers | | | ☑ | | | | | | |
| Clothes Washers | | | ☑ | | | | | | |
| Process | | | ☑ | | | | | | |
| Kitchen Spray Rinse | | | ☑ | | | | | | |
| Internal Leakage | | | ☑ | | | | | | |
| Baths | | | | | | | | | |
| Other | | | ☑ | | | | | | |
| Irrigation | | | ☐ | | | | | | |
| Pools | | | | | | | | | |
| Wash Down | | | | | | | | | |
| Car Washing | | | | | | | | | |
| External Leakage | | | ☐ | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | | ☑ | | | | | | |
| Cooling | | | ☑ | | | | | | |

**Comments**

> **Utility Costs** - Survey cost is ~$500-$1,500 in-house staff or $2,000-$10,000 if contracted out. Utility cost is $60 for fixtures + 2-3 hours staff time for survey. ~$500 per survey for Utility cost. Utility costs represent fixture giveaway number distributed and costs (1.5 spray valves $50/ea., 5 aerators @ $2/ea.). Approx. 1.5 nozzles can be found per CII account per Tso & Koeller 2005 report "Pre-rinse Spray Valve Programs: How are they really doing?"

> **Customer Costs** - reflects cost/time to install fixtures and address survey recommendations.

> **End Use Water Saving** - BAWSCA Phase 1 study on Making Conservation a California Way of Life found savings of 10-15% per site. Assume 15% per site and include giveaways. Giveaways assume 1.15 gpm pre-rinse spray valve replace 2.5 gpm, 0.5 gpm aerators replace 2.2 gpm in lavatories, and 1.8 gpm replace aerators replace 2.2 gpm in non-lavatory settings (kitchens, utility rooms, etc.). This is an indoor survey only. Irrigation and landscaping will not be evaluated as part of the survey. Cooling systems will be evaluated in surveys.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 0.11%. ~7 BAWSCA agencies reported. Per 2018 BAWSCA Phase 1 Making Conservation a California Way of Life Strategic Plan study < 1% of CII accounts are audited per year.

**Results**

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| COM Toilets | 15.0% | agency-specific |
| COM Urinals | 15.0% | agency-specific |
| COM Lavatory Faucets | 15.0% | agency-specific |
| COM Showers | 15.0% | agency-specific |
| COM Dishwashers | 15.0% | agency-specific |
| COM Clothes Washers | 15.0% | agency-specific |
| COM Process | 15.0% | agency-specific |
| COM Kitchen Spray Rinse | 15.0% | agency-specific |
| COM Internal Leakage | 15.0% | agency-specific |
| COM Other | 15.0% | agency-specific |
| COM Non-Lavatory/Kitchen Faucets | 15.0% | agency-specific |
| COM Cooling | 15.0% | agency-specific |

**Targets**

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.110% |
| Only Effects New Accts | ☐ |

# Measure 2: CII Water Efficient Technology (WET) Rebate

| Overview | |
|---|---|
| Name | CII Water Efficient Technology (WET) Rebate |
| Abbr | 2 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2022 |
| Last Year | 2045 |
| Measure Length | 24 |

| Measure Life | |
|---|---|
| Permanent | ☑ |

| Fixture Cost per Device | Utility | Customer | Fix/Acct |
|---|---|---|---|
| COM | $5,000.00 | $5,000.00 | 1 |
| IND | $5,000.00 | $5,000.00 | 1 |

| Administration Costs | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Program modeled after the Valley Water program to provides rebates to commercial, industrial and institutional sites to help implement equipment changes that reduce water use. Rebate amount is $4 per ccf saved annually up to 50% of the cost of the equipment.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☑ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | | ☑ | | ☑ | | | | |
| Urinals | | | ☑ | | ☑ | | | | |
| Lavatory Faucets | | | ☑ | | ☑ | | | | |
| Showers | | | ☑ | | ☑ | | | | |
| Dishwashers | | | ☑ | | ☑ | | | | |
| Clothes Washers | | | ☑ | | ☑ | | | | |
| Process | | | ☑ | | ☑ | | | | |
| Kitchen Spray Rinse | | | ☑ | | | | | | |
| Internal Leakage | | | ☑ | | ☑ | | | | |
| Baths | | | | | | | | | |
| Other | | | ☑ | | ☑ | | | | |
| Irrigation | | | ☐ | | ☐ | | | | |
| Pools | | | | | | | | | |
| Wash Down | | | | | | | | | |
| Car Washing | | | | | | | | | |
| External Leakage | | | ☑ | | ☑ | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | | ☑ | | ☑ | | | | |
| Cooling | | | ☑ | | ☑ | | | | |

**Comments**

> **Utility Costs** - Program modeled after Valley Water. Incentive value for BAWSCA program based on cost effectiveness. Pre-rinse spray valves can cost $60/ea. These are also distributed during CII surveys. https://fishnick.com/equipment/sprayvalves/
Dipper wells: Installation of electricity access can cost ~$350/ea. A health dept. permit might be ~$400/ea. A permit for electricity installation might be ~$200, though not apply to all. ConserveWell Drop-in model costs ~ $510/well. ConserveWell Wall-mount model costs ~$565/well.

> **Customer Costs** - Customer costs reflect installation.

> **End Use Water Savings** - Eligible fixtures will change based on changes in plumbing codes that would negate the need for the fixture to be rebated. Ending eligibility of certain fixtures avoids free-ridership. Savings and both utility and customer costs will vary depending on rebated fixtures. Averaged overall estimates for costs and savings are assumed to account for the variance in devices. Water savings data is provided for dipper wells as an example of one possible newer device to increase water savings indoors for businesses: https://server-products.com/ConserveWell-notdipperwell. Dipper Well Replacement Field Evaluation Report. Frontier Energy Report # 50115-R0. Nov 2017. Los Banos site saved 176,000 gal/yr & Madera site saved 116,000 gal/yr. https://fishnick.com/publications/fieldstudies/Dipper_Well_Replacement_Field_Evaluation_ICP.pdf.

> **Targets** - Assumes 0.5% of CII accounts are targeted each year.

| Results | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| agency-specific | |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| COM Toilets | 20.0% | agency-specific |
| IND Toilets | 20.0% | agency-specific |
| COM Urinals | 20.0% | agency-specific |
| IND Urinals | 20.0% | agency-specific |
| COM Lavatory Faucets | 20.0% | agency-specific |
| IND Lavatory Faucets | 20.0% | agency-specific |
| COM Showers | 20.0% | agency-specific |
| IND Showers | 20.0% | agency-specific |
| COM Dishwashers | 20.0% | agency-specific |
| IND Dishwashers | 20.0% | agency-specific |
| COM Clothes Washers | 20.0% | agency-specific |
| IND Clothes Washers | 20.0% | agency-specific |
| COM Process | 20.0% | agency-specific |
| IND Process | 20.0% | agency-specific |
| COM Kitchen Spray Rinse | 20.0% | agency-specific |
| COM Internal Leakage | 20.0% | agency-specific |
| IND Internal Leakage | 20.0% | agency-specific |
| COM Other | 20.0% | agency-specific |
| IND Other | 20.0% | agency-specific |
| COM External Leakage | 20.0% | agency-specific |
| IND External Leakage | 20.0% | agency-specific |
| COM Non-Lavatory/Kitchen Faucets | 20.0% | agency-specific |
| IND Non-Lavatory/Kitchen Faucets | 20.0% | agency-specific |
| COM Cooling | 20.0% | agency-specific |
| IND Cooling | 20.0% | agency-specific |

| Targets | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.500% |
| Only Effects New Accts | ☐ |

## Measure 3: School Building Retrofit

### Overview

| | |
|---|---|
| Name | School Building Retrofit |
| Abbr | 3 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2028 |
| Measure Length | 10 |

### Measure Life

| | |
|---|---|
| Permanent | ☑ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| COM | $5,000.00 | $5,000.00 | 1 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Program provides site audits and customized rebates for fixture replacements and irrigation upgrades at school sites. Eligible sites may include K-12 schools as well as colleges and universities.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | | ☑ | | | | | | |
| Urinals | | | ☑ | | | | | | |
| Lavatory Faucets | | | ☑ | | | | | | |
| Showers | | | ☑ | | | | | | |
| Dishwashers | | | ☑ | | | | | | |
| Clothes Washers | | | ☑ | | | | | | |
| Process | | | ☑ | | | | | | |
| Kitchen Spray Rinse | | | ☑ | | | | | | |
| Internal Leakage | | | ☑ | | | | | | |
| Baths | | | | | | | | | |
| Other | | | ☑ | | | | | | |
| Irrigation | | | ☑ | | | | | | |
| Pools | | | | | | | | | |
| Wash Down | | | | | | | | | |
| Car Washing | | | | | | | | | |
| External Leakage | | | ☑ | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | | ☑ | | | | | | |
| Cooling | | | ☑ | | | | | | |

### Comments

> **Utility Costs** - $5,000 utility cost assumes replacement of high use toilets and some irrigation system improvement (where applicable).

> **Customer Costs** - Assumes cost of installation and remainder of devices.

> **End Use Water Savings** - Savings similar to CII survey and incentive measures combined.

> **Targets** - Assumes 0.1% of institutional accounts targeted each year

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| agency-specific | |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| COM Toilets | 15.0% | agency-specific |
| COM Urinals | 15.0% | agency-specific |
| COM Lavatory Faucets | 15.0% | agency-specific |
| COM Showers | 15.0% | agency-specific |
| COM Dishwashers | 15.0% | agency-specific |
| COM Clothes Washers | 15.0% | agency-specific |
| COM Process | 15.0% | agency-specific |
| COM Kitchen Spray Rinse | 15.0% | agency-specific |
| COM Internal Leakage | 15.0% | agency-specific |
| COM Other | 15.0% | agency-specific |
| COM Irrigation | 15.0% | agency-specific |
| COM External Leakage | 15.0% | agency-specific |
| COM Non-Lavatory/Kitchen Faucets | 15.0% | agency-specific |
| COM Cooling | 15.0% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.100% |
| Only Effects New Accts | ☐ |

## Measure 4: Residential Outdoor Water Surveys

**Overview**

| | |
|---|---|
| Name | Residential Outdoor Water Surveys |
| Abbr | 4 |
| Category | Default |
| Measure Type | Standard Measure |

**Time Period**

| | |
|---|---|
| First Year | 2023 |
| Last Year | 2045 |
| Measure Length | 23 |

**Measure Life**

| | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

**Fixture Cost per Device**

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $383.00 | $50.00 | 1 |

**Administration Costs**

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Outdoor water surveys offered for existing customers. Normally those with high water use are targeted and provided a customized report on how to save water. Can be combined with indoor surveys or focused on certain customer classes. Residential customers would be eligible for free landscape water surveys upon request. Typically during the surveys, the surveyor will checks for leaks, provide direction on appropriate irrigation scheduling, demonstrate how to set irrigation controllers, provide guidance on plant selection and offer additional ways to increase outdoor efficiencies (car washing, pool covers, mulch etc.). Low-cost, general-use, outdoor efficiency fixtures assumed to be handed out during the survey as needed.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☐ | | | | | | | | |
| Showers | ☐ | | | | | | | | |
| Dishwashers | ☐ | | | | | | | | |
| Clothes Washers | ☐ | | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☐ | | | | | | | | |
| Baths | ☐ | | | | | | | | |
| Other | ☐ | | | | | | | | |
| Irrigation | ☑ | | | | | | | | |
| Pools | ☐ | | | | | | | | |
| Wash Down | ☑ | | | | | | | | |
| Car Washing | ☑ | | | | | | | | |
| External Leakage | ☑ | | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Time estimates includes field time, drive time, scheduling, and data entry. Assume staff avg fully burdened Rate with fringe and overhead is $136/hr., (ACWD Water Conservation Rate is $50/hr. for base rate with fringe and overhead add 1.72%). Utility fixture costs assume all surveyed accounts receive a kit with $9 of supplies including a rain gauge, an auto shut-off hose nozzle, and a soil moisture sensor. Utility Cost = ((136*2.75 hours per survey) +($9 supplies))* 25% admin markup> Administration Costs - Based on Big Bear, CA program, administration time assumes 75 min/audit (primarily 70% staff, 30% supervisor).

> **End Use Water Savings** - Savings based off of California Urban Water Agencies water Savings Study (4/13/15); Outdoor Residential Water Surveys saved on average 21 gpd per audit. Assumed 10% savings on outdoor end uses and 5% selected on pools to be conservative which total up to an approximate average savings of 21 gpd per residential audit.

> **Targets** - WCWDB FY16/17 & FY17/18 ~11 BAWSCA agencies reported. 0.8% SF survey participation.

**Results**

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| | agency-specific |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Fixed

| | Savings GPD/Acct | Avg GPD/Acct |
|---|---|---|
| SF Irrigation | 18.0 | agency-specific |
| SF Wash Down | 0.5 | agency-specific |
| SF Car Washing | 0.5 | agency-specific |
| SF External Leakage | 2.0 | agency-specific |

**Targets**

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.800% |
| Only Effects New Accts | ☐ |

# Measure 5: Large Landscape Outdoor Water Surveys

| Overview | |
|---|---|
| Name | Large Landscape Outdoor Water Surveys |
| Abbr | 5 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

| Measure Life | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

| Fixture Cost per Device | | | |
|---|---|---|---|
| | Utility | Customer | Fix/Acct |
| IRR | $1,500.00 | $1,000.00 | 1 |

| Administration Costs | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multifamily residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | | | | | | | | | |
| Showers | | | | | | | | | |
| Dishwashers | | | | | | | | | |
| Clothes Washers | | | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | | | | | | | | | |
| Baths | | | | | | | | | |
| Other | | | | | | | | | |
| Irrigation | | | | | | | ☑ | | |
| Pools | | | | | | | | | |
| Wash Down | | | | | | | | | |
| Car Washing | | | | | | | | | |
| External Leakage | | | | | | | ☑ | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Assumes all large landscape accounts can apply. Assume 3 acres cost $500/Acre, $1,500 per site.

> **Customer Costs** - Assumes cost to review/update controller programming or fix minor leaks to align water use to an appropriate level for the amount and type of landscaping at the site.

> **End Use Water Savings** - Savings based off of California Urban Water Agencies water savings study (4/13/15) of 326 gpda, average of 15% for CII landscape accounts; distributed between irrigation and external leakage. The actual savings for the DSS Model is directly tied to service area irrigation characteristics for COM or IRR accounts based on billing categories and will vary by service area. The actual water savings of 20% of irrigation and 10% of leakage is conservative but yields representative end use water savings for this measure.

> **Targets** - Customer participation based on BAWSCA Water Conservation Data Base measure record.

| Results | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| agency-specific | |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| IRR Irrigation | 20.0% | agency-specific |
| IRR External Leakage | 10.0% | agency-specific |

| Targets | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 1.000% |
| Only Effects New Accts | ☐ |

## Measure 6: Large Landscape (Waterfluence) Program

### Overview

| | |
|---|---|
| Name | Large Landscape (Waterfluence) Program |
| Abbr | 6 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2020 |
| Last Year | 2039 |
| Measure Length | 20 |

### Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| IRR | $1,480.00 | $0.00 | 1 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Website provides feedback on irrigation water use (budget vs. actual). Current Waterfluence Program.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | | | | | | | | | |
| Showers | | | | | | | | | |
| Dishwashers | | | | | | | | | |
| Clothes Washers | | | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | | | | | | | | | |
| Baths | | | | | | | | | |
| Other | | | | | | | | | |
| Irrigation | | | | | | | ☑ | | |
| Pools | | | | | | | | | |
| Wash Down | | | | | | | | | |
| Car Washing | | | | | | | | | |
| External Leakage | | | | | | | ☐ | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | | | | | | | | |
| Cooling | | | | | | | | | |

### Comments

> **Utility Costs** - Water Budgeting software like Waterfluence at $74 per site. Assuming a five-year investment per site, unit cost is set at $1,480 per 20 year site monitoring fee. Monitoring fee is adjusted to account for accounts coming online over the program duration.

> **Administrative Costs** - represents approximately $5,000 for staff time and an annual service fee of $2,000 to administer the program.

> **Customer Costs** - No cost to customers as these are mostly adjustments to existing controller programming or change in landscape maintenance practices.

> **End Use Water Savings** - Savings is estimated based on past experience with other utilities. Also accounts for behavior and watering schedule changes.

> **Targets** - Customer participation of 5% based on BAWSCA Water Conservation Database. Based on percent of IRR/Dedicated Landscape Accounts when available.

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| IRR Irrigation | 30.0% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 5.000% |
| Only Effects New Accts | ☐ |

## Measure 7: Lawn Be Gone! and Rainwater Capture Rebates

### Overview

| | |
|---|---|
| Name | Lawn Be Gone! And Rainwater Capture Rebates |
| Abbr | 7 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

### Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 5 |
| Repeat | ☐ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $500.00 | $2,000.00 | 1 |
| MF | $2,500.00 | $20,000.00 | 1 |
| COM | $2,500.00 | $20,000.00 | 1 |
| IND | $2,500.00 | $20,000.00 | 1 |
| GOV | $2,500.00 | $20,000.00 | 1 |
| IRR | $2,500.00 | $20,000.00 | 1 |

### Administration Costs

Method: Percent

| | |
|---|---|
| Markup Percentage | 25% |

### Description

Provide a per square foot incentive for to remove turf and replace with low water use plants or permeable hardscape. Landscape conversion includes conversion of turf to lower-water-using turf varieties. Rebate based on dollars per square foot removed, and capped at an upper limit for single family residence, multifamily residence and/or commercial account.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Urinals | | | ☐ | | ☐ | ☐ | | | |
| Lavatory Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Showers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☑ | ☑ | ☑ | | ☑ | ☑ | ☑ | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | ☐ | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

### Comments

> **Utility Costs** - Assume rebate of $1/sq foot of turf removed which equates to approximately 25% of total project cost. Assume MF/CII costs of $2,500 and SF costs of $500. Assume large sites have more than one meter. Therefore large sites can qualify for multiple rebates to make it a worthwhile effort with a higher total site incentive value.

> **Customer Cost** - Per 2013 BAWSCA effort MF/CII costs of $20,000/customer and SF cost of $2,000/customer.

> **End Use Water Savings** - Water Savings based upon Valley Water program at 31 gallons per square foot/yr. for years 2-5, and saving 48 gal/feet squared/yr. during the fifth year following conversion. Assume an average of 18% over the 5 years of the study.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 0.13%. ~15 BAWSCA agencies reported. Includes SF, MF and CII customer categories combined.

### Results

Units: MG

| | |
|---|---|
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Irrigation | 18.0% | agency-specific |
| MF Irrigation | 18.0% | agency-specific |
| COM Irrigation | 18.0% | agency-specific |
| IND Irrigation | 18.0% | agency-specific |
| GOV Irrigation | 18.0% | agency-specific |
| IRR Irrigation | 18.0% | agency-specific |

### Targets

Target Method: Percentage

| | |
|---|---|
| % of Accts Targeted / yr | 0.130% |
| Only Effects New Accts | ☐ |

# Measure 8: Financial Incentives for Irrigation & Landscape Upgrades

## Overview

| | |
|---|---|
| Name | Financial Incentives for Irrigation & Landscape Upgrades |
| Abbr | 8 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2023 |
| Last Year | 2045 |
| Measure Length | 23 |

| Measure Life | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $250.00 | $100.00 | 1 |
| MF | $500.00 | $500.00 | 1 |
| COM | $500.00 | $500.00 | 1 |
| IND | $500.00 | $500.00 | 1 |
| GOV | $500.00 | $500.00 | 1 |
| IRR | $500.00 | $500.00 | 1 |

## Administration Costs

| Method: | Percent |
|---|---|
| Markup Percentage | 25% |

## Description

For customers with landscape, provide incentives for substantive landscape retrofits or installation of water efficient equipment upgrades; Rebates can also contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades.

> Rebate for residential accounts and up to 50% more for commercial customers.

> Financial incentives for: WBICs, rotating sprinkler nozzles, rainwater containers (barrels and cisterns), and greywater retrofits

> Landscape conversion and turf removal is not part of this measure.

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Urinals | | | ☐ | | ☐ | ☐ | | | |
| Lavatory Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Showers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☑ | ☑ | ☑ | | ☑ | ☑ | ☑ | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | ☐ | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

## Comments

> **Utility Costs** - $250 for SF accounts. $500 utility cost is per non-residential account. Large sites will have more than one account and qualify for a larger total rebate per site. EBMUD and Valley Water programs offer up to $2,000-$3,000 for residential customers and up to $15,000-$60,000 for commercial customers.

> **Customer Costs** - Customer costs per account will vary significantly based on devices.

> **End Use Water Savings** - The water savings are based on the following from the 2018 Landscape Rebate Water Savings Study from Valley Water:

> The annual water savings for replacing timer-based automatic irrigation controllers with weather-based irrigation controllers with rain shut-off devices were statistically significant each year following conversion, incrementally increased each year following conversion, and were on average 9 gal/ft2/yr or an average of 27%

> The annual water savings for replacing old sprinklers with high-efficiency nozzles were 1,243 gal/unit/yr on average. or an average of 15.3%

>Annual savings for replacing old sprinklers with high-efficiency nozzles including pressure regulation and/or check valves were significant in the first year following conversion, saving 1,661 gal/unit/yr on average, or an average of 18%.

> Total average irrigation savings is 20.1%

> Soil moisture sensor savings may be 20% of irrigation use is based on more than 10 California site water use reports conducted over multiple months in years 2015-2017 as provided by Brian Holland www.sustainablewatersavings.com. Studies show a range of 20%-60% savings for trained soil moisture sensor device installation and site management. A lower savings estimate is assumed for layperson usage and non-drought normal planning years. The manufacturer claims device batteries last 10-12 years.

> **Targets** - 0.25% to keep total utility budget and staff time for this program to reasonable levels.

## Results

| Units | MG |
|---|---|
| Average Water Savings (mgd) | |
| | agency-specific |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Irrigation | 20.1% | agency-specific |
| MF Irrigation | 20.1% | agency-specific |
| COM Irrigation | 20.1% | agency-specific |
| IND Irrigation | 20.1% | agency-specific |
| GOV Irrigation | 20.1% | agency-specific |
| IRR Irrigation | 20.1% | agency-specific |

## Targets

| Target Method: | Percentage |
|---|---|
| % of Accts Targeted / yr | 0.250% |
| Only Effects New Accts | ☐ |

# Measure 9: Landscape & Irrigation Codes

## Overview

| | |
|---|---|
| Name | Landscape & Irrigation Codes |
| Abbr | 9 |
| Category | Default |
| Measure Type | Standard Measure |

## Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

## Measure Life

| | |
|---|---|
| Permanent | ☑ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $100.00 | $2,000.00 | 1 |
| MF | $100.00 | $2,000.00 | 1 |
| COM | $100.00 | $2,000.00 | 1 |
| IND | $100.00 | $5,000.00 | 1 |
| GOV | $100.00 | $2,000.00 | 1 |
| IRR | $100.00 | $2,000.00 | 1 |

## Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

## Description

Existing Model Water Efficient Landscape Ordinance (MWELO), as amended in 2015, which establishes specific outdoor water efficiency requirements for new accounts and existing accounts undergoing eligible site renovations.

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Urinals | | | ☐ | | ☐ | ☐ | | | |
| Lavatory Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Showers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☑ | ☑ | ☑ | | ☑ | ☑ | ☑ | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☑ | ☑ | ☑ | | ☑ | ☑ | ☑ | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

## Comments

> **Utility Costs** - $100/fixture and 25% admin costs represent staff time for enforcement and inspection of landscapes.

> **Customer Costs** - Assume average additional cost to build landscape by MWELO standards (cost to comply versus install typical all-turf) landscape ($2000-$5000/acct). Also includes non-residential customer smart irrigation controller cost of $750 based on $700 device unit cost (per RainBird ITC-LX) and $50 unit installation cost per controller with 3 controllers needed for large sites.

> **End Use Water Savings** - The maximum applied water allowance (MAWA) has been lowered from 70% of the reference evapotranspiration (ETo) to 55% for residential landscape projects, and to 45% of ETo for non-residential projects. Savings are simplified to be the difference from the prior standard to the new MWELO standard budget difference of 70-55% for residential or 70-45% for non-residential. This water allowance reduces the landscape area that can be planted with high water use plants such as cool season turf. For typical residential projects, the reduction in the MAWA reduces the percentage of landscape area that can be planted to high water use plants from 33% to 25%. The site-wide irrigation efficiency of the previous ordinance (2010) was 0.71; for the purposes of estimating total water use, the revised MWELO defines the irrigation efficiency (IE) of drip irrigation as 0.81 and overhead irrigation and other technologies must meet a minimum IE of 0.75. Also assumed that the amount of irrigated landscape per new development for each individual parcel is reducing over time (meaning that the lot size for homes/businesses is shrinking when comparing existing homes versus new homes/businesses.) Assume some external leakage reduction (since new development would not have much) in addition to irrigation water use reduction. Assume end use savings as compared to existing account irrigation water end use.

> **Targets** - Assumes 90% of new accounts will comply. High because assumes total accounts targeted includes a number of existing account remodels that are eligible.

## Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Irrigation | 25.0% | agency-specific |
| MF Irrigation | 25.0% | agency-specific |
| COM Irrigation | 25.0% | agency-specific |
| IND Irrigation | 25.0% | agency-specific |
| GOV Irrigation | 25.0% | agency-specific |
| IRR Irrigation | 25.0% | agency-specific |
| SF External Leakage | 10.0% | agency-specific |
| MF External Leakage | 10.0% | agency-specific |
| COM External Leakage | 10.0% | agency-specific |
| IND External Leakage | 10.0% | agency-specific |
| GOV External Leakage | 10.0% | agency-specific |
| IRR External Leakage | 10.0% | agency-specific |

## Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 90.000% |
| Only Effects New Accts | ☑ |

## Measure 10: Residential Indoor Water Surveys

**Overview**

| | |
|---|---|
| Name | Residential Indoor Water Surveys |
| Abbr | 10 |
| Category | Default |
| Measure Type | Standard Measure |

**Time Period**

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

**Measure Life**

| | |
|---|---|
| Permanent | ☐ |
| Years | 5 |
| Repeat | ☐ |

**Fixture Cost per Device**

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $100.00 | $50.00 | 1 |
| MF | $100.00 | $50.00 | 1 |

**Administration Costs**

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Indoor water surveys for existing residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, toilet devices. Could be combined with Residential Outdoor Water Surveys measure.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☑ | ☑ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | ☑ | | | | | | | |
| Showers | ☑ | ☑ | | | | | | | |
| Dishwashers | ☑ | ☑ | | | | | | | |
| Clothes Washers | ☑ | ☑ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☑ | ☑ | | | | | | | |
| Baths | ☑ | ☑ | | | | | | | |
| Other | ☑ | ☑ | | | | | | | |
| Irrigation | ☐ | ☐ | | | | | | | |
| Pools | ☐ | ☐ | | | | | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Utility costs for this measure are primarily staff time. Admin costs/time estimates includes field time, drive time, scheduling, and data entry. Portion 25% to admin in measure design. Giveaway device costs and device rebates as a result of this measure are not included since these are covered in separate measures.

> **Customer Costs** - Customer costs represent average customer cost to implement any survey suggestions.

> **End Use Water Savings** - Savings represents average account savings. Savings based off of California Urban Water Agencies water savings study (4/13/15). Approximate 5.8% savings for indoor. Slightly lower value of 5% water savings were selected to account for efficient devices installed during the recent CA drought, and more efficient homes built to CALGreen on the market in the past 5 years.

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 2.71%. ~11 BAWSCA agencies reported. 0.8% SF survey participation and 4.6% MF survey participation.

**Results**

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| | agency-specific |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Toilets | 5.0% | agency-specific |
| MF Toilets | 5.0% | agency-specific |
| SF Lavatory Faucets | 5.0% | agency-specific |
| MF Lavatory Faucets | 5.0% | agency-specific |
| SF Showers | 5.0% | agency-specific |
| MF Showers | 5.0% | agency-specific |
| SF Dishwashers | 5.0% | agency-specific |
| MF Dishwashers | 5.0% | agency-specific |
| SF Clothes Washers | 5.0% | agency-specific |
| MF Clothes Washers | 5.0% | agency-specific |
| SF Internal Leakage | 5.0% | agency-specific |
| MF Internal Leakage | 5.0% | agency-specific |
| SF Baths | 5.0% | agency-specific |
| MF Baths | 5.0% | agency-specific |
| SF Other | 5.0% | agency-specific |
| MF Other | 5.0% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 5.0% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 5.0% | agency-specific |

**Targets**

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 2.710% |
| Only Effects New Accts | ☐ |

# Measure 11: Residential Water-Savings Devices Giveaway

### Overview

| | |
|---|---|
| Name | Residential Water-Savings Devices Giveaway |
| Abbr | 11 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

### Measure Life

| | |
|---|---|
| Permanent | ☑ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $12.00 | $15.00 | 2 |
| MF | $12.00 | $15.00 | 8 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Utility would buy high efficiency showerheads and faucets, aerators in bulk and give them away at Utility office or community events.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | ☑ | | | | | | | |
| Showers | ☑ | ☑ | | | | | | | |
| Dishwashers | ☐ | ☐ | | | | | | | |
| Clothes Washers | ☐ | ☐ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☐ | ☐ | | | | | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | | | | | | | |
| Irrigation | ☐ | ☐ | | | | | | | |
| Pools | ☐ | ☐ | | | | | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

### Comments

> **Utility Costs** - Devices are ordered in bulk. Devices are given away individually, and not necessarily as a "kit". Average cost for devices: 1.2 gpm bathroom aerators ($1/ea.), 1.8 gpm kitchen aerators ($2.10/ea.), 1.8 gpm showerheads ($4.60/ea.). Admin costs for tracking of program

> **Customer Costs** - Assumes minimal cost for installation.

> **End Use Water Savings** - Assume kits save 27.6% (reduced to be conservative) by assuming only 25% of kits are actually installed in the homes and yield water savings. Assumed Kit savings of 27.6% * 0.25 installed = 6.9% actual savings

> **Targets** - WCWDB FY16/17 & FY17/18 average measure participation rate of: 1.24%. ~12 BAWSCA agencies reported.

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| agency-specific | |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Lavatory Faucets | 6.9% | agency-specific |
| MF Lavatory Faucets | 6.9% | agency-specific |
| SF Showers | 6.9% | agency-specific |
| MF Showers | 6.9% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 6.9% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 6.9% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 1.250% |
| Only Effects New Accts | ☐ |

## Measure 12: Flowmeter Rebate

### Overview

| | |
|---|---|
| Name | Flowmeter Rebate |
| Abbr | 12 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2020 |
| Last Year | 2024 |
| Measure Length | 5 |

### Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $200.00 | $400.00 | 1 |
| MF | $200.00 | $400.00 | 1 |
| COM | $200.00 | $400.00 | 1 |
| IND | $200.00 | $400.00 | 1 |
| GOV | $200.00 | $400.00 | 1 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Program provides rebates for flow measuring devices which inform customers of their water use and provide leak detection and remote shutoff with a smart phone interface. Devices are targeted to residential users and can monitor indoor only, whole site meter use, and/or irrigation only use.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☐ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Urinals | | | ☐ | | ☐ | ☐ | | | |
| Lavatory Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Showers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

### Comments

> Focus of Program: non-irrigation accounts

> **Utility Costs** - $200 rebate amount based off of EBMUD flowmeter rebate program https://www.ebmud.com/water/conservation-and-rebates/rebates/flowmeter-rebate/

> **Administration Costs** - Assume 25% admin to cover management of measure.

> **Customer Costs** - Customer costs assume half the customers would install more-costly remote or auto-shut-off device and half the less-costly sensor. Product examples: Flume, Flo, Buoy, Phyn Flume sensor straps around water meter and provides intelligent leak detection and real-time water use via mobile app. No pipes cut. ($200).
Water Hero Leak Detection & Automatic Water Shut Off System ($650).
Plumbed components last 20+ years; electronics last ~10 yrs.

> **End Use Water Savings** - Savings based on study results from EBMUD, San Antonio, and WaterNow Alliance savings of 7% of total SF account use provided Feb 2020.

> **Targets** - Assume 0.5% of accounts targeted each year.

### Results

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| | agency-specific |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Internal Leakage | 35.0% | agency-specific |
| MF Internal Leakage | 35.0% | agency-specific |
| COM Internal Leakage | 35.0% | agency-specific |
| IND Internal Leakage | 35.0% | agency-specific |
| GOV Internal Leakage | 35.0% | agency-specific |
| SF Irrigation | 15.0% | agency-specific |
| MF Irrigation | 15.0% | agency-specific |
| COM Irrigation | 15.0% | agency-specific |
| IND Irrigation | 15.0% | agency-specific |
| GOV Irrigation | 15.0% | agency-specific |
| SF External Leakage | 35.0% | agency-specific |
| MF External Leakage | 35.0% | agency-specific |
| COM External Leakage | 35.0% | agency-specific |
| IND External Leakage | 35.0% | agency-specific |
| GOV External Leakage | 35.0% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.500% |
| Only Effects New Accts | ☐ |

# Measure 13: Leak Repair & Plumbing Emergency Assistance

| Overview | |
|---|---|
| Name | Leak Repair & Plumbing Emergency Assistance |
| Abbr | 13 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2023 |
| Last Year | 2045 |
| Measure Length | 23 |

| Measure Life | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

| Fixture Cost per Device | | | |
|---|---|---|---|
| | Utility | Customer | Fix/Acct |
| SF | $200.00 | $100.00 | 1 |
| MF | $200.00 | $100.00 | 2 |

| Administration Costs | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Program provides leak identification and possible rebates and/or pre-negotiated pricing with approved plumbers to assist customers in locating and repair leaks.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☐ | ☐ | | | | | | | |
| Showers | ☐ | ☐ | | | | | | | |
| Dishwashers | ☐ | ☐ | | | | | | | |
| Clothes Washers | ☐ | ☐ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☑ | ☑ | | | | | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | | | | | | | |
| Irrigation | ☐ | ☐ | | | | | | | |
| Pools | ☐ | ☐ | | | | | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☑ | ☑ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☐ | ☐ | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Utility costs might represent staff time for account leak identification, multiple notifications and a possible site survey (incl drive time) and reporting.

> **Customer Costs** - Cost to fix the leak.

> **End Use Water Savings** - Savings might be over 200% if based on a targeted account's using 2-4 times the amount of the previous year's water use. Assume 50% of internal leaks are fixed. Assume 1 leak per SF, 2 leaks per MF (typically duplex owners), as these programs typically are for owner-occupied residences.

> **Targets** - Assume 0.1% of accounts per year need leak repair and plumbing assistance.

| Results | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| agency-specific | |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Internal Leakage | 50.0% | agency-specific |
| MF Internal Leakage | 50.0% | agency-specific |
| SF External Leakage | 50.0% | agency-specific |
| MF External Leakage | 50.0% | agency-specific |

| Targets | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.100% |
| Only Effects New Accts | ☐ |

# Measure 14: Multifamily HET Direct Install

**Overview**

| | |
|---|---|
| Name | Multifamily HET Direct Install |
| Abbr | 14 |
| Category | Default |
| Measure Type | Standard Measure |

**Time Period**

| | |
|---|---|
| First Year | 2023 |
| Last Year | 2027 |
| Measure Length | 5 |

**Measure Life**

| | |
|---|---|
| Permanent | ☑ |

**Fixture Cost per Device**

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| MF | $350.00 | $25.00 | 25 |

**Administration Costs**

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 20% |

**Description**

Program provides property owners and managers of multi-family housing direct installation of high-efficiency toilets.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | ☑ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | | ☐ | | | | | | | |
| Showers | | ☐ | | | | | | | |
| Dishwashers | | ☐ | | | | | | | |
| Clothes Washers | | ☐ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | | ☐ | | | | | | | |
| Baths | | ☐ | | | | | | | |
| Other | | ☐ | | | | | | | |
| Irrigation | | ☐ | | | | | | | |
| Pools | | ☐ | | | | | | | |
| Wash Down | | ☐ | | | | | | | |
| Car Washing | | ☐ | | | | | | | |
| External Leakage | | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | ☐ | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Cost** - Cost reflects cost of 1.1 gpf or lower toilet and installation fees based upon City of Santa Monica, CA program. https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Water/DirectInstall_Toilet.pdf
> **Administrative Cost** - reflects utility staff time to track and run program.
> **Customer Cost** - Minimal customer cost.
> **End Use Water Savings** - Savings estimates assume the difference between 0.8 gpf and 1.6 gpf or 50% savings on average.
> **Targets** - Assumes 0.1% of multifamily accounts targeted per year.

**Results**

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| | agency-specific |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| MF Toilets | 50.0% | agency-specific |

**Targets**

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.100% |
| Only Effects New Accts | ☐ |

## Measure 15: Multifamily Submetering for Existing Accounts

### Overview

| | |
|---|---|
| Name | Multifamily Submetering for Existing Accounts |
| Abbr | 15 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2020 |
| Last Year | 2045 |
| Measure Length | 26 |

### Measure Life

| | |
|---|---|
| Permanent | ☑ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| MF | $150.00 | $450.00 | 20 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Provide submeters for individual units in condos developments and mobile home parks. This program is intended to be modeled after the existing Valley Water program.

### Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | ☑ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | | ☑ | | | | | | | |
| Showers | | ☑ | | | | | | | |
| Dishwashers | | ☑ | | | | | | | |
| Clothes Washers | | ☑ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | | ☑ | | | | | | | |
| Baths | | ☑ | | | | | | | |
| Other | | ☐ | | | | | | | |
| Irrigation | | ☐ | | | | | | | |
| Pools | | ☐ | | | | | | | |
| Wash Down | | ☐ | | | | | | | |
| Car Washing | | ☐ | | | | | | | |
| External Leakage | | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

### Comments

> **Utility Cost** - Utility costs for this measure are primarily staff time and $150 rebate modeled off the Valley Water submeter rebate program.

> **Customer Cost** - Customer cost is for the meter (~$600/acct) minus the rebate amount.

> **End Use Water Savings** - Savings based on estimated metering retrofit projects and education measure estimated savings. Leak savings are higher since submetering should make leaks easier to identify and locate. Assume savings on indoor only. No outdoor because it would have a separate meter likely. Assumed average 15-30% water savings per meter based off of Valley Water 2007 Pilot Study on mobile homes which saved an average of 23% per meter.

> **Targets** - assumes only 0.1% of accounts targeted each year

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| agency-specific | |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| MF Toilets | 20.0% | agency-specific |
| MF Lavatory Faucets | 20.0% | agency-specific |
| MF Showers | 20.0% | agency-specific |
| MF Dishwashers | 20.0% | agency-specific |
| MF Clothes Washers | 20.0% | agency-specific |
| MF Internal Leakage | 20.0% | agency-specific |
| MF Baths | 20.0% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 20.0% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.100% |
| Only Effects New Accts | ☐ |

# Measure 16: New Development Submetering

## Overview

| | |
|---|---|
| Name | New Development Submetering |
| Abbr | 16 |
| Category | Default |
| Measure Type | Standard Measure |

## Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

## Measure Life

| | |
|---|---|
| Permanent | ☑ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| MF | $20.00 | $600.00 | 20 |

## Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

## Description

This is an existing code that, as of January 1, 2018, requires the metering of individual units in new multifamily, condos, townhouses, mobile-home parks and business centers (less than four stories and with water heater in the units).

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | | ☑ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | | ☑ | | | | | | | |
| Showers | | ☑ | | | | | | | |
| Dishwashers | | ☑ | | | | | | | |
| Clothes Washers | | ☑ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | | ☑ | | | | | | | |
| Baths | | ☐ | | | | | | | |
| Other | | ☐ | | | | | | | |
| Irrigation | | ☐ | | | | | | | |
| Pools | | ☐ | | | | | | | |
| Wash Down | | ☐ | | | | | | | |
| Car Washing | | ☐ | | | | | | | |
| External Leakage | | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

## Comments

> This is a CA regulation as of 1/1/2018

> **Utility Costs** - For this measure cost is staff time for enforcement for plan checks and random inspections. Assume no fixture costs to the utility. Assume average of 20 submeters per MF account (i.e. 20 apartment units per utility meter). The time per submeter verification could be averaged across smaller sites if the service area has smaller or fewer apartments.

> **Customer Costs** - Cost of submeter which would be purchased by the customer.

> **Administration Costs** - Cost for staff to administer and track participants.

> **End Use Water Savings** - Valley Water has an existing submetering program since 2001 that was analyzed. Measure saved 22% when analyzed on mobile home parks in 2007. This program on new development starting in 2020 and into the future is modified to new accounts which use less water due to newer building standards, therefore there are less savings by adding individual submeters. To be conservative, assume savings on indoor only. No outdoor savings are assumed because typically large sites have separate irrigation meters.

> **Targets** - Per code this applies to mixed-use accounts, assume that 50% of new MF accounts are eligible.

## Results

Units: MG

| | |
|---|---|
| **Average Water Savings (mgd)** | |
| agency-specific | |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| MF Toilets | 5.0% | agency-specific |
| MF Lavatory Faucets | 5.0% | agency-specific |
| MF Showers | 5.0% | agency-specific |
| MF Dishwashers | 5.0% | agency-specific |
| MF Clothes Washers | 5.0% | agency-specific |
| MF Internal Leakage | 5.0% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 5.0% | agency-specific |

## Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 50.000% |
| Only Effects New Accts | ☑ |

# Measure 17: New Development Hot Water On Demand

| Overview | |
|---|---|
| Name | New Development Hot Water On Demand |
| Abbr | 17 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

| Measure Life | |
|---|---|
| Permanent | ☑ |

| Fixture Cost per Device | | | |
|---|---|---|---|
| | Utility | Customer | Fix/Acct |
| SF | $50.00 | $500.00 | 1 |
| MF | $50.00 | $500.00 | 3 |

| Administration Costs | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Existing code which requires new residential development to include efficient hot water on demand systems. Systems reduce hot water waiting times. Coordination with building department and tracking.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | ☑ | | | | | | | |
| Showers | ☑ | ☑ | | | | | | | |
| Dishwashers | ☐ | ☐ | | | | | | | |
| Clothes Washers | ☐ | ☐ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☐ | ☐ | | | | | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | | | | | | | |
| Irrigation | ☐ | ☐ | | | | | | | |
| Pools | ☐ | ☐ | | | | | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Utility costs represent time to monitor implementation.
> **Customer Costs** - Customer costs represent new development installation and device (less than existing retrofit costs).
> **End Use Water Savings** - Water savings based on Jim Lutz paper and information from Gary Klein and David Grieshop. See spreadsheet titled "Hot Water On Demand Water Savings Estimate_2013" which purports that a 1750 sq. ft house saves ~ 1600 gallons per year or 4.3 gpd. Assumes equivalent percentage savings on shower and faucet end uses. Conservatively assumes 3 units or homes per MF account. More information for example system by ACT on www.gothotwater.com.
> **Targets** - Assume applies to all new residential accounts

| Results | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| agency-specific | |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

| End Use Savings Per Replacement | | |
|---|---|---|
| Method: | Percent | |
| | % Savings/Acct | Avg GPD/Acct |
| SF Lavatory Faucets | 4.0% | agency-specific |
| MF Lavatory Faucets | 4.0% | agency-specific |
| SF Showers | 4.0% | agency-specific |
| MF Showers | 4.0% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 4.0% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 4.0% | agency-specific |

| Targets | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 90.000% |
| Only Effects New Accts | ☑ |

# Measure 18: Low Impact New & Remodeled Development

**Overview**

| | |
|---|---|
| Name | Low Impact New & Remodeled Development |
| Abbr | 18 |
| Category | Default |
| Measure Type | Standard Measure |

**Time Period**

| | |
|---|---|
| First Year | 2020 |
| Last Year | 2029 |
| Measure Length | 10 |

**Measure Life**

| | |
|---|---|
| Permanent | ☑ |

**Fixture Cost per Device**

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $400.00 | $2,000.00 | 1 |
| MF | $500.00 | $5,000.00 | 1 |

**Administration Costs**

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

**Description**

Utility would require developers of new/remodeled sites to follow low impact development concepts, standards, and Best Management Practices for stormwater and water conservation benefits. Encourage or require use of bio-retention facilities, rain water cisterns, gray water plumbing, etc.

**Customer Classes**

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**End Uses**

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☑ | ☑ | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | ☑ | | | | | | | |
| Showers | ☑ | ☑ | | | | | | | |
| Dishwashers | ☑ | ☐ | | | | | | | |
| Clothes Washers | ☑ | ☑ | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☑ | ☑ | | | | | | | |
| Baths | ☑ | ☑ | | | | | | | |
| Other | ☑ | ☑ | | | | | | | |
| Irrigation | ☐ | ☐ | | | | | | | |
| Pools | ☐ | ☐ | | | | | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | ☑ | | | | | | | |
| Cooling | | | | | | | | | |

**Comments**

> **Utility Costs** - Assume utility costs for plan checks and inspection time. Assume administrative costs for scheduling, follow-up, and reporting.

> **Customer Costs** - Customer costs represent fees and device upgrade costs.

> **End Use Water Savings** - Depending on ordinance design (site budget or matching average of last 5 years of site use), etc., assume reduction to all end uses. Up to 100% if a totally water neutral site, but assume 50% of all end uses saved as compared to average account use since these are water-efficient measures taken to above and beyond existing plumbing codes. 5% savings is conservative at this early stage of measure design. Savings include rainwater catchment and graywater, which historically do not yield high water savings.

> **Targets** - Targeting 50% of new development, as not all will qualify; some redevelopment will be subject. Affects new development for all customer categories except irrigation only accounts.

> Program is assume to end in 10 years to account for saturation of efficient fixtures due to new housing regulations in California.

**Results**

| | |
|---|---|
| Units | MG |
| Average Water Savings (mgd) | |
| agency-specific | |
| Lifetime Savings - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Lifetime Costs - Present Value ($) | |
| Utility | agency-specific |
| Community | agency-specific |
| Benefit to Cost Ratio | |
| Utility | agency-specific |
| Community | agency-specific |
| Cost of Savings per Unit Volume ($/mg) | |
| Utility | agency-specific |

**End Use Savings Per Replacement**

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Toilets | 5.0% | agency-specific |
| MF Toilets | 5.0% | agency-specific |
| SF Lavatory Faucets | 5.0% | agency-specific |
| MF Lavatory Faucets | 5.0% | agency-specific |
| SF Showers | 5.0% | agency-specific |
| MF Showers | 5.0% | agency-specific |
| SF Dishwashers | 5.0% | agency-specific |
| SF Clothes Washers | 5.0% | agency-specific |
| MF Clothes Washers | 5.0% | agency-specific |
| SF Internal Leakage | 5.0% | agency-specific |
| MF Internal Leakage | 5.0% | agency-specific |
| SF Baths | 5.0% | agency-specific |
| MF Baths | 5.0% | agency-specific |
| SF Other | 5.0% | agency-specific |
| MF Other | 5.0% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 5.0% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 5.0% | agency-specific |

**Targets**

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 50.000% |
| Only Effects New Accts | ☑ |

# Measure 19: Fixture Retrofit on Resale or Water Account Change

## Overview

| | |
|---|---|
| Name | Fixture Retrofit on Resale or Water Account Change |
| Abbr | 19 |
| Category | Default |
| Measure Type | Standard Measure |

| Time Period | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

| Measure Life | |
|---|---|
| Permanent | ☑ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $272.00 | $100.00 | 1 |
| MF | $408.00 | $100.00 | 3 |
| COM | $408.00 | $200.00 | 3 |
| IND | $408.00 | $200.00 | 3 |
| GOV | $408.00 | $200.00 | 3 |

## Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 10% |

## Description

This is an existing code requiring fixture retrofit upon resale or permitted alteration. Model assumes agencies will take active role in ensuring compliance, in participation by sending retrofit letters to new accounts holders who do not have a certificate on file. Random inspections would be conducted by utility staff to ensure process is valid and yields fixture replacements.

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☐ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Urinals | | | ☑ | | ☑ | ☑ | | | |
| Lavatory Faucets | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Showers | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

## Comments

> **Utility Costs** - Random inspections would be conducted by utility staff to ensure process is valid and yields fixture replacements. Assume staff avg fully burdened Rate with fringe and overhead is $136/hr, (ACWD Water Conservation Rate is $50/hr for base rate with fringe and overhead add 1.72%) Assuming 2 hours for single family and 3 for MF/CII on average per site, assuming inspections are random. Assume a typical unit has 2 toilets, 1 showerhead, 2 bath aerators, and 1 kitchen aerator replaced as needed. Non-residential units are assume to have 1 urinal too. Assume multiple units per non-SF account.

> **Customer Costs** - Represent any fixture cost to comply with California standards. CII cost accounts for urinals too.

> **Administration Costs** - 10% costs represent staff time to administer the measure.

> **End Use Water Savings** - Savings from this code measure assume 2.2 gpm faucets, 2.5 showerheads, 1.6 gpf toilets and 1.0 gpf urinals are replaced with 1.2 gpm bathroom aerators ($1/ea), 1.8 gpm kitchen aerators ($2.10/ea), 1.8 gpm showerheads ($4.60/ea), 1.28 gpf ($100/ea), and 0.125 gpf urinals ($150/ea).

> **Targets** - Target % percent of accounts is a conservative assumption for recent resale and water account change rates.

> This measure is modeled through the full analysis period in order to reach ALL pre-1992 housing stock.

## Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Toilets | 20.0% | agency-specific |
| MF Toilets | 20.0% | agency-specific |
| COM Toilets | 20.0% | agency-specific |
| IND Toilets | 20.0% | agency-specific |
| GOV Toilets | 20.0% | agency-specific |
| COM Urinals | 87.5% | agency-specific |
| IND Urinals | 87.5% | agency-specific |
| GOV Urinals | 87.5% | agency-specific |
| SF Lavatory Faucets | 45.5% | agency-specific |
| MF Lavatory Faucets | 45.5% | agency-specific |
| COM Lavatory Faucets | 45.5% | agency-specific |
| IND Lavatory Faucets | 45.5% | agency-specific |
| GOV Lavatory Faucets | 45.5% | agency-specific |
| SF Showers | 28.0% | agency-specific |
| MF Showers | 28.0% | agency-specific |
| COM Showers | 28.0% | agency-specific |
| IND Showers | 28.0% | agency-specific |
| GOV Showers | 28.0% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 18.2% | agency-specific |
| MF Non-Lavatory/Kitchen Faucets | 18.2% | agency-specific |
| COM Non-Lavatory/Kitchen Faucets | 18.2% | agency-specific |
| IND Non-Lavatory/Kitchen Faucets | 18.2% | agency-specific |
| GOV Non-Lavatory/Kitchen Faucets | 18.2% | agency-specific |

## Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.200% |
| Only Effects New Accts | ☐ |

# Measure 20: Public & School Education

## Overview

| | |
|---|---|
| Name | Public & School Education |
| Abbr | 20 |
| Category | Default |
| Measure Type | Standard Measure |

## Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2045 |
| Measure Length | 27 |

## Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 2 |
| Repeat | ☐ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $1.00 | $0.00 | 1 |

## Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 15% |

## Description

Program includes in-person and online outreach to residential customers, schools and all CII customers, landscapers and contractors. Outreach includes tools and resources specific to outdoor water use efficiency (e.g. WaterWise gardening tool and landscape watering calculator) as well as general information on water conservation through community events, websites, and social media.

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☑ | | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | | | | | | | | |
| Showers | ☑ | | | | | | | | |
| Dishwashers | ☑ | | | | | | | | |
| Clothes Washers | ☑ | | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☑ | | | | | | | | |
| Baths | ☑ | | | | | | | | |
| Other | ☑ | | | | | | | | |
| Irrigation | ☑ | | | | | | | | |
| Pools | ☑ | | | | | | | | |
| Wash Down | ☑ | | | | | | | | |
| Car Washing | ☑ | | | | | | | | |
| External Leakage | ☑ | | | | | | | | |
| Outdoor | | | | | | | | | |
| vatory/Kitchen Faucets | ☑ | | | | | | | | |
| Cooling | | | | | | | | | |

## Comments

> **Utility Cost** - Cost based off of BAWSCA FY17/18 Water Wise School Education summary. Program Cost ($90,669) + BAWSCA Admin Cost ($2,315) / Number of Agencies. 8 agencies are participating so total cost is $11,623 per agency. Assume a total of $1.00 per account per agency to cover cost of all BAWSCA public information activities including school education.

> **Customer Costs** - Assume no cost to customers.

> **End Use Water Savings** - Public information water savings is assumed at 0.5% on all end uses.

> **Targets** - Target 50% of accounts every year. Assumes a service area reaches half of their customers each year on average.

## Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Toilets | 0.1% | agency-specific |
| SF Lavatory Faucets | 0.5% | agency-specific |
| SF Showers | 0.5% | agency-specific |
| SF Dishwashers | 0.5% | agency-specific |
| SF Clothes Washers | 0.5% | agency-specific |
| SF Internal Leakage | 0.5% | agency-specific |
| SF Baths | 0.5% | agency-specific |
| SF Other | 0.5% | agency-specific |
| SF Irrigation | 0.5% | agency-specific |
| SF Pools | 0.5% | agency-specific |
| SF Wash Down | 0.5% | agency-specific |
| SF Car Washing | 0.5% | agency-specific |
| SF External Leakage | 0.5% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 0.5% | agency-specific |

## Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 50.000% |
| Only Effects New Accts | ☐ |

# Measure 21: Billing Report Educational Tool Non-AMI

## Overview

| | |
|---|---|
| Name | Billing Report Educational Tool Non-AMI |
| Abbr | 21 |
| Category | Default |
| Measure Type | Standard Measure |

## Time Period

| | |
|---|---|
| First Year | 2019 |
| Last Year | 2028 |
| Measure Length | 10 |

## Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 4 |
| Repeat | ☐ |

## Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $2.00 | $20.00 | 1 |

## Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 15% |

## Description

Program provides a customer portal and optional water use reports to show customers their individualized current and historical water use patterns and relative efficiency (e.g. BAWSCA WaterSmart Software Program). Modeled for agencies with monthly meter reads and billing, not AMI meter data.

## Customer Classes

| SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|
| ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☑ | | | | | | | | |
| Urinals | | | | | | | | | |
| Lavatory Faucets | ☑ | | | | | | | | |
| Showers | ☑ | | | | | | | | |
| Dishwashers | ☑ | | | | | | | | |
| Clothes Washers | ☑ | | | | | | | | |
| Process | | | | | | | | | |
| Kitchen Spray Rinse | | | | | | | | | |
| Internal Leakage | ☑ | | | | | | | | |
| Baths | ☐ | | | | | | | | |
| Other | ☐ | | | | | | | | |
| Irrigation | ☑ | | | | | | | | |
| Pools | ☐ | | | | | | | | |
| Wash Down | ☑ | | | | | | | | |
| Car Washing | ☑ | | | | | | | | |
| External Leakage | ☑ | | | | | | | | |
| Outdoor | | | | | | | | | |
| atory/Kitchen Faucets | ☑ | | | | | | | | |
| Cooling | | | | | | | | | |

## Comments

> **Utility Cost** - Includes a set up fee of $9,000 per Agency. $1.75/account for email notification per year. This cost was increased by $.25/account for set up fees.

> **Customer Cost** - Reflects cost of minor action. Would on average be very small for behavior change or fixing minor leaks based on access to their billing data. If customer takes action for a significant change assume the costs and savings are captured in other active conservation programs.

> **Administration Costs** - Cost for utility staff to track and monitor program ran by WaterSmart software.

> **End Use Water Savings assumptions** - Water savings of 4% for residential customers was developed through a 2017 WaterSmart program analysis for BAWSCA agencies is an average across the 85% of accounts targeted. The analysis was conducted during the end of a drought period and savings can overlap other active and passive conservation programs. For long term water savings, the savings has been reduced to 1% which is still very cost effective.

> **Targets** - The target % is based on the BAWSCA's agreement for WaterSmart software which includes and estimated customer target range of 50%-85%. According to 2020 efforts, the BAWSCA agencies select to target 85% of their customers.

> **Measure length** - Assume this measure lasts 10 years, as after that time most BAWSCA agencies will have switched to AMI meters and AMI water data portals to share information with their customers.

## Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

## End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Toilets | 1.0% | agency-specific |
| SF Lavatory Faucets | 1.0% | agency-specific |
| SF Showers | 1.0% | agency-specific |
| SF Dishwashers | 1.0% | agency-specific |
| SF Clothes Washers | 1.0% | agency-specific |
| SF Internal Leakage | 1.0% | agency-specific |
| SF Irrigation | 1.0% | agency-specific |
| SF Wash Down | 1.0% | agency-specific |
| SF Car Washing | 1.0% | agency-specific |
| SF External Leakage | 1.0% | agency-specific |
| SF Non-Lavatory/Kitchen Faucets | 1.0% | agency-specific |

## Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 85.000% |
| Only Effects New Accts | ☐ |

# Measure 22: AMI Customer Portal

### Overview

| | |
|---|---|
| Name | AMI Customer Portal |
| Abbr | 22 |
| Category | Default |
| Measure Type | Standard Measure |

### Time Period

| | |
|---|---|
| First Year | 2020 |
| Last Year | 2045 |
| Measure Length | 26 |

### Measure Life

| | |
|---|---|
| Permanent | ☐ |
| Years | 10 |
| Repeat | ☐ |

### Fixture Cost per Device

| | Utility | Customer | Fix/Acct |
|---|---|---|---|
| SF | $110.00 | $300.00 | 1 |
| MF | $110.00 | $300.00 | 1 |
| COM | $110.00 | $1,000.00 | 1 |
| IND | $110.00 | $1,000.00 | 1 |
| GOV | $110.00 | $1,000.00 | 1 |

### Administration Costs

| | |
|---|---|
| Method: | Percent |
| Markup Percentage | 25% |

### Description

Program provides customer portal for accounts with AMI meters capable of providing continuous consumption data to customers and utility. System provides identification and notification of suspected customer leaks as well as improved customer service and enhanced ability to identify water theft. This measure is only applicable to agencies that already have AMI.

### Customer Classes

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| | ☑ | ☑ | ☑ | ☐ | ☑ | ☑ | ☐ | ☐ | ☐ |

### End Uses

| | SF | MF | COM | INST | IND | GOV | IRR | FIRE | REC |
|---|---|---|---|---|---|---|---|---|---|
| Toilets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Urinals | | | ☐ | | ☐ | ☐ | | | |
| Lavatory Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Showers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Dishwashers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Clothes Washers | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Process | | | ☐ | | ☐ | | | | |
| Kitchen Spray Rinse | | | ☐ | | | ☐ | | | |
| Internal Leakage | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Baths | ☐ | ☐ | | | | | | | |
| Other | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Irrigation | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Pools | ☐ | ☐ | | | | ☐ | | | |
| Wash Down | ☐ | ☐ | | | | | | | |
| Car Washing | ☐ | ☐ | | | | | | | |
| External Leakage | ☑ | ☑ | ☑ | | ☑ | ☑ | | | |
| Outdoor | | | | | | | | | |
| vatory/Kitchen Faucets | ☐ | ☐ | ☐ | | ☐ | ☐ | | | |
| Cooling | | | ☐ | | ☐ | ☐ | | | |

### Comments

> **Utility Costs** - Basis for the starting value cost estimate is $200 per AMI customer where assumes (a) customer AMI portal cost: $1.75/account for 5 years, equals $9/account based on WaterSmart Portal cost for AMI meter. This cost was increased by $1/acct to account for set up fees.; (b) cost estimate includes an average of $100 leak repair for those customer-side leaks found and fixed; (c) $200 meter cost estimated by Valley Water staff assumed to be covered by other utility departments. Cost estimate does not include service leak repair (assume included in Water Loss measure).

> **Administration Costs** - This is for utility staff to track and monitor program ran by WaterSmart software.

> **Customer Costs** - Customer cost includes leak repair.

> **End Use Water Savings** - AMI savings based on significant reductions to leakage and irrigation end uses. Savings based on SFPUC case study per Julie Ortiz ppt at 2019 Peer-to-Peer "AMI: Everything you need to know to run a successful program." Savings are estimated to be 20%-50% on leakage (internal and external) with a potential additional 5% savings on all other end uses due to behavioral changes, 5% savings to irrigation.

> **Targets** - Assumes 0.5% per year take action to actually save water based on information provided by AMI customer portal, ether by behavior or leak repair.

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| | agency-specific |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### End Use Savings Per Replacement

Method: Percent

| | % Savings/Acct | Avg GPD/Acct |
|---|---|---|
| SF Internal Leakage | 20.0% | agency-specific |
| MF Internal Leakage | 20.0% | agency-specific |
| COM Internal Leakage | 20.0% | agency-specific |
| IND Internal Leakage | 20.0% | agency-specific |
| GOV Internal Leakage | 20.0% | agency-specific |
| SF Irrigation | 5.0% | agency-specific |
| MF Irrigation | 5.0% | agency-specific |
| COM Irrigation | 5.0% | agency-specific |
| IND Irrigation | 5.0% | agency-specific |
| GOV Irrigation | 5.0% | agency-specific |
| SF External Leakage | 20.0% | agency-specific |
| MF External Leakage | 20.0% | agency-specific |
| COM External Leakage | 20.0% | agency-specific |
| IND External Leakage | 20.0% | agency-specific |
| GOV External Leakage | 20.0% | agency-specific |

### Targets

| | |
|---|---|
| Target Method: | Percentage |
| % of Accts Targeted / yr | 0.500% |
| Only Effects New Accts | ☐ |

## Measure 23: Water Loss

### Overview

| | |
|---|---|
| Name | Water Loss |
| Abbr | 23 |
| Category | Default |
| Measure Type | Water Loss Measure |

### Time Period

| | |
|---|---|
| First Year | 2019 |

### Backlog Costs

| | |
|---|---|
| Total Backlog Work Costs | $1,000,000 |
| Years to Complete Backlog | 10 |

### Maintenance Costs

| | |
|---|---|
| Annual Maintenance Costs | $50,000 |

### Target

| | |
|---|---|
| Total GPCD Reduction | 0.3 |

### Description

> Water Loss Audit - Based on SB 555 requirements, maintain a thorough annual accounting using AWWA water system audit software submitted to California DWR. Includes accounting for production, sales by customer class and quantity of water produced but not sold (non-revenue water). This provides a picture of your system, including water usage patterns and trends needed to identify appropriate conservation activities. In conjunction with system accounting, include audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining non-revenue water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and non-revenue water every year by a pre-determined amount based on cost-effectiveness. Continuously analyze billing data for system errors and mis-registering meters. Identify and quickly notify customers of apparent leaks. Address meter testing and repair/replacement to insure more accurate meter reads and revenue collection. Actions could include meter calibration and accelerated meter replacement.

> Real Water Loss Reduction - Measure covers efforts to find and repair leaks in the distribution system to reduce real water loss. Actions could include installation of data loggers and proactive leak detection. Leak repairs would be handled by existing crews at no extra cost.

> Distribution System Pressure Regulation - Install additional pressure regulators in portions of distribution system to maintain pressure within limits so accounts do not receive excessive pressure.

### Results

| | |
|---|---|
| Units | MG |
| **Average Water Savings (mgd)** | |
| agency-specific | |
| **Lifetime Savings - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Lifetime Costs - Present Value ($)** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Benefit to Cost Ratio** | |
| Utility | agency-specific |
| Community | agency-specific |
| **Cost of Savings per Unit Volume ($/mg)** | |
| Utility | agency-specific |

### Comments

> **Backlog cost and years basis** - based on agency information.

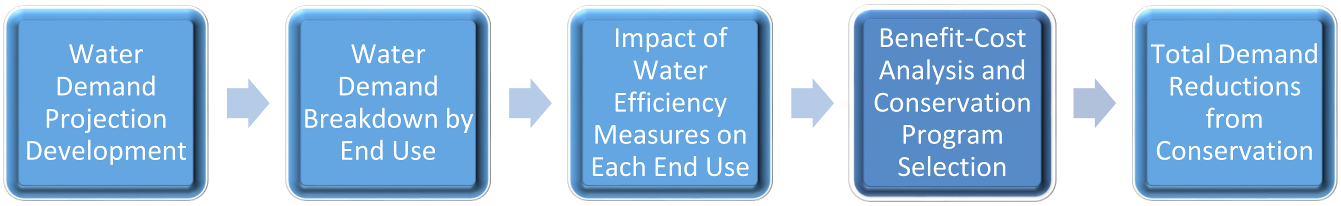
> **Annual maintenance cost basis** - based on agency information.

> **Savings target basis** - based on agency information.

> The savings is over the life of the measure which is tied to the agency current Non-Revenue Water percentage which can be found in the GREEN "Non-Revenue Water" portion of the DSS Model. All measures are advised to have "Annual Maintenance Costs" inputted to allow for budget estimates for complete program. Additional water savings of "NRW" real water losses may be available when technically feasible. Rule of thumb is minimum system water losses below approximately 6% (as defined as the difference between production and consumption or alternatively as a percent of System Input Volume using AWWA Water System Audit definitions). For NRW below 6% (which can be found in the GREEN "NRW" portion of the DSS Model), input "0%" for new real water savings and "$0" in the Backlog Cost section. For NRW above 6%, a GPCD savings input volume can be computed (an estimate of annual savings volume divided by total population). For example a 4.0 GPCD is equivalent to a 2% reduction for the system with a 150 GPCD water use.

> Additional Water Loss Control Program budget to achieve these water savings is inputted into the "Backlog Cost" section along with the duration of the years to accomplish the estimated reduction. In other words, $250,000 over 5 years would add $50,000 per year to assist with meeting NRW reduction goals.

# APPENDIX G – DSS MODEL OVERVIEW



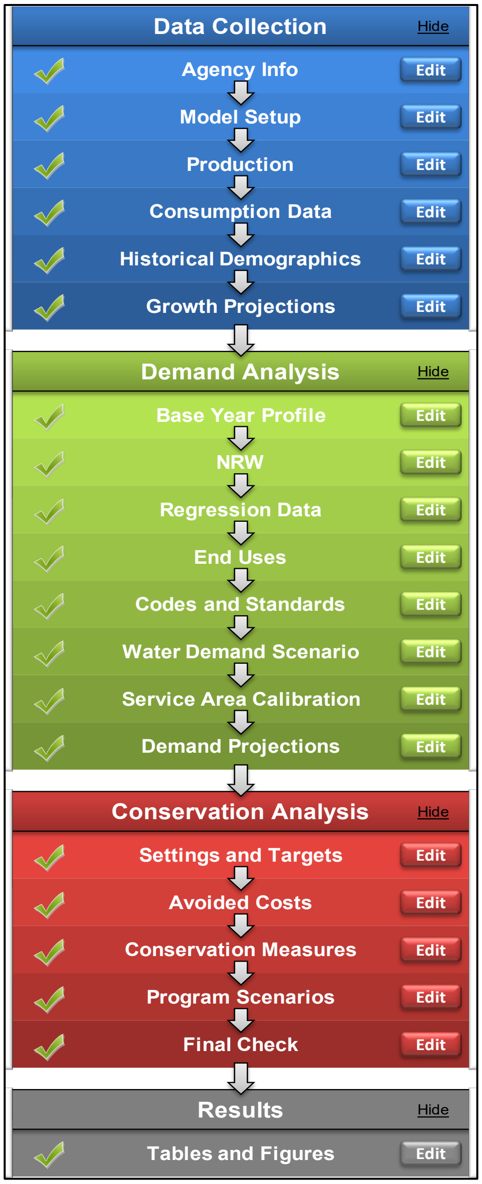




**Figure G-1 DSS Model Main Page**

**DSS Model Overview:** The Demand Side Management Least Cost Planning Decision Support System Model (DSS Model) as shown in Figure G-1 is used to prepare long-range, detailed demand projections. The purpose of the extra detail is to enable a more accurate assessment of the impact of water efficiency programs on demand and to provide a rigorous and defensible modeling approach necessary for projects subject to regulatory or environmental review.

Originally developed in 1999 and continuously updated, the DSS Model is an "end-use" model that breaks down total water production (water demand in the service area) to specific water end uses, such as plumbing fixtures and appliance uses. The model uses a bottom-up approach that allows for multiple criteria to be considered when estimating future demands, such as the effects of natural fixture replacement, plumbing codes, and conservation efforts. The DSS Model may also use a top-down approach with a utility-prepared water demand forecast.

**Demand Forecast Development and Model Calibration:** To forecast urban water demands using the DSS Model, customer demand data is obtained from the water agency being modeled. Demand data is reconciled with available demographic data to characterize water usage for each customer category in terms of number of users per account and per capita water use. Data is further analyzed to approximate the split of indoor and outdoor water usage in each customer category. The indoor/outdoor water usage is further divided into typical end uses for each customer category. Published data on average per capita indoor water use and average per capita end use is combined with the number of water users to calibrate the volume of water allocated to specific end uses in each customer category. In other words, the DSS Model checks that social norms from end studies on water use behavior (e.g., flushes per person per day) are not exceeded or drop below reasonable use limits.

**Passive Water Savings Calculations:** The DSS Model is used to forecast service area water fixture use. Specific end-use type, average water use, and lifetime are compiled for each fixture. Additionally, state and national plumbing codes and appliance standards are modeled by customer category. These fixtures and plumbing codes can be added to, edited, or deleted by the user. This process yields two demand forecasts, one with plumbing codes and one without plumbing codes.

**Active Conservation Measure Analysis Using Benefit-Cost Analysis:** As shown in Figure G-2, the DSS Model evaluates active conservation measures using benefit-cost analysis with the present value of the cost of water saved ($/Million Gallons or $/Acre-Feet). Benefits are based on savings in water and wastewater facility operations and maintenance (O&M) and any deferred capital expenditures.

**Figure G-2. Sample Benefit-Cost Analysis Summary**

Conservation Measures

Benefit Cost Analysis

Previo | Conser | AMI | RES | WC | IRR | CIIR | NO | MU | LDS | PRV | LEA | UHE | UHE | TOI | HO | RAI | RAI | SPR | Lan | SCH | GEN | DIP | B/C | Next

Review Data

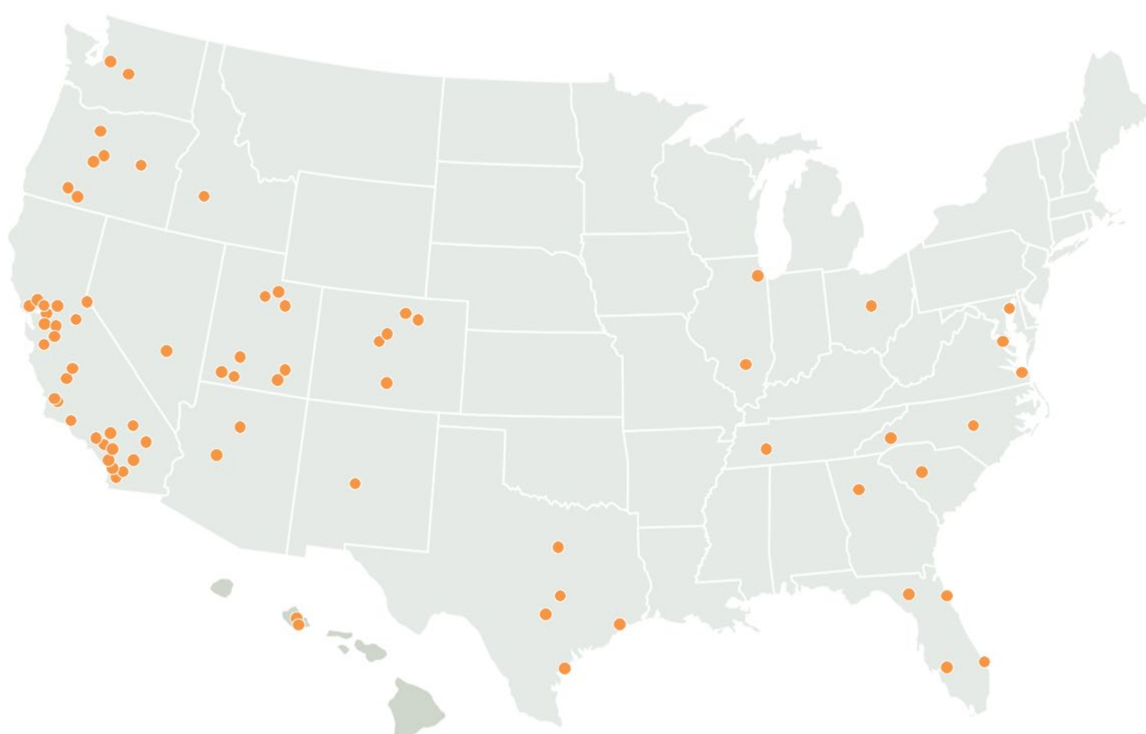
Benefit Cost Analysis

Util Cost Five Year Start Year 2020 | Water Savings Year 2030 | Units AF

| | Measure | Present Value of Water Utility Benefits | Present Value of Community Benefits | Present Value of Water Utility Costs | Present Value of Community Costs | Water Utility Benefit to Cost Ratio | Community Benefit to Cost Ratio | Five Years of Water Utility Costs 2020-2025 | Water Savings in 2030 (afy) | Cost of Savings per Unit Volume ($/af) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMI | Full AMI Implementation | $3,976,434 | $16,635,194 | $1,566,069 | $5,893,340 | 2.54 | 2.82 | $320,000 | 133.764878 | $324 |
| RESH | Residential Rebates for HECW | $139,312 | $365,447 | $95,879 | $200,665 | 1.45 | 1.82 | $50,325 | 5.124572 | $824 |
| WC | Water Checkup | $7,648,165 | $30,288,419 | $6,005,949 | $7,665,564 | 1.27 | 3.95 | $1,382,995 | 239.652915 | $877 |
| IRRE\ | Irrigation Evaluations | $1,589,488 | $1,589,488 | $1,918,184 | $4,332,779 | 0.83 | 0.37 | $443,824 | 98.051821 | $646 |
| CIIRe | CII Water Survey Level 2 and Customized Rebate | $910,720 | $3,313,109 | $915,904 | $2,581,185 | 0.99 | 1.28 | $193,725 | 18.753753 | $1,055 |
| NOZZ | Free Sprinkler Nozzle Program | $277,886 | $277,886 | $329,386 | $455,933 | 0.84 | 0.61 | $103,145 | 23.005687 | $680 |
| MULC | Mulch Program | $80,739 | $80,739 | $287,676 | $287,676 | 0.28 | 0.28 | $66,932 | 4.554625 | $2,000 |
| LDS | Water Conserving Landscape and Irrigation Codes | $1,055,819 | $1,055,819 | $350,316 | $7,979,608 | 3.01 | 0.13 | $78,568 | 46.098525 | $161 |
| PRV | Pressure Reduction Valve Rebate | $102,170 | $193,972 | $49,161 | $132,223 | 2.08 | 1.47 | $37,818 | 8.503521 | $425 |
| LEAK | Leak Detection Device Rebate | $174,130 | $847,416 | $306,843 | $1,288,743 | 0.57 | 0.66 | $80,053 | 6.065394 | $1,895 |
| UHET | Ultra-High Efficiency Toilet Rebate | $538,624 | $538,624 | $405,529 | $761,556 | 1.33 | 0.71 | $362,736 | 16.287780 | $921 |

**Model Use and Validation:** As shown in Figure G-3, the DSS Model has been used for over 20 years for practical applications of conservation planning in over 300 service areas representing 60 million people, including extensive efforts nationally and internationally in Australia, New Zealand, and Canada.

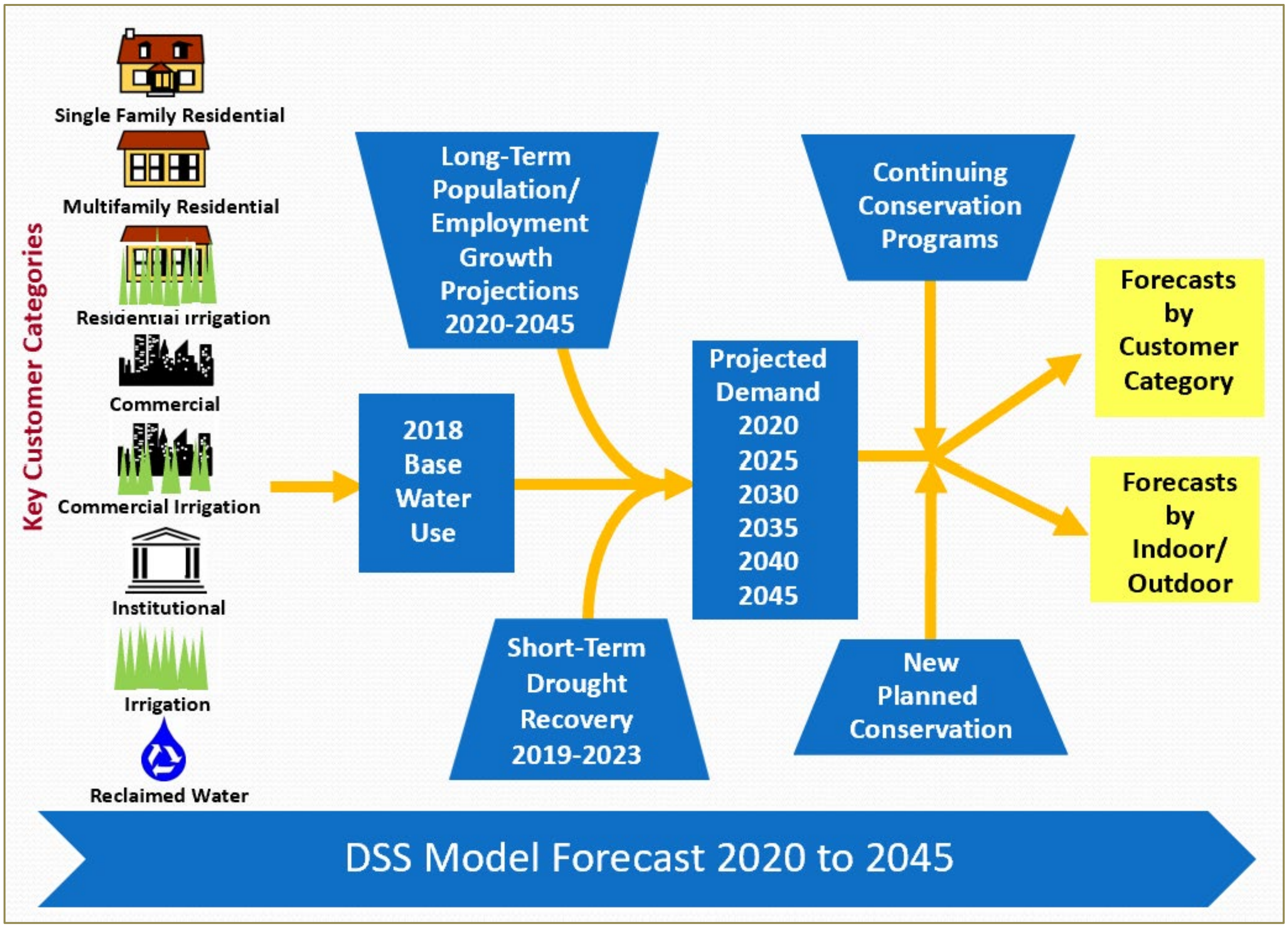
**Figure G-3. DSS Model Analysis Locations in the U.S.**



The California Urban Water Conservation Council, (now known as theCalifornia Water Efficiency Partnership) has peer reviewed and endorsed the model since 2006. It is offered to all CalWEP members for use to estimate water demand, plumbing code, and conservation program savings.

The DSS Model can use one of the following: 1) a statistical approach to forecast demands (e.g., an Econometric Model); 2) a forecasted increase in population and employment; 3) predicted future demands; or 4) a demand projection entered into the model from an outside source. The following figure presents the flow of information in the DSS Model Analysis.

**Figure G-4**. **DSS Model Analysis Flow**



**APPENDIX D**
City of Sunnyvale
2020 Urban Water Management Plan
Projected Demands Provided to Wholesale Agencies

| Anticipated Supplies (AF) or % of Demand | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Groundwater Pumping | 87 | 112 | 112 | 112 | 112 | 112 |
| Valley Water Treated Water | 8665 | 9215 | 9338 | 11226 | 11923 | 12478 |
| SFPUC Purchased Water | 11052 | 10263 | 10418 | 11990 | 12811 | 13555 |
| Local Surface Water | 0 | 0 | 0 | 0 | 0 | 0 |
| Recycled Water Deliveries | 383 | 896 | 1010 | 1120 | 1232 | 1602 |
| Other Water - Describe | 0 | 0 | 0 | 0 | 0 | 0 |
| Total - Calculated | 20187 | 20486 | 20878 | 24448 | 26078 | 27747 |

# APPENDIX E

City of Sunnyvale
2020 Urban Water Management Plan
SBX 7-7 Compliance

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| **SB X7-7 Table 0: Units of Measure Used in 2020 UWMP***<br>*(select one from the drop down list)* |
|---|
| Acre Feet |
| **The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.* |
| NOTES: |

| SB X7-7 Table 2: Method for 2020 Population Estimate | |
|---|---|
| **Method Used to Determine 2020 Population**<br>(may check more than one) | |
| ☑ | **1. Department of Finance** (DOF) or<br>**American Community Survey** (ACS) |
| ☐ | **2. Persons-per-Connection Method** |
| ☐ | **3. DWR Population Tool** |
| ☐ | **4. Other**<br>DWR recommends pre-review |
| NOTES: | |

| SB X7-7 Table 3: 2020 Service Area Population | |
|---|---|
| **2020 Compliance Year Population** | |
| **2020** | 156,503 |
| NOTES: | |

| SB X7-7 Table 4: 2020 Gross Water Use | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compliance Year 2020 | **2020 Volume Into Distribution System** *This column will remain blank until SB X7-7 Table 4-A is completed.* | **2020 Deductions** | | | | | **2020 Gross Water Use** |
| | | **Exported Water *** | **Change in Dist. System Storage*** (+/-) | **Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.* | **Water Delivered for Agricultural Use*** | **Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.* | |
| | 20,187 | | | - | | - | **20,187** |

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

## SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

| Name of Source | Well |
|---|---|
| **This water source is** *(check one)* **:** | |
| ☑ | The supplier's own water source |
| ☐ | A purchased or imported source |

| **Compliance Year 2020** | Volume Entering Distribution System [1] | Meter Error Adjustment [2] *Optional* *(+/-)* | Corrected Volume Entering Distribution System |
|---|---|---|---|
| | 87 | - | 87 |

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES

## SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s) Meter Error Adjustment

Complete one table for each source.

| Name of Source | Recycled Water |
|---|---|
| **This water source is** *(check one)* **:** | |
| ☑ | The supplier's own water source |
| ☐ | A purchased or imported source |

| **Compliance Year 2020** | Volume Entering Distribution System [1] | Meter Error Adjustment [2] *Optional* *(+/-)* | Corrected Volume Entering Distribution System |
|---|---|---|---|
| | 383 | | 383 |

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment -*** *See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES: Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2)

## SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

| Name of Source | SFPUC |
|---|---|
| **This water source is** *(check one)* **:** | |
| ☐ | The supplier's own water source |
| ☑ | A purchased or imported source |

| **Compliance Year 2020** | Volume Entering Distribution System [1] | Meter Error Adjustment [2] *Optional* *(+/-)* | Corrected Volume Entering Distribution System |
|---|---|---|---|
| | 11,052 | | 11,052 |

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

## SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

| Name of Source | Valley Water |
|---|---|
| **This water source is** *(check one)* **:** | |
| ☐ | The supplier's own water source |
| ☑ | A purchased or imported source |

| **Compliance Year 2020** | Volume Entering Distribution System [1] | Meter Error Adjustment [2] *Optional* *(+/-)* | Corrected Volume Entering Distribution System |
|---|---|---|---|
| | 8,665 | | 8,665 |

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.* [2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

| SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD) | | |
|---|---|---|
| **2020 Gross Water** ***Fm SB X7-7 Table 4*** | **2020 Population** ***Fm SB X7-7 Table 3*** | **2020 GPCD** |
| 20,187 | 156,503 | **115** |
| NOTES: | | |

## SB X7-7 Table 9: 2020 Compliance

| Actual 2020 GPCD[1] | Optional Adjustments to 2020 GPCD — Enter "0" if Adjustment Not Used: Extraordinary Events[1] | Weather Normalization[1] | Economic Adjustment[1] | TOTAL Adjustments[1] | Adjusted 2020 GPCD [1] *(Adjusted if applicable)* | 2020 Confirmed Target GPCD [1, 2] | **Did Supplier Achieve Targeted Reduction for 2020?** |
|---|---|---|---|---|---|---|---|
| 115 | - | - | - | - | 115 | 156 | **YES** |

[1] *All values are reported in GPCD*

[2] ***2020 Confirmed Target GPCD*** *is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.*

NOTES:

**APPENDIX F**

City of Sunnyvale

2020 Urban Water Management Plan

2016 Santa Clara Valley Water District Groundwater Management Plan

The 2016 Santa Clara Valley Water District Groundwater Management Plan can be downloaded at:

2016 Valley Water GMP

**APPENDIX G**

City of Sunnyvale

2020 Urban Water Management Plan

Water Conservation Plan

# CHAPTER 7

# ENVIRONMENTAL MANAGEMENT

*The Environmental Management chapter contains information on the following topics:*

- **Water Supply** — information on various sources of potable and nonpotable water, and policies to ensure adequate supplies, water conservation efforts and water quality.
- **Wastewater Collection and Treatment** — information on the wastewater collection system and the Water Pollution Control Plant and policies for future treatment issues.
- **Urban Runoff** — Information on sources of urban runoff and treatment methods, as well as policies to minimize quantity of urban runoff and improve quality.
- **Air Quality** — information on sources air pollution and policies for addressing this pollution through transportation and land use.
- **Solid Waste** — information on collection, recycling programs and disposal and policies to reduce future waste and increase recycling efforts.

## WATER SUPPLY

### GOAL EM-1
### ADEQUATE WATER SUPPLIES

ACQUIRE AND MANAGE WATER SUPPLIES SO THAT EXISTING AND FUTURE REASONABLE DEMANDS FOR WATER, AS PROJECTED IN THE 20-YEAR FORECAST, ARE RELIABLY MET. *(Previously Water Resources Goal A / Adopted in 2008)*

The City has several sources of potable water to meet expected water demand. These include local groundwater wells, imported supplies from the San Francisco Public Utilities Commission (SFPUC) and Santa Clara Valley Water District (SCVWD), plus interagency connections with other local water suppliers for emergencies. Temporary interruptions of water supply from one source can be readily offset by increasing supply from the other available sources.

In order to further manage supplies, the City uses recycled water for nonpotable use and water conservation efforts. Future challenges will include the possible expansion of the recycled water system and new capital projects to address the aging water infrastructure.

During the last 10 years, on average, SFPUC and SCVWD have together supplied approximately 90 percent of the total potable water used in the City. Of the remaining 10 percent, about six percent of the potable water demand has been supplied by seven City-owned and operated wells. To offset potable water demand for landscape irrigation and other non-potable uses, the remaining four percent has been supplied by recycled water produced by the Sunnyvale Water Pollution Control Plant (WPCP).

Figure 7-1:
Water System Facilities Map

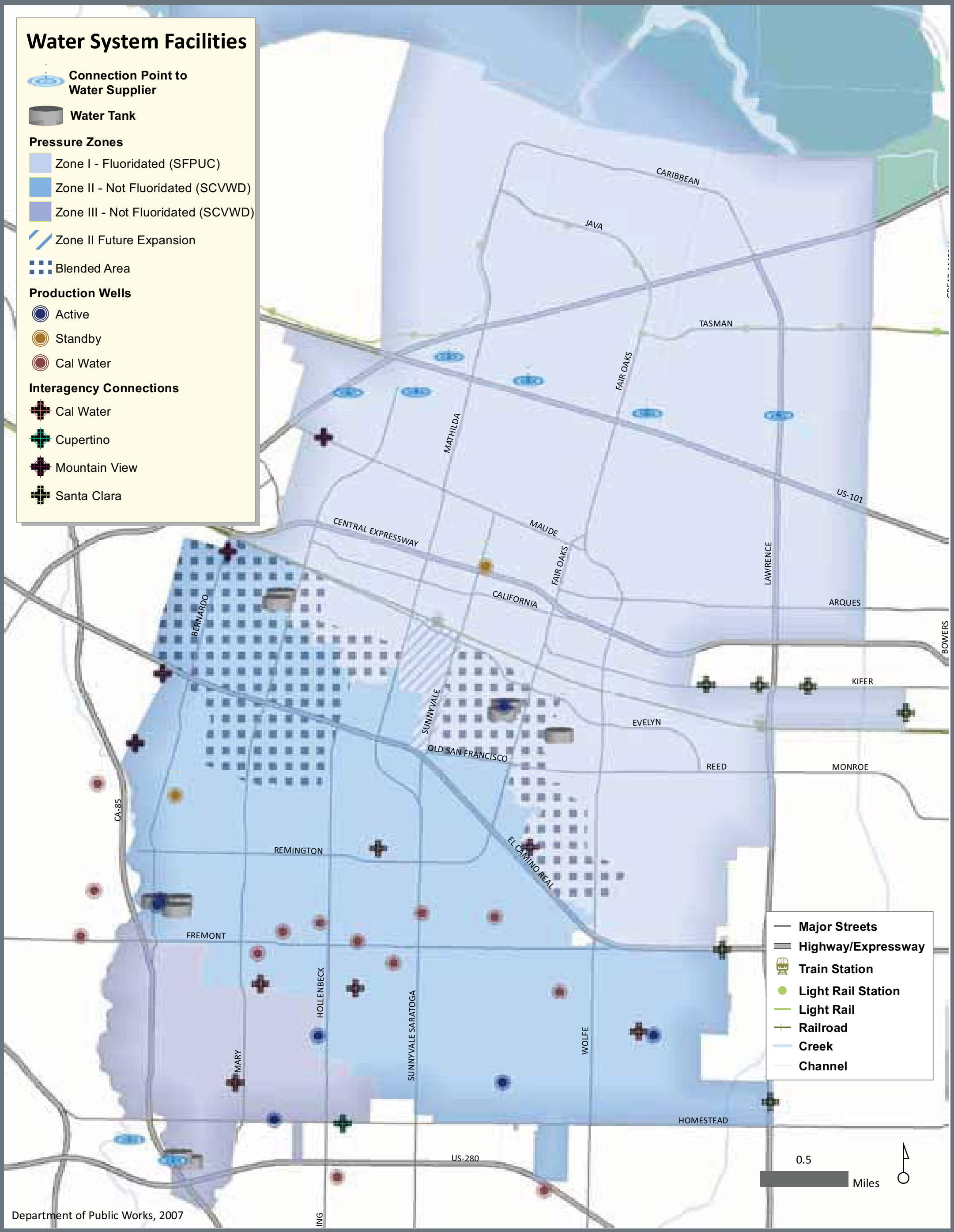
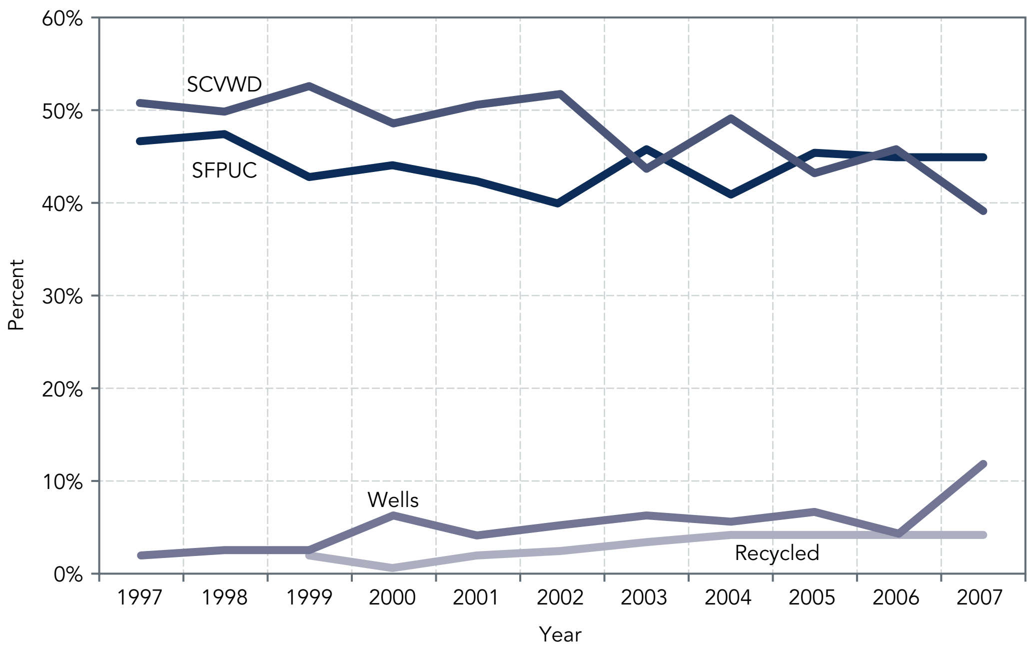


Figure 7-2: Historical Percentage of Annual Water Deliveries by Source




*Source: Department of Public Works, 2007*

## San Francisco Public Utilities Commission (SFPUC)

SFPUC uses the Hetch-Hetchy Reservoir outside of Yosemite Valley as its primary water source. Maximum and minimum usages of water are stipulated in the City's current individual contract with SFPUC. If the overall usage by all suburban retail customers exceeds the maximum available level, the maximum amount of water available to Sunnyvale would be reduced based on the master agreement that covers both the City and other SFPUC wholesale customers. The City would then rely on one of its other water supply sources (Santa Clara Valley Water, City Wells, Recycled Water) to meet the demand.

Under the current contract and barring catastrophic events, the SFPUC believes it can meet the demands of its retail and wholesale customers in years of average and above-average precipitation.

## Santa Clara Valley Water District (SCVWD)

The current contract calls for Sunnyvale to submit proposed water delivery schedules to SCVWD for three-year periods, indicating amounts of treated water desired by the City during each of the three years. SCVWD can make reductions to the water requested by Sunnyvale consistent with its ability to deliver water to all its customers.

To maintain water supply reliability and flexibility, SCVWD's water supply is from a variety of sources including local groundwater, imported water, local surface water, and recycled water. The District has a program to optimize the use of groundwater and surface water and prevent groundwater overdraft and land subsidence.

**Subsidence:** Subsidence is the motion of a surface (usually, the Earth's surface) as it shifts downward relative to a fixed point such as sea-level. The opposite of subsidence is uplift, which results in an increase in elevation. Subsidence can occur when too much groundwater is pumped out, causing the land above to sink.

### City Wells

Sunnyvale has seven operating wells that are kept in full production capacity and one well maintained in stand-by mode for emergencies. The seven operating wells are used as a supplemental source to the imported SFPUC and SCVWD water supplies. Well water is an important component of the City's water shortage contingency plan, as indicated in the Urban Water Management Plan (UWMP).

SCVWD, charged with alleviating land surface subsidence and monitoring of groundwater levels and withdrawal rates, has authority over the amount of water that can be extracted from local wells. The allowable withdrawal of groundwater by Sunnyvale depends on a number of factors, including withdrawals by other water agencies, quantity of water recharged and carryover storage from the previous year.

Cal Water provides service from its own wells and facilities to about a dozen service area pockets in Sunnyvale many of which are connected with the City's system.

### Recycled Water

The Water Pollution Control Plant (WPCP) produces approximately 13 million gallons per day (mgd) of high-quality advanced secondary-treated wastewater. A portion of this water is further treated to "disinfected tertiary" recycled water standards, and can be used for approved non-potable purposes, such as landscape irrigation, industrial cooling towers and construction. Recycled water is a reliable, drought-resistant, City-controlled supply that helps conserve and augment the potable water supply *(See Figure 7-3, Existing Recycled Water Facilities)*.

See **GOAL EM-7 (Effective Wastewater Treatment)** for discussion and policies relating to the Water Pollution Control Plant and its production of recycled water.

Recycled water is currently delivered to primarily irrigation customers. Most recycled water usage occurs between April and October, with usage demand peaking during the months of July and August.

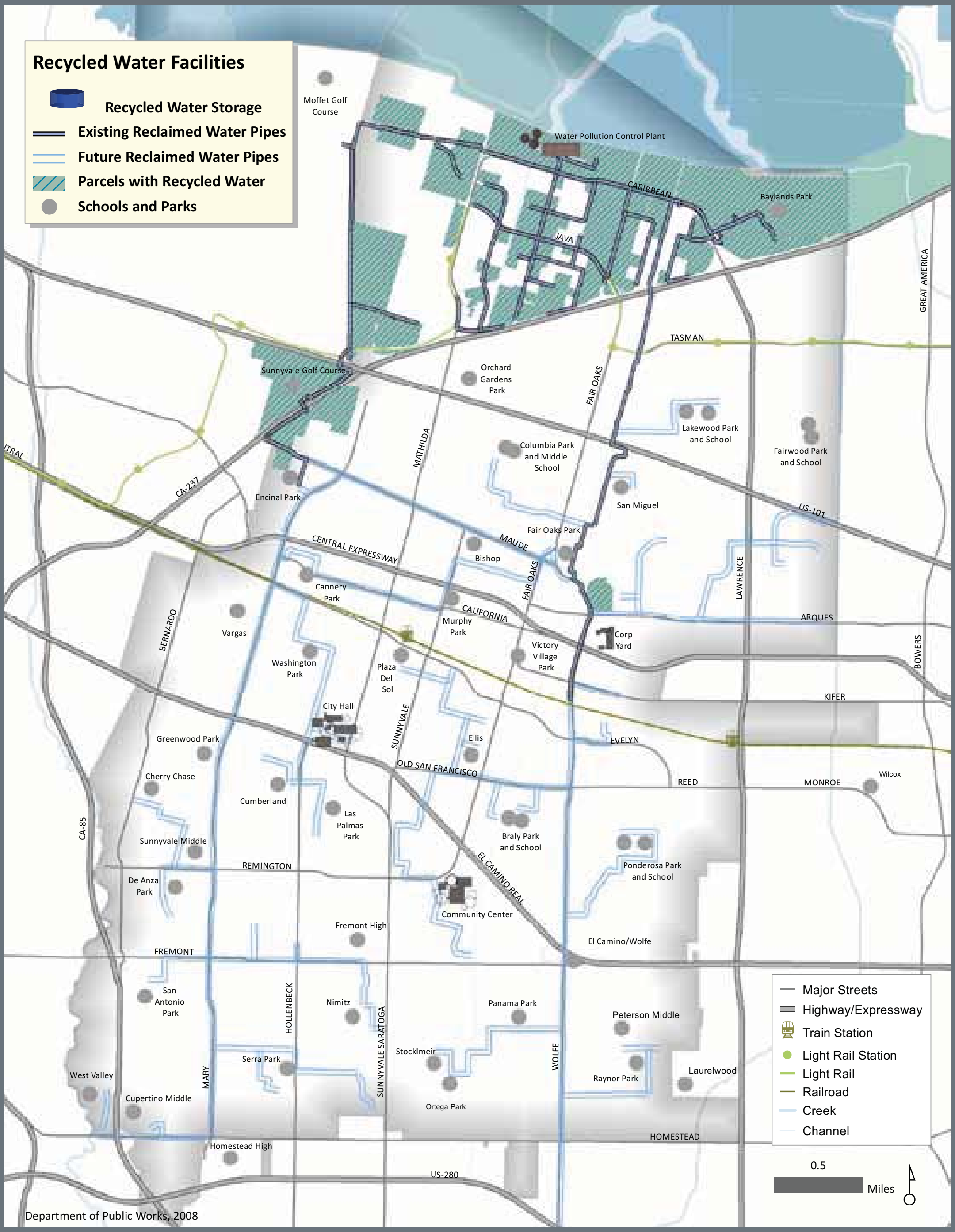
The WPCP can normally meet all recycled water demand, although seasonal changes in the WPCP's oxidation ponds occasionally make it difficult to meet the more stringent water quality requirements for disinfected tertiary recycled water versus discharge to the Bay. Modest increases in demand can be accommodated by the existing production and delivery systems.

### Future Water Supply Issues

According to the annually-updated 20-year water forecast, the City has adequate supply commitments and facilities to reliably meet the projected water needs of its residents and businesses for the foreseeable future.

Innovative demand-side influence programs can help balance future supply versus demand. Techniques such as water banking, water transfers, plumbing retrofits, landscaping with low-water using plants, rate structures encouraging conservation, and other more restrictive demand side management options could be put into effect if needed. These measures, together with increased use of recycled water for non-potable purposes, appear adequate to ensure sufficient water supply to meet the foreseeable needs of the future.

Figure 7-3:
Recycled Water System Map



The City will also continue to address the following:

- Replacement and repair of City water supply infrastructure and City wells.
- Coordination with SFPUC and SCVWD to ensure their infrastructure is repaired and maintained adequately.
- Planning for the possibility of an earthquake and its effect on the levees and the water system.
- Temporary loss of water supplies from SCVWD, which could be replaced in the short term by a combination of increased production from City wells and an increase in SFPUC supply.
- Increased storage and system capacity for recycled water supply to facilitate significant increases in recycled water production. The WPCP's Strategic Implementation Plan (SIP) will include an evaluation of recycled water production in the context of the overall future needs of the plant.

See **GOAL SN-1 (Acceptable Levels of Risk for Natural and Human-Caused Hazards)** for discussion and policies relating to earthquake hazards and mitigation.

**POLICY EM-1.1** MANAGE WATER SUPPLY TO MEET DEMANDS FOR POTABLE WATER THROUGH THE EFFECTIVE USE OF WATER SUPPLY AGREEMENTS. *(Previously Water Resources Policy A.1.)*

- EM-1.1a Investigate possibilities to increase well water sources within the City. (Previously Water Resources Action Statement A.1c)

**POLICY EM-1.2** MAXIMIZE RECYCLED WATER USE FOR ALL APPROVED PURPOSES BOTH WITHIN AND IN AREAS ADJACENT TO THE CITY, WHERE FEASIBLE. *(Previously Water Resources Policy A.2.)*

See **GOAL EM-7 (Effective Wastewater Treatment)** for policies relating to the production of recycled water.

- EM-1.2a Update the 2000 Recycled Water Master Plan to provide a current roadmap for potential expansions to the City's recycled water system. *(Previously Water Resources Action Statement A.2f)*
- EM-1.2b Pursue opportunities for external funding for existing and future recycled water projects by supporting the efforts of regional water quality and recycling organizations such as BARWRP as they seek and apply for funding for expansion and continued support of recycled water and water quality in the region. *(Previously Water Resources Action Statement A.2h)*

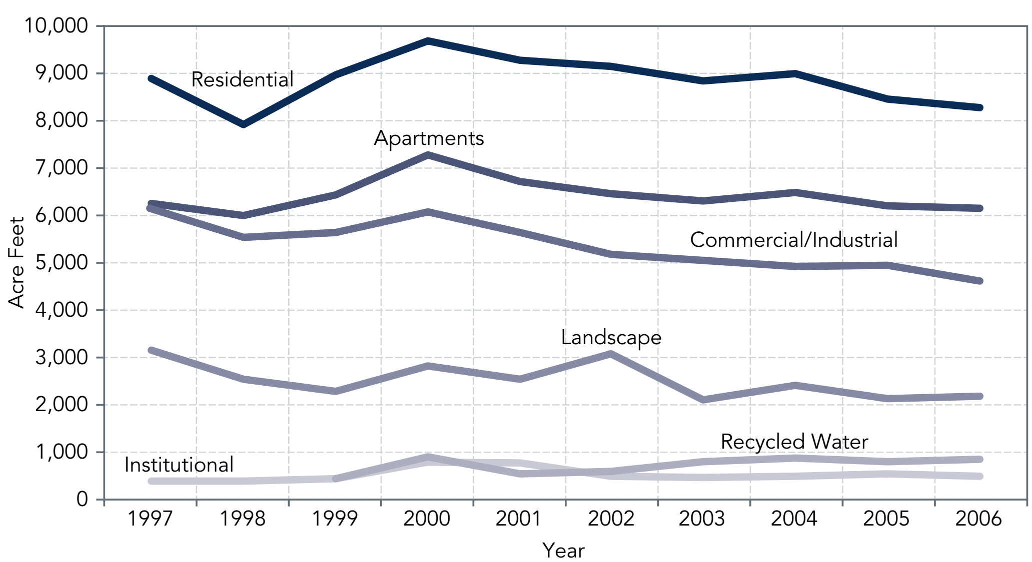
**POLICY EM-1.3** PROVIDE ENOUGH REDUNDANCY IN THE WATER SUPPLY SYSTEM SO THAT MINIMUM POTABLE WATER DEMAND AND FIRE SUPPRESSION REQUIREMENTS CAN BE MET UNDER BOTH NORMAL AND EMERGENCY CIRCUMSTANCES. *(Previously Water Resources Policy A.3)*

## GOAL EM-2
### WATER CONSERVATION

PROMOTE MORE EFFICIENT USE OF THE CITY'S WATER RESOURCES TO REDUCE THE DEMANDS PLACED ON THE CITY'S WATER SUPPLIES. *(Previously Water Resources Goal B / Adopted in 2008)*

The City currently provides water in six broad categories: multi-family residential, single-family residential, institutional, landscape, commercial/industrial (incorporating all non-residential accounts not classified as landscape) and users of recycled water (Figure 7-3).

Figure 7-4: Annual Water Consumption by Use Category



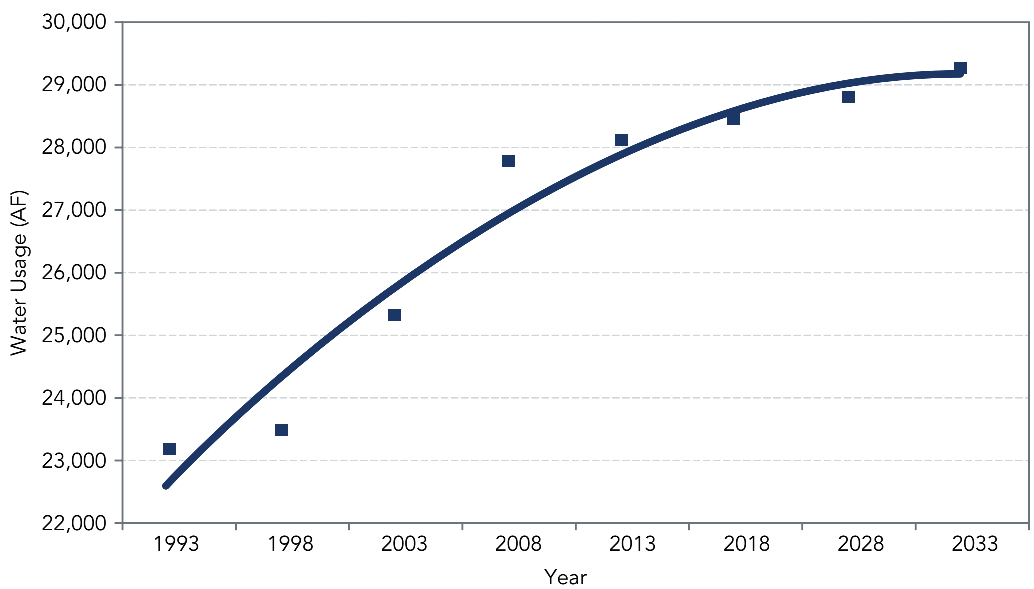

*Source: Department of Public Works, 2007*

From 1987 to 1992, California experienced a prolonged drought, with severe water shortages and water rationing in Santa Clara County. Through the cooperative efforts of water retailers and their customers, Santa Clara County endured the drought with minimal economic and aesthetic impacts. Between 1984 and 1993, the City experienced a decrease in water consumption, primarily due to water conservation in the residential, commercial, and industrial sectors. Some of the demand management practices that were used to maximize the availability of water supply during the drought, such as inverted rates and water Best Management Practices, continue to this day. On-going water conservation efforts were able to reduce potable water consumption from 161 gallons per capita per day in 2000 to 139 gallons per capita per day in 2006, a 13.6 percent reduction for residential customers. Demand in the commercial/industrial sector remained flat with a slight decline in 2006.

The Sunnyvale 2005 Urban Water Management Plan is available at *GeneralPlan.inSunnyvale.com*

Water use varies depending on weather, seasonal climatic patterns, business conditions and the economy. Long-term trends in water requirements are valuable in projecting future supply needs. Figure 7-5 illustrates past, current and projected total water usage through 2030. Additional details on the current and planned water supplies to meet these demands are provided in the Sunnyvale Urban Water Management Plan.

Figure 7-5: Historic and Projected Water Demand




*Source: Department of Public Works, 2007*

The City uses a variety of demand management measures to assist in meeting this projected demand. Many of the Demand Management Measures (DMMs) offered by Sunnyvale are actually programs run by or coordinated through Santa Clara Valley Water District (SCVWD). The programs have been either funded through the wholesale water rates paid by Sunnyvale, or directly reimbursed by the City. The DMMs implemented by the City, water usage restrictions during normal and drought years and other details can be found in the Urban Water Management Plan.

See **Goal EM-1 (Adequate Water Supplies)** and Goal EM-7 (Effective Wastewater Treatment) for more information about the City's recycled water system.

Conservation measures include the following:

- Inclining block tier rate structure that penalizes excessive water consumption
- Conservation efforts consistent with industry Best Management Practices (BMPs)
- Recycled water program to replace the use of potable water for non-potable uses where possible.

The City also has a drought response based on the Sunnyvale Water Conservation Plan. This plan, adopted in 1977 and updated in 1989, includes mandatory and voluntary water use restrictions associated with different levels of reduction, rate block adjustments for each level, and approaches for enforcement.

The City will continue to plan and coordinate its water needs with regional and local wholesalers and retailers for best management of available water supplies. By 2030 the City expects to save almost 800 acre feet of water per year through conservation measures.

Additional information on water conservation measures and programs can be found in on the SCVWD website. The SFPUC also has corresponding plans for the City and County of San Francisco.

**POLICY EM-2.1** LOWER OVERALL WATER DEMAND THROUGH THE EFFECTIVE USE OF WATER CONSERVATION PROGRAMS IN THE RESIDENTIAL, COMMERCIAL, INDUSTRIAL AND LANDSCAPING ARENAS. *(Previously Water Resources Policy B.1)*

One acre foot of water = 325,851 gallons. 800 acre feet of water = approximately 260 million gallons of water.

## GOAL EM-3
### RELIABLE AND SAFE WATER DISTRIBUTION

PROACTIVELY MAINTAIN THE WATER DISTRIBUTION SYSTEM INFRASTRUCTURE TO ENSURE THE RELIABLE AND SAFE DELIVERY OF WATER UNDER NORMAL AND EMERGENCY CONDITIONS TO BOTH CURRENT AND FUTURE CUSTOMERS. *(Previously Water Resources Goal C / Adopted in 2008)*

The City owns, operates, and maintains a water supply and distribution system that includes connections with City suppliers and neighboring water utilities. Although not obvious, ground elevations in Sunnyvale vary from sea level at the north end of the City to 300 feet above sea level at the southwest corner. Because of this elevation difference, the water system is broken up into a series of three pressure zones (Figure 7-1, Water System Facilities).

Within the City's service area, some pocketed areas adjacent to Fremont Avenue and Sunnyvale-Saratoga Road receive water from Cal Water. These areas were formerly part of the county, but have been annexed by Sunnyvale. Cal Water produces water from its own wells, which meets all federal and state quality requirements. The City has provided six emergency connections to Cal Water service areas to improve fire flows and reliability, and all fire hydrants have been replaced to conform to City standards.

Perhaps the largest water system issue for the City is the need for significant and on-going investment in improvements to the water system infrastructure. A significant portion of the City's investment in water system infrastructure is represented by the transmission and distribution pipelines. Approximately 80 percent of the 330 miles of transmission and distribution pipelines and related facilities were constructed in the 1960s and are potentially approaching the end of their estimated 50 year service life. While actual service life varies depending on site specific factors, utility services provided today are "using up" infrastructure resources which must be replaced to serve future customers.

**POLICY EM-3.1** MAINTAIN A PREVENTIVE MAINTENANCE PROGRAM THAT PROVIDES FOR RELIABILITY OF POTABLE AND RECYCLED WATER SYSTEMS. *(Previously Water Resources Policy C.1)*

**POLICY EM-3.2** MAINTAIN A PROACTIVE LONG RANGE INFRASTRUCTURE PLAN THAT IDENTIFIES SCHEDULES AND FUNDS AND IMPLEMENTS NEEDED SYSTEM UPGRADES AND REPLACEMENTS BEFORE FACILITIES EXCEED THEIR EFFECTIVE USEFUL LIVES. *(Previously Water Resources Policy C.2)*

**POLICY EM-3.3** MAINTAIN AN UP-TO-DATE EMERGENCY WATER OPERATIONS PLAN. *(Previously Water Resources Policy C.3)*

## GOAL EM-4
### ADEQUATE WATER QUALITY

ENSURE THAT ALL WATER MEETS STATE AND FEDERAL STANDARDS FOR AESTHETICS, QUALITY AND HEALTH. *(Previously Water Resources Goal D/ Adopted In 2008)*

The principal law governing drinking water safety in the United Stated is the Safe Drinking Water Act (SDWA). Enacted in 1974, the SDWA requires the Environmental Protection Agency (EPA) to establish comprehensive national drinking water regulations and to set enforceable standards for health-related drinking water contaminants.

Water delivered in the City originates from different sources and is therefore subject to different water quality conditions. Waters from different sources blend within the distribution system, depending on the daily demand, seasonal quality and relative quantity fluctuations, and temporary interruptions due to maintenance activities, resulting in water quality variances. In all cases the City's water quality meets or exceeds all federal and state requirements.

The City conducts an extensive water quality monitoring program in compliance with all applicable state and federal requirements. Over 2,000 samples are collected each year from the distribution system, imported sources, wells in operation, storage tanks, and/or household taps, depending on the constituent of interest. Samples are analyzed by either the City's state-certified laboratory or an outside state-certified laboratory. The City has been in consistent compliance with the requirements of its water quality monitoring program since it was instituted in 1988.

The California Department of Public Health (CDPH) requires the City to distribute to all customers an Annual Water Quality Report. This report provides information on contaminants that may be present in the three source waters and in the distribution system. Testing has consistently shown that the water provided by the City meets established water quality standards.

The SFPUC completed construction of its new, system-wide fluoridation facility in 2005. Beginning in November 2005, all water delivered from the SFPUC was fluoridated. SCVWD does not currently fluoridate its water, though it is currently studying the feasibility of doing so. The City does not fluoridate its well water. As a result, some areas of Sunnyvale receive fluoridated water (the northern part of the City approximately north of El Camino Real), other areas receive non-fluoridated water (southern portion), and some areas receive a mixture. City staff manages the water system to provide consistent concentrations of fluoride by keeping the SFPUC and SCVWD service areas separated as much a possible.

The SDWA regulations have continued to evolve as more monitoring data have been collected by water systems, monitoring and detection capabilities have improved, and new constituents of concern have been identified. City staff continues to closely track new and proposed regulations and update monitoring and analyses accordingly.

**POLICY EM-4.1** MAINTAIN AND UPDATE A COMPREHENSIVE WATER QUALITY-MONITORING PROGRAM THAT MEETS OR EXCEEDS ALL STATE AND FEDERAL REQUIREMENTS, WHILE ALSO MEETING SPECIFIC CITY AND RESIDENTS' NEEDS. *(Previously Water Resources Policy D.1)*

**POLICY EM-4.2** MAINTAIN AN AGGRESSIVE INSPECTION AND PREVENTIVE MAINTENANCE PROGRAM THAT ENSURES THAT BACKFLOW FROM POTENTIALLY CONTAMINATED WATER SERVICES IS PREVENTED. *(Previously Water Resources Policy D.2)*

- EM-4.2a Investigate the potential for the City owning all backflow devices, thereby ensuring their proper function and maintenance. *(Previously Water Resources Action Statement D.2d)*

**POLICY EM-4.3** PROVIDE APPROPRIATE SECURITY AND PROTECTION OF WATER FACILITIES. *(Previously Water Resources Policy D.3)*

**POLICY EM-4.4** MAINTAIN AND UPDATE AN ACTION PLAN THAT RESPONDS TO AND PROTECTS WATER SUPPLIES FROM CONTAMINATION. *(Previously Water Resources Policy D.4)*

## WASTEWATER COLLECTION AND TREATMENT

### GOAL EM-5
### MINIMAL POLLUTION AND QUANTITY OF WASTEWATER

ENSURE THAT THE QUANTITY AND COMPOSITION OF WASTEWATER GENERATED IN THE CITY DOES NOT EXCEED THE CAPABILITIES OF THE WASTEWATER COLLECTION SYSTEM OR AND THE WATER POLLUTION CONTROL PLANT. *(Previously Wastewater Goal 3.3.A / Adopted in 2001)*

### GOAL EM-6
### EFFECTIVE WASTEWATER COLLECTION SYSTEM

CONTINUE TO OPERATE AND MAINTAIN THE WASTEWATER COLLECTION SYSTEM SO THAT ALL SEWAGE AND INDUSTRIAL WASTES GENERATED WITHIN THE CITY ARE COLLECTED AND CONVEYED UNDER SAFE AND SANITARY CONDITIONS TO THE WATER POLLUTION CONTROL PLANT. *(Previously Wastewater Goal 3.3B / Adopted in 2001)*

### GOAL EM-7
### EFFECTIVE WASTEWATER TREATMENT

CONTINUE TO OPERATE AND MAINTAIN THE WATER POLLUTION CONTROL PLANT, USING COST EFFECTIVE METHODS, SO THAT ALL SEWAGE AND INDUSTRIAL WASTES GENERATED WITHIN THE CITY RECEIVE SUFFICIENT TREATMENT TO MEET THE EFFLUENT DISCHARGE AND RECEIVING WATER STANDARDS OF REGULATORY AGENCIES. *(Previously Wastewater Goal 3.3C / Adopted in 2001)*

The wastewater from homes and businesses (toilet, shower, kitchen sink, etc.) is carried by sanitary sewer lines to the Sunnyvale Water Pollution Control Plant (WPCP), where it is treated before being discharged to local waterways which flow into the San Francisco Bay. The amount and quality of this effluent is regulated by the San Francisco Bay Water

Quality Control Board. The Board's purpose is to protect beneficial uses of the San Francisco Bay in compliance with the California Water Code and federal Clean Water Act.

## WATER COLLECTION SYSTEM

Sunnyvale's wastewater collection system has the capacity to convey all sewage and industrial wastes generated when the City is fully developed in accordance with the land use projections (approximately 55.7 million gallons per day). Five major trunk networks terminate at the Water Pollution Control Plant (WPCP), referred to as the Lawrence, Borregas, Lockheed, Moffett and Cannery trunks. Figure 7-7 is a map showing drainage area boundaries for the areas served by the five collection networks. Capacities of individual networks are:

### Figure 7-6: Capacities of Individual Sewer Collection Areas

| Collection Area | Capacity in Million Gallons per Day (MGD) |
|---|---|
| Lawrence | 22.0 |
| Borregas | 17.0 |
| Cannery | 5.5 |
| Lockheed | 4.9 |
| Moffett Field | 6.3 |
| TOTAL | 55.7 |

Based on growth projections in 2001, it is not anticipated that flows will exceed the capacity of the overall collection system. Specific locations within the collection system may require additional capacity in the future.

As sanitary sewers become older, gaps from cracks, joints, aging gaskets and leaking services tend to allow some groundwater or rainwater to enter the system. This process is called infiltration. A certain amount of rainwater may also find its way into the wastewater system as inflow. Inflow can result from direct connections of storm drains or downspouts to the wastewater system, either in the right-of-way or on private property. Components of the system itself, such as piping, manholes, pumps, etc., will also require replacement as they exhaust their life expectancy.

Infiltration and inflow can interfere with the needed capacity of sanitary sewers and the WPCP. Though virtually impossible to eliminate altogether, maintenance crews use closed circuit video inspection to monitor for bad joints and/or broken pipes which allow infiltration. Private industry is also inspected for illegal storm drain cross-connections to ensure that the quantity of rainfall that flows to the WPCP is kept under control. If infiltration and inflow are allowed to continue unmitigated, additional wastewater flows could overwhelm treatment plant capacity and result in increased treatment costs.

City crews maintain the operation of the sewer main lines by regular flushing and performing repairs to the system. Areas of known-grease or dirt accumulation are flushed on an enhanced cleaning schedule. Depending upon the degree of build-up, the frequency may vary from several weeks to several months.

## WATER POLLUTION CONTROL PLANT

The WPCP provides treatment of wastewater from residential, commercial, and industrial sources from the City of Sunnyvale, the Rancho Rinconada portion of Cupertino, and Moffett Federal Airfield. The WPCP is designed to treat an average of 29.5 million gallons of wastewater per day and a peak flow of 40 million gallons per day. From 2004 to 2007, the average dry weather effluent flow was 14.2 MGD, well within the plant capacity.

See *wpcp.insunnyvale.com* for more information on the NPDES Permit and related programs and regulations.

The WPCP is designed to combine physical, chemical, and natural biological processes to treat wastewater This unique combination allows the WPCP to consistently produce a high-quality effluent from which more than 85 percent of the pollutants have been removed from the influent. This wastewater treatment process provides both secondary and advanced treatment to produces a high quality effluent, suitable for discharge into San Francisco Bay under a National Pollutant Discharge Elimination System (NPDES) permit and for recycling for irrigation and other uses.

Wastewater is treated at three distinct levels: primary, secondary, and tertiary.

- **Primary Treatment** — The first stage in the treatment process to remove solids.
- **Secondary Treatment** — The second stage in the treatment process where oxygen is added to help remove remaining solids and bionutrients.
- **Tertiary Treatment** — The third stage in the treatment process to remove ammonia, algae, and bacteria.

Potable water is fit for consumption by humans and other animals. Non-potable water is all other water.

Recycled water is tertiary treated wastewater diverted from discharge and treated for reuse in industrial processes, landscape irrigation, and other non-potable uses. It is used by businesses and the City of Sunnyvale for landscape and golf course irrigation, and decorative ponds. By reusing water in this way, valuable potable (drinking) water is conserved. The rest of the tertiary effluent is discharged into the Guadalupe Slough, which flows to the Bay.

See **Goal EM-1 (Adequate Water Supplies)** for discussion, policies, and a map of the recycled water system.

In 2011, about 10 percent of the daily flow is diverted for reuse. The City of Sunnyvale water recycling program provides a sustainable and drought-resistant supply of water to portions of the City for non-potable uses.

### Wastewater Pre-Treatment Program

The Pretreatment Program includes Industrial Waste Inspectors, Laboratory Chemists and Field Technicians, whose primary goal is the protection of the treatment plant and sanitary sewer collection system from industrial waste. By regulating the disposal of industrial wastewater into the sanitary sewer, the Pretreatment Program seeks to prevent the introduction of pollutants that could interfere with the operation of the

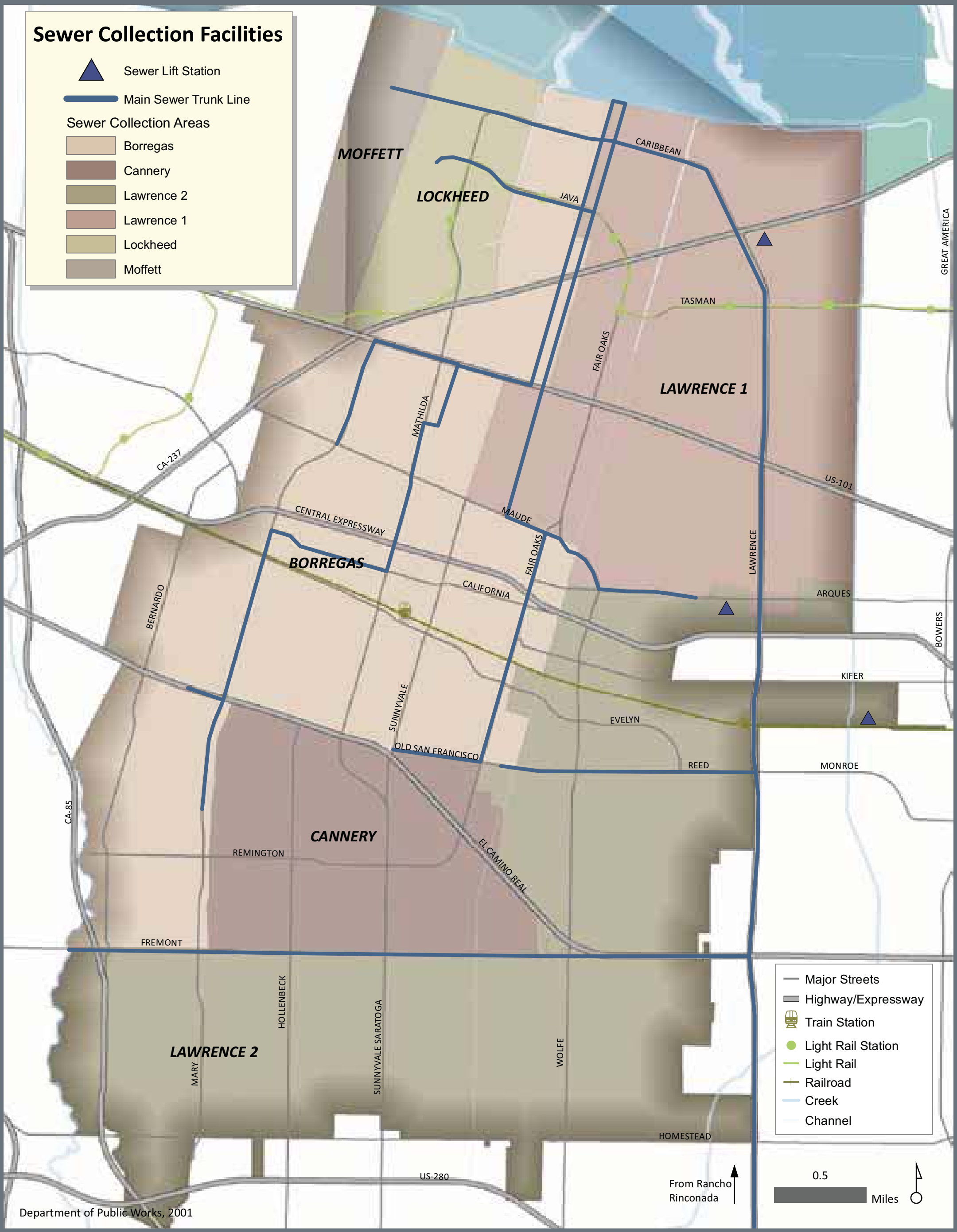



Figure 7-7: Sewer Collection Area Maps

See *wpcp.inSunnyvale.com* for annual water quality reports and information.

Plant, cause damage to the sewer system, compromise public health or worker safety, or pass through the Plant to the Bay.

Industrial and commercial facilities are regulated through discharge permits, Best Management Practices (BMPs), and routine inspection and monitoring. Discharge Permits contain specific requirements and limits for the concentration of pollutants in wastewater discharges. On average, the Pretreatment Program has 70 active industrial wastewater discharge permits issued to Significant Industrial Users (SIUs). Additionally, hundreds of commercial facilities are regulated through the application of BMPs tailored to specific activities commonly found in commercial businesses. When implemented, the BMPs reduce or eliminate the introduction of pollutants into the sanitary sewer.

### Regulatory Compliance Activities

The WPCP operates under the requirements set for by the Global Warming Solutions Act of 2006, Assembly Bill 32 or AB 32. AB 32 is a California State Law that fights climate change by establishing a comprehensive program to reduce greenhouse gas emissions from all sources throughout the state. AB 32 requires the California Air Resources Board (CARB) to develop regulations and market mechanisms to reduce California's greenhouse gas emissions to 1990 levels by 2020, representing a 25 percent reduction statewide, with mandatory caps beginning in 2012 for significant emissions sources. For the Plant, it sets in motion a series of mandatory reporting, and equipment maintenance requirements that are additional to the "normal" function of maintaining plant effluent compliance.

### Future Water Pollution Control Plant Improvements

Plant capacity appears sufficient based on use in 2001 and the updated projections. The Environmental Protection Agency requires that when flows reach 75 percent of design capacity, agencies begin to evaluate future needs and develop plans for expansion, if appropriate. Based on 2001 figures, it is not anticipated that this milestone will be reached in Sunnyvale and it will not be necessary to evaluate ways to provide additional capacity at the WPCP during the next five to ten years. Projections indicate that flows may not continue to increase significantly between 2001 and 2020. This overall projection is attributed to changes in land use, changes in water consumption patterns, and the overall reduced rate of growth.

Portions of the WPCP were first constructed in 1954 and are now nearly 50 years old. In addition, the nature of wastewater treatment itself presents an adverse environment for facilities and equipment. In order to maintain this infrastructure and ensure the ongoing ability to meet effluent and recycled water quality requirements, it is necessary to have in place a strategy for the ongoing refurbishment and replacement of components of the plant.

An asset condition assessment conducted in 2005 identified several critical plant structures as at-risk, and in need of rehabilitation soon. In 2007, a Capital Project Strategic Infrastructure Plan (SIP) was put in place to set future direction of plant process enhancements and physical improvements. Following completion of this effort, SIP implementation is expected to continue for ten to fifteen years for construction of new and/or rehabilitated plant facilities.

Policies supporting Goal EM-5 (Minimal Pollution and Quantity of Wastewater):

**POLICY EM-5.1** WATER POLLUTION CONTROL PLANT IMPROVEMENTS SHOULD BE DESIGNED, CONSTRUCTED AND MAINTAINED AND THE QUANTITY OF INDUSTRIAL WASTES SHOULD BE CONTROLLED SO THAT THE PLANT DOES NOT HAVE TO BE EXPANDED IN EXCESS OF ITS CAPACITY OF 29.5 MGD. *(Previously Wastewater Policy 3.3A.1)*

**POLICY EM-5.2** ENSURE THAT WASTES DISCHARGED TO THE WASTEWATER COLLECTION SYSTEM CAN BE TREATED BY EXISTING TREATMENT PROCESSES OF THE WATER POLLUTION CONTROL PLANT. *(Previously Wastewater Policy 3.3A.2)*

Policy supporting Goal EM-6 (Effective Wastewater Collection System):

**POLICY EM-6.1** INSPECT CRITICAL POINTS IN THE WASTEWATER MANAGEMENT SYSTEM ANNUALLY TO ENSURE THAT THE PROPER LEVEL OF MAINTENANCE IS BEING PROVIDED AND THAT THE FLOW IN SEWERS DOES NOT EXCEED DESIGN CAPACITY. *(Previously Wastewater Management Policy 3.3B.1)*

Policy supporting Goal EM-7 (Effective Wastewater Treatment):

**POLICY EM-7.1** MONITOR WATER POLLUTION CONTROL PLANT OPERATIONS AND MAINTENANCE TO MEET REGULATORY STANDARDS. *(Previously Wastewater Management Policy 3.3C.1)*

**POLICY EM-7.2** COORDINATE OPERATING PROCEDURES WITH THE CITY ENERGY POLICY TO OPTIMIZE AN ALTERNATIVE ENERGY PROGRAM SO THAT MINIMUM USE AND RELIANCE ARE PLACED ON OUTSIDE ENERGY SOURCES. *(Previously Wastewater Management Policy 3.3C.2)*

**POLICY EM-7.3** ACTIVELY PARTICIPATE IN THE WATERSHED MANAGEMENT APPROACH TO SOLVING WATER QUALITY ISSUES OF THE SANTA CLARA BASIN WATERSHED AND THE SOUTH BAY. *(Previously Wastewater Management Policy 3.3C.3)*

**POLICY EM-7.4** PRODUCE QUALITY RECYCLED WATER AND SEEK TO MAXIMIZE THE USE OF THIS RESOURCE. *(Previously Wastewater Management Policy 3.3C.4)*

- EM-7.4a Study feasibility of recycled water for restoration and/or enhancement of marshlands.

## URBAN RUNOFF

## GOAL EM-8
### PROTECTION OF CREEKS AND BAY

ASSURE THE REASONABLE PROTECTION OF BENEFICIAL USES OF CREEKS AND SAN FRANCISCO BAY, ESTABLISHED IN THE REGIONAL BOARD'S BASIN PLAN, AND PROTECT ENVIRONMENTALLY SENSITIVE AREAS. *(Previously Surface Runoff Goal A / Adopted in1993)*

## GOAL EM-9
### ADEQUATE STORM DRAIN SYSTEM

MAINTAIN STORM DRAIN SYSTEM TO PREVENT FLOODING. *(Previously Surface Runoff Goal B / Adopted in 1993)*

## GOAL EM-10
### REDUCED RUNOFF AND POLLUTANT DISCHARGE

MINIMIZE THE QUANTITY OF RUNOFF AND DISCHARGE OF POLLUTANTS TO THE MAXIMUM EXTENT PRACTICABLE BY INTEGRATING SURFACE RUNOFF CONTROLS INTO NEW DEVELOPMENT AND REDEVELOPMENT LAND USE DECISIONS. *(Previously Surface Runoff Goal D / Adopted in 1993)*

Urban runoff consists of stormwater runoff from rainfall as well as non-stormwater runoff from human activities (e.g. over-irrigation of landscapes, vehicle washing, discharges from pools, spas, or water features, etc.). Urban runoff is collected and transported through the city's storm drain system and ultimately discharged to local waterways. Managing urban runoff minimizes the discharge of pollutants to creeks, waterways, and San Francisco Bay, and prevents or minimizes flooding. The protection of local waterways preserves water quality and maintains the structural integrity of creeks, channels, and shoreline to prevent both potential flooding and the degradation of their natural form and function.

Urbanization increases impervious surfaces associated with development, which increases the amount of urban runoff. Runoff typically collects impurities while passing over rooftops, streets, parking lots, landscaping and gutters. Often this runoff is untreated and deposits impurities in the creeks and the San Francisco Bay after being conveyed through a storm drain system. This increased runoff results in increased erosion and sedimentation in creeks. Conveying runoff through a storm drain system also makes less water available to creeks and groundwater during dry weather.

There are two approaches to managing urban runoff. The first is the conveyance approach, which seeks to "get rid of the water." A conveyance stormwater system collects and concentrates runoff through a network of impervious gutters, drainage structures and underground pipes. Because the system collects water from impermeable surfaces and carries it through impervious pipes, suspended pollutants are concentrated in the rapidly flowing runoff. When the system reaches its outfall, large volumes of polluted water can be emptied, untreated, into a natural water body and the large volume can further erode our natural waterways.

The City, as part of the region, is transitioning from the conveyance approach to a newer infiltration approach often referred to as Low Impact Development (LID). This system seeks to "preserve and restore the hydrologic cycle." An infiltration stormwater system seeks to infiltrate runoff into the soil by allowing its to flow slowly over permeable surfaces. These permeable surfaces can double as recreational and landscape areas during dry weather. Because the infiltration network allows much of the runoff to return to the soil, overall runoff volume is reduced, and more water is available to replenish groundwater and maintain stream base flows. Storm drain systems are designed to transport urban runoff to the San Francisco Bay or nearby creeks or channels. Adequate storm drain systems help prevent or minimize property damage due to flooding. The

**Impervious Surfaces:** Constructed or modified surfaces that do not effectively allow infiltration of rainfall into the soil below. Impervious surfaces include, but are not limited to building rooftops, asphalt or concrete pavement, sidewalks, and driveways where such surfaces are not constructed with pervious materials. **Pervious Surfaces:** May include natural or designed landscapes or specially constructed paving materials (e.g. pervious paving) that allow stormwater to infiltrate into sub-surface soils.

City of Sunnyvale owns and operates approximately 150 miles of storm drains, with two pump stations that collect runoff from low-lying urban areas and discharge to creeks and sloughs which are at a higher elevation (see Figure 7-8: Storm Drain System).

To address both the quantity and quality of urban runoff, the City has undertaken a series of programs to both reduce and treat runoff. These programs and actions are collectively described as Urban Runoff Best Management Practices (BMPs). Urban Runoff BMPs are continually changing based on recent studies, practical experience and advancements in construction materials. These new practices include Low Impact Development, source control and pollution prevention. Low Impact Development includes methods to retain and treat runoff onsite through detention and landscape features. Source control measures typically include reducing the amount of impervious surface for new development or large remodeling/additions. Pollution prevention includes installing non-mechanical filters to lessen the volume of runoff, minimizing pesticides, covering areas such trash enclosures or loading docks and requiring drainage of dirty areas to sanitary sewer lines rather than storm drains. Public outreach and information is also an important part of reducing urban runoff.

See *dpw.inSunnyvale.com* for more information about Urban Runoff BMPs and City programs.

## Regulations and Permit Requirements

There are a variety of laws and permit requirements regulating the quantity and quality of urban runoff regionally. These agencies include:

- **Federal** — The Federal Clean Water Act, as amended in 1987, requires the City to obtain NPDES permits for discharge of stormwater and develop stormwater management plans and "to reduce the discharge of pollutants to the maximum extent practicable." The San Francisco Bay Regional Water Quality Control Board (Regional Board or RWQCB) issues permits to meet requirements of the Federal Clean Water Act.
- **State** — The Clean Water Act and State of California legislation requires that the beneficial uses of water bodies be protected, and must meet standards set for water quality and to control sources of pollution.
- **City** — The City has an ordinance that addresses stormwater pollution prevention and provides appropriate adequate legal authority to implement provisions of its NPDES Stormwater Discharge Permit, which effectively implement controls on pollutants in urban runoff and meet permit requirements.

**Maximum Extent Practicable:** A standard for implementation of stormwater management programs under the Clean Water Act to reduce the level of the pollutants in stormwater runoff to the maximum extent possible, taking into account equitable considerations and competing facts including, but not limited to the seriousness of the problem, public health risks, environmental benefits, pollutant removal effectiveness, regulatory compliance, cost, and technical feasibility.

## Collaboration with Regional Agencies

Water resource protection at the local and regional level is becoming more complex. A wide variety of regulatory agencies, diverse sources of nonpoint source pollution, and a multitude of stakeholders make it difficult to achieve a consistent, easily understandable strategy for watershed protection. The City continually works with a variety of agencies and stakeholders to facilitate watershed protection and urban runoff management.

The City is a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of 13 south bay cities, the SCVWD, and Santa Clara Country. All members of SCVURPPP have shared a common NPDES stormwater permit for their discharge into local creeks and South San Francisco Bay since 1990 and leverage resources to better facilitate each agency's compliance with the permit.

Through SCVURPPP, the City also participates in the Bay Area Stormwater Management Agencies Association (BASMAA), which was started by local governments to promote regional consistency and to facilitate the efficient use of public resources by sharing information. In addition, BASMAA provides a forum for representing and advocating the common interests of member programs at the regional and state level.

The City also participates in the California Stormwater Quality Association (CASQA), a quasi-governmental organization, which advises the State Water Resources Control Board on matters related to developing stormwater regulations. It assists municipalities and others in compliance with the municipal, construction and industrial NPDES stormwater mandates of the federal Clean Water Act.

**Beneficial Uses:** The uses of water of the State of California that are protected against degradation. Examples of beneficial uses include, but are not limited to: domestic, municipal, agricultural and industrial water supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation of fish and wildlife and other aquatic resources or preserves.

## Future Trends

Regulatory requirements from both state and federal agencies will continue and likely become more restrictive as each NPDES Permit is re-issued. The City will need to perform periodic updating of the goals and policies associated with urban runoff, the Urban Runoff Management Plan, and sections of the Sunnyvale Municipal Code to address these changes, update data and emerging trends, as well as measure success toward completing urban runoff goals. Annual reports will continue to be made to the Regional Board to demonstrate compliance with NPDES permit provisions and document the City's progress toward meeting the establish goals and policies through the implementation of action statements.

In addition, the storm drain systems will continue to be monitored and maintained to ensure the adequate collection and transfer of urban runoff.

Figure 7-8: Storm Drain System

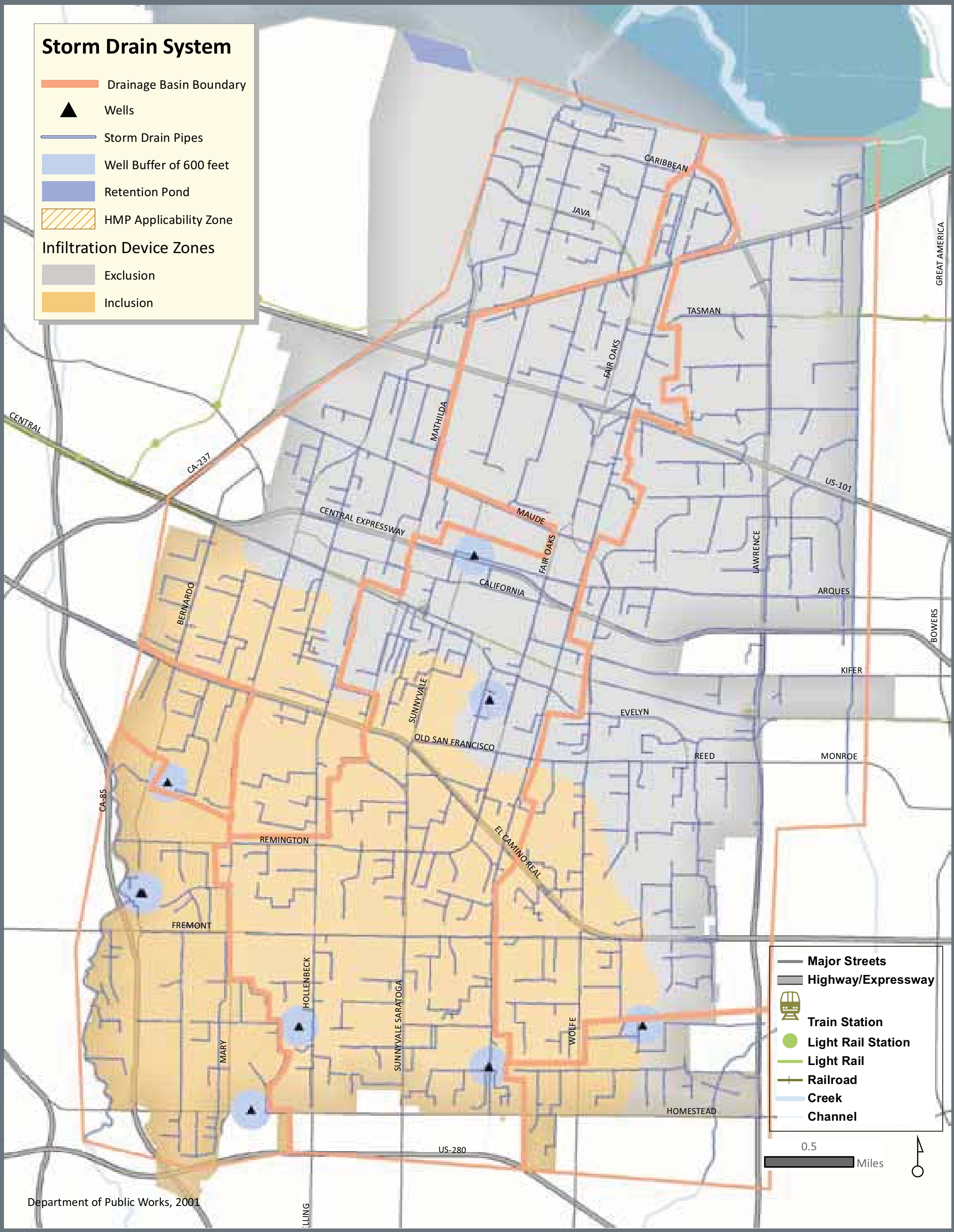


Figure 7-9: Where does it go?

Policies that support Goal EM-8 (Protection of Creeks and Bay):

**POLICY EM-8.1** COMPLY WITH REGULATORY REQUIREMENTS AND PARTICIPATE IN PROCESSES WHICH MAY RESULT IN MODIFICATIONS TO REGULATORY REQUIREMENTS. *(Previously Surface Runoff Policy A.1)*

**POLICY EM-8.2** CONTINUE TO SUPPORT THE IDENTIFICATION AND DEVELOPMENT OF APPROACHES TO STORMWATER TREATMENT AND BEST MANAGEMENT PRACTICES TO CONTROL SOURCES OF POLLUTANTS THROUGH PARTICIPATION IN LOCAL, REGIONAL, STATEWIDE AND NATIONAL ASSOCIATIONS AND AGENCIES (E.G. SANTA CLARA VALLEY URBAN RUNOFF POLLUTION PREVENTION PROGRAM (SCVRRP), BAY AREA STORMWATER MANAGEMENT AGENCIES ASSOCIATION, STORMWATER QUALITY ASSOCIATION, AND AMERICAN PUBLIC WORKS ASSOCIATION AND SIMILAR ORGANIZATIONS). *(Previously Surface Runoff Policy A.2)*

**POLICY EM-8.3** ENSURE THAT STORMWATER CONTROL MEASURES AND BEST MANAGEMENT PRACTICES (BMPS) ARE IMPLEMENTED TO REDUCE THE DISCHARGE OF POLLUTANTS IN STORM WATER TO THE MAXIMUM EXTENT PRACTICABLE. *(Previously Surface Runoff Policy A.3)*

- EM-8.3a Modify Industrial Pretreatment permits to also require BMPs to control the discharge of pollutants to city-owned storm drains. *(Previously Surface Runoff Action Statement A.3b)*
- EM-8.3b Label approximately 1060 municipal storm drainage inlets a year until all inlets are labeled and maintain labels as necessary to educate the public on the fate of material discharged to storm drains. *(Previously Surface Runoff Action Statement A.3e)*

**POLICY EM-8.4** EFFECTIVELY PROHIBIT ILLICIT DISCHARGES AND IMPROPER DISPOSAL OF WASTES INTO THE STORM DRAIN SYSTEM. *(Previously Surface Runoff Policy A.4)*

**POLICY EM-8.5** PREVENT ACCELERATED SOIL EROSION. CONTINUE IMPLEMENTATION OF A CONSTRUCTION SITE INSPECTION AND CONTROL PROGRAM TO PREVENT DISCHARGES OF SEDIMENT FROM EROSION AND DISCHARGES OF OTHER POLLUTANTS FROM NEW AND REDEVELOPMENT PROJECTS. (PREVIOUSLY SURFACE RUNOFF POLICY A.5)

**POLICY EM-8.6** (NEW) MINIMIZE THE IMPACTS FROM STORMWATER AND URBAN RUNOFF ON THE BIOLOGICAL INTEGRITY OF NATURAL DRAINAGE SYSTEMS AND WATER BODIES.

Policies that support Goal EM-9 (Adequate Storm Drain System):

**POLICY EM-9.1** MAINTAIN AND OPERATE THE STORM DRAIN SYSTEM SO THAT STORM WATERS ARE DRAINED FROM 95 PERCENT OF THE STREETS WITHIN ONE HOUR AFTER A STORM STOPS. *(Previously Surface Runoff Policy B.1.)*

**POLICY EM-9.2** RESPOND TO STORM DRAIN EMERGENCIES. *(Previously Surface Runoff Policy B.2)*

Policies that support Goal EM-10 (Reduced Runoff and Pollutant Discharge):

**POLICY EM-10.1** CONSIDER THE IMPACTS OF SURFACE RUNOFF AS PART OF LAND USE AND DEVELOPMENT DECISIONS AND IMPLEMENT BMPS TO MINIMIZE THE TOTAL VOLUME AND RATE OF RUNOFF OF WASTE QUALITY AND QUANTITY (HYDRO MODIFICATION) OF SURFACE RUNOFF AS PART OF LAND USE AND DEVELOPMENT DECISIONS. *(Previously Surface Runoff Policy D.1)*

**POLICY EM-10.2** CONSIDER THE ABILITY OF A LAND PARCEL TO DETAIN EXCESS STORM WATER RUNOFF IN FLOOD PRONE AREAS AND REQUIRE INCORPORATION OF APPROPRIATE CONTROLS. REQUIRE THE INCORPORATION OF APPROPRIATE STORMWATER TREATMENT AND CONTROL MEASURES FOR NEW AND REDEVELOPMENT REGULATED PROJECTS AND/OR ANY SITES THAT MAY REASONABLY BE CONSIDERED TO CAUSE OR CONTRIBUTE TO THE POLLUTION OF STORMWATER AND URBAN RUNOFF AS DEFINED IN THE CURRENT VERSION OF THE STORMWATER MUNICIPAL REGIONAL PERMIT. *(Previously Surface Runoff Policy D.2)*

**POLICY EM-10.3** REQUIRE THE INCORPORATION OF APPROPRIATE STORMWATER TREATMENT AND CONTROL MEASURES FOR INDUSTRIAL AND COMMERCIAL FACILITIES AS IDENTIFIED IN THE STORMWATER MUNICIPAL REGIONAL PERMIT. *(New)*

**POLICY EM-10.4** SUPPORT LEGISLATION AND REGULATIONS THAT WILL REDUCE OR ELIMINATE POLLUTANTS OF CONCERN AT THE SOURCE. *(New)*

**POLICY EM-10.5** PROMOTE EDUCATION AND OUTREACH EFFORTS TO SCHOOLS, YOUTH, RESIDENTS, AND BUSINESSES REGARDING URBAN RUNOFF AND STORMWATER POLLUTION PREVENTION ACTIONS. *(New)*

## AIR QUALITY

### GOAL EM-11
### IMPROVED AIR QUALITY

IMPROVE SUNNYVALE'S AIR QUALITY AND REDUCE THE EXPOSURE OF ITS CITIZENS TO AIR POLLUTANTS. *(Previously Air Quality Goal A / Adopted in 1993)*

All major urban areas in California, including Sunnyvale, experience some degree of reduced air quality. The combination of climatic conditions and a multitude of air pollutant sources (particularly the automobile) results in reduced air quality, which can be considered as reducing the quality of life by adversely affecting human health, causing damage to plants or crops, and other effects such as soiling, visibility reduction and accelerated corrosion of materials.

One of the major reasons that air quality continues to be a problem in the Bay Area specifically and California in general, is a relatively high rate of population and economic growth. The major obstacle to improved air quality in the future is increasing population and vehicle use and deteriorating operating conditions on highways and roads.

The major air quality problems in the Bay Area are ozone, carbon monoxide, and PM-10. Ozone and carbon monoxide are primarily released in the air from combustion sources such as automobiles and factories. PM-10 (otherwise known as suspended particulate matter) is a collection of particles of dust, soot, aerosols and other matter which are small enough to remain suspended in the air for a long period of time. Man-made sources of PM-10 include automobile exhausts and road travel, smoke, and factory emissions.

To combat this, the most efficient and cost-effective technological or "hardware" controls have already been implemented. Remaining technological controls, which are increasingly expensive, have been found to be unable to reduce emissions to the point where all air quality standards (glossary in the margin) would be met. Therefore, attention has been focused in recent years on the relationship of land use, community design and transportation as a means of reducing air pollutant generation. For further information on air quality measurements and modeling, see Appendix H, Air Quality Technical Report.

### Cooperation with Regional Agencies

Past efforts by federal, state and local governments have resulted in steady, gradual improvement in air quality in Sunnyvale and the greater Bay Area. Sunnyvale is within the Bay Area Air Quality Management District (BAAQMD). The City of Sunnyvale has implemented a number of programs and projects that directly or indirectly reduce air pollutant emissions. Most of these programs are part of a larger regional effort to improve air quality. These projects include:

- Adding high occupancy vehicle (HOV) lanes to U.S. 101, S.R. 85, and S.R. 237. These improvements have expanded their capacity.
- Facilitating regional transportation such as the Tasman Light Rail extension, increases in Caltrain service, and a "Super Express" commuter bus service.
- Constructing high occupancy vehicle (HOV) lanes on Lawrence Expressway.

**POLICY EM-11.1** THE CITY SHOULD ACTIVELY PARTICIPATE IN REGIONAL AIR QUALITY PLANNING. *(Previously Air Quality Policy C.1 also Air Quality Goal C)*

## Land Use and Air Quality

Future development within Sunnyvale impacts regional air quality. Direct impacts are those related to emissions released on-site from stationary sources. Indirect impacts are related to vehicle trips attracted to or generated by residential, commercial or employment-generating land uses.

**Stationary Sources** — Industries are required to provide information to the public about emissions of toxic air contaminants (quick description in the margin) and their impact on public health. There are 71 sources of TACs within Sunnyvale. The majority of these sources are microelectronic industries, dry cleaners and auto repair businesses.

Future growth in Sunnyvale may include new stationary sources of pollutants. However, any new stationary sources would be subject to the "no net increase" requirements of the California Clean Air Act, which requires BAAQMD to develop a permitting system that provides new sources, can only be approved if there is an offsetting decrease in emissions elsewhere in the air basin. For any new businesses or facilities that could emit air pollutants, it is important to consider sensitive receptors. The siting of any new sensitive receptors also needs to consider any existing air pollutant sources nearby.

**Indirect Sources**— Indirect automobile emissions estimated with future buildout are shown to increase slightly in the next 10 years. Reducing emissions from these indirect sources is likely to be an important strategy in regional efforts to attain the state and federal ambient air quality standards in the Bay Area.

There are several methods in which land use regulations can be used to both reduce emissions and alleviate the impact on residents. By locating employment and retail service areas closer to residential areas, vehicle use can be reduced.

In 1993, the Sunnyvale Futures Study examined the effects of revising the General Plan to provide for an improved jobs/housing balance. The study considered potential residential designations of several sites previously designated with commercial and industrial uses and was approved by Council and created a series of Industrial-to-Residential (ITR sites.) Preliminary findings indicated that increased carbon monoxide concentrations will occur at certain intersections. However, predicted air quality would

The Bay Area Air Quality Management District (BAAQMD) is required to prepare and adopt a list of actions, improvements and programs that improve system-wide transportation level of service (LOS) and improve air quality. **See Goal LT-5 (Effective, Safe, Pleasant and Convenient Transportation)** for further discussion and policies on transportation improvements.

**California Clean Air Act** — A law setting forth a comprehensive program to ensure that all areas within the State of California will attain federal and state ambient air quality standards by the earliest practicable date. The law mandates comprehensive planning and implementation efforts, and empowers local air pollution control districts to adopt transportation control measures and indirect source control measures to achieve and maintain the ambient air quality standards.

**Sensitive Receptors** — Sensitive populations such as children, athletes, elderly and the sick that are more susceptible to the effects of air pollution than the population at large.

fall within the standards. Improvements in the job/housing balance would provide more local housing options, reducing commute lengths and vehicle miles traveled.

Major progress has been made in the 1980's and 1990's in reducing emissions from stationary sources and mobile sources in the Bay Area, with the result that steady improvement in air quality has been documented despite population growth. Under the California Clean Air Act and Amendments, the state Air Resources Board and BAAQMD will be adopting new and more stringent regulations on existing and future industrial sources, implementing more stringent emission standards for vehicles, developing and implementing transportation control measures (TCMs) to reduce vehicular emissions, and adding new sources to the list of controlled process (e.g. consumer products, fireplaces and wood stoves, etc.). These measures, if implemented expeditiously, should continue the overall improvement in air quality evident over the past 20 years.

**See Goal LT-1 (Coordinated Regional Planning)** and **LT-6 (Supportive Economic Development Environment)** for policies on mixed uses and locating housing closer to employment centers

**POLICY EM-11.2** UTILIZE LAND USE STRATEGIES TO REDUCE AIR QUALITY IMPACT, INCLUDING OPPORTUNITIES FOR CITIZENS TO LIVE AND WORK IN CLOSE PROXIMITY. *(Previously Air Quality Policies B.1 and C.2)*

**POLICY EM-11.3** REQUIRE ALL NEW DEVELOPMENT TO UTILIZE SITE PLANNING TO PROTECT CITIZENS FROM UNNECESSARY EXPOSURE TO AIR POLLUTANTS. *(Previously Air Quality Policy A.1)*

**POLICY EM-11.4** APPLY THE INDIRECT SOURCE RULE TO NEW DEVELOPMENT WITH SIGNIFICANT AIR QUALITY IMPACTS. INDIRECT SOURCE REVIEW WOULD COVER COMMERCIAL AND RESIDENTIAL PROJECTS AS WELL AS OTHER LAND USES THAT PRODUCE OR ATTRACT MOTOR VEHICLE TRAFFIC. *(Previously Air Quality Policy B.3)*

### Transportation Improvements and Air Quality

There are two main ways that transportation improvements can positively impact air quality. The first is to reduce congestion that causes increased vehicle emissions (stop-and-go). The second is to enhance and encourage alternative modes of transportation to reduce the total number of car trips. Sunnyvale has undertaken a variety of programs to improve air quality with regards to transportation.

Reduce Congestion

- Traffic signal improvement and synchronization
- Ten-year capital improvements plan
- Preferential parking for carpool vehicles
- Transportation demand management (TDM)

Alternative Transportation Modes

- Continue to require City sidewalks
- Develop requirements for bicycle facilities
- Bicycle and Pedestrian Advisory Committee (BPAC) to review and advise City Council on capital improvement projects involving bicycle and pedestrian facilities as well as educational programs.
- Electric City vehicles

**POLICY EM-11.5** REDUCE AUTOMOBILE EMISSIONS THROUGH TRAFFIC AND TRANSPORTATION IMPROVEMENTS. *(Previously Air Quality Policy A.2)*

**POLICY EM-11.6** CONTRIBUTE TO A REDUCTION IN REGIONAL VEHICLE MILES TRAVELED. *(Previously Air Quality Policy C.3)*

**POLICY EM-11.7** REDUCE EMISSIONS FROM CITY OF SUNNYVALE FLEET VEHICLES. *(Previously Air Quality Policy C.4)*

**POLICY EM-11.8** ASSIST EMPLOYERS IN MEETING REQUIREMENTS OF TRANSPORTATION DEMAND MANAGEMENT (TDM) PLANS FOR EXISTING AND FUTURE LARGE EMPLOYERS AND PARTICIPATE IN THE DEVELOPMENT OF TDM PLANS FOR EMPLOYMENT CENTERS IN SUNNYVALE. *(Previously Air Quality Policy B.2)*

See **Goal LT-5 (Effective, Safe, Pleasant and Convenient Transportation)** for policies on transportation improvements.

**Transportation Demand Management (TDM) —** Strategies that reduce travel demand such as telecommuting, teleshopping, flextime, carpooling, increased use of public transit, and other strategies to reduce the number of trips made in single-occupant vehicles.

## SOLID WASTE

### Collection Programs

**GOAL EM-12**
**SAFE AND HEALTHY SOLID WASTE COLLECTION**
ENSURE THAT MUNICIPAL SOLID WASTE IS COLLECTED AND TRANSPORTED IN A SAFE AND HEALTHY MANNER. *(Previously Solid Waste Goal 3.2A / Adopted in 1993)*

**GOAL EM-13**
**CLEAN NEIGHBORHOODS**
ENCOURAGE RESIDENTS TO MAINTAIN CLEAN NEIGHBORHOODS BY PREVENTING UNSIGHTLY ACCUMULATIONS OF DISCARDED MATERIALS AND ILLEGAL DUMPING OF MUNICIPAL SOLID WASTE. *(Previously Solid Waste Goal 3.2B / Adopted in 1996)*

Solid waste consists of virtually all of the materials discarded by residents and businesses in the course of daily life, business activities and manufacturing. It does not include hazardous wastes, radioactive wastes, medical waste, sewage or liquids. Because accumulations of solid waste can present public health problems, the Sunnyvale Municipal Code requires all occupied residence and business premises to subscribe to regular collection services. According to a 2010 study performed for the City by Cascadia Consulting Group, single-family residents generate approximately 34 percent of the solid waste collected, multi-family residents account for 22 percent, and the remaining 44 percent comes from businesses, government agencies, schools and other institutions and construction and demolition projects.

Collection of solid waste in Sunnyvale is performed by a private company under contract with the City. The contract takes the form of a franchise agreement that is "exclusive," that is, no other company is allowed to collect solid waste. Exclusivity minimizes the community and environmental impacts of refuse collection by limiting the number of trucks used for collection. It reduces pavement damage, noise and air pollution from heavy collection trucks compared to an open market approach where multiple companies may serve homes and businesses located near each other. The Sunnyvale franchise agreement also gives the City the ability to enforce community standards for service quality, collection hours, truck and container colors and cleanliness, graffiti removal, use of clean air fuels, etc.

The City periodically provides special disposal programs at discounted or no cost. These programs are designed to discourage illegal dumping of solid waste and to minimize accumulations of discarded material in the community. These programs include:

- **Spring/Fall Extra Dump Weekends —**On four weekends per year (two each for spring and fall), Sunnyvale residents can dispose of extra solid waste at the City-owned Sunnyvale Materials Recovery and Transfer (SMaRT Station®), 301 Carl Road, at no charge. "Extra Dump" Weekends are for residents only, and not for businesses, contractors, non-resident property owners or other commercial establishments. The SMaRT Station permit allows over 1,000 vehicle trips per day on Extra Dump event days.
- **On-Call Collection —** Service to residents of single-family homes includes as many as two on-call collections per calendar year. Residents may schedule these pickups on any of their regular collection days and may set out two cubic yards of extra solid waste and two "bulky" items, such as a couch, refrigerator, or other appliance.
- **Neighborhood Cleanups —** Working with recognized neighborhood associations, the City offers a number of neighborhood cleanup events. During these events, typically held on a weekend, the City arranges for delivery of "roll-off" debris boxes to pre-selected locations. The boxes are emptied and returned throughout the event. These events provide a convenient disposal option for residents who cannot or do not utilize other special disposal options.

**POLICY EM-12.1** PROVIDE CONVENIENT AND COMPETITIVELY PRICED SOLID WASTE COLLECTIONS SERVICES. *(Previously Solid Waste Policy 3.2A.1)*

**POLICY EM-13.1** PROVIDE PERIODIC OPPORTUNITIES FOR RESIDENTS TO DISPOSE OF REFUSE AT DISCOUNTED OR NO CHARGE. *(Previously Solid waste Policy 3.2C.1)*

## Recycling and Source Reduction

### GOAL EM-14
### RECYCLING AND SOURCE REDUCTION PROGRAMS

REDUCE SOLID WASTE THROUGH RECYCLING, SOURCE REDUCTION, EDUCATION AND SPECIAL PROGRAMS. *(Previously Solid Waste Goal 3.2B/Adopted in 1996)*

Sunnyvale has long been a leader in recycling and in 1982 was one of the first cities in the Bay Area to begin collecting residential recyclables at curbside. In 1990, Sunnyvale became the first city in the state to adopt the Source Reduction and Recycling Element required by the Integrated Waste Management Act of 1989 (AB 939). In 1994 the SMaRT Station materials recovery facility (MRF) began sorting recyclables from solid waste and remains one of the most sophisticated municipal MRFs in the nation.

These and other programs and facilities are reflected in Sunnyvale's state-calculated diversion rate, which has increased from 18 percent in 1990 to 65 percent in 2009. In 2009 the state Disposal Reporting System coordinated by CalRecycle documented disposal of 88,442 tons originating in Sunnyvale. This marks a 60 percent disposal reduction since 1982, when the City disposed of 222,000 tons, even though the City has seen substantial growth in population and business activity over that 27-year period. Milestone dates of major components of the City's diversion effort include:

- Curbside recycling for single-family residences (1982)
- Concrete Recycling lease at Sunnyvale Landfill (1985)
- Household Hazardous Waste drop-off events (1985)
- Cardboard collection for businesses (1991)
- City Facility Recycling (1991)
- Materials Recovery Facility operations at SMaRT Station (1994)
- Yard trimmings collection for single-family residences (1994)
- Recycling collection for multi-family residences (1996)
- New Materials Recovery Facility at SMaRT Station (2009)

## Zero Waste Strategic Plan

In 2009, the City Council adopted a Zero Waste Policy that broadly describes a vision for even greater diversion efforts. The first step in implementing the Zero Waste Policy was a 2010 study detailing the composition of Sunnyvale's generated and disposed waste (the latter consisting of the unrecycled residue following materials recovery at the SMaRT Station).

As of 2011, the City had contracted with a consultant to create a Zero Waste Strategic Plan that will define just what "Zero Waste" is and will identify program and facility options for achieving Zero Waste. Potential actions will be both "upstream," as in placing controls on problematic materials that become waste and "downstream," as in technologies such as composting and anaerobic digestion with the potential to extract additional value from SMaRT Station residues that are currently disposed.

Many components of solid waste have economic value when they are separated, handled, packaged or offered for collection in a manner different from solid waste. Other components have been designated by state or federal regulations as hazardous waste that may not be disposed in a landfill. Over the past 30 years, this trend has led to an increasingly fragmented waste stream, with equally fragmented systems for collecting, handling and disposing or recycling individual waste stream components.

This increased regulation and special handling has provided benefits to the environment by minimizing damaging discharges to air, water and land. It has also increased the efficiency of the economy as a whole, by extracting value from products previously disposed. But, while those who manufacture, distribute and retail products profit from their sale, the "end of life" costs associated with achieving these environmental and societal benefits are borne primarily by local agencies, such as the City, and ultimately paid for by local rate payers and taxpayers. This imbalanced approach provides a misleading message to consumers by understating the true cost of their individual purchases, while increasing the refuse disposal bills of the community, regardless of the individual rate payer's level of consumption.

### Product Stewardship

One way to restore an appropriate balance of responsibility is the concept of Product Stewardship, an approach that holds producers liable for the costs of responsibly managing their products at end of life. Extending producer responsibility for products from "cradle to cradle" acknowledges that producers have the greatest control over product design and therefore have the greatest ability and responsibility to reduce toxicity and waste. The City of Sunnyvale has a history of supporting product stewardship – on April 16, 2002, Council directed that the City become a member of the national Product Stewardship Institute and passed a product stewardship resolution.

Product Stewardship is more effective at the state and national levels than it is locally, given the flows of people and products throughout the region. Successful examples in California include 2010 legislation that will put the paint industry in charge of collecting waste paint and the carpet industry in charge of recovering and recycling used carpeting. The cost of the stewardship system will be built into the cost paid by consumers of paint and carpet.

### Household Hazardous Wastes

By law, hazardous wastes are not to be collected or disposed along with municipal solid waste. Disposal of hazardous wastes generated by businesses is regulated by state and federal laws that require documentation of shipments, including their receipt at the hazardous waste disposal site.

Hazardous waste generated by residential use is termed, “Household Hazardous Waste,” or HHW. Common HHW items include paint, pesticides, lawn care products, home maintenance and cleaning products and automotive products. It is illegal to dispose of HHW with ordinary garbage.

One way to reduce the amount of HHW that is improperly disposed is to provide residents with legal opportunities for disposal of HHW. To this end, the City provides HHW drop off events by way of the Countywide HHW Program, with a portion of the program funding coming from a per-ton fee charged by Santa Clara County on disposed solid waste. The remaining cost is paid by the Solid Waste Program from garbage collection rate revenues.

The City leases to the Countywide HHW Program an event site at 164 Carl Road. As of 2011, this is one of three fixed locations at which the Program holds regular events, eleven a year at the Sunnyvale site. The other locations are in San Martin and in San Jose. Sunnyvale residents are eligible to use events at the three fixed sites or any of the temporary locations used by the Program. Sunnyvale resident participation, measured by the number of vehicles dropping off HHW, equals 7-8 percent of the number of single-family homes in Sunnyvale.

Encouraging resident use of HHW events is not necessarily the best or most cost-effective way to decrease improper disposal of HHW. HHW disposal is costly (about $60 per vehicle on average, in 2010) and unbridled use of HHW events could cause serious cost increases for the Solid Waste Fund and higher rates for Sunnyvale residents and businesses.

As a result, the City encourages reduced generation of HHW and an Extended Producer Responsibility (EPR) approach to handling discarded HHW. Residents are encouraged to reduce generation by:

- Using non-toxic alternatives
- Using up products that would become HHW if discarded
- Sharing products with neighbors and friends

As described above, an EPR approach to items that will become HHW when discarded places more responsibility for end-of-life management with the businesses that manufacture, distribute and sell hazardous materials to consumers. EPR has the potential to reduce the City’s cost of managing HHW material. Materials that adversely affect public health and the environment if improperly disposed and that could be better managed with an EPR approach include pharmaceuticals, sharps (needles and lancets) and household batteries.

**POLICY EM-14.1** REDUCE GENERATION OF SOLID WASTE BY PROVIDING SOURCE REDUCTION PROGRAMS AND PROMOTING REDUCTION BEHAVIOR. *(Previously Solid Waste Policy 3.2B.1)*

**POLICY EM-14.2** MAXIMIZE DIVERSION OF SOLID WASTE FROM DISPOSAL BY USE OF DEMAND MANAGEMENT TECHNIQUES, PROVIDING AND PROMOTING RECYCLING PROGRAMS AND ENCOURAGING PRIVATE SECTOR RECYCLING. *(Previously Solid Waste Policy 3.2B.2)*

**POLICY EM-14.3** MEET OR EXCEED ALL FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS CONCERNING SOLID WASTE DIVERSION AND IMPLEMENTATION OF RECYCLING AND SOURCE REDUCTION PROGRAMS. *(Previously Solid Waste Policy 3.2B.3)*

**POLICY EM-14.4** INCREASE DEMAND FOR RECYCLED MATERIALS BY ADVOCATING LOCAL, STATE AND FEDERAL LEGISLATION THAT WILL INCREASE USE OF RECYCLED CONTENT PRODUCTS. *(Previously Solid Waste Policy 3.2B.4)*

## Disposal Programs

### GOAL EM-15
### ENVIRONMENTALLY-SOUND DISPOSAL

DISPOSE OF SOLID WASTE IN AN ENVIRONMENTALLY SOUND, DEPENDABLE AND COST-EFFECTIVE MANNER. *(Previously Solid Waste Goal 3.2D / Adopted in 1996)*

From the City's perspective, the environmental impacts, costs and legal liabilities of solid waste disposal link together the past, the future and the present. The past is important because the City and individual waste generators located in Sunnyvale retain liability for environmental issues related to waste previously disposed, regardless of the location. This calls for responsible management of the closed Sunnyvale Landfill, which served the community's waste disposal needs from the 1920s to 1993. The future is important because it will someday become the past. That is to say, the City's choices of disposal method and location for the waste of the future will someday create liability for actions taken or not taken with regard to that waste. In the present, the City expends money based on past waste disposal decisions and plans its future disposal methods and locations.

The City's choice of disposal method and site is of great importance to the City itself and to waste generators located in Sunnyvale due to the liability associated with disposal. Waste placed in a landfill doesn't go "away" and, under certain circumstances, future environmental cleanup costs at a disposal site may create financial liability for the City. In decades past the City has, in fact, been assessed liability for small percentages of the cleanup cost at two hazardous waste landfills and a waste oil recycling facility. Although the dollar amounts in these cases were relatively small, the experience is instructive.

### Closed Sunnyvale Landfill

The Sunnyvale Landfill stopped accepting refuse on September 30, 1993. Final cover placement in compliance with state regulations was completed in 1994. Approximately 93 of the landfill's 100 acres contain waste. An area of about 7 acres is developed for post-closure use as a biosolids monofill disposal site. It is designed to accept biosolids from the WPCP when market conditions or the characteristics of the biosolids make it difficult or expensive to take them elsewhere.

The closed landfill represents one of the largest areas of open space in Sunnyvale. It is especially valued for recreation because portions are adjacent to the Bay Trail. The walking trails and landfill maintenance roads on the South and West Hills are heavily used for lunch time recreation by employees of companies located in the nearby Moffett Park industrial area. Walking, biking, bird watching and the scenic views from the top of the West Hill are especially popular with the public.

Since closure, the landfill has developed increasing biological diversity. Many mammal, reptile and bird species are observed. Most notable is the Western Burrowing Owl (Athene cunicularia hypugaea), a "species of special concern." Burrowing owls nest in old ground squirrel burrows on the landfill surface and are observed seasonally, often at up to four sites. The City manages the landfill surface around these owl sites so as to enhance its value as habitat for the owls (for example, grass is mowed short to enhance visibility of prey and predators). Landfill maintenance activities are scheduled to avoid active burrows and to avoid choice nesting sites in the breeding season. Additionally, leash laws are actively enforced as the presence of loose dogs discourages use of the landfill as owl habitat.

### Asphalt and Concrete Recycling Facility

Since 1985, the City has leased space at or near the landfill to a private company that recycles concrete and asphalt. The source of the raw material is typically pavement material generated by roadway and sidewalk repairs or demolition of concrete structures. Because the facility accepts material that would be otherwise disposed of in a landfill, it is an important component of the City's compliance with the 50 percent diversion mandate contained in the California Integrated Waste Management Act of 1989 (AB 939). The City's lease requires the operator to report the jurisdiction of origin of the raw materials, and that information is available to the City and other jurisdictions for preparing AB 939 compliance reports.

### Household Hazardous Waste

Another post-closure activity is the Household Hazardous Waste (HHW) event site at 164 Carl Road, which is leased by the City to the Countywide HHW Program. This location is also used as an operations base and storage location for the City's landfill post-closure maintenance staff.

See **Goal EM-13 (Recycling and Source Reduction Programs)** for discussion of Household Hazardous Waste collection.

### Kirby Canyon Landfill

Waste is disposed at Kirby Canyon under a 1991 disposal agreement between the City and Waste Management of California, a private company that operates Kirby Canyon, leasing the site from Castle & Cook. The term of the disposal agreement ends in 2021. The agreement requires that the City deliver to the SMaRT Station all municipal solid waste collected by its franchised hauler. It then requires that all municipal solid waste that is not segregated at the SMaRT Station for recycling be delivered to Kirby Canyon for disposal. Although the agreement was drawn up contemplating disposal at Kirby Canyon, it does contain provisions for Waste Management to direct the City's waste elsewhere under specified conditions.

In 1991 Sunnyvale, Mountain View and Palo Alto selected the Kirby Canyon Landfill, operated by Waste Management of California and located in south San Jose, as their site for long term garbage disposal. These three "SMaRT Station" cities, combined, are the largest single customer at Kirby Canyon. Identifiable contributors of the waste, such as large industrial generators located in Sunnyvale, can also be named directly in cleanup actions. As a result, these generators tend to share the City's concern about the integrity of disposal sites. The cities cooperated in the construction and now the operation of the SMaRT Station pursuant to the 1992 Second Memorandum of Understanding (MOU). The MOU spells out each city's operational and financial obligations and benefits with regard to the facility. It places Sunnyvale at the center of the relationship as owner and operator of the SMaRT Station.

The agreement with Waste Management allows the landfill operator to increase City costs due to regulatory changes. Depending on the type of regulation, these cost increases could apply to incoming solid waste as well as "in place" solid waste disposed in prior years. Reducing the amount of solid waste for which the City is responsible in landfills in the future may be the most cost-effective way to manage the cost of complying with future environmental regulations.

The City's decision to enter into a long-term disposal contract with Waste Management was driven in part by the technical qualifications of that company, its proactive approach to regulatory compliance and its practice of keeping up with rapidly changing requirements and standards for landfill construction, operation and monitoring. City staff conducts an annual review and assessment of regulatory documents for Kirby Canyon to verify that the site continues to be operated in a way that minimizes future City liabilities. Future city decisions and policies that affect where Sunnyvale wastes (hazardous and non-hazardous alike) are disposed should likewise consider not just the immediate cost of disposal, but also the potential for long-term environmental cleanup liabilities.

### Planning For Future Disposal

The fact that Sunnyvale has landfill disposal capacity under contract until 2021 should not lead to complacency. There were 16 years between the designation of the SMaRT Station site as suitable for a transfer station and the date the facility was ready for operation. It should be assumed that acquiring new disposal capacity will take a minimum of five years—possibly longer if coordination with other cities is required. Thus, the City should begin the process of arranging for post-2021 disposal no later than 2016. The time prior to 2016 should be used to determine a Zero Waste Strategic Plan and investigate potential technologies, partnerships and funding issues, all of which will affect the amount and type of disposal capacity required post-2021.

As 2021 approaches, the City should begin developing its strategy for future transfer and disposal methods, locations and partnerships. This process must be well under way no later than 2016, five years prior to the expiration of the current disposal agreement in order to assure an orderly transition to post-2021 disposal options consistent with the Zero Waste Strategic Plan.

**POLICY EM-15.1** ASSURE THAT THE CITY POSSESSES A MINIMUM OF FIVE YEARS OF REFUSE DISPOSAL CAPACITY AT ALL TIMES. *(Previously Solid Waste Policy 3.2D.1)*

- EM-15.1a When available disposal capacity equals 10 years or less, initiate actions to arrange for sufficient capacity to accommodate present and projected City needs. *(Previously Solid Waste Action Statement 3.2D.1b)*

**POLICY EM-15.2** REDUCE THE AMOUNT OF REFUSE BEING DISPOSED, GENERATE RECYCLING REVENUES, AND MINIMIZE TRUCK TRAVEL TO THE DISPOSAL SITE THROUGH USE OF THE SUNNYVALE MATERIALS RECOVERY AND TRANSFER (SMART) STATION. *(Previously Solid Waste Policy 3.2D.2)*

**APPENDIX H**

City of Sunnyvale

2020 Urban Water Management Plan

SFPUC and Valley Water Drought Analyses Documents

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission

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March 30, 2021

Danielle McPherson
Senior Water Resources Specialist
Bay Area Water Supply and Conservation Agency
155 Bovet Road, Suite 650
San Mateo, CA 94402

Dear Ms. McPherson,

Attached please find additional supply reliability modeling results conducted by the SFPUC. The SFPUC has conducted additional supply reliability modeling under the following planning scenarios:

- Projected supply reliability for years 2020 through 2045, assuming that demand is equivalent to the sum of the projected retail demands on the Regional Water System (RWS) and Wholesale Customer purchase request projections provided to SFPUC by BAWSCA on January 21st (see Table 1 below).
- Under the above demand conditions, projected supply reliability for scenarios both with and without implementation of the Bay-Delta Plan Amendment starting in 2023.

The SFPUC will be using this supply modeling in the text of its draft UWMP and moving the original modeling results into an appendix.

**Table 1: Retail and Wholesale RWS Demand Assumptions Used for Additional Supply Reliability Modeling (mgd)**

| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Retail | 66.5 | 67.2 | 67.5 | 68.6 | 70.5 | 73.7 |
| Wholesale[1, 2] | 132.1 | 146.0 | 147.9 | 151.9 | 156.3 | 162.8 |
| **Total** | **198.6** | **213.2** | **215.4** | **220.5** | **226.8** | **236.5** |

[1] Wholesale purchase request projections provided to the SFPUC by BAWSCA on January 21st, 2021
[2] Includes demands for Cities of San Jose and Santa Clara

Please note the following about the information presented in the attached tables:

- Assumptions about infrastructure conditions remain the same as what was provided in our January 22nd letter.
- The Tier 1 allocations were applied to the RWS supplies to determine the wholesale supply, as was also described in the January 22nd letter; for any system-wide shortage above 20%, the Tier 1 split for a 20% shortage was applied.
- The SFPUC water supply planning methodology, including simulation of an 8.5-year design drought, is used to develop these estimates of water supply available from the RWS for five dry years. In each demand scenario for 2020 through 2045, the RWS deliveries are estimated using the standard SFPUC procedure, which includes adding increased levels of rationing as needed to balance the demands on the RWS system with available water supply. Some simulations may have increased levels of rationing in the final years of the design drought sequence, which can influence the comparison of results in the first five years of the sequence.
- Tables 7 and 8 in the attached document provide RWS and wholesale supply availability for the five-year drought risk assessment from 2021 to 2025. SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. Therefore, the supply projections for 2021 to 2025 are based on meeting 2020 levels of demand. However, in years when the Bay-Delta Plan Amendment is not in effect, sufficient RWS supplies will be available to meet the Wholesale Customers' purchase requests assuming that they are between the 2020 and 2025 projected levels. This is not reflected in Tables 7 and 8 because SFPUC did not want to make assumptions about the growth of purchase requests between 2020 and 2025.

In our draft UWMP, we acknowledge that we have a Level of Service objective of meeting average annual water demand of 265 mgd from the SFPUC watersheds for retail and Wholesale Customers during non-drought years, as well as a contractual obligation to supply 184 mgd to the Wholesale Customers. Therefore, we will still include the results of our modeling based on a demand of 265 mgd in order to facilitate planning that supports meeting this Level of Service objective and our contractual obligations. The results of this modeling will be in an appendix to the draft UWMP. As will be shown in this appendix, in a normal year the SFPUC can provide up to 265 mgd of supply from the RWS. The RWS supply projections shown in the attached tables are more accurately characterized as supplies that will be used to meet projected retail and Wholesale Customer demands.

It is our understanding that you will pass this information on to the Wholesale Customers. If you have any questions or need additional information, please do not hesitate to contact Sarah Triolo, at striolo@sfwater.org or (628) 230 0802.

Sincerely,

Paula Kehoe
Director of Water Resources

### Table 2: Projected Total RWS Supply Utilized and Portion of RWS Supply Utilized by Wholesale Customers in Normal Years [For Table 6-9]:

| Year | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| RWS Supply Utilized (mgd) | 198.6 | 213.2 | 215.4 | 220.5 | 226.8 | 236.5 |
| RWS Supply Utilized by Wholesale Customers[a] (mgd) | 132.1 | 146.0 | 147.9 | 151.9 | 156.3 | 162.8 |

[a] RWS supply utilized by Wholesale Customers is equivalent to purchase request projections provided to SFPUC by BAWSCA on January 21, 2021, and includes Cities of San Jose and Santa Clara.

## *Basis of Water Supply Data: With Bay-Delta Plan Amendment*

### Table 3a: Basis of Water Supply Data [For Table 7-1], Base Year 2020, With Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2020 | 198.6 | 100% | 132.1 | |
| Single dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 1st Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 2nd Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 3rd Dry year[1] | | 119.2 | 60% | 74.5 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 4th Dry year | | 119.2 | 60% | 74.5 | • Same as above |
| Consecutive 5th Dry year | | 119.2 | 60% | 74.5 | • Same as above |

[1] Assuming this year represents 2023, when Bay Delta Plan Amendment would come into effect.

### Table 3b: Basis of Water Supply Data [For Table 7-1], Base Year 2025, With Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2025 | 213.2 | 100% | 146.0 | |
| Single dry year | | 149.2 | 70% | 93.3 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 1st Dry year | | 149.2 | 70% | 93.3 | • Same as above |
| Consecutive 2nd Dry year | | 127.9 | 60% | 80.0 | • Same as above |
| Consecutive 3rd Dry year | | 127.9 | 60% | 80.0 | • Same as above |
| Consecutive 4th Dry year | | 127.9 | 60% | 80.0 | • Same as above |
| Consecutive 5th Dry year | | 127.9 | 60% | 80.0 | • Same as above |

**Table 3c: Basis of Water Supply Data [For Table 7-1], Base Year 2030, With Bay-Delta Plan Amendment**

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2030 | 215.4 | 100% | 147.9 | |
| Single dry year | | 150.8 | 70% | 94.2 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 1st Dry year | | 150.8 | 70% | 94.2 | • Same as above |
| Consecutive 2nd Dry year | | 129.2 | 60% | 80.8 | • Same as above |
| Consecutive 3rd Dry year | | 129.2 | 60% | 80.8 | • Same as above |
| Consecutive 4th Dry year | | 129.2 | 60% | 80.8 | • Same as above |
| Consecutive 5th Dry year | | 129.2 | 60% | 80.8 | • Same as above |

**Table 3d: Basis of Water Supply Data [For Table 7-1], Base Year 2035, With Bay-Delta Plan Amendment**

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2035 | 220.5 | 100% | 151.9 | |
| Single dry year | | 154.4 | 70% | 96.5 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 1st Dry year | | 154.4 | 70% | 96.5 | • Same as above |
| Consecutive 2nd Dry year | | 132.3 | 60% | 82.7 | • Same as above |
| Consecutive 3rd Dry year | | 132.3 | 60% | 82.7 | • Same as above |
| Consecutive 4th Dry year | | 132.3 | 60% | 82.7 | • Same as above |
| Consecutive 5th Dry year | | 121.3 | 55% | 75.8 | • Same as above |

**Table 3e: Basis of Water Supply Data [For Table 7-1], Base Year 2040, With Bay-Delta Plan Amendment**

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2040 | 226.8 | 100% | 156.3 | |
| Single dry year | | 158.8 | 70% | 99.2 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 1st Dry year | | 158.8 | 70% | 99.2 | • Same as above |
| Consecutive 2nd Dry year | | 136.1 | 60% | 85.1 | • Same as above |
| Consecutive 3rd Dry year | | 136.1 | 60% | 85.1 | • Same as above |
| Consecutive 4th Dry year | | 120.2 | 53% | 75.1 | • Same as above |
| Consecutive 5th Dry year | | 120.2 | 53% | 75.1 | • Same as above |

## Table 3f: Basis of Water Supply Data [For Table 7-1], Base Year 2045, With Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2045 | 236.5 | 100% | 162.8 | |
| Single dry year | | 141.9 | 60% | 88.7 | • At shortages 20% or greater, wholesale allocation is assumed to be 62.5% |
| Consecutive 1st Dry year | | 141.9 | 60% | 88.7 | • Same as above |
| Consecutive 2nd Dry year | | 141.9 | 60% | 88.7 | • Same as above |
| Consecutive 3rd Dry year | | 141.9 | 60% | 88.7 | • Same as above |
| Consecutive 4th Dry year | | 120.6 | 51% | 75.4 | • Same as above |
| Consecutive 5th Dry year | | 120.6 | 51% | 75.4 | • Same as above |

## Table 3g: Projected RWS Supply Availability [Alternative to Table 7-1], Years 2020-2045, With Bay-Delta Plan Amendment

| Year | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Average year | 100% | 100% | 100% | 100% | 100% | 100% |
| Single dry year | 100% | 70% | 70% | 70% | 70% | 60% |
| Consecutive 1st Dry year | 100% | 70% | 70% | 70% | 70% | 60% |
| Consecutive 2nd Dry year | 100% | 60% | 60% | 60% | 60% | 60% |
| Consecutive 3rd Dry year[1] | 60% | 60% | 60% | 60% | 60% | 60% |
| Consecutive 4th Dry year | 60% | 60% | 60% | 60% | 53% | 51% |
| Consecutive 5th Dry year | 60% | 60% | 60% | 55% | 53% | 51% |

[1] Assuming that at base year 2020, this year represents 2023, when Bay Delta Plan Amendment would come into effect.

## ***Basis of Water Supply Data: Without Bay-Delta Plan Amendment***

### Table 4a: Basis of Water Supply Data [For Table 7-1], Base Year 2020, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2020 | 198.6 | 100% | 132.1 | |
| Single dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 1st Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 2nd Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 3rd Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 4th Dry year | | 198.6 | 100% | 132.1 | |
| Consecutive 5th Dry year | | 198.6 | 100% | 132.1 | |

### Table 4b: Basis of Water Supply Data [For Table 7-1], Base Year 2025, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2025 | 213.2 | 100% | 146.0 | |
| Single dry year | | 213.2 | 100% | 146.0 | |
| Consecutive 1st Dry year | | 213.2 | 100% | 146.0 | |
| Consecutive 2nd Dry year | | 213.2 | 100% | 146.0 | |
| Consecutive 3rd Dry year | | 213.2 | 100% | 146.0 | |
| Consecutive 4th Dry year | | 213.2 | 100% | 146.0 | |
| Consecutive 5th Dry year | | 213.2 | 100% | 146.0 | |

### Table 4c: Basis of Water Supply Data [For Table 7-1], Base Year 2030, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2030 | 215.4 | 100% | 147.9 | |
| Single dry year | | 215.4 | 100% | 147.9 | |
| Consecutive 1st Dry year | | 215.4 | 100% | 147.9 | |
| Consecutive 2nd Dry year | | 215.4 | 100% | 147.9 | |
| Consecutive 3rd Dry year | | 215.4 | 100% | 147.9 | |
| Consecutive 4th Dry year | | 215.4 | 100% | 147.9 | |
| Consecutive 5th Dry year | | 215.4 | 100% | 147.9 | |

### Table 4d: Basis of Water Supply Data [For Table 7-1], Base Year 2035, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2035 | 220.5 | 100% | 151.9 | |
| Single dry year | | 220.5 | 100% | 151.9 | |
| Consecutive 1st Dry year | | 220.5 | 100% | 151.9 | |
| Consecutive 2nd Dry year | | 220.5 | 100% | 151.9 | |
| Consecutive 3rd Dry year | | 220.5 | 100% | 151.9 | |
| Consecutive 4th Dry year | | 220.5 | 100% | 151.9 | |
| Consecutive 5th Dry year | | 220.5 | 100% | 151.9 | |

### Table 4e: Basis of Water Supply Data [For Table 7-1], Base Year 2040, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2040 | 226.8 | 100% | 156.3 | |
| Single dry year | | 226.8 | 100% | 156.3 | |
| Consecutive 1st Dry year | | 226.8 | 100% | 156.3 | |
| Consecutive 2nd Dry year | | 226.8 | 100% | 156.3 | |
| Consecutive 3rd Dry year | | 226.8 | 100% | 156.3 | |
| Consecutive 4th Dry year | | 226.8 | 100% | 156.3 | |
| Consecutive 5th Dry year | | 226.8 | 100% | 156.3 | |

### Table 4f: Basis of Water Supply Data [For Table 7-1], Base Year 2045, Without Bay-Delta Plan Amendment

| Year Type | Base Year | RWS Volume Available (mgd) | % of Average Supply | Wholesale Volume Available (mgd) | Notes on Calculation of Wholesale Supply |
|---|---|---|---|---|---|
| Average year | 2045 | 236.5 | 100% | 162.8 | |
| Single dry year | | 236.5 | 100% | 162.8 | |
| Consecutive 1st Dry year | | 236.5 | 100% | 162.8 | |
| Consecutive 2nd Dry year | | 236.5 | 100% | 162.8 | |
| Consecutive 3rd Dry year | | 236.5 | 100% | 162.8 | |
| Consecutive 4th Dry year | | 212.8 | 90% | 139.1 | • At a 10% shortage level, the wholesale allocation is 64% of available supply<br>• The retail allocation is 36% of supply, which resulted in a positive allocation to retail of 2.9 mgd, which was re-allocated to the Wholesale Customers |
| Consecutive 5th Dry year | | 212.8 | 90% | 139.1 | • Same as above |

**Table 4g: Projected RWS Supply [Alternative to Table 7-1], Years 2020-2045, Without Bay-Delta Plan Amendment**

| Year | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| Average year | 100% | 100% | 100% | 100% | 100% | 100% |
| Single dry year | 100% | 100% | 100% | 100% | 100% | 100% |
| Consecutive 1st Dry year | 100% | 100% | 100% | 100% | 100% | 100% |
| Consecutive 2nd Dry year | 100% | 100% | 100% | 100% | 100% | 100% |
| Consecutive 3rd Dry year | 100% | 100% | 100% | 100% | 100% | 100% |
| Consecutive 4th Dry year | 100% | 100% | 100% | 100% | 100% | 90% |
| Consecutive 5th Dry year | 100% | 100% | 100% | 100% | 100% | 90% |

## ***Supply Projections for Consecutive Five Dry Year Sequences***

**Table 5: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], With Bay-Delta Plan Amendment**

| | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|
| First year | 93.3 | 94.2 | 96.5 | 99.2 | 88.7 |
| Second year | 80.0 | 80.8 | 82.7 | 85.1 | 88.7 |
| Third year | 80.0 | 80.8 | 82.7 | 85.1 | 88.7 |
| Fourth year | 80.0 | 80.8 | 82.7 | 75.1 | 75.4 |
| Fifth year | 80.0 | 80.8 | 75.8 | 75.1 | 75.4 |

**Table 6: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], Without Bay-Delta Plan Amendment**

| | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|
| First year | 146.0 | 147.9 | 151.9 | 156.3 | 162.8 |
| Second year | 146.0 | 147.9 | 151.9 | 156.3 | 162.8 |
| Third year | 146.0 | 147.9 | 151.9 | 156.3 | 162.8 |
| Fourth year | 146.0 | 147.9 | 151.9 | 156.3 | 139.1 |
| Fifth year | 146.0 | 147.9 | 151.9 | 156.3 | 139.1 |

**Table 7: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], With Bay-Delta Plan Amendment. This table assumes Bay Delta Plan comes into effect in 2023.**

| Year | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|
| RWS Supply (mgd) | 198.6 | 198.6 | 119.2 | 119.2 | 119.2 |
| Wholesale Supply (mgd) | 132.1 | 132.1 | 74.5 | 74.5 | 74.5 |

**Table 8: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], Without Bay Delta Plan**

| Year | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|
| RWS Supply (mgd) | 198.6 | 198.6 | 198.6 | 198.6 | 198.6 |
| Wholesale Supply (mgd) | 132.1 | 132.1 | 132.1 | 132.1 | 132.1 |

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

The January 22, 2021, SFPUC Regional Water System (RWS) Supply Reliability Letter (Supply Reliability Letter) provides RWS supplies available to the Wholesale Customers under two scenarios: (1) With Bay-Delta Plan, and (2) Without Bay-Delta Plan. Your agency must choose which scenario to use for your agency's 2020 UWMP submittal tables. However, you may discuss both scenarios in the body of your agency's UWMP. The purpose of this attachment is to provide further detail about your agency's allocation of total RWS supplies available to the Wholesale Customers under both scenarios.

**Data Sources for Projected RWS Purchases**

Supply allocations are based on projected RWS purchases provided to BAWSCA by the Member Agencies. Following the completion of the Demand Study in June 2020, BAWSCA used the results to develop a table for each Member Agency listing possible supplies and total demand for 2025, 2030, 2035, 2040, and 2045. BAWSCA populated the tables with total demand after passive conservation and entered active conservation, as calculated in the agencies' DSS Model, as a source of supply. Multi-source agencies were asked to complete the table with supply projections, including from the RWS, to meet total demand. Single-source agencies were offered the opportunity to review the tables upon request. Because active conservation was treated as a source of supply, projected RWS purchases are after passive and active conservation.

Water Management Representatives (WMRs) received a draft copy of all projected wholesale RWS purchase requests as part of the January 7, 2021 WMR meeting agenda packet and meeting slides. Agencies were asked to notify BAWSCA if changes were necessary regarding their purchase requests prior to BAWSCA sending those purchase requests to the SFPUC. Purchase requests were transmitted to the SFPUC via a letter dated January 15, 2021 for use in their 2020 UWMP efforts.

Note that the projected RWS purchases used by BAWSCA for fiscal years 2020-21 and for 2021-22 were provided to Christina Tang, BAWSCA's Finance Manager, by each Member Agency in January 2021. This annual reporting is part of the SFPUC's wholesale rate setting process. Member Agencies have provided BAWSCA with these projected purchases annually for the past 10 years.

**UWMP Tables 7-1 and 7-5**

UWMP Table 7-1 requests supply reliability for a normal year, a single dry year, and multiple (five) dry years. Tables 3, 4, 5, and 6 provided in the Supply Reliability Letter will help your agency complete UWMP Table 7-1. The Drought Risk Assessment (DRA) in UWMP Table 7-5 also requests a five-year drought sequence but specifies years 2021 through 2025. Supply Reliability Letter Tables 9 and 10 will help your agency complete UWMP Table 7-5.

The Supply Reliability Letter provides four tables for completing UWMP Table 7-1. The Supply Reliability Letter Tables 3 (with Bay-Delta Plan) and 4 (without Bay-Delta Plan) use 2020 as the base year. Depending on which scenario you choose, these will be the basis for your agency's five-year DRA (UWMP Table 7-5). The Supply Reliability Letter Tables 5 (with Bay-Delta Plan) and 6 (without Bay-Delta Plan) use 2025 as the base year. Depending on which scenario you choose, these will be the basis for UWMP Tables 7-2 through 7-4. Your agency may submit multiple UWMP Tables 7-1 with different base years (see Figure 1 below).

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Figure 1: Footnote from Draft UWMP Table 7-1**

| |
|---|
| *Supplier may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If a Supplier uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.* |

Total RWS supplies available to the Wholesale Customers in the first through fifth consecutive dry years in Supply Reliability Letter Table 3 align with those in Table 9 of the same letter. Similarly, Supply Reliability Letter Table 4 aligns with Table 10 of the same letter.

Table A below provides a summary of the Member Agencies' RWS supply drought cutbacks under each of the four supply availability conditions and is intended to help you complete UWMP Tables 7-1and 7-5.

**Table A: Wholesale Customer Drought Cutbacks Based on a Single Dry Year and Multiple Dry Years (Base Year 2020)**

| | (a) | (b) | (c) | (d) | (e) | (f) | (g) |
|---|---|---|---|---|---|---|---|
| (1) | Projected SF RWS Wholesale Purchases | 132.2 MGD | 138.6 MGD | 140.8 MGD | 140.8 MGD | 140.8 MGD | 140.8 MGD |
| (2) | Supply Available to the Wholesale Customers | Percent Cutback on Wholesale RWS Purchases | | | | | |
| | | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** |
| (3) | 157.5 MGD | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| (4) | 132.5 MGD | 0.0% | -4.4% | -5.9% | -5.9% | -5.9% | -5.9% |
| (5) | 82.8 MGD | -37.4% | -40.3% | -41.2% | -41.2% | -41.2% | -41.2% |
| (6) | 74.5 MGD | -43.7% | -46.3% | -47.1% | -47.1% | -47.1% | -47.1% |

Table A, column (a), rows 3 through 6 lists total RWS supplies available to the Wholesale Customers as provided in the Supply Reliability Letter tables. Row 1 provides cumulative actual wholesale RWS purchases for 2020. In years when the Bay-Delta Plan is not in effect, sufficient RWS supplies will be available to meet the Wholesale Customers' purchase requests assuming that they are between the 2020 and 2025 projected levels. As such, RWS supply available to the Wholesale Customers in the 2021 and 2022 is equal to the cumulative projected wholesale RWS.. Projected RWS purchases for years 2021 and 2022 were provided to Christina Tang, BAWSCA's Finance Manager, by the Member Agencies in January 2021. The SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. Additionally, the Tier 2 Plan calculates each agencies' Allocation Factor once at the onset of a drought and it remains the same until the shortage condition is over. Therefore, wholesale RWS demand in 2023 through 2025 is assumed to be static based on the 2022 projected demand.

Table B below provides a summary of the Member Agencies' RWS supply drought cutbacks under each of the four supply availability conditions and is intended to help you complete UWMP Table 7-1.

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table B: Wholesale Customer Drought Cutbacks Based on a Single Dry Year and Multiple Dry Years (Base Year 2025)**

| | (a) | (b) | (c) | (d) | (e) | (f) |
|---|---|---|---|---|---|---|
| (1) | Projected SF RWS Wholesale Purchases | 146.0 MGD | 146.0 MGD | 146.0 MGD | 146.0 MGD | 146.0 MGD |
| (2) | Supply Available to the Wholesale Customers | Percent Cutback on Wholesale RWS Purchases | | | | |
| | | **2025** | **2026** | **2027** | **2028** | **2029** |
| (3) | 157.5 MGD | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| (4) | 132.5 MGD | -9.2% | -9.2% | -9.2% | -9.2% | -9.2% |
| (5) | 82.8 MGD | -43.3% | -43.3% | -43.3% | -43.3% | -43.3% |
| (6) | 74.5 MGD | -49.0% | -49.0% | -49.0% | -49.0% | -49.0% |

Table B, column (a), rows 3 through 6 lists total RWS supplies available to the Wholesale Customers as provided in the Supply Reliability Letter tables. Row 1 provides cumulative projected wholesale RWS purchases for 2025 through 2029. The SFPUC's modeling approach does not allow for varying demands over the course of a dry year sequence. Additionally, the Tier 2 Plan calculates each agencies' Allocation Factor once at the onset of a drought and it remains the same until the shortage condition is over. Therefore, wholesale RWS demand is assumed to be static between 2025 and 2029 based on the 2025 projected demand.

To complete UWMP Tables 7-1 and 7-5, reference tables in the Supply Reliability Letter to identify total RWS supplies available to the Wholesale Customers and apply the percent cutback in the corresponding year of the drought sequence using Tables A and B. For example, in Supply Reliability Letter Table 3, in the 5th consecutive year of a drought, the volume available to the Wholesale Customers is 74.5 MGD. To calculate RWS supplies available to your agency in 2025 using table A, locate the row with 74.5 MGD on the table – row 6 – and the column for 2025 – column (g). Then apply the percent cutback to your agency's RWS demand in 2025.

A list of purchase projections by agency are provided in Tables C, D, E, and F. The table also indicates the percent cutback that should be applied based on total RWS supplies available to the Wholesale Customers. Tables C and E use Scenario 1: With Bay-Delta Plan. Tables D and F use Scenario 2: Without Bay-Delta Plan. Tables C and D use 2020 as the base year and Tables E and F use 2025 as the base year.

BAWSCA understands that agencies are updating projected demands for their 2020 UWMPs and that projected RWS purchases may change from what was previously provided. Additionally, BAWSCA recognizes that not all Member Agencies will choose the same scenario for their UWMP supply reliability tables. For both reasons, projected RWS purchases in each Member Agency's 2020 UWMP may not add up to total Wholesale demands in the SFPUC's 2020 UWMP. This is consistent with direction given by the Department of Water Resources, which encourages suppliers use the UWMP tables to represent what they believe to be the most likely supply reliability scenario and to characterize the five-consecutive year drought in a manner that is best suited for understanding and managing their water service reliability and individual agency level of risk tolerance.

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table C: Scenario 1: With Bay-Delta Plan - Projected Wholesale Customer RWS Demand and Percent Cutback for a Single Dry Year and Multiple Dry Years (Base Year 2020)**

| | **2020** (184 MGD) | | **2021** (157.5 MGD) | | **2022** (132.5 MGD) | | **2023** (74.5 MGD) | | **2024** (74.5 MGD) | | **2025** (74.5 MGD) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agency | Actual Purchases | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback |
| ACWD | 7.87 | 0.0% | 9.44 | 0.0% | 9.46 | -5.9% | 9.46 | -47% | 9.46 | -47% | 9.46 | -47% |
| Brisbane/GVMID | 0.64 | 0.0% | 0.62 | 0.0% | 0.65 | -5.9% | 0.65 | -47% | 0.65 | -47% | 0.65 | -47% |
| Burlingame | 3.48 | 0.0% | 3.34 | 0.0% | 3.35 | -5.9% | 3.35 | -47% | 3.35 | -47% | 3.35 | -47% |
| Coastside | 1.02 | 0.0% | 1.54 | 0.0% | 1.23 | -5.9% | 1.23 | -47% | 1.23 | -47% | 1.23 | -47% |
| CalWater Total | 29.00 | 0.0% | 29.66 | 0.0% | 29.81 | -5.9% | 29.81 | -47% | 29.81 | -47% | 29.81 | -47% |
| Daly City | 3.97 | 0.0% | 4.00 | 0.0% | 4.01 | -5.9% | 4.01 | -47% | 4.01 | -47% | 4.01 | -47% |
| East Palo Alto | 1.57 | 0.0% | 1.63 | 0.0% | 1.69 | -5.9% | 1.69 | -47% | 1.69 | -47% | 1.69 | -47% |
| Estero | 4.34 | 0.0% | 4.48 | 0.0% | 4.51 | -5.9% | 4.51 | -47% | 4.51 | -47% | 4.51 | -47% |
| Hayward | 13.92 | 0.0% | 14.47 | 0.0% | 15.12 | -5.9% | 15.12 | -47% | 15.12 | -47% | 15.12 | -47% |
| Hillsborough | 2.62 | 0.0% | 2.95 | 0.0% | 3.05 | -5.9% | 3.05 | -47% | 3.05 | -47% | 3.05 | -47% |
| Menlo Park | 2.96 | 0.0% | 2.92 | 0.0% | 2.93 | -5.9% | 2.93 | -47% | 2.93 | -47% | 2.93 | -47% |
| Mid-Peninsula | 2.66 | 0.0% | 2.65 | 0.0% | 2.80 | -5.9% | 2.80 | -47% | 2.80 | -47% | 2.80 | -47% |
| Millbrae | 1.90 | 0.0% | 1.95 | 0.0% | 2.15 | -5.9% | 2.15 | -47% | 2.15 | -47% | 2.15 | -47% |
| Milpitas | 5.92 | 0.0% | 5.88 | 0.0% | 5.34 | -5.9% | 5.34 | -47% | 5.34 | -47% | 5.34 | -47% |
| Mountain View | 7.67 | 0.0% | 7.80 | 0.0% | 8.05 | -5.9% | 8.05 | -47% | 8.05 | -47% | 8.05 | -47% |
| North Coast | 2.37 | 0.0% | 2.58 | 0.0% | 2.66 | -5.9% | 2.66 | -47% | 2.66 | -47% | 2.66 | -47% |
| Palo Alto | 9.75 | 0.0% | 9.44 | 0.0% | 9.66 | -5.9% | 9.66 | -47% | 9.66 | -47% | 9.66 | -47% |
| Purissima Hills | 1.75 | 0.0% | 1.97 | 0.0% | 2.02 | -5.9% | 2.02 | -47% | 2.02 | -47% | 2.02 | -47% |
| Redwood City | 8.76 | 0.0% | 8.72 | 0.0% | 9.07 | -5.9% | 9.07 | -47% | 9.07 | -47% | 9.07 | -47% |
| San Bruno | 0.95 | 0.0% | 3.39 | 0.0% | 3.40 | -5.9% | 3.40 | -47% | 3.40 | -47% | 3.40 | -47% |
| San José | 4.26 | 0.0% | 4.31 | 0.0% | 4.51 | -5.9% | 4.51 | -47% | 4.51 | -47% | 4.51 | -47% |
| Santa Clara | 3.27 | 0.0% | 3.29 | 0.0% | 3.50 | -5.9% | 3.50 | -47% | 3.50 | -47% | 3.50 | -47% |
| Stanford | 1.43 | 0.0% | 1.40 | 0.0% | 1.54 | -5.9% | 1.54 | -47% | 1.54 | -47% | 1.54 | -47% |
| Sunnyvale | 9.33 | 0.0% | 9.35 | 0.0% | 9.45 | -5.9% | 9.45 | -47% | 9.45 | -47% | 9.45 | -47% |
| Westborough | 0.82 | 0.0% | 0.84 | 0.0% | 0.81 | -5.9% | 0.81 | -47% | 0.81 | -47% | 0.81 | -47% |
| **Wholesale Total** | **132.2** | **132.2†** | **138.6** | **138.6†** | **140.8** | **132.5†** | **140.8** | **74.5†** | **140.8** | **74.5†** | **140.8** | **74.5†** |

† Total supply available to the Wholesale Customers after drought cutback.

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table D: Scenario 2: Without Bay-Delta Plan - Projected Wholesale Customer RWS Demand and Percent Cutback for a Single Dry Year and Multiple Dry Years (Base Year 2020)**

| Agency | **2020** (184 MGD) | | **2021** (157.5 MGD) | | **2022** (132.5 MGD) | | **2023** (132.5 MGD) | | **2024** (132.5 MGD) | | **2025** (132.5 MGD) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Actual Purchases | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback |
| ACWD | 7.87 | 0.0% | 9.44 | 0.0% | 9.46 | -5.9% | 9.46 | -5.9% | 9.46 | -5.9% | 9.46 | -5.9% |
| Brisbane/GVMID | 0.64 | 0.0% | 0.62 | 0.0% | 0.65 | -5.9% | 0.65 | -5.9% | 0.65 | -5.9% | 0.65 | -5.9% |
| Burlingame | 3.48 | 0.0% | 3.34 | 0.0% | 3.35 | -5.9% | 3.35 | -5.9% | 3.35 | -5.9% | 3.35 | -5.9% |
| Coastside | 1.02 | 0.0% | 1.54 | 0.0% | 1.23 | -5.9% | 1.23 | -5.9% | 1.23 | -5.9% | 1.23 | -5.9% |
| CalWater Total | 29.00 | 0.0% | 29.66 | 0.0% | 29.81 | -5.9% | 29.81 | -5.9% | 29.81 | -5.9% | 29.81 | -5.9% |
| Daly City | 3.97 | 0.0% | 4.00 | 0.0% | 4.01 | -5.9% | 4.01 | -5.9% | 4.01 | -5.9% | 4.01 | -5.9% |
| East Palo Alto | 1.57 | 0.0% | 1.63 | 0.0% | 1.69 | -5.9% | 1.69 | -5.9% | 1.69 | -5.9% | 1.69 | -5.9% |
| Estero | 4.34 | 0.0% | 4.48 | 0.0% | 4.51 | -5.9% | 4.51 | -5.9% | 4.51 | -5.9% | 4.51 | -5.9% |
| Hayward | 13.92 | 0.0% | 14.47 | 0.0% | 15.12 | -5.9% | 15.12 | -5.9% | 15.12 | -5.9% | 15.12 | -5.9% |
| Hillsborough | 2.62 | 0.0% | 2.95 | 0.0% | 3.05 | -5.9% | 3.05 | -5.9% | 3.05 | -5.9% | 3.05 | -5.9% |
| Menlo Park | 2.96 | 0.0% | 2.92 | 0.0% | 2.93 | -5.9% | 2.93 | -5.9% | 2.93 | -5.9% | 2.93 | -5.9% |
| Mid-Peninsula | 2.66 | 0.0% | 2.65 | 0.0% | 2.80 | -5.9% | 2.80 | -5.9% | 2.80 | -5.9% | 2.80 | -5.9% |
| Millbrae | 1.90 | 0.0% | 1.95 | 0.0% | 2.15 | -5.9% | 2.15 | -5.9% | 2.15 | -5.9% | 2.15 | -5.9% |
| Milpitas | 5.92 | 0.0% | 5.88 | 0.0% | 5.34 | -5.9% | 5.34 | -5.9% | 5.34 | -5.9% | 5.34 | -5.9% |
| Mountain View | 7.67 | 0.0% | 7.80 | 0.0% | 8.05 | -5.9% | 8.05 | -5.9% | 8.05 | -5.9% | 8.05 | -5.9% |
| North Coast | 2.37 | 0.0% | 2.58 | 0.0% | 2.66 | -5.9% | 2.66 | -5.9% | 2.66 | -5.9% | 2.66 | -5.9% |
| Palo Alto | 9.75 | 0.0% | 9.44 | 0.0% | 9.66 | -5.9% | 9.66 | -5.9% | 9.66 | -5.9% | 9.66 | -5.9% |
| Purissima Hills | 1.75 | 0.0% | 1.97 | 0.0% | 2.02 | -5.9% | 2.02 | -5.9% | 2.02 | -5.9% | 2.02 | -5.9% |
| Redwood City | 8.76 | 0.0% | 8.72 | 0.0% | 9.07 | -5.9% | 9.07 | -5.9% | 9.07 | -5.9% | 9.07 | -5.9% |
| San Bruno | 0.95 | 0.0% | 3.39 | 0.0% | 3.40 | -5.9% | 3.40 | -5.9% | 3.40 | -5.9% | 3.40 | -5.9% |
| San José | 4.26 | 0.0% | 4.31 | 0.0% | 4.51 | -5.9% | 4.51 | -5.9% | 4.51 | -5.9% | 4.51 | -5.9% |
| Santa Clara | 3.27 | 0.0% | 3.29 | 0.0% | 3.50 | -5.9% | 3.50 | -5.9% | 3.50 | -5.9% | 3.50 | -5.9% |
| Stanford | 1.43 | 0.0% | 1.40 | 0.0% | 1.54 | -5.9% | 1.54 | -5.9% | 1.54 | -5.9% | 1.54 | -5.9% |
| Sunnyvale | 9.33 | 0.0% | 9.35 | 0.0% | 9.45 | -5.9% | 9.45 | -5.9% | 9.45 | -5.9% | 9.45 | -5.9% |
| Westborough | 0.82 | 0.0% | 0.84 | 0.0% | 0.81 | -5.9% | 0.81 | -5.9% | 0.81 | -5.9% | 0.81 | -5.9% |
| **Wholesale Total** | **132.2** | **132.2†** | **138.6** | **138.6†** | **140.8** | **132.5†** | **140.8** | **132.5†** | **140.8** | **132.5†** | **140.8** | **132.5†** |

† Total supply available to the Wholesale Customers after drought cutback.

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table E: Scenario 1: With Bay-Delta Plan - Projected Wholesale Customer RWS Demand and Percent Cutback for a Single Dry Year and Multiple Dry Years (Base Year 2025)**

| Agency | **2025** (184 MGD) | | **2026** (82.8 MGD) | | **2027** (74.5 MGD) | | **2028** (74.5 MGD) | | **2029** (74.5 MGD) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback |
| ACWD | 7.68 | 0% | 7.68 | -43.3% | 7.68 | -49% | 7.68 | -49% | 7.68 | -49% |
| Brisbane/GVMID | 0.89 | 0% | 0.89 | -43.3% | 0.89 | -49% | 0.89 | -49% | 0.89 | -49% |
| Burlingame | 4.33 | 0% | 4.33 | -43.3% | 4.33 | -49% | 4.33 | -49% | 4.33 | -49% |
| Coastside | 1.40 | 0% | 1.40 | -43.3% | 1.40 | -49% | 1.40 | -49% | 1.40 | -49% |
| CalWater Total | 29.99 | 0% | 29.99 | -43.3% | 29.99 | -49% | 29.99 | -49% | 29.99 | -49% |
| Daly City | 3.57 | 0% | 3.57 | -43.3% | 3.57 | -49% | 3.57 | -49% | 3.57 | -49% |
| East Palo Alto | 1.88 | 0% | 1.88 | -43.3% | 1.88 | -49% | 1.88 | -49% | 1.88 | -49% |
| Estero | 4.07 | 0% | 4.07 | -43.3% | 4.07 | -49% | 4.07 | -49% | 4.07 | -49% |
| Hayward | 17.86 | 0% | 17.86 | -43.3% | 17.86 | -49% | 17.86 | -49% | 17.86 | -49% |
| Hillsborough | 3.26 | 0% | 3.26 | -43.3% | 3.26 | -49% | 3.26 | -49% | 3.26 | -49% |
| Menlo Park | 3.55 | 0% | 3.55 | -43.3% | 3.55 | -49% | 3.55 | -49% | 3.55 | -49% |
| Mid-Peninsula | 2.86 | 0% | 2.86 | -43.3% | 2.86 | -49% | 2.86 | -49% | 2.86 | -49% |
| Millbrae | 2.29 | 0% | 2.29 | -43.3% | 2.29 | -49% | 2.29 | -49% | 2.29 | -49% |
| Milpitas | 6.59 | 0% | 6.59 | -43.3% | 6.59 | -49% | 6.59 | -49% | 6.59 | -49% |
| Mountain View | 8.60 | 0% | 8.60 | -43.3% | 8.60 | -49% | 8.60 | -49% | 8.60 | -49% |
| North Coast | 2.34 | 0% | 2.34 | -43.3% | 2.34 | -49% | 2.34 | -49% | 2.34 | -49% |
| Palo Alto | 10.06 | 0% | 10.06 | -43.3% | 10.06 | -49% | 10.06 | -49% | 10.06 | -49% |
| Purissima Hills | 2.09 | 0% | 2.09 | -43.3% | 2.09 | -49% | 2.09 | -49% | 2.09 | -49% |
| Redwood City | 8.46 | 0% | 8.46 | -43.3% | 8.46 | -49% | 8.46 | -49% | 8.46 | -49% |
| San Bruno | 3.24 | 0% | 3.24 | -43.3% | 3.24 | -49% | 3.24 | -49% | 3.24 | -49% |
| San José | 4.50 | 0% | 4.50 | -43.3% | 4.50 | -49% | 4.50 | -49% | 4.50 | -49% |
| Santa Clara | 4.50 | 0% | 4.50 | -43.3% | 4.50 | -49% | 4.50 | -49% | 4.50 | -49% |
| Stanford | 2.01 | 0% | 2.01 | -43.3% | 2.01 | -49% | 2.01 | -49% | 2.01 | -49% |
| Sunnyvale | 9.16 | 0% | 9.16 | -43.3% | 9.16 | -49% | 9.16 | -49% | 9.16 | -49% |
| Westborough | 0.86 | 0% | 0.86 | -43.3% | 0.86 | -49% | 0.86 | -49% | 0.86 | -49% |
| **Wholesale Total** | **146.0** | **146.0†** | **146.0** | **82.8†** | **146.0** | **74.5†** | **146.0** | **74.5†** | **146.0** | **74.5†** |

† Total supply available to the Wholesale Customers after drought cutback.

## Attachment B: Updated 2020 UWMP Drought Cutbacks

**Table F: Scenario 2: Without Bay-Delta Plan - Projected Wholesale Customer RWS Demand and Percent Cutback for a Single Dry Year and Multiple Dry Years (Base Year 2025)**

| Agency | **2025** (184 MGD) | | **2026** (157.5 MGD) | | **2027** (157.5 MGD) | | **2028** (157.5 MGD) | | **2029** (132.5 MGD) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback | Projected Demand | Drought Cutback |
| ACWD | 7.68 | 0.0% | 7.68 | 0.0% | 7.68 | 0.0% | 7.68 | 0.0% | 7.68 | -9.2% |
| Brisbane/GVMID | 0.89 | 0.0% | 0.89 | 0.0% | 0.89 | 0.0% | 0.89 | 0.0% | 0.89 | -9.2% |
| Burlingame | 4.33 | 0.0% | 4.33 | 0.0% | 4.33 | 0.0% | 4.33 | 0.0% | 4.33 | -9.2% |
| Coastside | 1.40 | 0.0% | 1.40 | 0.0% | 1.40 | 0.0% | 1.40 | 0.0% | 1.40 | -9.2% |
| CalWater Total | 29.99 | 0.0% | 29.99 | 0.0% | 29.99 | 0.0% | 29.99 | 0.0% | 29.99 | -9.2% |
| Daly City | 3.57 | 0.0% | 3.57 | 0.0% | 3.57 | 0.0% | 3.57 | 0.0% | 3.57 | -9.2% |
| East Palo Alto | 1.88 | 0.0% | 1.88 | 0.0% | 1.88 | 0.0% | 1.88 | 0.0% | 1.88 | -9.2% |
| Estero | 4.07 | 0.0% | 4.07 | 0.0% | 4.07 | 0.0% | 4.07 | 0.0% | 4.07 | -9.2% |
| Hayward | 17.86 | 0.0% | 17.86 | 0.0% | 17.86 | 0.0% | 17.86 | 0.0% | 17.86 | -9.2% |
| Hillsborough | 3.26 | 0.0% | 3.26 | 0.0% | 3.26 | 0.0% | 3.26 | 0.0% | 3.26 | -9.2% |
| Menlo Park | 3.55 | 0.0% | 3.55 | 0.0% | 3.55 | 0.0% | 3.55 | 0.0% | 3.55 | -9.2% |
| Mid-Peninsula | 2.86 | 0.0% | 2.86 | 0.0% | 2.86 | 0.0% | 2.86 | 0.0% | 2.86 | -9.2% |
| Millbrae | 2.29 | 0.0% | 2.29 | 0.0% | 2.29 | 0.0% | 2.29 | 0.0% | 2.29 | -9.2% |
| Milpitas | 6.59 | 0.0% | 6.59 | 0.0% | 6.59 | 0.0% | 6.59 | 0.0% | 6.59 | -9.2% |
| Mountain View | 8.60 | 0.0% | 8.60 | 0.0% | 8.60 | 0.0% | 8.60 | 0.0% | 8.60 | -9.2% |
| North Coast | 2.34 | 0.0% | 2.34 | 0.0% | 2.34 | 0.0% | 2.34 | 0.0% | 2.34 | -9.2% |
| Palo Alto | 10.06 | 0.0% | 10.06 | 0.0% | 10.06 | 0.0% | 10.06 | 0.0% | 10.06 | -9.2% |
| Purissima Hills | 2.09 | 0.0% | 2.09 | 0.0% | 2.09 | 0.0% | 2.09 | 0.0% | 2.09 | -9.2% |
| Redwood City | 8.46 | 0.0% | 8.46 | 0.0% | 8.46 | 0.0% | 8.46 | 0.0% | 8.46 | -9.2% |
| San Bruno | 3.24 | 0.0% | 3.24 | 0.0% | 3.24 | 0.0% | 3.24 | 0.0% | 3.24 | -9.2% |
| San José | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | -9.2% |
| Santa Clara | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | 0.0% | 4.50 | -9.2% |
| Stanford | 2.01 | 0.0% | 2.01 | 0.0% | 2.01 | 0.0% | 2.01 | 0.0% | 2.01 | -9.2% |
| Sunnyvale | 9.16 | 0.0% | 9.16 | 0.0% | 9.16 | 0.0% | 9.16 | 0.0% | 9.16 | -9.2% |
| Westborough | 0.86 | 0.0% | 0.86 | 0.0% | 0.86 | 0.0% | 0.86 | 0.0% | 0.86 | -9.2% |
| **Wholesale Total** | **146.0** | **146.0†** | **146.0** | **146.4†** | **146.0** | **146.8†** | **146.0** | **147.1†** | **146.0** | **132.5†** |

† Total supply available to the Wholesale Customers after drought cutback.

## Attachment B: Updated 2020 UWMP Drought Cutbacks

### <u>UWMP Table 7-4</u>

Supply Reliability Letter Tables 7 and 8 will help your agency complete UWMP Table 7-4. Table G below provides a summary of the Member Agencies' RWS supply drought cutbacks under each of the four supply availability conditions and is intended to help you complete UWMP Table 7-4. The table assumes (1) the Tier 2 Plan will be used to allocate supplies available to the Wholesale Customers when average Wholesale Customers' RWS shortages are greater than 10 and up to 20 percent, and (2) an equal percent reduction will be shared across all Wholesale Customers when average Wholesale Customers' RWS shortages are 10 percent or less or greater than 20 percent.

**Table G: Drought Cutbacks Based on Projected Demands Under All Water Supply Availability Conditions**

| | (a) | (b) | (c) | (d) | (e) | (f) |
|---|---|---|---|---|---|---|
| (1) | Projected SF RWS Wholesale Purchases | 146.0 MGD | 147.9 MGD | 151.9 MGD | 156.3 MGD | 162.8 MGD |
| (2) | Supply Available to the Wholesale Customers | % Cutback on Wholesale RWS Purchases | | | | |
| | | **2025** | **2030** | **2035** | **2040** | **2045** |
| (3) | 157.5 MGD | 0.0% | 0.0% | 0.0% | 0.0% | -3.2% |
| (4) | 132.5 MGD | -9.3% | -10.4% | Tier 2 Avg. -14%* | Tier 2 Avg. -16%* | Tier 2 Avg. -19%* |
| (5) | 82.8 MGD | -43.3% | -44.0% | -45.5% | -47.0% | -49.1% |
| (6) | 74.5 MGD | -49.0% | -49.6% | -51.0% | -52.3% | -54.2% |

* Calculated average. Individual agency cutbacks are calculated in Table H.

Table G, column (a) lists total RWS supplies available to the Wholesale Customers as provided in the Supply Reliability Letter tables. Row 1 provides cumulative projected wholesale RWS purchases for 2025, 2030, 2035, 2040, and 2045.

Tables H, I, J and K provide additional detail by agency for each of the four supply availability conditions listed in Table G. To complete UWMP Table 7-4, reference Table 7 or 8 (depending on which Bay-Delta Plan scenario you choose) in the Supply Reliability Letter to identify total RWS supplies available to the Wholesale Customers and apply the percent cutback in the corresponding year using Table G or input the volumetric drought allocation using Tables H, I, J and K below.

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table H: Drought Allocations when Total Supplies Available to the Wholesale Customers are Equal to 157.5 MGD**

| Projected SF RWS Wholesale Purchases | 146.0 MGD | 147.9 MGD | 151.9 MGD | 156.3 MGD | 162.8 MGD |
|---|---|---|---|---|---|
| | Drought Allocation (MGD) | | | | |
| Agency | **2025** | **2030** | **2035** | **2040** | **2045** |
| ACWD | 7.68 | 7.68 | 7.68 | 7.68 | 8.82 |
| Brisbane/GVMID | 0.89 | 0.89 | 0.88 | 0.89 | 0.87 |
| Burlingame | 4.33 | 4.40 | 4.47 | 4.58 | 4.54 |
| Coastside | 1.40 | 1.38 | 1.36 | 1.33 | 1.28 |
| CalWater Total | 29.99 | 29.74 | 29.81 | 30.27 | 29.71 |
| Daly City | 3.57 | 3.52 | 3.49 | 3.46 | 3.32 |
| East Palo Alto | 1.88 | 1.95 | 2.10 | 2.49 | 2.80 |
| Estero | 4.07 | 4.11 | 4.18 | 4.23 | 4.24 |
| Hayward | 17.86 | 18.68 | 19.75 | 20.82 | 21.43 |
| Hillsborough | 3.26 | 3.25 | 3.26 | 3.26 | 3.15 |
| Menlo Park | 3.55 | 3.68 | 3.87 | 4.06 | 4.15 |
| Mid-Peninsula | 2.86 | 2.84 | 2.88 | 2.89 | 2.83 |
| Millbrae | 2.29 | 2.50 | 2.45 | 2.82 | 3.10 |
| Milpitas | 6.59 | 6.75 | 7.03 | 7.27 | 7.29 |
| Mountain View | 8.60 | 8.90 | 9.20 | 9.51 | 9.61 |
| North Coast | 2.34 | 2.33 | 2.34 | 2.34 | 2.27 |
| Palo Alto | 10.06 | 10.15 | 10.28 | 10.51 | 10.44 |
| Purissima Hills | 2.09 | 2.09 | 2.12 | 2.13 | 2.08 |
| Redwood City | 8.46 | 8.49 | 8.64 | 8.74 | 8.62 |
| San Bruno | 3.24 | 3.22 | 3.20 | 3.20 | 3.11 |
| San José | 4.50 | 4.50 | 4.50 | 4.50 | 4.35 |
| Santa Clara | 4.50 | 4.50 | 4.50 | 4.50 | 4.35 |
| Stanford | 2.01 | 2.18 | 2.35 | 2.53 | 2.61 |
| Sunnyvale | 9.16 | 9.30 | 10.70 | 11.44 | 11.71 |
| Westborough | 0.86 | 0.85 | 0.85 | 0.84 | 0.82 |
| **Wholesale Total** | **146.0** | **147.9** | **151.9** | **156.3** | **157.5** |

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table I: Drought Allocations when Total Supplies Available to the Wholesale Customers are Equal to 132.5 MGD**

| Projected SF RWS Wholesale Purchases | 146.0 MGD | 147.9 MGD | 151.9 MGD | 156.3 MGD | 162.8 MGD |
|---|---|---|---|---|---|
| | Drought Allocation (MGD) | | | | |
| Agency | **2025** | **2030** | **2035** | **2040** | **2045** |
| ACWD | 6.97 | 6.88 | 6.91 | 6.91 | 8.20 |
| Brisbane/GVMID | 0.81 | 0.79 | 0.73 | 0.73 | 0.72 |
| Burlingame | 3.93 | 3.94 | 3.96 | 3.89 | 3.80 |
| Coastside | 1.27 | 1.24 | 1.22 | 1.20 | 1.19 |
| CalWater Total | 27.21 | 26.65 | 26.46 | 25.69 | 24.69 |
| Daly City | 3.24 | 3.15 | 3.04 | 3.01 | 2.98 |
| East Palo Alto | 1.70 | 1.75 | 1.97 | 2.30 | 2.62 |
| Estero | 3.69 | 3.68 | 3.76 | 3.87 | 3.77 |
| Hayward | 16.20 | 16.74 | 17.32 | 17.69 | 18.07 |
| Hillsborough | 2.96 | 2.92 | 2.90 | 2.75 | 2.56 |
| Menlo Park | 3.22 | 3.30 | 3.37 | 3.33 | 3.26 |
| Mid-Peninsula | 2.59 | 2.54 | 2.59 | 2.62 | 2.54 |
| Millbrae | 2.07 | 2.24 | 2.16 | 2.32 | 2.45 |
| Milpitas | 5.98 | 6.05 | 6.25 | 6.31 | 6.35 |
| Mountain View | 7.80 | 7.97 | 8.28 | 8.49 | 8.34 |
| North Coast | 2.12 | 2.09 | 2.11 | 2.11 | 2.11 |
| Palo Alto | 9.13 | 9.09 | 9.26 | 9.46 | 9.71 |
| Purissima Hills | 1.89 | 1.87 | 1.42 | 1.38 | 1.32 |
| Redwood City | 7.67 | 7.61 | 7.89 | 7.70 | 7.49 |
| San Bruno | 2.94 | 2.88 | 2.56 | 2.51 | 2.45 |
| San José | 4.08 | 4.03 | 3.03 | 2.91 | 2.76 |
| Santa Clara | 4.08 | 4.03 | 3.03 | 2.91 | 2.76 |
| Stanford | 1.82 | 1.95 | 2.06 | 2.13 | 2.16 |
| Sunnyvale | 8.31 | 8.33 | 9.46 | 9.51 | 9.43 |
| Westborough | 0.78 | 0.76 | 0.76 | 0.76 | 0.76 |
| **Wholesale Total** | **132.5** | **132.5** | **132.5** | **132.5** | **132.5** |

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table J: Drought Allocations when Total Supplies Available to the Wholesale Customers are Equal to 82.8 MGD**

| Projected SF RWS Wholesale Purchases | 146.0 MGD | 147.9 MGD | 151.9 MGD | 156.3 MGD | 162.8 MGD |
|---|---|---|---|---|---|
| | Drought Allocation (MGD) | | | | |
| Agency | **2025** | **2030** | **2035** | **2040** | **2045** |
| ACWD | 4.36 | 4.30 | 4.19 | 4.07 | 4.64 |
| Brisbane/GVMID | 0.51 | 0.50 | 0.48 | 0.47 | 0.45 |
| Burlingame | 2.45 | 2.46 | 2.44 | 2.43 | 2.39 |
| Coastside | 0.79 | 0.77 | 0.74 | 0.71 | 0.68 |
| CalWater Total | 17.00 | 16.65 | 16.25 | 16.03 | 15.62 |
| Daly City | 2.02 | 1.97 | 1.90 | 1.83 | 1.75 |
| East Palo Alto | 1.06 | 1.09 | 1.14 | 1.32 | 1.47 |
| Estero | 2.31 | 2.30 | 2.28 | 2.24 | 2.23 |
| Hayward | 10.13 | 10.46 | 10.77 | 11.03 | 11.26 |
| Hillsborough | 1.85 | 1.82 | 1.78 | 1.73 | 1.66 |
| Menlo Park | 2.01 | 2.06 | 2.11 | 2.15 | 2.18 |
| Mid-Peninsula | 1.62 | 1.59 | 1.57 | 1.53 | 1.49 |
| Millbrae | 1.30 | 1.40 | 1.34 | 1.49 | 1.63 |
| Milpitas | 3.74 | 3.78 | 3.83 | 3.85 | 3.83 |
| Mountain View | 4.88 | 4.98 | 5.01 | 5.04 | 5.05 |
| North Coast | 1.33 | 1.30 | 1.28 | 1.24 | 1.19 |
| Palo Alto | 5.71 | 5.68 | 5.61 | 5.57 | 5.49 |
| Purissima Hills | 1.18 | 1.17 | 1.15 | 1.13 | 1.10 |
| Redwood City | 4.80 | 4.76 | 4.71 | 4.63 | 4.53 |
| San Bruno | 1.83 | 1.80 | 1.75 | 1.70 | 1.63 |
| San José | 2.55 | 2.52 | 2.45 | 2.38 | 2.29 |
| Santa Clara | 2.55 | 2.52 | 2.45 | 2.38 | 2.29 |
| Stanford | 1.14 | 1.22 | 1.28 | 1.34 | 1.37 |
| Sunnyvale | 5.19 | 5.21 | 5.83 | 6.06 | 6.16 |
| Westborough | 0.49 | 0.48 | 0.46 | 0.45 | 0.43 |
| **Wholesale Total** | **82.8** | **82.8** | **82.8** | **82.8** | **82.8** |

**Attachment B: Updated 2020 UWMP Drought Cutbacks**

**Table K: Drought Allocations when Total Supplies Available to the Wholesale Customers are Equal to 74.5 MGD**

| Projected SF RWS Wholesale Purchases | 146.0 MGD | 147.9 MGD | 151.9 MGD | 156.3 MGD | 162.8 MGD |
|---|---|---|---|---|---|
| | Drought Allocation (MGD) | | | | |
| Agency | **2025** | **2030** | **2035** | **2040** | **2045** |
| ACWD | 3.92 | 3.87 | 3.77 | 3.66 | 4.17 |
| Brisbane/GVMID | 0.46 | 0.45 | 0.43 | 0.42 | 0.41 |
| Burlingame | 2.21 | 2.21 | 2.19 | 2.18 | 2.15 |
| Coastside | 0.71 | 0.70 | 0.67 | 0.64 | 0.61 |
| CalWater Total | 15.30 | 14.98 | 14.62 | 14.43 | 14.05 |
| Daly City | 1.82 | 1.77 | 1.71 | 1.65 | 1.57 |
| East Palo Alto | 0.96 | 0.98 | 1.03 | 1.19 | 1.32 |
| Estero | 2.08 | 2.07 | 2.05 | 2.02 | 2.00 |
| Hayward | 9.11 | 9.41 | 9.69 | 9.92 | 10.14 |
| Hillsborough | 1.66 | 1.64 | 1.60 | 1.55 | 1.49 |
| Menlo Park | 1.81 | 1.86 | 1.90 | 1.94 | 1.96 |
| Mid-Peninsula | 1.46 | 1.43 | 1.41 | 1.38 | 1.34 |
| Millbrae | 1.17 | 1.26 | 1.20 | 1.34 | 1.47 |
| Milpitas | 3.36 | 3.40 | 3.45 | 3.47 | 3.45 |
| Mountain View | 4.39 | 4.48 | 4.51 | 4.53 | 4.54 |
| North Coast | 1.19 | 1.17 | 1.15 | 1.12 | 1.07 |
| Palo Alto | 5.14 | 5.11 | 5.04 | 5.01 | 4.94 |
| Purissima Hills | 1.06 | 1.05 | 1.04 | 1.02 | 0.99 |
| Redwood City | 4.31 | 4.28 | 4.24 | 4.17 | 4.08 |
| San Bruno | 1.65 | 1.62 | 1.57 | 1.53 | 1.47 |
| San José | 2.30 | 2.27 | 2.21 | 2.14 | 2.06 |
| Santa Clara | 2.30 | 2.27 | 2.21 | 2.14 | 2.06 |
| Stanford | 1.03 | 1.10 | 1.15 | 1.21 | 1.24 |
| Sunnyvale | 4.67 | 4.69 | 5.25 | 5.45 | 5.54 |
| Westborough | 0.44 | 0.43 | 0.41 | 0.40 | 0.39 |
| **Wholesale Total** | **74.5** | **74.5** | **74.5** | **74.5** | **74.5** |

### Table 1. Normal Year Supplies and Demand Comparison

| Water Supply | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|
| Local Surface water | 30,000 | 70,000 | 185,000 | 185,000 | 185,000 |
| Recycled water | 16,000 | 19,000 | 22,000 | 25,000 | 28,000 |
| Imported water | 130,000 | 134,000 | 136,000 | 139,000 | 142,000 |
| SFPUC Supply | 55,000 | 56,000 | 59,000 | 61,000 | 63,000 |
| Local groundwater storage | 140,000 | 164,000 | 163,000 | 162,000 | 162,000 |
| Supply from Storage | 75,000 | 75,000 | 75,000 | 70,000 | 70,000 |
| **Supply Total** | **446,000** | **518,000** | **640,000** | **642,000** | **650,000** |
| **Demand Total** | **330,000** | **320,000** | **330,000** | **335,000** | **345,000** |
| **Difference** | **116,000** | **198,000** | **310,000** | **307,000** | **305,000** |

**NOTES:** Recycled water and SFPUC supply are rounded to the nearest 1,000 AF. All other supplies are rounded to the nearest 5,000 AF. Supplies shown are based on modeled estimates of available supplies. Actual availability during any given year depends on hydrology, groundwater recharge operations and conditions, and other factors. Groundwater storage shown assumes groundwater can be drawn down to the severe stage of the Water Shortage Contingency Plan. This does not represent a sustainable long-term groundwater condition, but these supplies represent water that may be needed to get through a prolonged drought. Imported water allocations are provided by DWR in their Delivery Capability Report (DCR) 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

### Table 2. Single Dry Year Supply and Demand Comparison

| Water Supply | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|
| **Supply Total** | 355,000 | 373,000 | 497,000 | 503,000 | 505,000 |
| **Demand Total** | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| **Difference** | 25,000 | 53,000 | 167,000 | 168,000 | 160,000 |

**NOTES:** All numbers are rounded to the nearest 5,000 AF. The available groundwater is based on modeled estimates if the 1977 hydrology was repeated in the future. Supplies available for the single year drought represent water needed not only for that single drought year, but also water that may be needed for a prolonged drought. Valley Water would manage the supplies reported in the table assuming the drought may continue beyond a single year, and thus not all supplies are expected to be used by retailers during the single year drought. Imported water allocations are provided by DWR in their DCR 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

## Table 3. Multiple Dry Years Supply and Demand Comparison

| | | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|
| **First Year** | Supply Totals | 345,000 | 349,000 | 491,000 | 483,000 | 487,000 |
| | Demand Totals | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| | Difference | 15,000 | 29,000 | 161,000 | 148,000 | 142,000 |
| **Second Year** | Supply Totals | 370,000 | 376,000 | 477,000 | 482,000 | 501,000 |
| | Demand Totals | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| | Difference | 40,000 | 56,000 | 147,000 | 147,000 | 156,000 |
| **Third Year** | Supply Totals | 340,000 | 349,000 | 443,000 | 450,000 | 448,000 |
| | Demand Totals | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| | Difference | 10,000 | 29,000 | 113,000 | 115,000 | 103,000 |
| **Fourth Year** | Supply Totals | 347,000 | 341,000 | 416,000 | 421,000 | 429,000 |
| | Demand Totals | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| | Difference | 17,000 | 21,000 | 86,000 | 86,000 | 84,000 |
| **Fifth Year** | Supply Totals | 341,000 | 365,000 | 430,000 | 440,000 | 444,000 |
| | Demand Totals | 330,000 | 320,000 | 330,000 | 335,000 | 345,000 |
| | Difference | 11,000 | 45,000 | 100,000 | 105,000 | 99,000 |

**NOTES:** All numbers are rounded to the nearest 5,000 AF. WEAP model output for hydrologic years 1988-1992 was used to represent years 1 through 5 of the drought. Imported water allocations are provided by DWR in their DCR 2019, which does not include projected future regulations nor the hydrologic sequence for the most recent 2012-2016 drought. For comparison, the lowest total annual imported delivery during the 1987-1992 drought in the DCR 2019 dataset is 83,200AF, while the actual lowest annual imported delivery during the 2012-2016 drought was 60,320 AF. However, through Valley Water's Monitoring and Assessment Program, Valley Water is conservatively planning for investments by considering severe droughts, such as the 2012-2016 drought, will occur in the future. Projects included in the supply projections include transfer Bethany pipeline (2025); Anderson dam seismic retrofit and potable reuse (2030); Guadalupe, Calero, and Almaden dam seismic retrofits and Pacheco Reservoir Expansion (2035); and an additional 35,000 AF of conservation (to reach Valley Water's goal of 109,000 AF by 2040 with a 1992 baseline).

# APPENDIX I

City of Sunnyvale
2020 Urban Water Management Plan
Sunnyvale Water System Seismic Vulnerability Assessment

# Sunnyvale Water System
# Seismic Vulnerability Assessment

*Prepared for:*
*City of Sunnyvale*

*Prepared by:*

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*John Eidinger*

*G&E Report 83.01.01, Revision A (draft)*
*December 8, 2004*

# TABLE OF CONTENTS

# ABBREVIATIONS

| | |
|---|---|
| AC | Asbestos Cement pipe |
| ADD | Average Daily Demand (MGD) |
| BDPL | Bay Division Pipeline |
| CI | Cast Iron pipe |
| DI | Ductile Iron pipe |
| DWR | Department of Water Resources |
| g | acceleration of gravity (=32.2 feet / second / second) |
| G&E | G&E Engineering Systems Inc. |
| GIS | Geographical Information System |
| gpm | gallons per minute |
| HTWTP | Harry Tracy Water Treatment Plant |
| km | kilometer |
| M | Magnitude (moment magnitude) |
| MG | Million Gallons |
| MGD | Million Gallons per Day |
| MWD | Maximum Winter Demand (MGD) |
| PGA | Peak Ground Acceleration (measured in g) |
| PGD | Permanent Ground Displacement (measured in inches) |
| PGV | Peak Ground Velocity (measured in inches/second) |
| PG&E | Pacific Gas and Electric |
| PVC | Polyvinyl Chloride pipe |
| SBA | South Bay Aqueduct |
| SCADA | Supervisory Control and Data Acquisition system |
| SCVWD | Santa Clara Valley Water District |
| SFPUC | San Francisco Public Utilities Commission |
| SWP | State Water Project |
| USBR | United States Bureau of Reclamation |
| WTP | Water Treatment Plant |

# Chapter 1 Introduction

This report provides a seismic vulnerability assessment of the City of Sunnyvale's water system. The performance of the water system is described after earthquakes on the San Andreas, Hayward and Calaveras faults. A seismic improvement program is suggested that would reduce the adverse impacts of earthquakes on the Sunnyvale water system.

## 1.1 Objective and Scope

This report is organized into the following chapters:

- Chapter 2 provides an overview description of the major components of the SCVWD and SFPUC systems that provide water to Sunnyvale system, as well as a more detailed description of the Sunnyvale water system.
- Chapter 3 provides a description of the earthquake hazards that might affect the Sunnyvale water system.
- Chapter 4 provides the vulnerability analyses of the pipelines, reservoirs and pump and well stations in the Sunnyvale water system.
- Chapter 5 describes the response of the Sunnyvale water system after earthquakes.
- Chapter 6 provides possible capital improvements and emergency response activities that can be taken by Sunnyvale to improve the ability of the water system to provide satisfactory service after earthquakes in a cost effective manner.

## 1.2 Key Findings

For the San Andreas M 7.9 earthquake, the outcomes are severe for Sunnyvale water customers. Damage to existing tanks will result is loss of local storage needed for fire fighting and other uses in the first day after the earthquake. Widespread pipeline damage in the northern parts of Zone 1 will rapidly depressurize Zone 1, leading to widespread outages in that area. It will take up to 67 days to complete distribution system pipe repairs in the Sunnyvale system. It will take up to 15 days for the SFPUC to reliably restore supply to Sunnyvale. It will take up to 30 days for the SCVWD to reliably restore supply to Sunnyvale.

For the Hayward M 6.67 earthquake, the negative outcomes should be moderate for Sunnyvale customers, with about 11% of customers losing water supply, and essentially all customers restored to service within 10 days. For up to 15 days, Sunnyvale may have to rely only on local wells plus SCVWD supplies.

For the Calaveras M 6.23 earthquake, the negative outcomes should be very modest for Sunnyvale customers, with no more than 1% of customers losing water supply, and only for short periods of time.

A Seismic Improvement Program (SIP) is recommended that would substantially reduce the impacts from earthquakes. The highest priority upgrades (called Priority 1) cost about $1,438,000. This includes mitigation of main inlet-outlet pipes entering tanks, anchorage of two tanks, improving the emergency restoration capability, and developing a pipeline design manual for future pipe installations. This work should be implemented in the next 2 to 5 years.

A more costly effort ($3,552,000) is described to implement moderate priority upgrades (called Priority 2). This includes mitigation of overflow and drain pipes entering tanks, anchorage of three additional tanks, procurement of portable hose, adding a second connection of the SFPUC pipelines at the Alivso-Mary turnout, and minor structural improvements for pump stations. This work should be implemented in the next 5 to 20 years.

## *1.3 Limitations*

The professional services have been performed using the degree of care and skill ordinarily exercised under similar circumstances by reputable engineers practicing in the field of structural or civil engineering in this or similar localities at this time. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this information by other parties or for different purposes may not be appropriate.

# Chapter 2 System Description

Located in Santa Clara County, the City of Sunnyvale is an urban industrial and residential community of 132,000 residents (2001) with a workday population of about 160,000. The service area for the water utility is contiguous with the City limits; however, Cal Water service provides water for several small areas within the City of Sunnyvale. The service area encompasses about 24 square miles. The resident population in Sunnyvale is projected to increase to about 150,000 people by the year 2030.

Sections 2.1 to 2.4 describe the main features of the water system. Section 2.1 describes how the SCVWD system serves the Sunnyvale water system. Section 2.2 describes how the SFPUC system serves the Sunnyvale water system. Sections 2.3 and 2.4 describe the Sunnyvale water system.

## *2.1 SCVWD System Serving Sunnyvale*

The Sunnyvale water system receives treated surface water from the Santa Clara Valley Water District (SCVWD) via two SCVWD turnouts along the West Pipeline: Sunnyvale and Barranca.

Figure 2-1 shows a schematic profile of the main facilities in the SCVWD system. Figure 2-2 shows the main pipelines in the SCVWD system. Figure 2-3 shows the main features of the West pipeline.

The SCVWD obtains its raw water from local area reservoirs and via the South Bay Aqueduct from Bethany reservoir and via the Pacheco and Santa Clara Conduits from San Luis reservoir. The SCVWD water for Sunnyvale is treated at the Rinconada Water Treatment Plant and is then delivered to Sunnyvale via the West Pipeline and the Sunnyvale Distributary. Under normal operating conditions, the San Luis, Anderson or Calero reservoirs are the source of raw water for Sunnyvale, via the Pacheco, Santa Clara, Cross Valley and the Almaden Valley Pipelines. It is also possible to get SBA water via the Central pipeline to the Rinconada WTP.

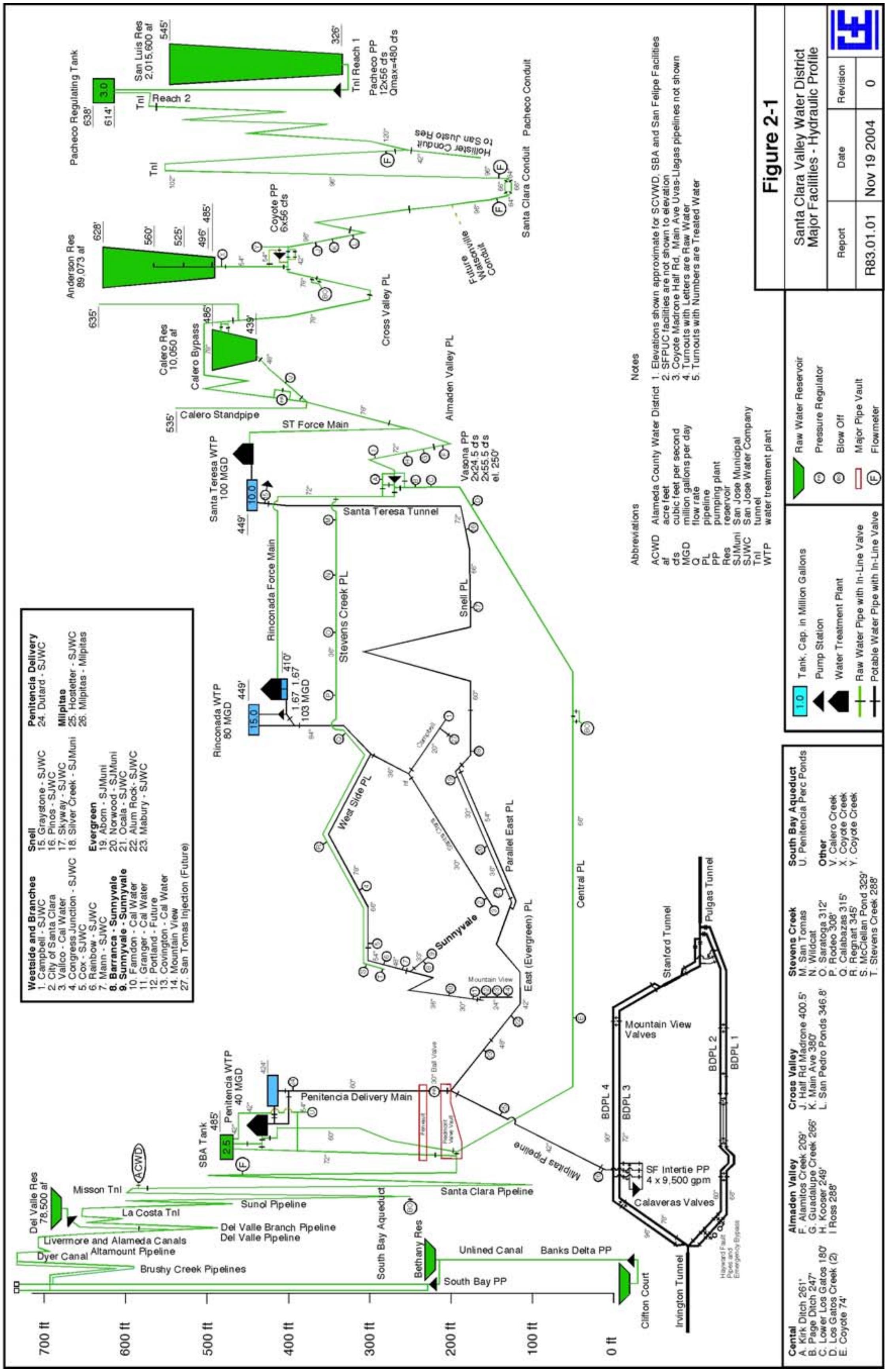


Figure 2-1
Santa Clara Valley Water District
Major Facilities - Hydraulic Profile
Report
R83.01.01
Date
Nov 19 2004
Revision
0
Pacheco Regulating Tank
San Luis Res
2,015,600 af
Pacheco PP
12x56 cfs
Qmax=480 cfs
Anderson Res
89,073 af
Coyote PP
6x56 cfs
Calero Res
10,050 af
Calero Bypass
Calero Standpipe
Cross Valley PL
Almaden Valley PL
Santa Teresa WTP
100 MGD
ST Force Main
Santa Teresa Tunnel
Vasona PP
2x24.5 cfs
2x55.5 cfs
el. 250'
Rinconada WTP
80 MGD
Rinconada Force Main
Stevens Creek PL
Snell PL
West Side PL
Parallel East PL
Central PL
East (Evergreen) PL
Penitencia WTP
40 MGD
Penitencia Delivery Main
SBA Tank
Milpitas Pipeline
Mountain View Valves
Stanford Tunnel
Pulgas Tunnel
SF Intertie PP
4 x 9,500 gpm
Calaveras Valves
Irvington Tunnel
Clifton Court
Del Valle Res
78,500 af
Misson Tnl
La Costa Tnl
Sunol Pipeline
Santa Clara Pipeline
Del Valle Branch Pipeline
Del Valle Pipeline
Livermore and Alameda Canals
Altamount Pipeline
Dyer Canal
Brushy Creek Pipelines
South Bay Aqueduct
Bethany Res
Unlined Canal
Banks Delta PP
South Bay PP
Santa Clara Conduit
Pacheco Conduit
Hollister Conduit
to San Justo Res
Future Watsonville Conduit
700 ft
600 ft
500 ft
400 ft
300 ft
200 ft
100 ft
0 ft
Notes
1. Elevations shown approximate for SCVWD, SBA and San Felipe Facilities
2. SFPUC facilities are not shown to elevation
3. Coyote Madrone Half Rd, Main Ave Uvas-Llagas pipelines not shown
4. Turnouts with Letters are Raw Water
5. Turnouts with Numbers are Treated Water
Abbreviations
ACWD Alameda County Water District
af acre feet
cfs cubic feet per second
MGD million gallons per day
Q flow rate
PL pipeline
PP pumping plant
Res reservoir
SJMuni San Jose Municipal
SJWC San Jose Water Company
Tnl tunnel
WTP water treatment plant
Tank, Cap. in Million Gallons
Pump Station
Water Treatment Plant
Raw Water Pipe with In-Line Valve
Potable Water Pipe with In-Line Valve
Raw Water Reservoir
Pressure Regulator
Blow Off
Major Pipe Vault
Flowmeter
Westside and Branches
1. Campbell - SJWC
2. City of Santa Clara
3. Vallco - Cal Water
4. Congress Junction - SJWC
5. Cox - SJWC
6. Rainbow - SJWC
7. Mann - SJWC
8. Barranca - Sunnyvale
9. Sunnyvale - Sunnyvale
10. Farndon - Cal Water
11. Granger - Cal Water
12. Portland - Future
13. Covington - Cal Water
14. Mountain View
27. San Tomas Injection (Future)
Snell
15. Graystone - SJWC
16. Pinos - SJWC
17. Skyway - SJWC
18. Silver Creek - SJMuni
Evergreen
19. Aborn - SJMuni
20. Norwood - SJMuni
21. Ocala - SJWC
22. Alum Rock- SJWC
23. Mabury - SJWC
Penitencia Delivery
24. Dutard - SJWC
Milpitas
25. Hostetter - SJWC
26. Milpitas - Milpitas
Cental
A. Kirk Ditch 261'
B. Page Ditch 247'
C. Lower Los Gatos 180'
D. Los Gatos Creek (2)
E. Coyote 74'
Almaden Valley
F. Alamitos Creek 209'
G. Guadalupe Creek 266'
H. Kooser 249'
I Ross 288'
Cross Valley
J. Half Rd Madrone 400.5'
K. Main Ave 360'
L. San Pedro Ponds 346.8'
Stevens Creek
M. San Tomas
N. Wildcat
O. Saratoga 312'
P. Rodeo 308'
Q. Calabazas 315'
R. Regnart 345'
S. McClellan Pond 329'
T. Stevens Creek 288'
South Bay Aqueduct
U. Penitencia Perc Ponds
Other
V. Calero Creek
X. Coyote Creek
Y. Coyote Creek

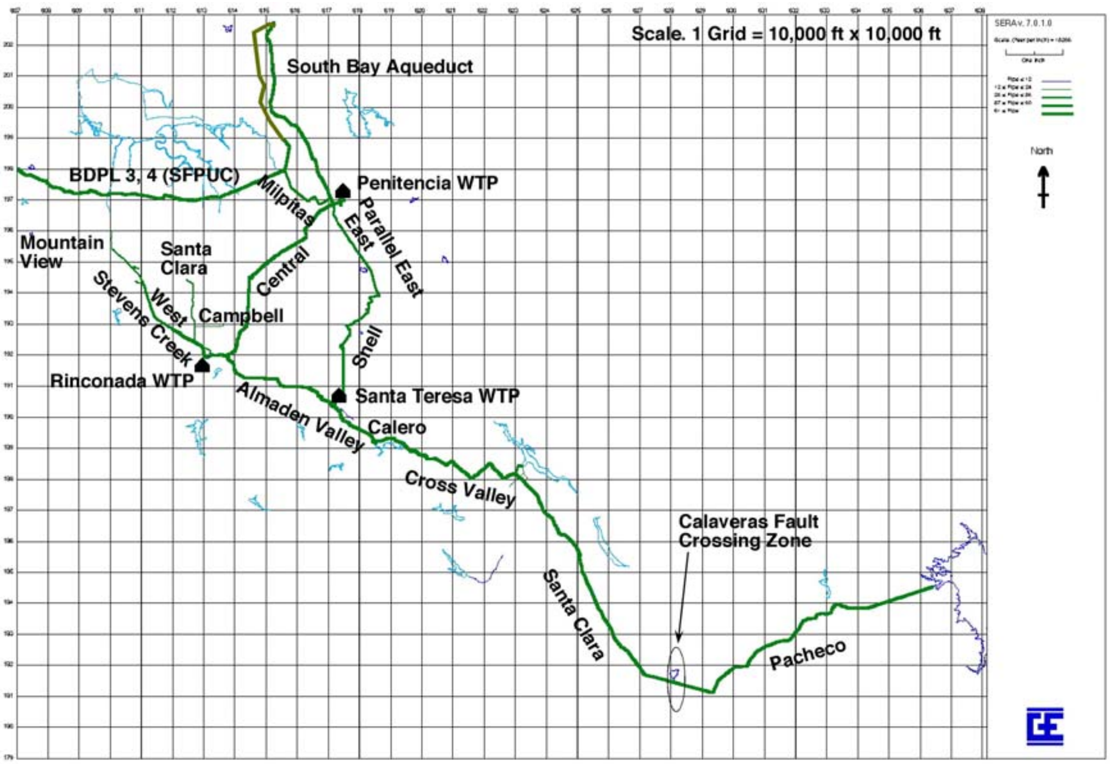



*Figure 2-2. SCVWD Pipelines*

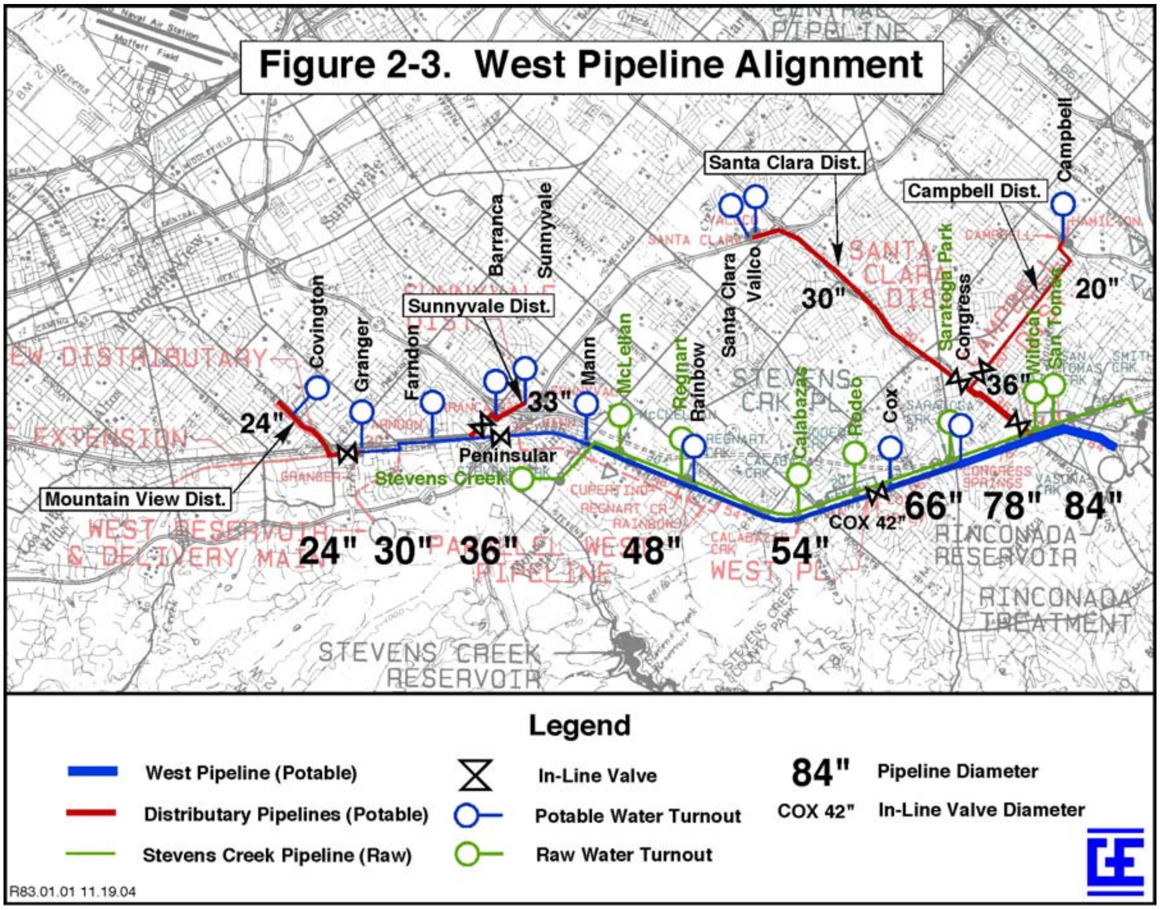



*Figure 2-3. West Pipeline Alignment*

## 2.2 SFPUC System Serving Sunnyvale

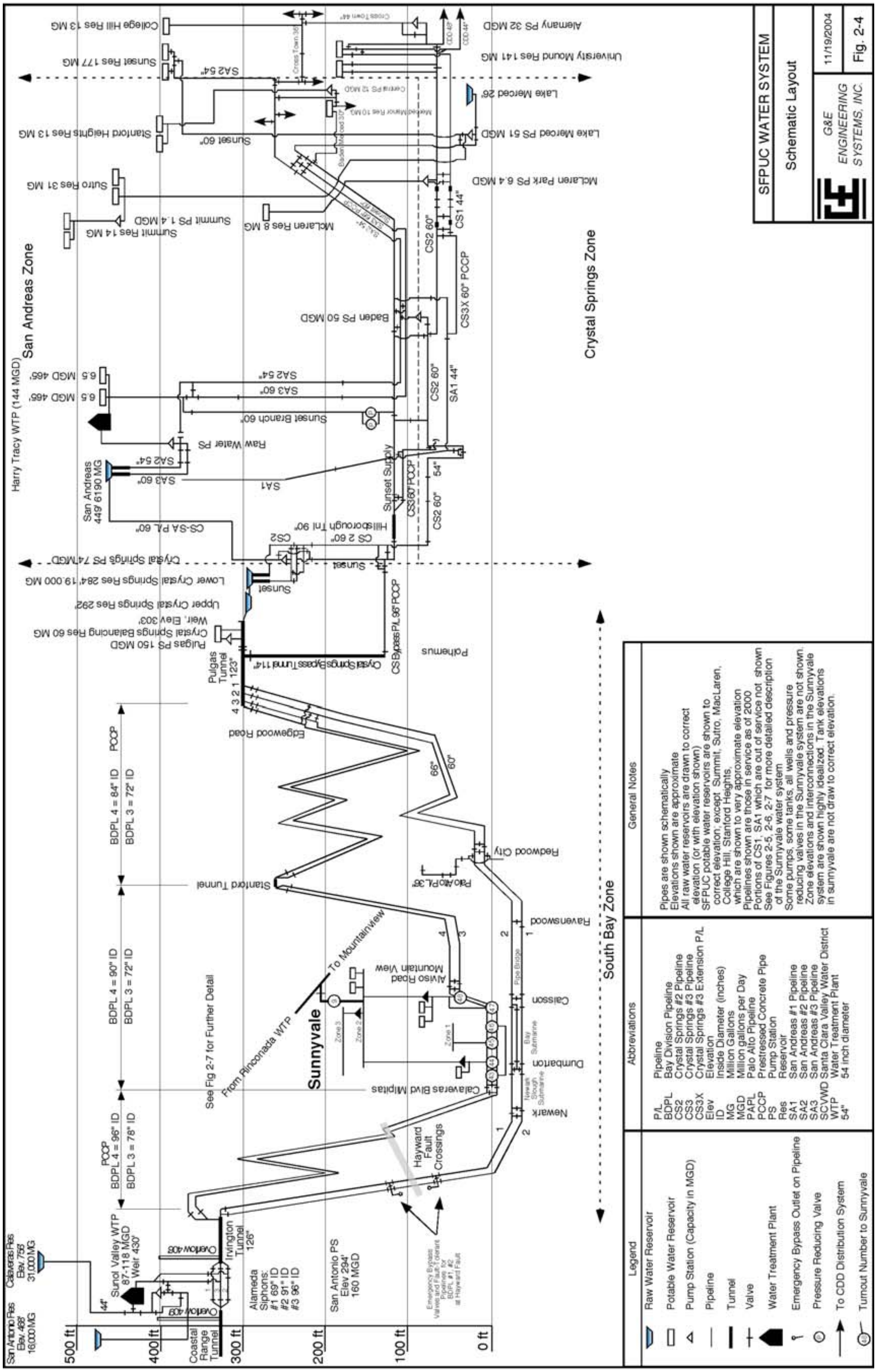
Figure 2-4 shows a schematic layout of the SFPUC system, and the six turnouts that connect the SFPUC with the Sunnyvale water system.

- The normal flow of water in the SFPUC system is from left to right, as shown in Figure 2-4. Water begins at the left where it goes through the Irvington Tunnel. Then the water is split into four pipelines, called the BDPL No. 1, 2, 3 and 4 pipes. BDPL No. 1 and 2 are parallel pipelines running from the Irvington tunnel westwards to where these pipes cross the bay, immediately south of the Dumbarton Bridge. BDPL No. 3 and 4 are parallel pipelines running from the Irvington tunnel southwards towards San Jose, where they traverse south of the Bay, and then head northwards up the Peninsula towards San Francisco. BDPL No. 3 and 4 pipelines combine into a single tunnel at the Stanford Campus, called the Stanford Tunnel.

- At the Pulgas Tunnel, all four BDPL pipelines re-connect, feeding into the Pulgas Tunnel. The water then enters Pulgas and the Crystal Springs Bypass tunnels. At the northern terminus of the Crystal Springs Bypass tunnel, the water is split into two pipelines, the Sunset Supply pipe and the Crystal Springs No. 2 pipe.

- There are six turnouts from the SFPUC system to the City of Sunnyvale water system. Figure 2-5 shows the geographic locations of these turnouts. Using the SFPUC nomenclature, these are called turnouts 43, 44, 45, 46, 47 and 48, from east to west, respectively.

The water in the SFPUC system is normally potable. Under normal conditions, this water comes from the Hetch Hetchy reservoir in Yosemite National Park, and / or from the Calaveras and San Antonio reservoirs via the Sunol Water Treatment Plant. As will be described later in this report, under certain post-earthquake conditions, it might be possible to get water from the Harry Tracy Water Treatment Plant to the City of Sunnyvale, by reversing the flow direction in the SFPUC system.


SFPUC WATER SYSTEM
Schematic Layout
G&E ENGINEERING SYSTEMS, INC.
11/19/2004
Fig. 2-4
San Andreas Zone
Crystal Springs Zone
South Bay Zone
Sunnyvale
Harry Tracy WTP (144 MGD)
Sunol Valley WTP 87-118 MGD Weir 430'
San Antonio PS Elev 294' 160 MGD
Irvington Tunnel 126"
Stanford Tunnel
Pulgas Tunnel 123"
Crystal Springs Bypass Tunnel 114"
Hayward Fault Crossings
See Fig 2-7 for Further Detail
From Rinconada WTP
To Mountainview
Legend
Raw Water Reservoir
Potable Water Reservoir
Pump Station (Capacity in MGD)
Pipeline
Tunnel
Valve
Water Treatment Plant
Emergency Bypass Outlet on Pipeline
Pressure Reducing Valve
To CDD Distribution System
Turnout Number to Sunnyvale
Abbreviations
P/L Pipeline
BDPL Bay Division Pipeline
CS2 Crystal Springs #2 Pipeline
CS3 Crystal Springs #3 Pipeline
CS3X Crystal Springs #3 Extension P/L
Elev Elevation
ID Inside Diameter (inches)
MG Million Gallons
MGD Million gallons per Day
PAPL Palo Alto Pipeline
PCCP Prestressed Concrete Pipe
PS Pump Station
Res Reservoir
SA1 San Andreas #1 Pipeline
SA2 San Andreas #2 Pipeline
SA3 San Andreas #3 Pipeline
SCVWD Santa Clara Valley Water District
WTP Water Treatment Plant
54" 54 inch diameter
General Notes
Pipes are shown schematically
Elevations shown are approximate
All raw water reservoirs are drawn to correct elevation (or with elevation shown)
SFPUC potable water reservoirs are shown to correct elevation; except: Summit, Sutro, MacLaren, College Hill, Stanford Heights, which are shown to very approximate elevation
Pipelines shown are those in service as of 2000
Portions of CS1, SA1 which are out of service not shown
See Figures 2-5, 2-6, 2-7 for more detailed description of the Sunnyvale water system
Some pumps, some tanks, all wells and pressure reducing valves in the Sunnyvale system are not shown.
Zone elevations and interconnections in the Sunnyvale system are shown highly idealized. Tank elevations in sunnyvale are not draw to correct elevation.

## 2.3 Sunnyvale Water Distribution System

### 2.3.1 Overall Description, Sources of Water, Water Demand

The City of Sunnyvale owns, operates and maintains the potable water distribution system serving Sunnyvale (Figure 2-5), with the exception of a few small areas served by Cal Water.

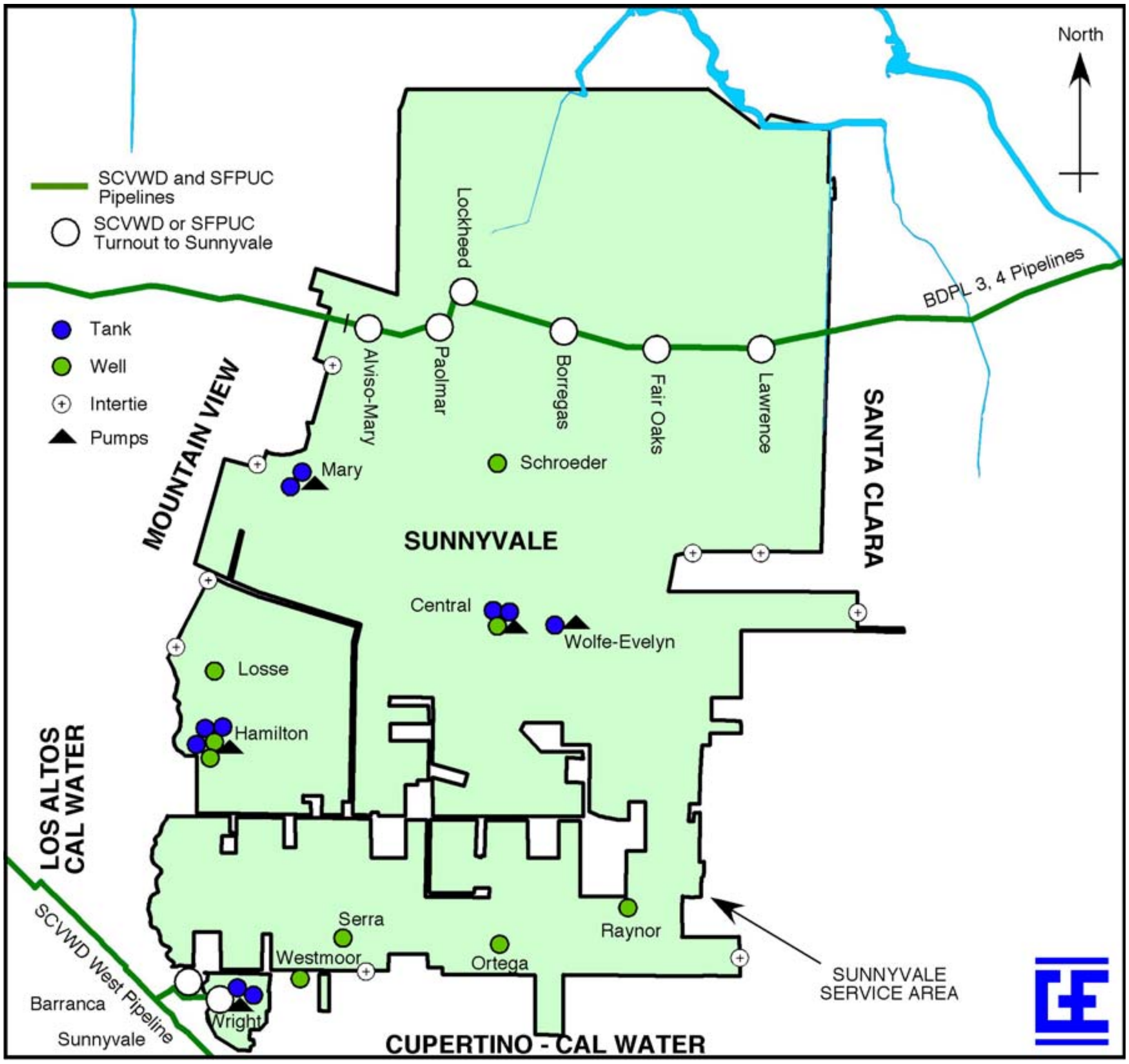



*Figure 2-5. Sunnyvale Service Area with Major Facilities*

In 1999, total Sunnyvale ADD potable water demand in Sunnyvale was 24.6 MGD with an additional 0.05 MGD of non-potable water demand. In fiscal 1999-00, ADD was 23.11 MGD. In 2000-01, ADD was 23.55 MGD. In 2001-02, ADD water demand was 22.3 MGD.

Average winter time demand for Sunnyvale (as measured for the months of December, January, February, March, and using 2001-02 SFPUC data) is about 64% of the yearly ADD.

In 2001-02, there were about 28,923 service connections in the system. Of these, about 90% were residential customers. Residential demand amounts to about 58% of total system demand.

Sunnyvale's water supply is currently made up of about 45% SFPUC water (44% in 2001/02), 45% SCVWD surface water (47% in 2001/02), and 10% (9% in 2001-02) from wells. Sunnyvale can supply 100% of their average day demand with only SFPUC supplies, or with only SCVWD surface water supplies.

SFPUC water is the only normal supply for Sunnyvale's Zone 1 (pressure zone boundaries are shown in Figure 2-6). There are no wells that directly feed into Zone 1

SCVWD surface water is the normal primary supply for Sunnyvale's Zones 2 and 3; with some well water making up the rest of the normal supply for Zones 2 and 3.

If SCVWD surface water supply was interrupted, Sunnyvale could provide peak summer day demand by relying on SFPUC and well water, assuming no other damage to the Sunnyvale water system. A one week long shutdown the of SCVWD Rinconada WTP did not pose any special problems for the Sunnyvale water system.

If the SFPUC switches to fluoridated water, then Sunnyvale would like SCVWD to start fluoridating its water. By using similar fluoridated water, the City of Sunnyvale would avoid the problem of having varied levels of fluoride in their water.

Sunnyvale uses recycled water in parts of its service area, including parks. The use of recycled water is expected to increase in the future. For purposes of this report, the recycled water system is assumed to not impact the SCVWD supply requirements following earthquake or other hazard events.

### 2.3.2 Water Demands Under Earthquake Emergency Conditions

Under earthquake emergency conditions, potential loss of water supply from the SCVWD at one or more turnouts would begin to impact Sunnyvale customers when local water storage is emptied, and when flow from local wells cannot keep up with local demand, assuming there was no damage to the Sunnyvale distribution system.

It would be desirable for Sunnyvale to be able to provide sufficient water to its customers such that the lack of water does not delay Sunnyvale to rapidly recover after a major earthquake. By "recovery" it is meant that there should be sufficient water to meet the domestic needs of the residential population, plus sufficient water to allow industry, commercial, institutional and municipal customers to continue near normal operations. It is implied that the use of water for outdoor irrigation purposes can be curtailed after a major earthquake, without significant (more than a few percent) impact to the economy of Sunnyvale as a whole.

It is recognized that within the first hours to days after a major earthquake, there may be variations in water demand due to the following issues:

- Damage to distribution system pipelines can cause severe leakage of water in the system, resulting in drop in pressure until such time that the leaking pipelines can be valved out, and then eventually repaired. Leaks can occur in the Sunnyvale potable distribution mains as well as via service connections connected to the mains.

- Fires may ignite after a major earthquake. If these fires are large or spread substantially, there may be a material increase in water demand in the system for purposes of fire fighting. In the Oakland Hills firestorm of 1991, peak water demands used for fire fighting reached about 30,000 gpm (43 MGD) for about 48 hours after the initial ignition.

- Concurrent earthquake damage to the Sunnyvale water utility customers (residences, commercial, industrial, etc.) will alter normal water demands by those users (initially higher for customers that sustain pipe breaks of their own service lines; subsequently lower for those customers that curtail normal operations). Ideally, it is desired to be able to restore at least MWD to Sunnyvale customers rapidly after a major earthquake; in this way, the water system will not be the limiting factor in restoring Sunnyvale to roughly pre-earthquake functional operations.

### 2.3.3 Non-Earthquake Emergency Conditions

The Sunnyvale domestic water system is designed to provide fire flows for "normal" fire emergencies in the area. Typical target fire flow rates for various types of development are as follows:

- 1,500 gpm x 2 hours (single family residential)
- 2,500 gpm x 2 hours (multi family residential)
- 3,000 gpm x 3 hours (commercial)
- 5,000 gpm x 4 hours (industrial)

Appendix III-A of the UFC provides a more detailed list of requirements for fire flows as a function of size and type of structure and use of sprinklers. Actual fire flow requirements for Sunnyvale may vary from those listed above.

## 2.4 Water Distribution System Infrastructure

### 2.4.1 Distribution Pipelines

The Sunnyvale waters system has about 280 miles of distribution pipelines. The largest diameter pipeline in the Sunnyvale water system is 30" diameter. Figure 2-6 shows the main pipelines.

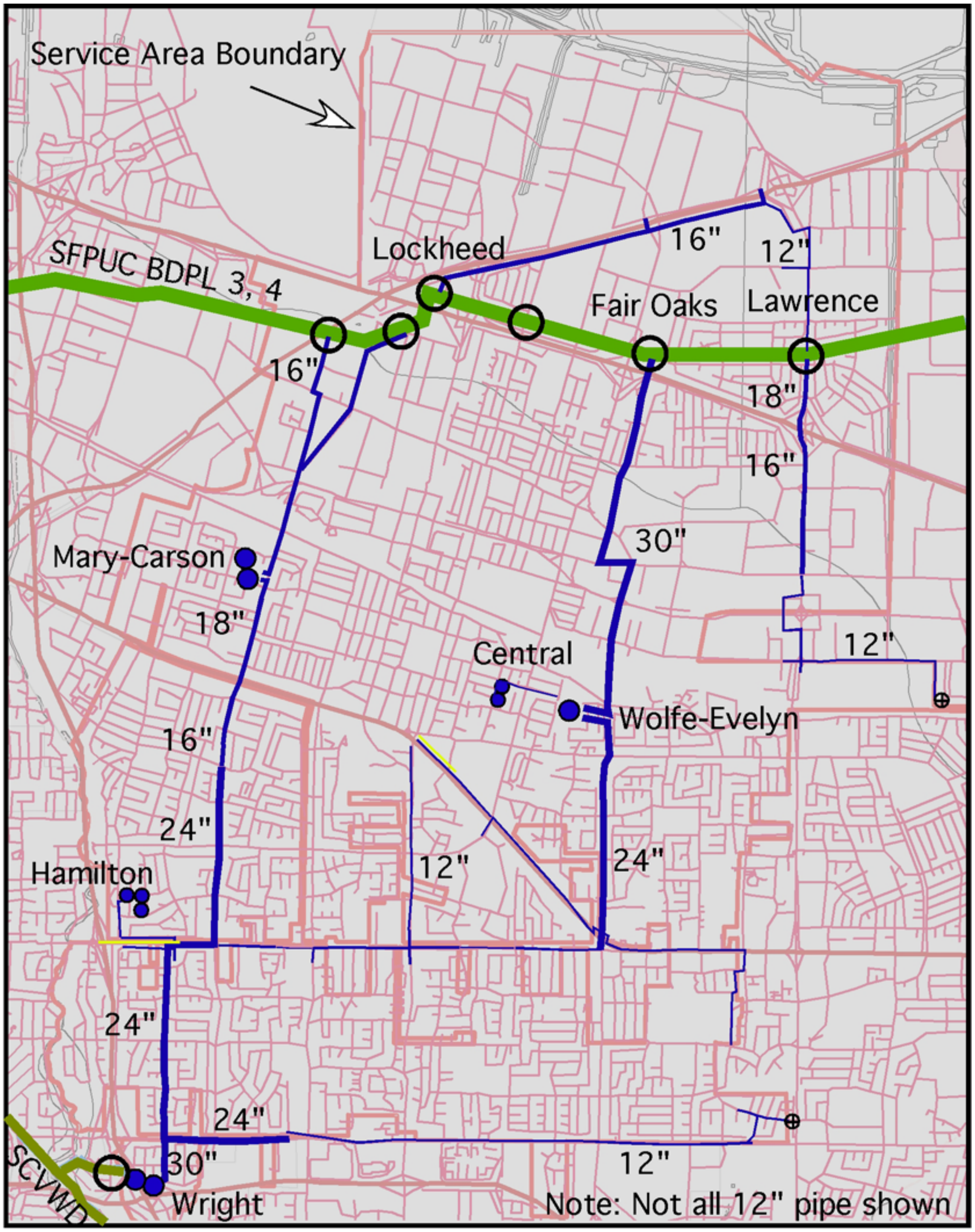



*Figure 2-6. Major Pipelines in the Sunnyvale Water System*

The pipeline materials in use largely reflect the common materials in use at the time of installation. Cast Iron (CI) pipelines are the oldest, and are no longer used for new installations. The bulk of the water system has been built since 1960. Asbestos Cement (AC) pipelines were common installations from about 1960 to 1985. PVC and DI pipelines are the most common material used since 1985 to the current time.

A significant portion of distribution pipelines are located in the high-susceptible liquefaction zones in the north part of the City of Sunnyvale (see Figure 3-3). Sunnyvale staff are aware of the issue, and recognize that the problem is exacerbated by corrosion impacts to the metal pipes in this area. Sunnyvale is currently in the process of replacing the metal pipes in this area with either PVC or coated ductile iron pipes. Detailed maps of pipe materials by location were not provided; for purposes of this report it is assumed that the bulk of the existing distribution pipe inventory in this area is AC or CI.

### 2.4.2 Pressure Zones

The system is divided into 3 pressure zones (Figure 2-7). Zone 1 is fed (normally) by SFPUC water. Zones 2 and 3 are fed by SCVWD surface and well water. Figure 2-8 provides additional detail.

Zone 1 is the lowest elevation zone, with a typical hydraulic gradient of 243 feet. Zone 2 is the middle elevation zone, with a typical hydraulic gradient of 316 feet. Zone 3 is the highest elevation zone, with a typical hydraulic gradient of 378 feet. The pressure for each zone is set primarily from the pressure in the SCVWD or SFPUC pipelines (via PRV), or via the pressure supplied from local wells or booster pump stations.

The following describes the main facilities in each zone:

- Zone 1. Central Well, with two 0.5 MG tanks and a booster pump station. This site does not have backup power.

- Zone 1. Schroeder Well. This well is approved for emergency backup operation. This well does not have backup power.

- Zone 1. Wolfe-Evelyn pump station. This site includes a 5.0 MG tank and a booster pump station. The site gets water via the SFPUC Fair Oaks (#44) turnout (no PRV). The pump station includes a propane powered pump.

- Zone 1. The Sunnyvale recycled water system serves parts of Zone 1. This system includes a 2.0 MG tank (San Lucar) with a booster pump station; the pump station does not have backup power. Note: evaluation of the recycled water system and its components is not included in this report.

- Zone 2. The Mary Carson site includes two 5.0 MG tanks and a booster pump station. The site gets water via the SFPUC Mary - Alviso turnout (no PRV). The pump station includes a propane powered pump.

- Zone 2. Hamilton Well, with three 0.5 MG tanks and a booster pump station with a propane powered backup pump.

- Zone 2. Raynor Well. The well site has a standby diesel-powered emergency generator.

- Zone 2. Ortega Well. This well site does not have backup power.

- Zone 2. Serra Well. This well site does not have backup power.

- Zone 3. Wright Avenue plant site includes two 5.0 MG reservoirs, and a booster pump station with a propane powered pump.

- Zone 3. Westmoor well. This site does not have backup power.

### 2.4.3 Potable Water Reservoirs

The distribution system includes 10 tanks with total storage capacity of 27.5 MG. The five largest tanks hold 5 MG each; the smallest 5 tanks hold 0.5 MG each. Each tank includes a booster pump station. In total, these tanks could supply about 1.3 days at ADD rate.

| Facility | Capacity (MG) | Type | Attached Pipes |
|---|---|---|---|
| Wolfe-Evelyn Water Plant | 5.0 | Welded Steel, Concrete ring | Inlet 24", Outlet 24" Overflow 16", drain |
| Central Water Plant #1 | 0.5 | Riveted Steel | Inlet 8", Outlet 10" Overflow 8" Drain 6" |
| Central Water Plant #2 | 0.5 | Welded Steel, Concrete Ring | Inlet 8", Outlet 10" Overflow 6" Drain 6" |
| Mary-Carson Water Plant #1 | 5.0 | Welded Steel, Concrete Ring | Inlet 16", Outlet 16" Overflow 18" Drain 6" |
| Mary-Carson Water Plant #2 | 5.0 | Welded Steel, Concrete Ring | Inlet 16", Outlet 16" Overflow 15" Drain 6" |
| Hamilton Water Plant #1 | 0.5 | Welded Steel, Concrete Ring | Inlet 8", Outlet 10" Drain 6", Overflow |
| Hamilton Water Plant #2 | 0.5 | Welded Steel, Concrete Ring | Inlet 8", Outlet 10" Drain 6", Overflow |
| Hamilton Water Plant #3 | 0.5 | Welded Steel, Concrete Ring | Inlet 8", Outlet 10" Drain 6", Overflow |
| Wright Ave #1 East | 5.0 | Welded Steel, Concrete Ring | Inlet 30", Outlet 30" Spare 30", Drain |
| Wright Ave #2 West | 5.0 | Welded Steel, Concrete Ring | Inlet 30", Outlet 30" Outlet 12", Drain 6" Overflow |

*Table 2-6. Water Tanks in Sunnyvale Water System*

Water from any of these ten these tanks can be moved to any of the three pressure zones.

Nine tanks are unanchored welded steel tanks; the tenth tank (Tank #1 at the Central site) is an unanchored riveted steel tank. All 5.0 MG tanks have knuckle roofs; all 0.5MG tanks have flat roofs. Table 2-6 lists all the attached pipes to these tanks. In most every case, the pipes were installed without addressing the possibility that the tank walls can uplift in large earthquakes, thereby damaging the pipes. In total, there are currently more than 20 side-entry inlet-outlet and drain pipes for these tanks that may be prone to damage due to tank wall uplift. Seismic mitigation for these pipes is addressed in Section 5 of this report.

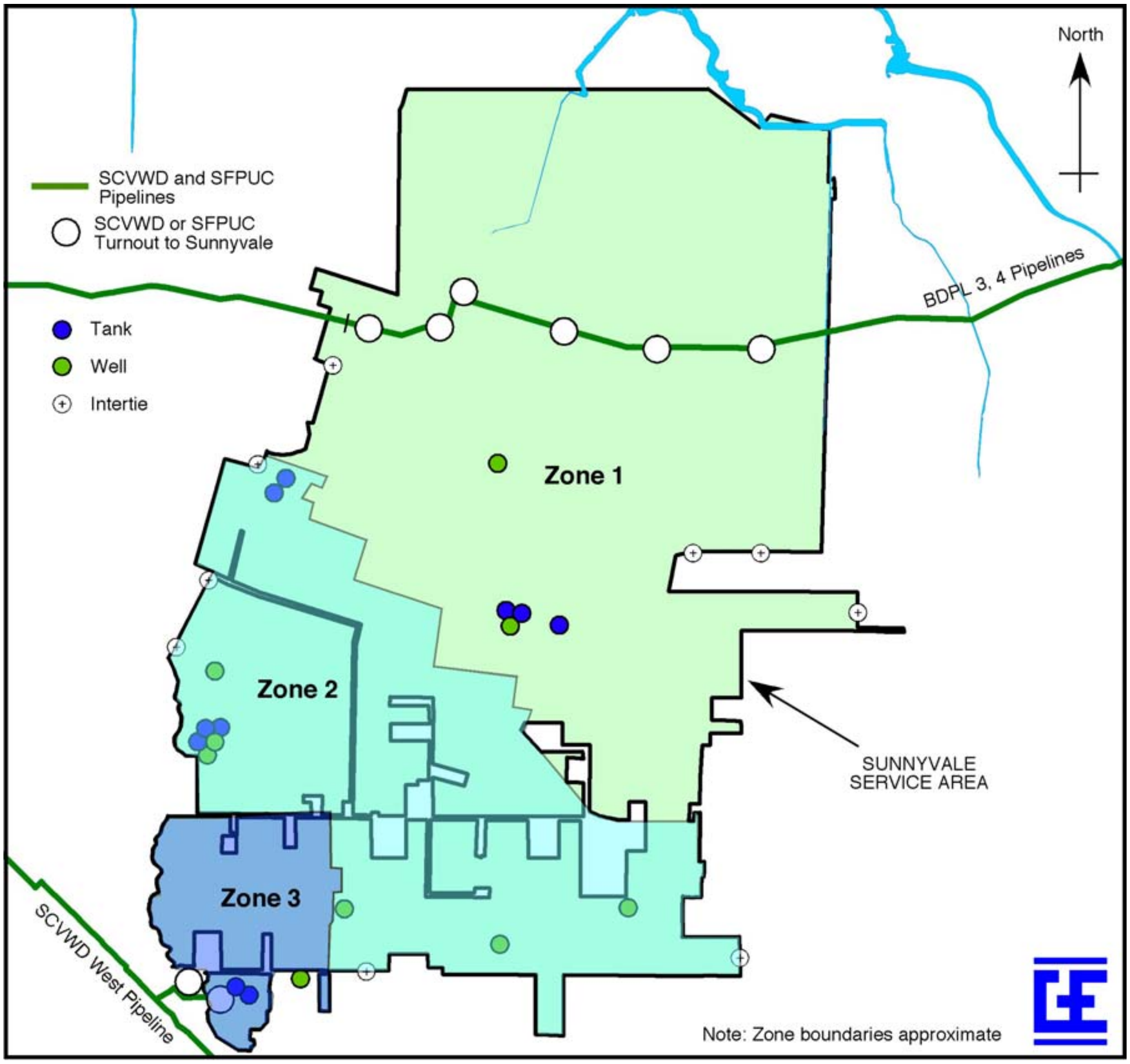
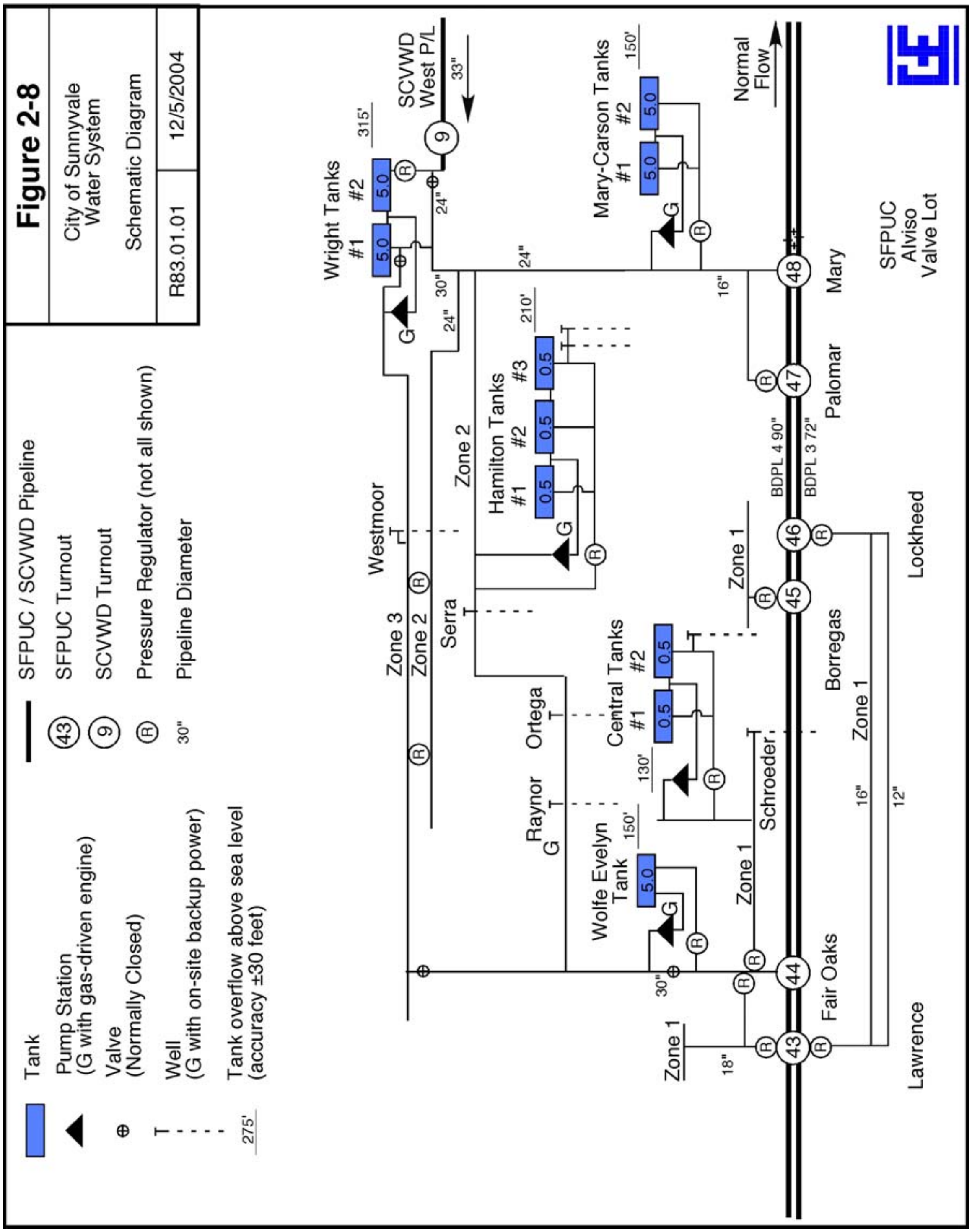



*Figure 2-7. Pressure Zone Boundaries*




## 2.4.4 Pump Stations

There are booster pump stations at each site with one or more tanks.

The Wolfe-Evelyn pump station can boost SFPUC water all the way to the Wright tanks. In this manner, the entire system can be served using SFPUC water should there be a planned (or unplanned) SCVWD outage, allowing for no other damage in the Sunnyvale system.

The capacities of the booster pumps (operating one at a time) are as follows (all electric powered except where noted):

- Central. 1 @ 634 gpm, 1 @ 453 gpm
- Wolfe-Evelyn. 1 @ 1566 gpm, 1 @ 2482 gpm, 1 @ 3553 gpm, 1 @ 5,000 gpm (propane powered gas engine)
- Mary-Carson. 1 @ 1697 gpm, 1 @ 2987 gpm, 1 @ 2873 gpm, 1 @ 5,000 gpm (propane powered gas engine)
- Hamilton. 1 @ 1584 gpm, 1 @ 769 gpm
- Wright. 1 @ 656 gpm, 1 @ 973 gpm, 1 @ 1041 gpm, 1 @ 5,000 gpm (propane powered gas engine)

### 2.4.5 Wells

The Sunnyvale water system includes 9 wells, 7 of which are used regularly and 2 of which are used as reserve. The reserve wells are completely potable.

The wells are normally used to supply about 10% of the total demand for Sunnyvale. At the current time, it is less expensive for Sunnyvale to purchase SCVWD surface water than to use well water, so well water is used more sparingly. If needed, well water could supply up to 45% of their total system-wide average day demand. Under normal operating conditions, Sunnyvale uses these wells to maintain pressure within the system during times of peak demand, and for emergencies.

Some of the wells have back-up diesel- or propane-powered emergency generators. Sunnyvale also has 2 additional portable generators. None of the well sites have quick-connect couplings for rapid installation of the portable generators.

Water from these wells meets all drinking water standards without any treatment requirements.

Well capacities are as follows (backup power status based on available information):

- Central 611 gpm (no permanent on site backup power)
- Hamilton 882 gpm, 634 gpm (on site propane backup power)
- Raynor 1901 gpm (on site diesel generator)

- Ortega 1629 gpm (no permanent on site backup power)
- Serra 634 gpm (no permanent on site backup power)
- Westmoor 475 gpm (no permanent on site backup power)
- Schroeder (backup) 475 gpm (no permanent on site backup power)
- Losse (backup) 400 gpm (no permanent on site backup power)

Total well capacity is 6,766 gpm (9.7 MGD) plus an additional 875 gpm (1.3 MGD) from the two backup wells.

### 2.4.6 SCVWD Connections

There are two SCVWD turnouts to Sunnyvale: Barranca and Sunnyvale (turnouts 8 and 9 in Figure 2-1). Both turnouts feed into Zone 3 (highest elevation zone) in Sunnyvale's water system. Water from Zone 3 also normally feeds Zone 2 via a series of pressure reducing stations.

In terms of relative importance, should the SCVWD have to close / throttle back supplies at these two turnouts, Sunnyvale would prefer to close the Barranca turnout first, and then throttle back the Sunnyvale turnout.

### 2.4.7 Emergency Connections and Other Local Facilities

The Sunnyvale water system has several interties to neighboring water systems. All these interties are used rarely.

- City of Santa Clara – 4 interties
- City of Mountain View – 4 interties.
- Cal Water (Los Altos) – 10 interties. Note: several small neighborhoods within Sunnyvale are served by the Cal Water system (non-colored areas in Figure 2-5). The Sunnyvale water system can provide fire flows for these areas.
- Mountain View. There are no hard piped interties with the City of Mountain View. However, interties could be easily set up using fire hoses, at several locations.

### 2.4.8 SCADA

There is a SCADA system for the water system. It provides telemetry and centralized control functions. Communication is done via phone lines; Sunnyvale has plans to install a new SCADA system in 2004; the new system will use radio signals.

## *2.5 Facility Descriptions*

### 2.5.1 Mary-Carson Water Plant

The Mary-Carson Water Plant includes two 5.0 MG tanks and a pump station. The nameplate on Tank 2 indicates construction in 1966.

Figure 2-9 shows Tank 1. Tank 1 rests on a concrete ring girder In the foreground is the 16" tank inlet pipe. In the background is the 16" tank outlet pipe. Figure 2-10 shows the overflow pipe outlet. These pipes are vulnerable to damage due to tank wall uplift.

*Figure 2-9. Mary Carson Tank 1*

*Figure 2-10. Mary Carson Tank 1 Overflow*

Figure 2-11 shows Tank 2. Tank 2 rests on a concrete ring girder. In the foreground is a metal hatch; beneath it is the Tank 2 inlet pipe. In the background is the 16" tank outlet pipe. Figure 2-12 shows the outlet pipe from Tank 2 (left) to Tank 1 (right), with a tee and pipe that proceeds to the pump station. Figure 2-13 shows the overflow pipe outlet. These pipes are vulnerable to damage due to tank wall uplift.

*Figure 2-11. Mary Carson Tank 2 (left), Tank 1 (right)*

*Figure 2-12. Mary Carson Tank 2 (left) and Tank 1 (right) and Outlet Pipes*

*Figure 2-13. Mary Carson Tank 2 Overflow Pipe*

*Figure 2-14. Mary Carson Pump Station Building*

Figure 2-14 shows the Mary-Carson pump station building. It is a rectangular reinforced masonry structure with wood roof. The pump station is located on a small hill south of Mary-Carson Tank #2, separated by a retaining wall, Figure 2-15a.

*Figure 2-15a. Retaining Wall (right), Tank 2 (left)*

There is some evidence of settlement between the pump station building and Tank 2 (evidenced by a rotated sidewalk, Figure 2-15b). This settlement is probably not critical, but should be monitored on a regular basis to verify that the settlement does not extend to undermine the foundation of the pump station.

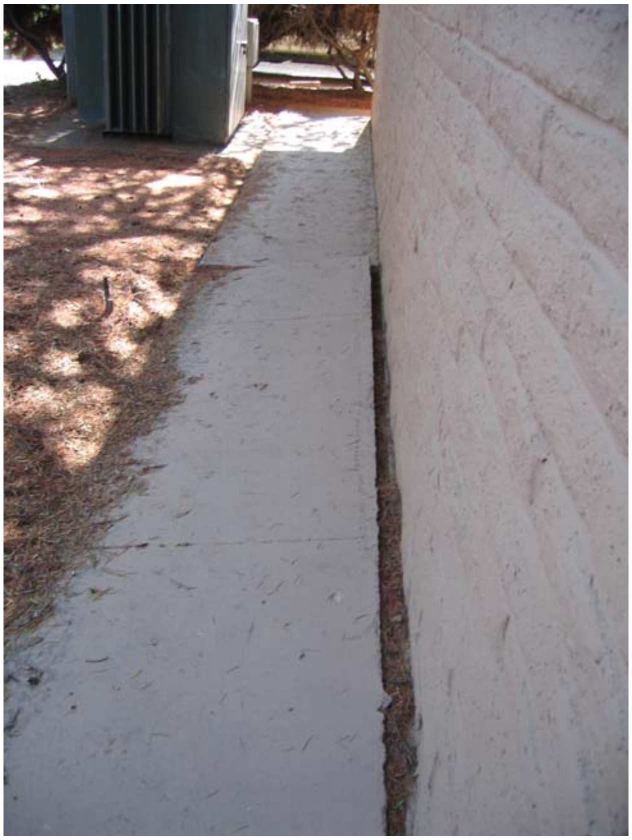


*Figure 2-15b. Mary Carson Pump Station Building – Rotated Sidewalk*

Figure 2-16 shows a steel plate bolted through a roof beam. The roof beam has suffered substantial damage.

*Figure 2-16. Mary Carson Pump Station Building – Repaired Roof Beam*

There is a propane tank on two small concrete footings nearby. The tank is lightly anchored to the footings.

There is one pad-mounted electrical control cabinet (Figure 2-17). A short examination could find no restraint of this top of this cabinet to the wall; opening one bay of the cabinet could not verify positive anchorage to the floor below. An allowance for anchorage / restraint mitigation is suggested.

The propane-powered engine is well anchored to a concrete foundation. Its start-up batteries are in a little battery rack, unanchored; this should be mitigated by bolting the rack to the floor, and inserting inert (Styrofoam or similar) spacers between the batter and the rack to prevent movement of the battery under strong ground shaking.

*Figure 2-17. Mary Carson Pump Station – Electrical Cabinet*

*Figure 2-18. Mary Carson Pump Station – Start-Up Batteries*

The three electrically-driven pumps are horizontal with motors and pumps on single concrete pedestals. These are seismically rugged.

The on-site SCADA control cabinet is wall mounted (adequate). Inside the cabinet is a lead acid battery for backup. The battery is unrestrained and can rattle / impact during strong ground shaking. The battery should be restrained (Velcro strap or similar).

*Figure 2-19. Mary Carson Pump Station –SCADA Cabinet and Battery*

### 2.5.2 Wright Avenue Water Plant

The Wright Avenue Water Plant includes two 5.0 MG tanks, a pump station and the SCVWD turnout.

Tank 1 was installed in 1959 (Horton Tank, Contract 8-0079, built by CB&I). It rests on a concrete ring girder foundation. Figure 2-20 shows the 30" outlet pipe; the extra 30" outlet pipe in the background was once used, but has since been capped and is not only used to feed a 4" irrigation pipe. Tank wall uplift will damage the outlet pipe, likely in the miter joint; so the valve may be used to isolate the tank; however, damage to the miter would result in shutdown of the pump station, so that the only way to get water into zone 3 would be via direct feed from SCVWD or via the Wolfe-Evelyn pump station using SFPUC feed. Due to the importance of having a primary feed to Zone 3 via the pump station (for immediate fire flows, etc.), plus possibly unreliable post-earthquake supply from SCVWD and SFPUC, mitigation to protect the miter joint is highly recommended.

The 30" inlet pipe enters the tank through the bottom. Tank wall uplift may damage this pipe (drawing review needed).

*Figure 2-20. Wright Avenue Tank 1 – 30" Outlet Pipe (Foreground) and 30" Spare Outlet (Background)*

Tank 2 has five courses. It rests on a concrete ring girder. Figure 2-21 shows the 30" inlet pipe. The pipe is directly connected to an altitude valve within a precast concrete vault, via a reducer / venturi. Original drawings (December 1973) show a 30" PRV, suggesting that the configuration seen in Figure 2-21 has been more recently installed. Tank wall uplift here will result in pipe damage, leading to loss of tank contents.

*Figure 2-21. Wright Avenue Tank 2 – 30" Inlet Pipe with Reducer to Vault*

Figure 2-22 shows the Tank 2 overflow pipe. Wall uplift will damage this pipe, although consequences may not be severe.

*Figure 2-22. Wright Avenue Tank 2 – Overflow Pipe*

*Figure 2-23. Wright Avenue Pump Station Building (Propane Tank in foreground)*

The Wright Avenue pump station is a rectangular reinforced masonry structure with wood roof (Figure 2-23). It has a similar style of construction as the pump station building at Mary-Carson. There is a propane tank outside the building, anchored to concrete footings. Inside the building are three medium-size horizontal pumps with electric motors (all seismically rugged). In a separate room inside the building is a gas-powered engine. The start-up battery is in small rack (Figure 2-24); the rack should be anchored and the battery restrained within the rack in a manner similar to that for the start-up batteries at Mary-Carson. The backup engine is well anchored.

*Figure 2-24. Wright Avenue Pump Station – Start-Up Battery for Backup Engine*

Figure 2-25 shows the 30" SCVWD pipeline at the Wright Avenue site. The pipe rests on concrete saddles with positive hold-down straps. There is a motor-operated valve on this pipe (SCVWD valve). There is no backup power on-site for this valve.

*Figure 2-25. SCVWD Turnout Pipeline at Wright Avenue (Tank 2 in background)*

### 2.5.3 Hamilton Water Plant

The Hamilton Water Plant includes three 0.5 MG tanks, a pump station and two wells.

Tank 1 has three courses, a flat roof with wind girder, Figure 2-26. It is 60 feet diameter and 24 feet high; all courses are 0.25" thick. It is supported on a concrete ring girder foundation. Figure 2-27 shows the 10" outlet; tank wall uplift will possibly break both pipes attached to the outlet; if the cast iron pipe leading to the left is broken, then the pump station will lose suction supply from all three Hamilton tanks.

Tank 2 has four courses, and a flat roof. It is supported on a concrete ring girder foundation. Some drawings suggest is it has nominal dimensions of 60 feet diameter x 24 feet high (like Tank 1), but available fabrication drawings suggest 56 feet diameter x 28.2 feet high (bottom course t = 0.3125 inches, 0.25 inches for higher courses.

Tank 3 has three courses and a flat roof. It is supported on a concrete ring girder foundation. Some drawings suggest is it has nominal dimensions of 60 feet diameter x 24 feet high (like Tank 1).

The emergency generator seen in Figure 2-26 had been recently procured; and had not yet been installed (August 2004).

*Figure 2-26. Hamilton Tanks (#2 foreground, #1 background) and Emergency Generator, showing 10" Outlet Pipes*


*Figure 2-27. Hamilton Tank #1 10" Outlet Pipe*

*Figure 2-28. Hamilton Tank #3 (foreground) 8" Inlet Pipe*

*Figure 2-29. Hamilton Tank #3 10" Outlet Pipe*

*Figure 2-30. Hamilton Tank #1 8" Inlet Pipe from Well #2*


*Figure 2-31. Hamilton Tank #2 10" Outlet Pipe to Pump Station*

Uplift of Tank 2 wall will break the 10" cast iron outlet pipe (Figure 2-31).

*Figure 2-32. Hamilton Tank #2 8" Inlet Pipe from Well*

All the buried piping at the Hamilton Water Plant site is shown as cast iron on drawings. Uplift of the tank walls can lead to easily pull apart of segmented cast iron pipe joints. Figure 2-31 shows one of the segmented cast iron pipe joints.

*Figure 2-33. Hamilton Tank #3 Overflow and Drain Pipe*

Tank wall uplift will not damage the drain or overflow pipe for Hamilton Tank #3 (Figure 2-33). The drain and overflow pipes for Hamilton Tanks #1 and 3 are similar.

The Hamilton pump station building is a rectangular reinforced masonry structure with wood roof. The style of construction is similar to the pump stations at Mary-Carson and Wright Avenue.

*Figure 2-34. Hamilton Tank #3 (background) and Pump Station Building*

There are two wells at the Hamilton site (Figures 2-35, 2-36). Both use submersible pumps.

*Figure 2-35. Hamilton Well #3*

*Figure 2-36. Hamilton Well #2*

The pump station has two horizontal electrically-driven pumps. Most electrical equipment is located in wall-mounted enclosure cabinets (okay). The pump station also has one propane-driven engine. The battery for the engine is in a small rack that should be anchored; and the battery within restrained, in a manner similar as for Mary-Carson and Wright Avenue.


*Figure 2-37. Engine and Start-Up Battery for Hamilton*

The propane tank (outside the building) is anchored to concrete footings.

### 2.5.4 Central Water Plant

The Central Water Plant includes two 0.5 MG tanks, a pump station and a well.

Tank #1 is a four course riveted steel tank. There is a wind girder and flat steel roof at the top of the tank. Vertical seams are made with two lines of rivets (lowest course, Figure 2-38) or three rows of rivets (second course from the bottom, Figure 2-40); horizontal seams are made with one line of rivets. The bottom course is welded to a bottom plate using fillet welds. There is no concrete ring girder foundation. Due to the eccentricities at the discontinuities between courses, additional bending is introduced in seismic loading, leading to lower capacity against mid-height buckling as compared to similarly thickness walls using full penetration welds. No drawings are available showing the design of this tank.

Tank #2 is a four course steel tank, of visually similar style of construction as Hamilton #2 and #3. It is supported on a concrete ring girder foundation.

*Figure 2-38. Tank #1 8" Inlet Pipe*

*Figure 2-39. Tank #1 Riveted Overflow and Drain to Catch Basin*

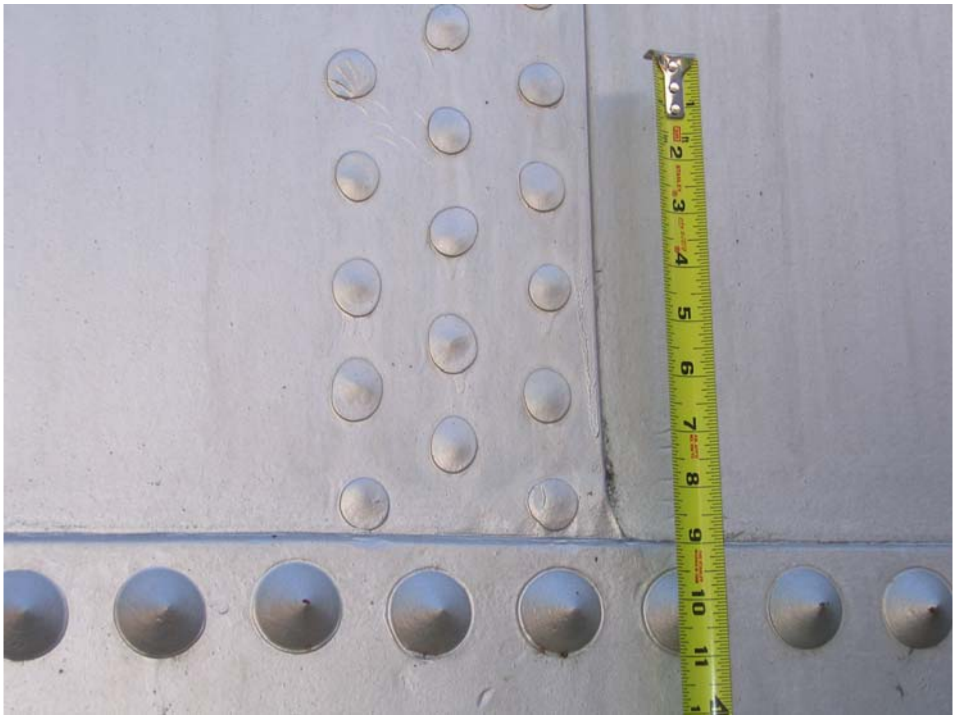


*Figure 2-40. Tank #1 Rivets at Connection from First Course (Lower) to Second Course (Upper)*

*Figure 2-41. Tank #2 (background) Inlet-Outlet and Overflow/Drain*

*Figure 2-42. Central #2 Inlet-Outlet (Restrained Joints) and 10" Outlet pipe to pump station (background)*

*Figure 2-43. Central #2 10" Outlet Pipe to Pump Station (right) and to System (going underground)*

*Figure 2-44. Central Well*

The Central well (Figure 2-44) has a submersible pump.

*Figure 2-45. Central Pump Station*

The building is rectangular with corrugated metal roof sheathing. Water from either tank enters the pump station via a 10" above ground pipe (Figure 2-45). On the inside, the above ground inlet pipe disrupts movement. Interior walls use wood paneling. There are storage shelves (unanchored, items are unrestrained, Figure 2-47 and 2-48). Electrical controls are in wall mounted (adequate) and floor standing cabinets (anchorage uncertain).

*Figure 2-46. Central Pump Station Suction Pipe Inside Building*


*Figure 2-47. Central Pump Station Storage Shelves*


*Figure 2-48. Central Pump Station Storage Shelves*

### 2.5.5 Wolfe-Evelyn Water Plant

The Wolfe-Evelyn Water Plant includes one 5.0 MG tank and a pump station.

*Figure 2-49. Wolfe-Evelyn Tank with Berms*

*Figure 2-50. Wolfe-Evelyn Tank –24" Inlet (foreground) and 24" Outlet (background) Pipes*

*Figure 2-51. Wolfe-Evelyn Tank 16" Overflow Pipe*

*Figure 2-52. Wolfe-Evelyn Pump Station Building*

The pump station building (Figure 2-52) is a rectangular reinforced masonry structure with wood roof, with the style of construction similar to that used at Mary-Carson, Wright Avenue and Hamilton pump stations. There are three horizontal electrically-driven pumps (seismically rugged). There is a floor-standing electrical control panel (no restraint or anchorage could be seen, Figure 2-53). There is a wall-mounted SCADA cabinet, while not opened, it likely has an unrestrained battery. There is a propane-gas driven engine, similar to that at Mary-Carson and Wright Avenue; its start-up battery rack should be anchored and the battery restrained as described for Mary-Carson and Wright Avenue (Figure 2-54).

*Figure 2-53. Wolfe-Evelyn Pump Station Electrical Controls*

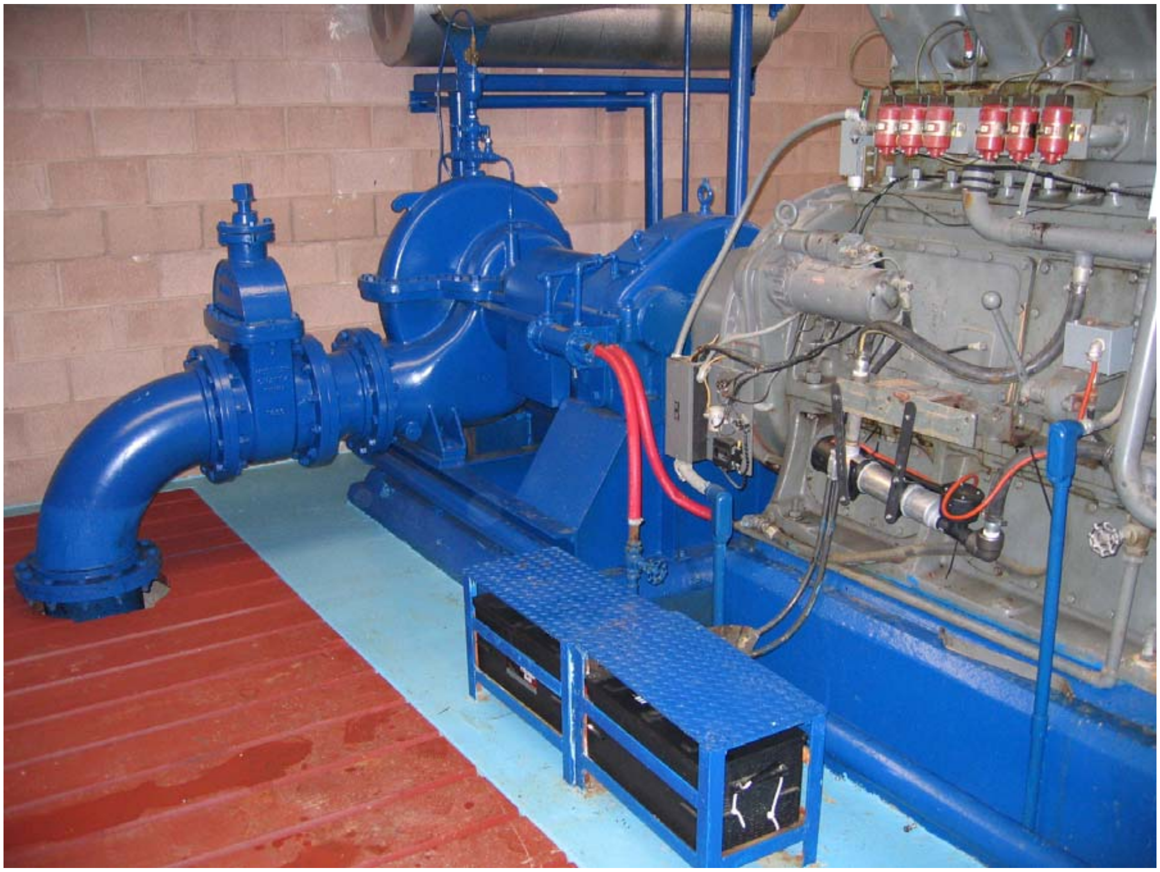


*Figure 2-54. Wolfe-Evelyn Pump Station Engine Set*

There is a propane tank located outside and near the building. The tank is anchored to concrete footings.

### 2.5.6 Westmoor Well

The Westmoor well (Figure 2-55) has a submersible pump. Controls are in an outdoor metal electrical cabinet enclosure. The enclosure structure is anchored to a concrete foundation.

*Figure 2-55. Westmoor Well*

### 2.5.7 Serra Well

The Serra well (Figure 2-56) has a submersible pump. Controls are in a reinforced masonry building with wood roof. The electrical controls are in a floor-standing electrical cabinet (anchorage unconfirmed). SCADA controls are in a small wall-mounted metal cabinet (adequate), with unrestrained backup batteries inside (the batteries should be restrained with Velcro straps or similar, Figure 2-57).

*Figure 2-56. Serra Well*


*Figure 2-57. Serra Well SCADA Batteries*

### 2.5.8 Ortega Well

The Ortega well (Figure 2-58) has a submersible pump. Controls are in an outdoor metal electrical cabinet enclosure. The enclosure structure is anchored to a concrete foundation. The batteries for the SCADA system should be restrained (Figure 2-59). A foundation for an emergency generator is located at the site; however, the generator has since been relocated to the Raynor well site.

The Ortega well site is located just west of the Sunnyvale East Channel (storm water channel), about 20 feet to channel centerline. The site is not mapped (on a regional basis – see Figure 3-4) as being particularly susceptible to liquefaction; this could be verified with more detailed investigation.

*Figure 2-58. Ortega Well*

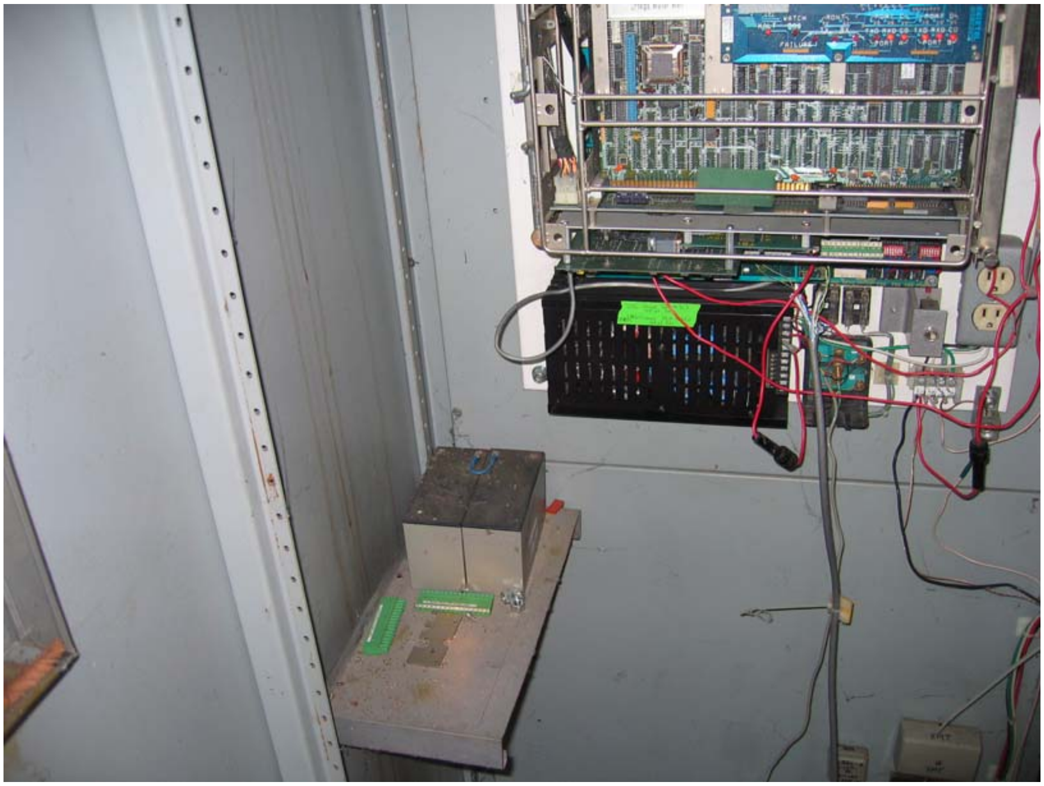


*Figure 2-59. Ortega Well – SCADA Batteries*

### 2.5.9 Raynor Well

The Raynor well (Figure 2-60) has a submersible pump. Controls are in an outdoor metal electrical cabinet enclosure located adjacent to a nearby school. The enclosure structure is anchored to a concrete foundation. The batteries for the SCADA system should be restrained (Figure 2-61).

*Figure 2-60. Raynor Well*


*Figure 2-61. Raynor Well – SCADA Batteries*

A permanent emergency generator (rated 360 kW) has been installed adjacent to the Raynor well site (Figure 2-62).

*Figure 2-62. Raynor Well – Emergency Generator*

The engine generator set is mounted on isolator units with internal stops (Figure 2-63). These types of stops are sometimes "seismically qualified" by the vendor; however, it is recommended that additional steel snubbers (heavy steel angles) be bolted to the foundation, leaving about /4" gap to the isolated skid, thereby providing positive load path to keep the engine set in place, should the isolator mounts fail.

*Figure 2-63. Raynor Well – Emergency Generator Isolator Mounts*

The startup batteries were confirmed to be well restrained; however, over time, as the batteries are replaced, care should be taken that the new batteries are suitably restrained.

### 2.5.10 Losse Well

The Losse well (Figure 2-64) has a submersible pump. Controls are in a wood-framed building.

*Figure 2-64. Losse Well*

*Figure 2-65. Losse Well – Control Building*

### 2.5.11 Schroeder Well

The Schroeder well (Figure 2-66) has a submersible pump. Controls are in reinforced masonry building.

*Figure 2-66. Schroeder Well*

*Figure 2-67. Schroeder Well – Control Building*

# Chapter 3 Seismic Hazards

## *3.1 Regional Faults*

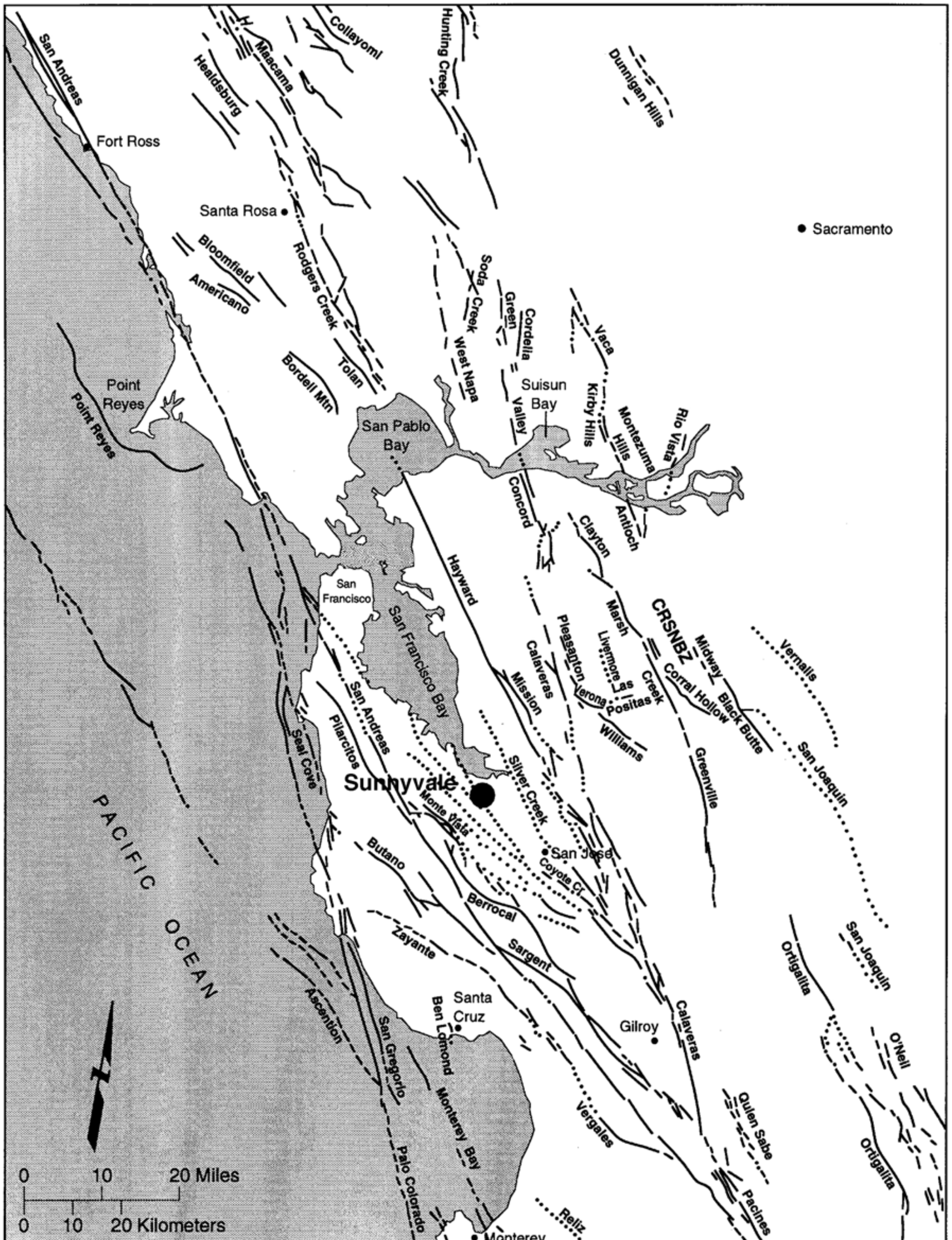
Based on its record of historic earthquakes and its position astride the North American - Pacific plate boundary, the San Francisco Bay region, within which the Sunnyvale water system is located, is considered to be one of the more seismically active regions of the world. During the historical period (approximately 160 years), faults within the region have produced 14 moderate to large magnitude (M > 6) earthquakes affecting the Bay Area, as well as many significant smaller magnitude (5 < M < 6) earthquakes (ref. Toppazada et al 1979, Toppazada et al 1981 and Real et al 1978.) Faults within the 80 km (50 mile) wide North American - Pacific plate boundary zone that may influence potential earthquake ground shaking and other earthquake-related hazards within Sunnyvale are illustrated in Figure 3-1.

Among the historically active regional faults, those anticipated to have potential significance to the performance of the Sunnyvale water system include the following:

- San Andreas
- Hayward
- Calaveras

Detailed characterizations of these three sources have been conducted during seismic evaluations of Caltrans bridges in the San Francisco Bay Area (ref. Geomatrix, 1993). Brief discussions of each of these sources are presented in the following paragraphs. Unless otherwise noted, magnitude (M) refers to moment magnitude.

**San Andreas fault**: The San Andreas fault, which extends over 1,200 km (750 miles) from the Gulf of California to Cape Mendocino, is the major fault within the region and has generated a few moderate to large earthquakes during the historical period (approximately 160 years), a M 6.8 to M 7.5 event in June 1838 along the Peninsula segment, a M 6.3 event in October 1965, and the great M 8 earthquake in April 1906 (including the Peninsula and Santa Cruz segments). The recent M 6.9 Loma Prieta earthquake on October 17, 1989 is considered by the Working Group on California Earthquake Probabilities (Working Group 2003, WG03) to have occurred on a fault near and parallel to the Santa Cruz segment of the San Andreas fault. The WG03 has estimated that during the 30 year time period between 2003 and 2032, there is a 21 percent probability of a M 7 or larger earthquake occurring on the San Francisco Peninsula segment of the San Andreas fault, which extends northward from the Loma Prieta rupture segment, and a less than 5 percent probability of a M 8 earthquake along the combined Peninsula and North Coast segments of the fault. The maximum earthquake for the San Andreas fault is judged to be in the range of M 7.75 to M 8 (moment magnitude); work (Niemi and Hall, 1992) indicates that on the average, an event of such magnitude can be expected to occur approximately every 200 to 300 years; the WG03 suggests once every 180 to 370 years.




| G&E Engineering Systems | **Figure 3-1. Map of Regional Earthquake Faults** | R76.01.09 |
|---|---|---|
| | | 12/11/2003 |

**Hayward fault**: The Hayward fault is a major component of the San Andreas fault system in the Bay Area and extends approximately 114 km (71 mi) from its intersection with the Calaveras fault southeast of San Jose northward through and along the East Bay hills to San Pablo Bay. It has been suggested on the basis of micro-seismicity data that the Hayward fault may connect with the Healdsburg-Rodgers Creek fault beneath San Pablo Bay (Ellsworth et al, 1982), although such a connection requires an en echelon jump between the faults. The Working Group (WG 1988) has postulated two potential rupture segments for the Hayward fault, a southern segment extending from Warm Springs to the San Leandro-Mills College area, and a northern segment extending from the San Leandro - Mills College area to San Pablo Bay. These segments have been the source of a large (M 6.8) earthquake during the historical period (October 1868). The Working Group (2003) has estimated that during the 30 year time period from 2003 to 2032, there is a 27 percent probability of a M 6.7 (or larger) earthquake occurring on the Hayward fault. Recent work by the USGS (through 2003) suggests that the fault segmentation locations that were postulated through about 1990 may not be so clearly defined. The maximum earthquake for the Hayward fault is judged to be in the range of M 7 to M 7.25; the average recurrence of such events is estimated to be approximately 150 to 250 years.

**Calaveras fault**: The approximately 120 km (75 mi) long Calaveras fault extends from south of Hollister to near Danville in Contra Costa County. The fault has been associated with the historical earthquakes of M 5.6 (July 1861), M 5.6 (March 1866), M 6.2 (June 1897), M 5.8 (July 1899), M 6.6 (July 1911), M 5.8 (August 1979), M 6.2 (April 1984) and M 5.1 (February 1988). The maximum earthquake for the Calaveras fault is judged to be in the range of M 6.75 to 7; the average recurrence of such events is estimated to be approximately 150 to 300 years.

**Other Faults**: As can be seen in Figure 3-1, there are a number of other faults in the San Francisco Bay Area that could impact the Sunnyvale water system. Of those not already mentioned above, the Rodgers Creek fault (north of San Pablo Bay) and the San Gregorio fault (at the Pacific Ocean coast line) are two of the more active and capable of large magnitude earthquakes. Due to their locations, the impacts on the Sunnyvale water system from earthquakes on these faults will likely be less severe than those from a large magnitude earthquake on the San Andreas, Hayward or Calaveras faults. Figure 3-2 shows the probability of earthquakes from various faults by the year 2032.

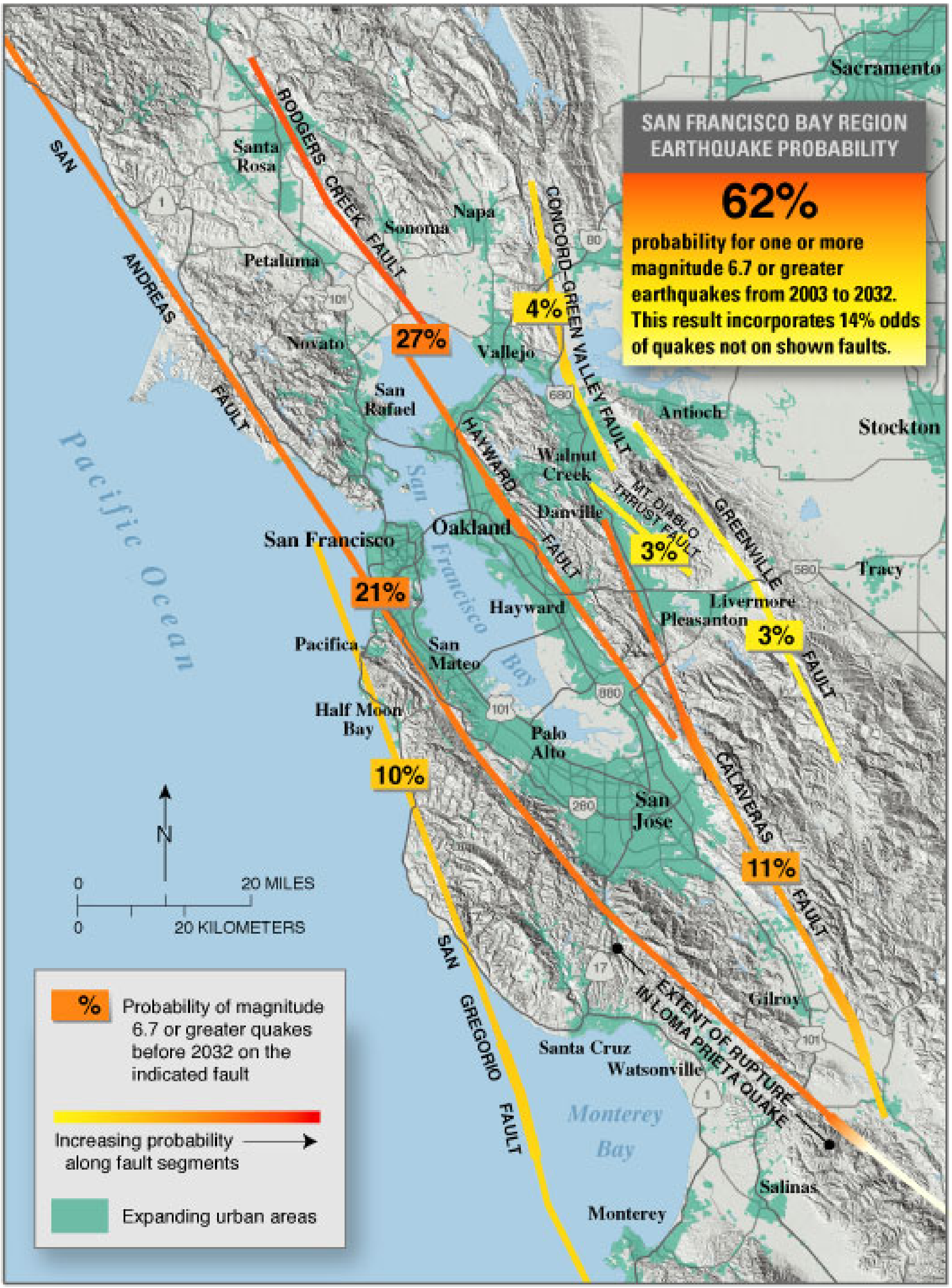



*Figure 3-2.Probabilities of Earthquakes by the Year 2032 (WG 2003)*

## 3.2 Selection of Earthquake Scenarios

For purposes of this project, it was decided to evaluate the Sunnyvale water system for three scenario earthquakes:

- San Andreas M 7.9, including its South Santa Cruz, Peninsula and North Coast segments. The probability of a M 7.9 or larger earthquake occurring on the San Andreas fault by the year 2032 is estimated to be 4.7%.

- Hayward M 6.67 on its South segment, with rupture extending through Milpitas. The probability of a M 6.67 or larger earthquake occurring on the south segment of the Hayward fault by the year 2032 is estimated to be 11.3%.

- Calaveras M 6.23 on its Central segment. The probability of a M 6.23 or larger earthquake occurring on the central segment of the Calaveras fault by the year 2032 is estimated to be 13.8%.

## 3.3 Geotechnical Hazards

There are four primary hazards induced by earthquakes:

- Ground shaking
- Liquefaction
- Landslide
- Surface faulting

Figures 3-3 and 3-4 overlay the Sunnyvale water system service area with the liquefaction hazard zones.

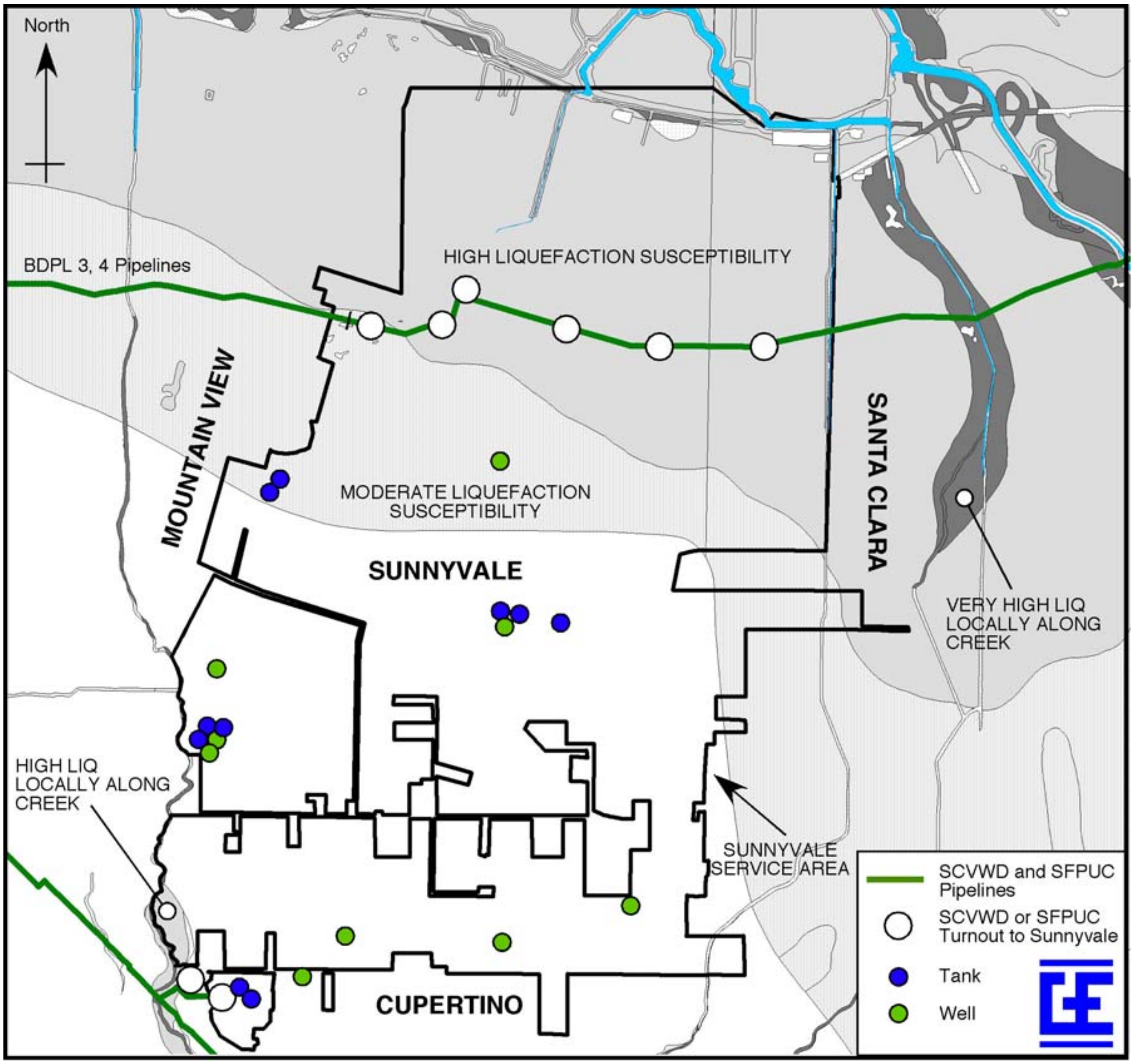



*Figure 3-3. Hazard Zones, Sunnyvale Water System*

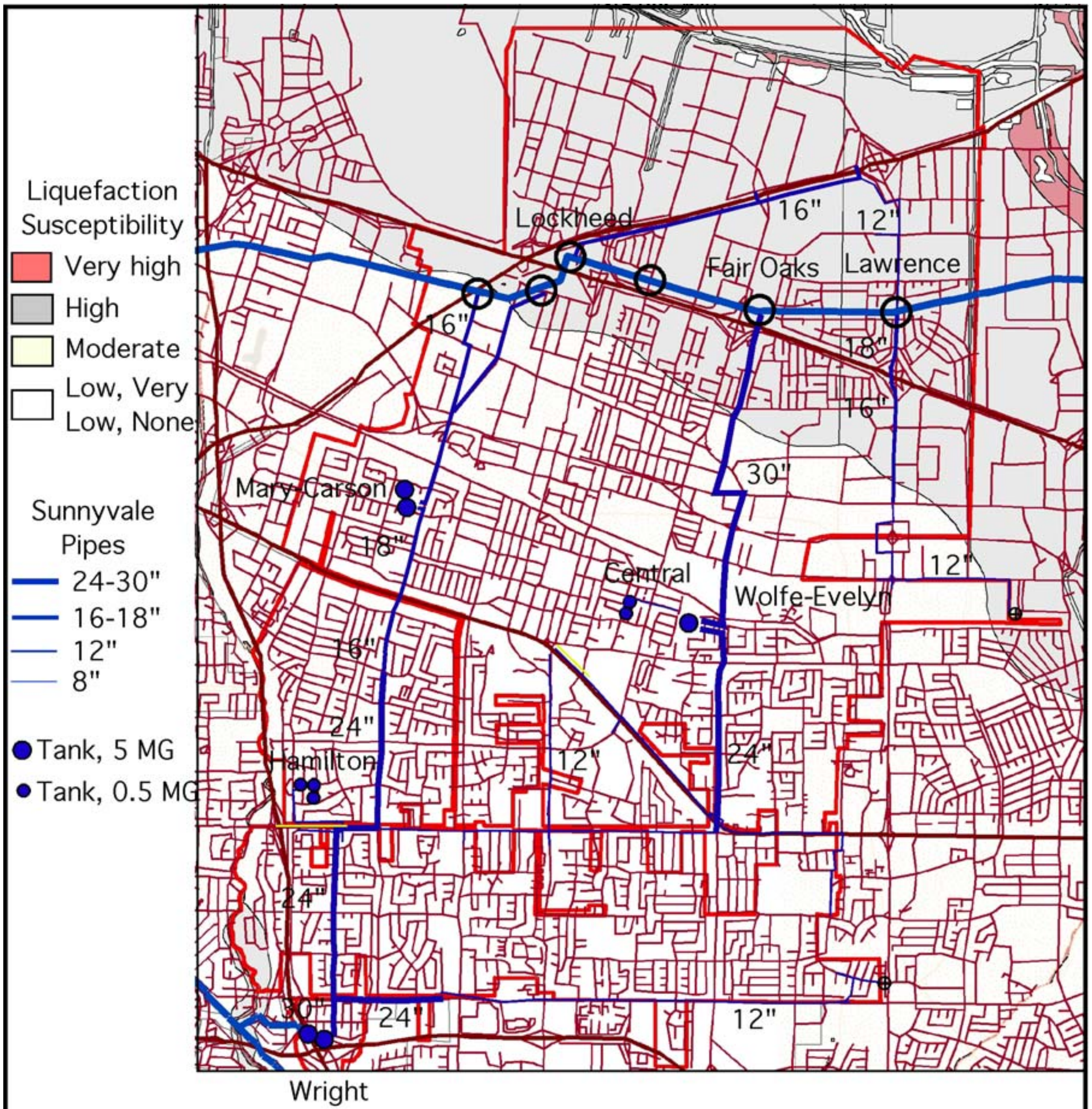



**Figure 3-4. Sunnyvale Pipe Network and Liquefaction Hazards**

For purposes of the current work, we quantify these hazards as follows:

- Ground shaking. Ground motion shaking levels are estimated for the Sunnyvale facilities and pipe network. For above ground facilities, the ground shaking hazard is quantified in terms of Peak Ground Acceleration (PGA) along with a suitable response spectral shape, in consideration of the local soil profile. For the buried pipe network, the ground shaking hazard is quantified in terms of Peak Ground Velocity (PGV). Section 3.4 quantifies the ground shaking hazard.

- Liquefaction. A regional liquefaction hazard map is shown in Figures 3-3 and 3-4. Section 3.5 quantifies the liquefaction hazard.

- Landslide. There are no mapped landslide zones in Sunnyvale (Geomatrix 2003b).

- Surface Faulting. The active San Andreas fault is situated about 8 km southwest at its closest approach to the Sunnyvale service area. Surface faulting is a negligible hazard in Sunnyvale.

## 3.4 Ground Shaking Hazard

Table 3-1 lists the expected (median) horizontal motions in the Sunnyvale water system from either the San Andreas M 7.9 earthquake, the Hayward M 6.67 or the Calaveras M 6.23 scenario earthquakes. These ground motions are expressed in terms of Peak Ground Acceleration (PGA), as measured at the surface for a typical location within each pressure zone. Actual recorded motions within the Sunnyvale service area may vary higher or lower than the values in Table 3-1 by about ±50% within the 16$^{th}$ to 84$^{th}$ percentile confidence limits.

| Pressure Zone | Location | Dominant Soil Conditions | San Andreas M 7.9 PGA, g | Hayward M 6.67 PGA, g | Calaveras M 6.23 PGA, g |
|---|---|---|---|---|---|
| Zone 1 | N. BDPL | Soft soil, alluvial | 0.38 | 0.34 | 0.25 |
| Zone 1 | S. BDPL | Firm alluvial | 0.35 | 0.22 | 0.14 |
| Zone 2 | | Firm alluvial | 0.38 | 0.20 | 0.12 |
| Zone 3 | | Firm alluvial | 0.42 | 0.17 | 0.11 |

*Table 3-1. Ground Motions (Horizontal PGA, g)*

Along with horizontal PGA, the amount of damage to structures and buried utilities in the Sunnyvale service area will be proportional to:

- Ground velocity. Damage to buried pipelines due to ground shaking is best correlated to peak ground velocity (PGV). PGV is correlated to PGA and the type and depth of soils beneath a site. PGVs are modestly amplified for firm alluvial sites, and greatly amplified for soft soils sites, as compared to rock sites.

- Response Spectra. The spectral energy content of ground motions is generally moderately stronger for firm alluvial sites than for rock sites, and much stronger for sites over deep soft soils than for rock sites. In addition, there will be vertical direction ground motions. Tanks and buildings are best evaluated using response spectra.

- Vertical motions. Vertical-direction ground motions are generally not as damaging to pump station buildings, tanks or buried pipelines as horizontal motions. In magnitude, the vertical PGA motions will be about 80% of those in Table 3-1 for the San Andreas event, and perhaps 50% of those in Table 3-1 for the Hayward or Calaveras events. In addition, all vertical motions will have 50% or lower energy content than horizontal motions in the "long period" portions of the corresponding response spectra.

## *3.5 Liquefaction Hazard*

A large portion of the Sunnyvale service area is exposed to significant liquefaction hazards. Figures 3-3and 3-4 show a map of the Sunnyvale service area, which is based on recent liquefaction hazard mapping performed by William Lettis and Associates and published by the USGS (Knudson et al, 2000) and updated by Geomatrix (2003b). The major liquefaction zones are as follows:

- Very High. There is a very small area in northernmost Sunnyvale that is mapped in the "Very High" susceptibility zone. There is likely little or no water system infrastructure in this zone.

- High. A large of area of northern Sunnyvale is mapped in the "High" susceptibility zone. A small area along Stevens Creek in southwest Sunnyvale is also mapped in the "High" zone. In total, about 85 miles of all water pipelines are in these zones. About 6 miles of pipe in these zones are located within 500 feet of creeks, and these creeks might be susceptible to lateral spreads.

- Moderate. A portion of the Sunnyvale water system service area is mapped within a moderate liquefaction susceptibility zone.

- Very Low. More than half of the Sunnyvale water pipelines are located in zones with very low susceptibility to liquefaction.

The performance of the Sunnyvale water system after large earthquakes will be influenced by what happens to the local soils during the earthquake.

In the 1906 Great San Francisco earthquake, there was no observed and recorded liquefaction within the City of Sunnyvale. However, this may not be entirely indicative of what may happen in future earthquakes. The water table in Sunnyvale was likely low in 1906, and the effort to recharge the groundwater basin over the past few decades suggests that the liquefaction hazard today may be higher than it was in 1906.

For purposes of this report, no site-specific liquefaction investigations have been performed. Instead, a regional liquefaction methodology is used. In this regional methodology, the potential for liquefaction at a particular location in Sunnyvale depends the susceptibility of the area, on the ground water levels, on the magnitude of the earthquake and on the level of ground acceleration.

## 3.6 Loma Prieta Earthquake

The City of Sunnyvale suffered a modest level of damage in the 1989 Loma Prieta earthquake. There were about 6 pipes that had to be repaired in Sunnyvale due to this earthquake. There was no damage to tanks. No new tanks have been added since 1989.

## 3.7 Regional Power Outage

A regional electricity power outage for more than one to two days could significantly impair the ability for SCVWD to deliver potable water to Sunnyvale. The main reason for this is that the Rinconada WTP is often supplied with raw water at high demand times via the Vasona pump station, and that pump station does not have back up power. A concurrent regional power outage during the summertime would also limit raw water supply to SCVWD to that available by gravity flow from Del Valle and Anderson reservoirs, likely requiring water rationing in Sunnyvale for the duration.

A regional power outage could be caused by, among other things, an earthquake, high winds, wildfire or a grid disruption.

Power outages from earthquakes are not likely to last more than 24 hours to the bulk of the Sunnyvale system. Power outages from high winds could cause localized outages in hillside communities with a large number of trees and overhead wires, locally lasting up to a few days, but for the most part of Sunnyvale lasting only a few hours. Power outages due to grid disruption (such as an unplanned fault when the PG&E and Western Intertie 500 kV high voltage grid is operating near its capacity) could lead to a widespread regional power (such as on August 10, 1996 due to failure of some transmission lines and equipment located several hundred miles from the Bay Area), but with the amount of local generation available in the greater Bay Area that does not rely on the 500 kV system, some power should be restored in the Sunnyvale area in under 24 hours.

The potential for a long term (more than 1 day) power outage for the entire Bay Area stems from the potential for grid failure due to human-originated or natural hazards. There have been no long term (more than 1 day) grid failures over the past decade in the Bay area. With the de-regulation of the power supply in California, there has been a substantial increase in investment in new power plants, many located in the 10 county greater Bay Area, and therefore reliance on imported power over the 500 kV grid is of less importance in terms of meeting non-peak demands. While some reliability improvements to the high voltage grid are forecasted in the immediate future, these will not likely be as robust as the recent improvements in power generation. Micro-generators are not considered to provide a significant improvement in system reliability for the near term future. A systematic attack on the power grid could result in damage to the grid requiring long term outages (more than 1 day) or demand restrictions, but complete failure of any single substation or transmission line would not likely lead to an outage lasting more than 24 hours.

During a regional power outage, Sunnyvale will not be able to operate its wells that do not have standby backup power. Water could be made available by gravity flow in Zones 1 and 2 from the ten local storage tanks (requires resetting of valves, and will result in low pressure in most portions of Sunnyvale), from surface water from the Rinconada WTP or the Rinconada treated water reservoir at reduced flow rate (for Zones 1, 2 or 3), and from the SFPUC BDPL pipelines (for Zones 1 and 2). Gravity flow from the SCVWD and SFPUC systems, coupled with wells with backup power, plus pumping from the ten local storage tanks, should be sufficient for Sunnyvale to operate at MWD rate or higher, for at least a few days through a regional power outage.

## 3.8 Heavy Rainfall and Flooding

Heavy rainfall can lead to flooding and landslides. The coastal region of California is subject to extreme variations in precipitation. In addition to individual storms, rare but extended periods of precipitation have occurred. These can include subtropical jet stream winds that contain warm, moisture-laden weather fronts. These fronts have been known to result in nearly continuous rainfall such as the nine day storm series in February 1986 that dropped 25 inches of rain in the Lexington Reservoir and affected much of the Northern California coast and Sierras.

The combined impact of these phenomena could theoretically impact (break) SFPUC or SCVWD transmission pipelines at perhaps one or two locations, once every 100 to 500 years, respectively. Given the location of the SCVWD and SFPUC pipelines that are most likely to be damaged due to flood-induced scour or rainfall-induced landslide, these impacts most likely will not result in complete simultaneous shutdown of both SFPUC and SCVWD supply to the Sunnyvale system.

According to Sunnyvale staff, there has been sporadic flooding in the City of Sunnyvale throughout the years. Sunnyvale has flap gates installed in the channels so that creek water does not backup into the streets during floods. Sunnyvale staff do not believe that any of their wells are in flood plains; most of the flood-prone areas of the city are in the northern extremes, where there are no wells.

Few if any pipelines in the Sunnyvale system are exposed to heavy rainfall-induced landslides, so this hazard poses little risk to the Sunnyvale system.

# Chapter 4 Vulnerability Assessment

Section 4 presents the seismic vulnerability evaluation of the Sunnyvale water system under three earthquake scenarios.

## 4.1 Pipeline Vulnerability

The seismic vulnerability of buried pipelines can be estimated by comparing the repair rate for the pipes versus the levels of seismic hazard the pipe is exposed to. This comparison is done using "fragility" models, also called vulnerability functions. These models are developed by examination of similar types of pipes that have been damaged (or not damaged) in past earthquakes. Fragilities for buried pipelines are based on the models in Eidinger et al (2001). Table 4-1 provides the "backbone" pipe vulnerability functions (damage algorithms, fragility curves) for PGV and PGD mechanisms using for this project. These functions are used to estimate pipeline damage with adjustments to account for the style of pipelines in the Sunnyvale system, following (Eidinger 2001).

| Hazard | Vulnerability Function | Lognormal Standard Deviation, β | Comment |
|---|---|---|---|
| Wave Propagation | RR=0.00187 * PGV | 1.15 | Based on 81 data points of which largest percentage (38%) was for CI pipe. |
| Permanent Ground Deformation | $RR=1.06 * PGD^{0.319}$ | 0.74 | Based on 42 data points of which largest percentage (48%) was for AC pipe. |
| Notes<br>1. RR = repairs per 1,000 feet of main pipe.<br>2. PGV = peak ground velocity, inches/second .PGD = permanent ground deformation, inches<br>3. Ground failure mechanisms used in PGD formulation: Liquefaction (88%); local tectonic uplift (12%) | | | |

*Table 4-1. Buried Pipe Vulnerability Functions*

## 4.2 Reservoir Vulnerability

The ten reservoirs (tanks) in the Sunnyvale system were evaluated to establish their likely performance in earthquakes. The evaluations were performed as follows.

Seismic Hazards. Site-specific ground motions were established for each of the ten reservoirs. Based on Table 3-1, it is clear that a magnitude 7.9 earthquake on the San Andreas fault will produce the highest level of ground shaking at any specific reservoir site. We evaluated the reservoir for the median-level ground motions as follows (peak ground accelerations, tied to firm soil response spectra):

- Wright Avenue tanks. Median 0.42g.
- Wolfe-Evelyn tank. Median 0.35g.
- Hamilton tanks. Median 0.38g.
- Central tanks. Median 0.35g.
- Mary-Carson tanks. Median 0.35g.

We obtained available design drawings for the reservoirs. No drawings were available for the Wright Avenue #2 or the Central #1 (riveted) reservoirs. Where there was incomplete data on the drawings, we made extrapolated based on the similarity of the tank to other reservoirs.

We evaluated that reservoirs assuming firm soil site response spectra. Vertical motions were taken as 75% of the horizontal motions for purposes of estimating vertical hydrodynamic loading. Impulsive water motions were set at 2% damping and convective (sloshing) motions were evaluated at 0.5% damping.

We evaluated each reservoir assuming code-based methods (AWWA D100-96) which use "Rw" factors. The Rw factors in the code are based on judgment, and serve to reduce the computed ground motions to a much lower level, and assume some level of ductile performance of steel tanks. For unanchored steel tanks, AWWA D100-96 permits Rw = 3.5. In other words, the AWWA D100-96 codes would take a ground motion with PGA = 0.35g, and evaluate the tank for only PGA = 0.10g (=0.35g / 3.5). We also back-checked the critical tank capacities assuming Rw=1 (elastic performance).

The actual seismic performance of more than 500 steel tanks in past earthquakes has been examined in (Eidinger et al, 2001). Many of these tanks (but not all) were designed to various versions of the AWWA D100 or similar API codes.

In the following paragraphs, the main steel tank damage modes are described, assuming the median-level ground motions for a San Andreas M 7.9 earthquake.

***Shell Buckling Mode***

One of the more common forms of damage in steel tanks involves outward buckling of the bottom shell courses, a phenomenon often termed "elephants foot". Sometimes the buckling occurs over the full circumference of the tank. Buckling of the lower courses has occasionally, although not always, resulted in the loss of tank contents due to weld or piping fracture, and in some cases total collapse of the tank.

Tanks with very thin shells, such as stainless steel shells common for beer, wine and milk storage tanks, have displayed another type of shell buckling mode, involving diamond-shaped buckles a distance above the base of the tank.

The Central #2 tank has a nominal factor of safety against buckling of 1.49, when using Rw = 3.5. However, when using Rw = 1.0, a full tank will likely buckle at a ground motion of PGA = 0.35g. With the possible exception of the Central #1 tank (riveted tank, for which no drawings are available), Central #2 tank is the tank most likely to fail in a large earthquake.

The Hamilton 2 tank is nominally acceptable for tank buckling, if in fact its height is limited to 24 feet. Based on conflicting drawings, and assuming the worst case, its height is 28 feet and diameter is 56 feet. Based on the latter dimensions, the tank is overloaded for seismic overturning moment; possibly it should be anchored.

The Hamilton 1 and 3 tanks are acceptable for tank buckling for the design motion, but might buckle if a much larger motion occurs.

The Wolfe-Evelyn, Mary-Carson 1 and Mary-Carson 2 tanks are not likely to buckle. The Wright No. 1 tank has the highest margin of safety against buckling.

No drawings were available for the Central #1 (riveted) tank. According to data provided by Justin Chapel, Central #1 tank is 4.17 feet shorter than Central #2. Assuming a steel wall thickness of 0.25", then Central #1 should be marginally acceptable for wall buckling.

No drawings were available for the Wright #2 tank. Assuming it is designed the same as Wright #1 (but visually, Wright #2 has 5 courses and Wright #1 has 4 courses, so this may not be the case); then Wright No. 2 should be adequate against buckling. If Wright #2 has thinner walls like the Mary-Carson or Wolfe-Evelyn tanks, then it is likely still adequate for buckling.

### *Roof and Miscellaneous Steel Damage*

Sloshing motion of the tank contents occurs during earthquake motion. The actual amplitude of motion at the tank circumference which have been estimated in past earthquakes, on the basis of scratch marks produced by floating roofs, to have exceeded several meters in some cases. For full or near full tanks, resistance of the roof to the free sloshing results in an upward pressure distribution on the roof. Common design codes (API, AWWA D100-96) do not provide guidance on the seismic design of tank roof systems for slosh impact forces, and modern tanks (post 1980) otherwise designed for earthquake forces for elephant foot buckling or other failure modes may still have inadequate designs for roof slosh impact forces.

Compounding the roof loading from water sloshing is the fact that unanchored tanks that uplift will impose substantial movements on roof beams that are attached to the exterior shell. No code requires the designed to design these beams to accommodate roof uplift. As these beams are often made from lightweight channels that are simply supported and tack welded to the underside of the roof plate, any uplift at the edges can quickly result in lateral torsional buckling of the channel member. Damage of this sort occurred in a 4 MG steel tank in the December 2003 San Simeon earthquake (Eidinger, 2004).

Steel roofs with curved knuckle joints appear to perform better than tanks with floating roofs or flat top roofs due to slosh impact forces, but these too have had their supporting beams damaged from slosh impact forces.

Lateral movement and torsional rotations due to ground shaking have caused broken guides, ladders and other appurtenances attached between the roof and the bottom plate. Extensive damage to roofs can sometimes cause extensive damage to the upper course of a steel tank. However, roof damage or broken appurtenances, although expensive to repair, usually does not lead to more than a third of total fluid contents loss.

Damage to roof and miscellaneous steel does not usually put the tank immediately out of service, and most contents will still be available for fire flows and consumption.

All ten of Sunnyvale's tanks are susceptible to roof damage in a San Andreas M 7.9 earthquake. Unrestricted water slosh heights are estimated to be 3 to 4 feet above the surface level at the time of the earthquake; if the tanks are full, there will be water slosh-impacts to the roof system at all the tanks. In Section X.X of this report, we describe possible mitigation strategies. To eliminate the potential for roof damage will involve anchorage of the tank to a foundation (relatively expensive), and improvements to roof beams (relatively modest cost). Minor elements (such as internal and external ladders that might be attached to both the foundation and roof) can be readily mitigated.

### *Anchorage Failure*

Many steel tanks have hold down bolts / straps / chairs or embedded channels (not applicable for existing Sunnyvale steel tanks). These anchors may be insufficient to withstand the total imposed load in large earthquake events, and can be damaged.

Seismic overloads will often result in anchor pull out, stretching or failure. However, failure of an anchor does not always lead to loss of tank contents. Anchorage of Sunnyvale steel tanks is suggested for all new installations, and possibly to be considered for retrofit of the existing Hamilton 2 and Central 2 0.5 MG steel tanks.

### *Foundation Failure*

Tank storage farms have frequently been sited in areas with poor foundation conditions. In past earthquakes (Niigata, 1964), liquefaction of materials under tanks, coupled with imposed seismic moments on the tank base from lateral accelerations, have resulted in base rotation and gross settlements of the order of several meters.

In other cases on firm foundations, fracture of the base-plate welds has occurred in tanks not restrained, or inadequately restrained against uplift. In these cases the seismic accelerations have resulted in uplift displacements on the tension side (up to 14 inches recorded in 1971 San Fernando) of the tank. Since the baseplate is held down by hydrostatic pressure of the tank contents, the base weld is subject to high stresses, and fracture may result. Bottom entry pipes, especially if located within 2 to 4 feet of the tank shell), can be damaged due to shell uplift, leading to loss of tank contents. In some cases, the resulting loss of liquid has resulted in scouring of the foundation materials in the vicinity, reducing support to the tank in the damaged area, and exacerbating the damage.

Another common cause of failure is severe distortion of the tank bottom at or near the tank side wall due to a soil failure (soil liquefaction, slope instability, or excessive differential settlement). These soil failures are best prevented through proper soil compaction prior to placement of the tank and through the use of a reinforced mat foundation under the tank.

Another less common cause of failure is due to tank sliding. There is no known case where an anchored tank with greater than 30 foot diameter has slid. Sliding is a possible concern for the unanchored Sunnyvale 0.5 MG tanks, when exposed to very high levels of ground shaking (over 0.5g). However, the risk is quite small, and mitigation is not suggested.

***Hydrodynamic Pressure Failure***

Tensile hoop stresses can become large due to shaking induced pressures between the fluid and the tank, and lead to splitting and leakage. This phenomenon has occurred in riveted tanks and more commonly at bolted steel tanks where leakage at the riveted joints has occurred from seismic pressure-induced yielding. This occurrence occurs more often in the upper courses on minimized cost tank installations. No known welded steel tank has actually ruptured due to seismically induced hoop strains; however, these large tensile hoop stresses can contribute to the likelihood of "elephant foot" buckling near the tank base due to overturning moment.

We evaluated all the Sunnyvale tanks at all shell levels for hydrodynamic pressure failures, including the effects of horizontal and vertical earthquake motions. we evaluated the shell assuming both code-based criteria (using Rw = 3.5 and factored allowable stresses in the steel) as well as nominal capacity criteria (using Rw = 1 and considering actual material properties to full yield level). For all the welded tanks, we find that the shell wall thicknesses at the highest loaded course are about 65% to 93% of what would be required for a newly-built tank to modern code; or 68% to 87% of the shell thickness to prevent incipient yield. Given that the nature of the yielding is ductile, and the rate of loading at high frequency (typically 4 to 8 hertz), it is felt that some minor yielding will not result in gross shell failure; although some minor wrinkles (buckles) may occur. For all but the riveted Central #1 tank, hydrodynamic pressure failure is not considered likely, and no mitigation is suggested.

### *Connecting Pipe Failure*

One of the more common causes of loss of tank contents in earthquakes has been fracture of piping at the connection to the tank. This generally results from large vertical displacements of the tank as a result of tank buckling, wall uplift, or foundation failure. This has happened to steel tanks in recent earthquakes in California including the 1989 Loma Prieta, 1992 Landers and 2003 San Simeon earthquakes, as well as many others. Failure of rigid piping connecting adjacent tanks has also resulted from relative horizontal displacements of the tanks. Piping failure has also caused extensive scour in the foundation materials.

Another failure mode has been the breaking of pipes that enter the tank from underground, due to relative movement of the tank and the pipe. For example, this has occurred several times during the 1985 Chilean earthquake, at a South San Francisco tank located near Daly City in the 1957 San Francisco earthquake and at a 4 MG tank in the 2003 Sam Simeon earthquake.

Rigid overflow pipes attached to steel tanks have exerted large forces on the tank wall supports due to shell wall uplift. The wall supports of one such pipe tore out of the shell of an oil tank in Richmond, due to the 1989 Loma Prieta earthquake; the pipe support failure left a small hole in the tank shell around mid height of the tank.

Sunnyvale has ten unanchored steel tanks in its system. All the tanks all have one or more rigid side entry pipes, including inlet-outlet pipes and overflow pipes. Some of the tanks have pipes entering from the bottom plate too close to the shell, which could be damaged by wall uplift. The seismic mitigation plan addresses these pipes.

By retrofitting the Sunnyvale tanks to provide a flexible loop in the pipe between the tank and the ground or independent piping supports, there should be sufficient for a high confidence of low probability of failure at Peak Ground Acceleration levels up to 0.5g. anchoring the tank to a suitably-sized foundation can also largely eliminate this weakness, as long as the foundation is suitably sized so that it prevents tank wall uplift. For new tank design, steel tanks should be anchored to a suitably-sized concrete foundation ring; any bottom-entry pipe should enter the tank at least 6 feet from the shell wall; and all side entry pipes (such as overflow pipes or inlet-outlet pipes) should be designed to accommodate up to a foot of tank wall uplift; or the design should validate that there will be no tank wall uplift assuming Rw = 1; and no compaction / settlement of the adjacent ground.

| Reservoir | Pipe | Vulnerable to Wall Uplift? | Fix Priority | Figures |
|---|---|---|---|---|
| Mary 2 | 16" side entry between two tanks | Yes | High | 2-11, 2-12 |
| Mary 1 | 16" side entry between two tanks | Yes | High | 2-9, 2-11, 2-12 |
| Mary 1 | Inlet with miter | Yes | High | 2-9 |
| Mary 1 | 18" Overflow | Yes | M-H | 2-10 |
| Mary 2 | 15" Overflow | Yes | M-H | 2-13 |
| Mary 2 | 16" bottom inlet | Low | Low | 2-11 |
| Wright 1 | 30" side to pumps and Tank 2 | Yes | High | 2-20 |
| Wright 1 | 30" side with 4" pipe | Yes | Moderate | 2-20 |
| Wright 2 | 12-16" overflow | Yes | M-H | 2-22 |
| Wright 2 | 30" inlet | Yes | High | 2-21 |
| Hamilton 1 | 8" inlet from well | Yes | High | 2-30 |
| Hamilton 1 | 6" overflow | No[1] | | Similar to 2-33 |
| Hamilton 1 | 10" to pumps and other tanks | Yes | High | 2-27 |
| Hamilton 2 | 8" inlet from well | Yes | High | 2-32 |
| Hamilton 2 | 6" overflow | No[1] | | Similar to 2-33 |
| Hamilton 2 | 10" to pumps and other tanks | Yes | High | 2-31 |
| Hamilton 3 | 8" inlet from well 3 | Yes | High | 2-28 |
| Hamilton 3 | 6" overflow | No[1] | | 2-33 |
| Hamilton 3 | 10" to pumps and other tanks | Yes | High | 2-29 |
| Central 1 | 8" inlet | Yes | High | 2-38 |
| Central 1 | 10" to pump station | Yes | High | No photo |
| Central 1 | Overflow and drain | No | | 2-39 |
| Central 2 | 8" inlet-outlet | Yes | High | 2-41, 2-42, 2-43 |
| Central 2 | 10" to pump station | Yes | High | 2-42, 2-43 |
| Central 2 | 6" drain, 6" overflow | No | | 2-41 |
| Wolfe-Evln | 24" inlet with PRV vault | Yes | High | 2-50 |
| Wolfe-Evln | 24" outlet with reducer vault | Yes | High | 2-50 |
| Wolfe-Evln | 16" overflow | Yes | M-H | 2-51 |

*Table 4-1. Attached Pipe Summary*

The meaning of the terms used in Table 4-1 follows:

- Vulnerability to uplift. The vulnerability is based on the median level of ground motion in a San Andreas M 7.9 earthquake. Yes indicates that the tank shell is

[1] Vulnerable if shell buckles

likely to uplift and put high stress on the attached pipe. No means that even if the tank wall uplifts, the attached pipe will not be unduly stressed. Low means that the attached pipe enters the tank through the bottom plate, and will have some vulnerability due to uplift.

- Fix priority. The fix priority assumes that a tank anchorage system is not installed, and that the tank shell will uplift. "High" indicates that damage to the pipe may result in complete loss of tank contents (assumes that it may take several hours before maintenance crews can reach the site to turn any valves). "Moderate" indicates that even if the pipe is damaged, the leak rate will be slow enough such that not much of the tank contents will be lost prior to the time it takes for a maintenance crew to turn a valve and isolate the leak. "M-H" indicates that pipe damage might lead to secondary tank shell damage, but direct loss of tank contents is not assured.

In addition to the pipes listed in Table 4-1, highly vulnerable drain pipes (should the tank wall uplift) that enter through the bottom shell include:

- Mary 1. 6" drain, 22 inches from side shell.
- Wolfe Evelyn. 6" drain, 22 inches from side shell.
- Wright 1. 6" drain, uncertain distance from side shell.

It is recommended that flexible couplings be added to these three pipes immediately outside the concrete ring wall. An allowance for two additional retrofits is made for Mary 2 and Wright 2, where available drawings are not specific.

### *Manhole Failure*

Loss of contents has occurred due to overloads on the manhole covers. This type of failure has occurred in thin walled, stainless steel tanks used for wine storage. This kind of failure has also occurred at manhole cover doubler plates when these doubler plates extend low enough in the bottom course to be highly strained in the event of elephant foot buckling.

For Sunnyvale tanks, manhole failure is unlikely unless there is gross shell buckling.

### *Summary*

For the ten reservoirs in their current (2004) configurations, the estimated chance of reaching various damage states in a San Andreas M 7.9 earthquake are as follows:

- Loss of all water due to broken pipes are wall buckling.

  - Central 1, 2. 25% each
  - Hamilton 1, 2, 3. 28% each
  - Wright 1, 2. 21% each
  - Mary Carson, Wolfe Evelyn. 15% each
  - Total loss of storage: 18%

By upgrading the attached pipes for all ten tanks and anchoring Central 2 and Hamilton 2, the estimated chance of reaching various damage states in a San Andreas M 7.9 earthquake is substantially reduced, but not eliminated, as follows:

- Loss of all water due to broken pipes are wall buckling.
  - Central 1, 2, Hamilton 1, 2, 3. 8% each
  - Wright 1, 2. 10% each
  - Mary Carson, Wolfe Evelyn. 7% each
  - Total loss of storage: 8%

## *4.3 Pump Station and Well Vulnerability*

The Sunnyvale pump station and well buildings are small in size, rectangular in plan, and use either timber frame or reinforced masonry styles of construction. None of the Sunnyvale pump station buildings is likely to suffer more than repairable damage even in a San Andreas M 7.9 earthquake; such damage should not impact immediate post-earthquake operations. Therefore, no seismic mitigation of these buildings is recommended.

Some of the timber buildings have suffered dry rot / termite damage or have otherwise suffered over time. This is particularly true at Mary-Carson (Figure 2-16). Similar damage is possible at the Wright Avenue and Wolfe-Evelyn pump stations. Extensive wood damage at the Central pump station was noted by Sunnyvale staff. While not strictly a seismic-vulnerability, the timber structures could be candidates for replacement with reinforced masonry (or reinforced concrete) structures. The Mary-Carson pump station is susceptible to complete loss due to fire (see high fuel load in Figure 2-14). Should there be a conflagration in the vicinity of the Mary-Carson pump station, it is likely the roof of the existing pump station burn, likely leading to total failure of the facility. In the 1991 Oakland-Hills firestorm, none of EBMUD's pump stations in the conflagration suffered any material damage (except for loss of electric power during the fire), and were quickly returned to service after the fire; all of EBMUD's pump stations had superior fire resistance than the Mary-Carson pump station.

Non-structural upgrades recommended at the pump stations include:

- Mary-Carson. Add restraint/anchorage for motor control center (allowance). Restrain engine start-up battery rack and battery. Restrain SCADA backup battery.

- Wright Avenue. Restrain engine start-up battery rack and battery. Restrain SCADA backup battery (allowance).

- Hamilton. Restrain engine start-up battery rack and battery. Restrain SCADA backup battery (allowance).

- Central. Restrain storage shelves (2). Anchor floor standing electrical cabinet (allowance).

- Wolfe-Evelyn. Add restraint/anchorage for motor control center (allowance). Restrain engine start-up battery rack and battery. Restrain SCADA backup battery.

- Serra. Add restraint/anchorage for motor control center (allowance). Restrain SCADA backup battery.

- Ortega. Restrain SCADA backup battery.

- Raynor. Restrain SCADA backup battery. Add snubbers for emergency generator.

- Other sites. An allowance is made to restrain SCADA backup batteries at all SFPUC-Sunnyvale turnouts. As part of the mitigation, all installation should be verified for restraint, and possibly it sill be found that 1 or 2 more not listed above should also be restrained.

All wells use submersible pumps. It is unlikely that any of the wells would be damaged by earthquakes.

## 4.4 Repair / Restoration Capability

The operations and maintenance of the Sunnyvale water system involves 26 full time employees; it is assumed that 14 can be assigned to make pipe repairs under emergency conditions. Sunnyvale can use its own work force to perform pipe repairs of any size; most commonly, they use in-house staff to make repairs for pipes up to 16" diameter, and they sometimes contract out for repairs to larger diameter pipes. It will take, on average, about 16 man-hours to make a repair to smaller diameter distribution pipe (12" and smaller), 60 man-hours for larger pipes (16" to 20") and 200 hours for the largest pipes (30").

The City of Sunnyvale has its own cable television station. This form of communication could be used to inform customers about the need for demand restrictions or other emergency information.

# Chapter 5 System Response

## *5.1 Scenario Earthquakes*

The response of the Sunnyvale system is influenced mostly by the following factors:

- Quantity of Sunnyvale pipeline damage
- Quantity of Sunnyvale reservoir damage
- How long SCVWD system is out of service
- How long SFPUC system is out of service
- How fast Sunnyvale can start up its wells, relying on emergency power (portable generators or on-site backup power)
- How long PG&E power is out of service
- How fast Sunnyvale can make pipeline repairs

The Sunnyvale system was analyzed for these factors, assuming the SCVWD and SFPUC systems in their present (2004) condition. Figure 5-1 shows the median-based system restoration curves for the Sunnyvale system, following the three scenario earthquakes, assuming all tanks are mitigated.

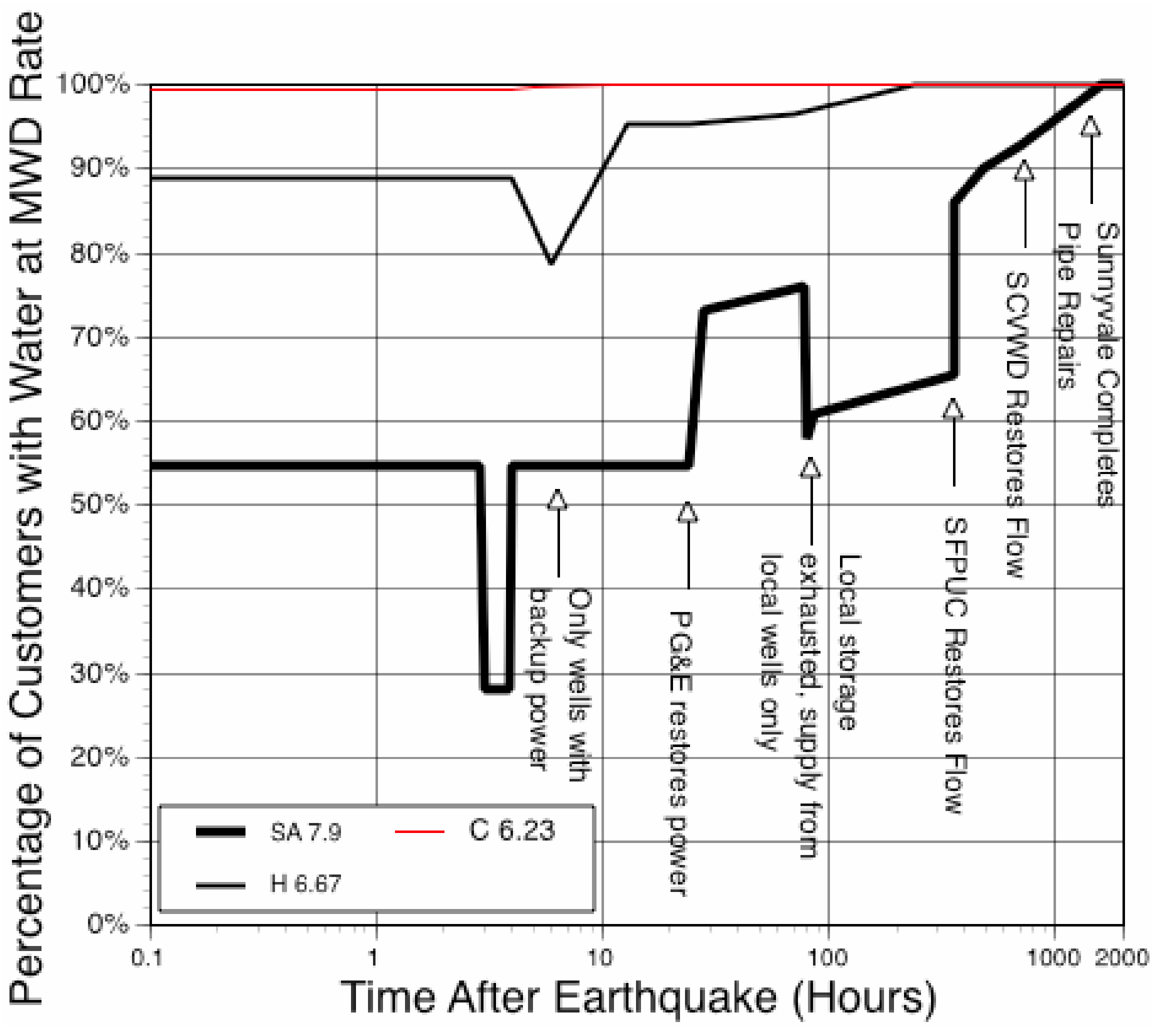



*Figure 5-1. Restoration of Service after Scenario Earthquakes*

In Figure 5-1, the three scenario earthquakes are delineated by the thick, medium and thin lines. The vertical axis represents the number of customers in the Sunnyvale system that can receive water, assuming system wide demand is kept to maximum winter day (MWD) rate (currently about 14.7 MGD). Figure 5-1 assumes that there will be no major damage to the tanks in the Sunnyvale system, which will require some amount of seismic improvement to achieve.

The median expected number of pipes that will suffer some type of damage in the Sunnyvale system is: 297 (San Andreas M 7.9); 45 (Hayward M 6.67); or 6 (Calaveras M 6.23). Pipeline damage can manifest itself as pin hole leaks or complete breaks. The number of repairs could vary by ±50% from these values, given uncertainties in ground motions and response of pipelines.

At time 0 hours (immediately after the earthquake), about 45%, 11% or 0.6% of Sunnyvale customers lose water supply, for the San Andreas, Hayward or Calaveras earthquakes, respectively. The amount varies between the earthquakes due to varying amounts of pipeline damage, and considers simultaneous fire flows and leak rates. The leak rates from the system are as follows:

- San Andreas 7.9: 68,000 gpm at time 0, decreasing to near 0 gpm at time 24 hours. The source for most of the leakage is the SFPUC pipelines, which will rapidly depressurize due to excessive demands, and SFPUC pipeline damage. Leak rates in Zone 3 (normally fed by SCVWD) will be under 1,000 gpm. Within a few hours, the leak rate will be limited to about one-third the pumped rate available from local tanks and from wells.

- Hayward M 6.67: 27,000 gpm at time 0, decreasing to near 0 gpm by time 24 hours. Leak rates in Zone 3 (normally fed by SCVWD) will be under 300 gpm. Within a few hours, the leak rate will be limited to about one-third the pumped rate available from local tanks and from wells.

- Calaveras M 6.23: 2,000 gpm at time 0, decreasing to near 0 gpm by time 24 hours. Leak rates in Zone 3 (normally fed by SCVWD) will be under 150 gpm.

Water needed for fire flows is assumed to peak at about 11,000 gpm (SA M 7.9); 6,000 gpm (Hayward M 6.67); or 3,600 gpm (Calaveras M 6.23), assuming calm to light wind conditions and adequate fire department response and no conflagrations. This assumes the relatively good performance of the pipeline network in Zones 2 and 3, and allows that the fire department can respond and control up to 15, 8 or 5 ignitions in the first 24 hours after the San Andreas, Hayward and Calaveras earthquakes respectively, using available resources. Given that the San Andreas M 7.9 event could result in widespread pipeline damage in the northern parts of Zone 1, when that part of the service area might be almost totally dry, then there is a higher risk of conflagration in that area, and this should be mitigated.

For the San Andreas M 7.9 event, it is assumed that SCVWD supplies will be lost to the two turnouts entirely for up to 30 days. For the Hayward M 6.67 and Calaveras M 6.23 events, it is assumed that SCVWD supplies will be lost to the two turnouts for 24 hours.

For the San Andreas M 7.9 and Hayward M 6.67 events, it is assumed that SFPUC supplies will be lost to the six turnouts entirely for up to 15 days (there is a reasonable chance that the SFPUC outage could be shorter, but this is not factored into the analysis). For the Calaveras M 6.23 events, it is not likely that SFPUC supply to Sunnyvale will be interrupted for more than a few hours while the SFPUC resets valves as needed in their water system. As the SCVWD supply should be reliable to Sunnyvale within 24 hours after the Hayward M 6.67 and Calaveras M 6.23 events, the reliance on SFPUC water is not critical for Sunnyvale in these events, once SCVWD supplies plus local wells are put into service.

For the San Andreas M 7.9, Hayward M 6.67 and Calaveras M 6.23 events, it is assumed that PG&E power will be lost within minutes after the earthquake, and will be restored to the major portion of the service area 24 hours after the earthquake. While it is possible that PG&E will be able to re-energize portions of the Sunnyvale service area within 4 to 8 hours after a major earthquake event, operational and emergency response considerations suggest it prudent to assume a longer term outage (24 hours). Power can be delivered to Sunnyvale via the PG&E 230 kV and lower voltage network, relying on the multiple power sources in the Pittsburg – Antioch area and the new Coyote power plant (under construction), without relying on the more vulnerable 500 kV network.

It is assumed that with a complete PG&E blackout, it will take Sunnyvale about 4 hours to startup its wells at the Hamilton site; the Raynor backup power unit will start automatically within 5 minutes of a PG&E power failure.

Assuming that just item 4 (Table 6-1 – non-structural upgrades) are implemented, but that none of the other tanks and pump station upgrades are implemented, Figure 5-2 shows the impact on Sunnyvale post-earthquake operations for the San Andreas M 7.9 earthquake.

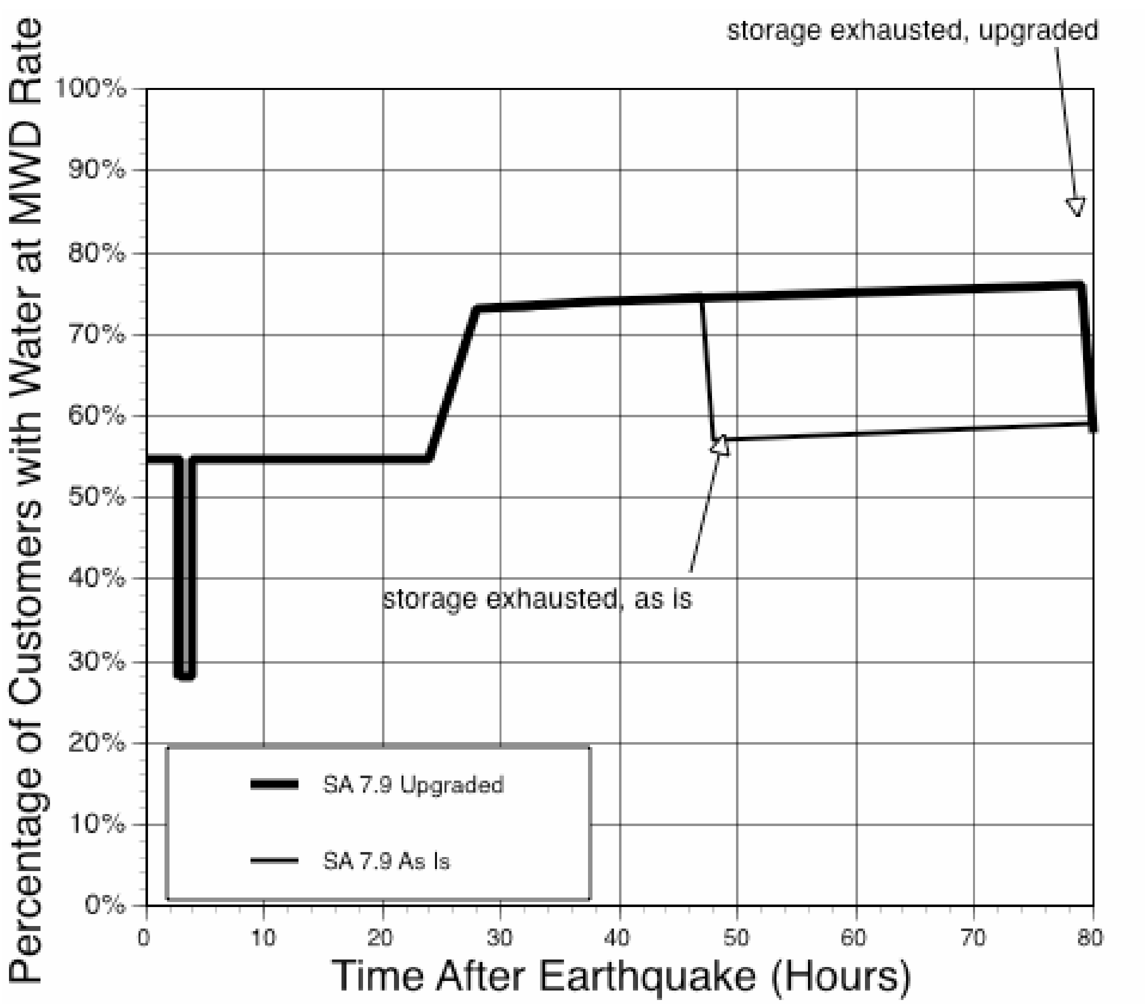



*Figure 5-2. Sunnyvale System Response, As-Is and Upgraded Conditions*

By upgrading the Sunnyvale tanks, the likelihood of tank damage (mostly to attached pipes) is substantially reduced. The post-earthquake storage of water in the Sunnyvale system would be increased by about 5 million gallons. As highlighted in Figure 5-2, if left unmitigated, local storage would be exhausted at about 48 hours post-earthquake. If the tanks are upgraded, the local storage would be exhausted at about 80 hours post-earthquake. The net result is that by upgrading the tanks, about 15% of all Sunnyvale customers would get water for 34 hours.

Another analysis was considered as to the impact on the Sunnyvale system should the SFPUC be able to maintain at least winter time flows post-earthquake. This would be the case should the SFPUC upgrade its BDPL 3 and 4 pipelines; or might be the case if Sunnyvale could draw water from a point just west of the Mary turnout and the SFPUC be able to backfeed water to Sunnyvale.

Another analysis was considered for the as-is condition for the Sunnyvale system, assuming that not even the recommended non-structural upgrades (Table 6-1) are performed. Without these non-structural upgrades, the startup batteries for the engines at the pump stations may fail, so it will take some manual effort to startup the engine; or await restoration of PG&E power. as configured only the Wright Avenue tanks can provide adequate supply into the water system via gravity feed. The net effect is that there will be additional water outages in the system during the first 24 hours; this is partially offset by somewhat improved service once PG&E power is restored, as the water not used in the first 24 hours will be available in the undamaged tanks.

Figure 5-3 shows the comparisons for 4 cases assuming a San Andreas M 7.9 earthquake:

- Dashed line. Sunnyvale system in its as-is condition, without any modifications

- Thin solid line. Sunnyvale system in its as-is condition, with only non-structural upgrades so that water in non-damaged tanks is available.

- Thick solid line. Sunnyvale system in an upgraded condition, including all the mitigations in the "high" priority upgrades listed in Table 6-1.

- Thick blue line. Sunnyvale system in an upgraded situation, assuming that water supply is not interrupted. This can be achieved including the mitigations in the "moderate" priority listed in Table 6-1; coupled with upgrades by either SFPUC and/or SCVWD to assure they can supply winter time flows to Sunnyvale within 24 hours post-earthquake; or development by Sunnyvale of about 6.5 MGD in new well supplies. The cost to develop these new wells might be on the order of $6,000,000.

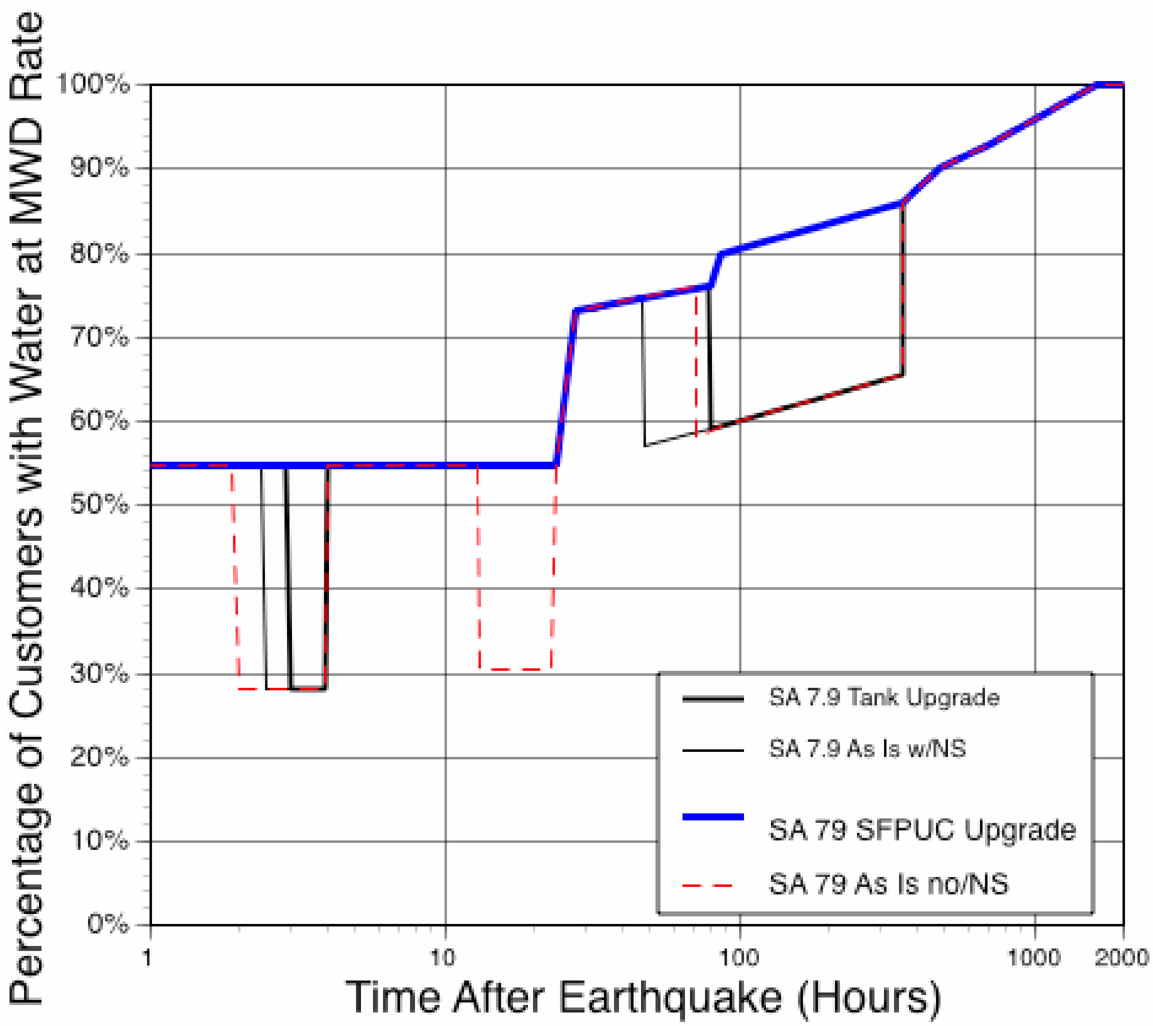



*Figure 5-3. Sunnyvale System Response, As-Is, Tank Upgrade and SFPUC Upgrade Conditions*

The thick blue line shows the best post-earthquake performance in the Sunnyvale system should there be adequate supply (from SFPUC, wells, tanks, SCVWD), and the only remaining outages stem from the time needed to repair broken pipes.

Figure 5-3 highlights that structural mitigation options (either upgrading tanks, or upgrade to SFPUC supply) will address only a portion of the total post-earthquake impacts to the water system. To further improve the post-earthquake response, three possible strategies are available:

- Sunnyvale should try to mobilize upon more crews for post-earthquake pipe repairs. This will require some changes to Sunnyvale's emergency response plans, and possibly entail bringing in work crews from outside the immediate San Francisco Bay Area. The faster these crews are brought in, the faster the pipes will be fixed. Due to practical limits as to the amount of mutual aid that Sunnyvale might be able to realistically use, the repair time might be shortened by 30% to 50%. By implementing an emergency response plan that would effectively double the repair crew force within one day after the earthquake (requires rapid call-up of pipe repair crews via mutual aid / contractors), the service restoration outage times (customers without water x time of outage) should be assumed to be (for benefit cost purposes) about 40% less than that shown in Figure 5-3. Item (9) in Table 6-1 addresses this issue,

- Sunnyvale should change the type of pipe in the distribution system, such that the amount of pipe damage is decreased by 50% to 75%. We do not recommend that Sunnyvale begin a pipe replacement program simply based on earthquakes. Instead, we recommend that Sunnyvale adopt a new pipeline design requirement for all new installations in the areas mapped as having high or very high liquefaction susceptibility. A new pipeline design guideline is currently under preparation by the ALA, and should be available by mid-2005. These guidelines will address items such as distribution pipe in liquefaction zones and service laterals. For the time being, it is recommended that Sunnyvale use only restrained pipelines (ductile iron, PVC, HDPE, welded steel, etc.) in these zones; metal pipe will require suitable corrosion protection. Item (10) in Table 6-1 addresses this issue.

- A third strategy that might have application would be for Sunnyvale to maintain a stock of large (5" to 6") to ultra-large (8" to 12") diameter flex hose with suitable manifolds to be used to rapidly restore service where existing mains break. The regional liquefaction maps are insufficient to forecast specific locations of pipe damage to Sunnyvale's 12" and larger pipes. To adopt this strategy will require additional mapping efforts in Sunnyvale to better define the hazards along the 12" and larger pipes; and then establish a logical strategy using portable hose. Item (5) in Table 6-1 addresses this issue.

# Chapter 6 Mitigation by Sunnyvale

## *6.1 General – Earthquake Conditions*

This report provides an overall "snapshot" of what might realistically happen to water supplies for Sunnyvale following major earthquakes on the San Andreas, Hayward and Calaveras faults.

For the San Andreas M 7.9 earthquake, the outcomes are severe for Sunnyvale water customers. The SCVWD West pipeline will likely be out of service. The SFPUC system may also be out of service. Local wells with backup power supplies can provide about 55% of winter time demand; increasing to about 75% of winter time demand once PG&E power is restored. Damage to existing tanks will result is loss of local storage needed for fire fighting and other uses in the first day after the earthquake. Widespread pipeline damage in the northern parts of Zone 1 will rapidly depressurize Zone 1, leading to widespread outages in that area. Damage to the ten tanks will lead to (on average) about 5 million gallons of lost storage. It will take up to 67 days to complete distribution system pipe repairs in the Sunnyvale system. It will take up to 15 days for the SFPUC to reliably restore supply to Sunnyvale. It will take up to 30 days for the SCVWD to reliably restore supply to Sunnyvale.

For the Hayward M 6.67 earthquake, the negative outcomes should be moderate for Sunnyvale customers, with about 11% of customers losing water supply, and essentially all customers restored to service within 10 days. For up to 15 days, Sunnyvale may have to rely only on local wells plus SCVWD supplies.

For the Calaveras M 6.23 earthquake, the negative outcomes should be very modest for Sunnyvale customers, with no more than 1% of customers losing water supply, and only for short periods of time.

Prior to embarking on a comprehensive seismic retrofit effort, further evaluations of the Sunnyvale water system might be useful to develop the following information:

- Establish better localized liquefaction, landslide and faulting susceptibility maps for Sunnyvale. This would involve detailed review of available boreholes; settlement and lateral spread evaluations, establishing the risk of sympathetic or independent fault offset on lesser active faults, and some mapping work. The emphasis should be to refine information for the wells near creeks. This work is required if item (5) in Table 6-1 is implemented; the cost is included in the Engineering, Design, Planning and Inspection item in Table 6-1.

- Refine the pipeline and well damage estimates based on the refined landslide, liquefaction and faulting information, and using better pipeline inventory information and in consideration of the major pipeline replacement / upgrade program envisioned under Sunnyvale's planned pipeline replacement program. Develop a strategy for using portable hose / portable pipe post-earthquake to more rapidly restore water service. Procure suitable hardware. This work is required if item (5) in Table 6-1 is implemented; the cost is included in the Engineering, Design, Planning and Inspection item in Table 6-1.

- Make sure that a suitable Sunnyvale water system emergency response plan is in place, and staff trained. The time needed to restore water service within Sunnyvale as listed in this report, is dependent on the ability of the Sunnyvale staff to rapidly mobilize its work force able to provide 168 manhours of field work per day after either the San Andreas M 7.9 earthquake. This could be done using 14 people on 12 hour shifts (or more people with shorter shifts). Pipe repairs after a major earthquake will be a high priority activity, and the emergency response plan needs to consider this level of effort in conjunction with deployment and operation of portable pumps and valve turning requirements. An improved emergency response plan would consider the rapid use of mutual aid / outside contractors to effectively double the available manpower (and spare parts / heavy equipment) needed to make repairs.

- Establish a 2 to 20–year long capital improvement program which incorporates cost-effective improvements to the water system that can materially reduce the impact of water outages in the Sunnyvale system. Most of the severe consequences to Sunnyvale could be eliminated if either the SCVWD or SFPUC systems could be upgraded to reliably deliver at least 5 MGD uninterrupted or within 8 hours after a San Andreas M 7.9 or Hayward M 6.67 earthquake; by implementing the improvements described in Section 6; and with a long term program to install liquefaction-resistant pipelines in the high-susceptible liquefaction areas in Sunnyvale.

## *6.2 Seismic Improvement Program*

It is recommended that Sunnyvale develop a Seismic Improvement Program (SIP) for its water system. Certain activities / improvements have already been identified and are summarized below.

Ultimately, the SIP should be implemented as part of an overall CIP (Capital Improvements Program). Possible SIP Elements, as a first assessment, are as follows:

- Seismic upgrade of side entry pipes to tanks listed as "high priority" in Table 4-1. The unit installation cost for a 12" diameter pipe is $16,000, which includes hardware and labor for installation. Additional soft costs (design, engineering, outage planning, inspection) are 40%. The costs are higher for 16" to 30" diameter pipes, and lower for 8" to 10" diameter pipes. The effort includes modification of 17 side-entry pipes that are susceptible to damage from wall uplift (unanchored tanks). Relocation of one valve vault is considered for the Wright 2 30" inlet pipe. $435,000. Priority high. (1)

- Seismic upgrade of side entry pipes to tanks listed as "medium and medium-high priority" in Table 4-1. The effort includes modification of 5 side-entry pipes that are susceptible to damage from wall uplift (unanchored tanks). $104,000. Priority medium. (2)

- Seismic upgrade of five bottom entry drain pipes to tanks (three listed and allowance for Mary 2 and Wright 2). The effort includes modification of 5 bottom-entry pipes that are susceptible to damage from wall uplift (unanchored tanks). $50,000. Priority high. (3)

- Various non-structural upgrades at pump stations as listed in Section 4.3. The unit cost to install anchors for electrical cabinets and adding restraint for engine batteries is $1,000 each, assuming a crew of 2 people can do one upgrade in 4 hours. Restraint of SCADA batteries should take less effort. Total field effort is estimated at $10,000. Priority high (4).

- Update critical pipeline analyses for updated hazards assessment. Establish pipeline retrofit / replacement / flex hose redundancy plan in consideration of earthquake, build out and other operational needs. Provide conceptual design sketches for pipeline alternatives. Include 2,000 feet of 12" diameter hose plus deployment vehicles. Estimated cost: $140,000. (5)

- Seismic upgrade of tanks. This includes upgrade of foundation systems to allow anchorage of the tank. This is the most important for the Central #2 and Hamilton #2 tanks; and to a somewhat lesser extent for the Central #1, Hamilton #1 and Hamilton #3 tanks. An allowance is made for anchoring these five tanks. These upgrades are meant to upgrade seismic reliability in a cost effective manner, but not to meet all the requirements of current codes. Upgrades include new foundations, new anchorage of lower course to new foundations. A lower cost alternative would be to maintain water levels no more than about 50% full, which will eliminate most of the major seismic risk, but introduce other operational issues. $750,000. Priority high (2 tanks), medium (3 tanks) (6).

- Add another connection to the SFPUC system for Zone 2, west of the current Alviso – Mary turnout. This will increase reliability to Sunnyvale should there be damage to both SFPUC pipelines where they traverse the San Tomas, Coyote and Guadalupe creeks. This would materially improve supply availability in Sunnyvale after large earthquakes on the Hayward fault, and to some extent after larger earthquakes on the San Andreas fault. $500,000 allowance, which includes two new 12" outlets, meters, valves, valve vault, attached pipes; all within a congested location. (7).

- Minor pump station timber roof upgrades to increase beam and diaphragm strength where wood rot has weakened the roofs. ($15,000). (8)

- Emergency power / portable pumps / post-earthquake operational plans. Develop an operational strategy to rapidly and effectively manage the water system to isolate leakage; cross connect between pressure zones; procure and manage spare parts and heavy equipment and mutual aid; coordinate rapid pipeline restorations; training of Sunnyvale staff. $25,000. (9)

- Develop seismic design procedure manual for new water system installations: $20,000. (10). This manual should be a required element as part of implementing the current pipe replacement program. This manual should cover:

  - Pipeline material and joinery selections for distribution and backbone pipelines as a function of system redundancy, local liquefaction issues, and corrosion. At a minimum, new backbone pipeline installations that cross creek or liquefaction zones must have isolation valves and bypass outlets (manifolds or hydrants or blow offs) located immediately outside the hazard zone; pipelines in localized high susceptibility hazard zones should be capable of remaining intact under differential settlement of 3 inches over 30 feet.

- Tanks. All new tank and reservoir installations should be designed to site specific ground motions (at least PGA = 0.45g). Steel tanks should be anchored to concrete ring wall foundations; unanchored steel tanks are not recommended if they just meet code minimums. All attached pipes should be provided with sufficient flexibility to accommodate any tank (or tank and foundation) uplift up to 12 inches for seismic loads with R=1. New tank and reservoir roof support systems, including their columns and beams, should be designed to accommodate any sloshing-induced loads or likely tank wall uplift. Internal pipes and their supports (chemical injection, mixing, etc.) should be designed for earthquake induced fluid-structure loading.

- Emergency generators, propane tanks. All batteries should be restrained. All vibration isolation systems shall be shown to remain elastic under site specific ground motions. All tanks should be anchored.

- Underground structures. Criteria should be included to cover soil pressures due to earthquakes.

Table 6-1 summarizes the Seismic Improvement Program that might be implemented by Sunnyvale. All dollars are in year 2004 dollars. Two possible levels of funding are suggested, P1 (highest) and P2 (moderate). By doing nothing, service restoration would be about that shown in Figure 5-2 (as-is condition). By implementing P1 without the improved emergency response plan, service restoration would be about that shown in Figure 5-1. By implementing P2, coupled with likely upgrades to the SFPUC system, the service restoration outage times (customers without water x time of outage) would be about 40% less than that shown in Figure 5-3. The cost for mitigation for the SCVWD and SFPUC systems are not included.

| Item | P1 (highest) | P2 (moderate) |
|---|---|---|
| 1. High Priority Side Entry Pipes | $435,000 | $435,000 |
| 2. Moderate Priority Side Entry Pipes | | $104,000 |
| 3. High Priority Bottom Entry Pipes | $50,000 | $50,000 |
| 4. Non structural items | $10,000 | $10,000 |
| 5. Portable pipe / ultra large diameter hose | | $140,000 |
| 6. Anchor Tanks | $300,000 | $750,000 |
| 7. Add second SFPUC connection at Alviso | | $500,000 |
| 8. Minor wood roof upgrades | | $15,000 |
| Total, construction | 795,000 | 2,004,000 |
| Contractor mobilization, general conditions, profit @25% | 200,000 | 501,000 |
| Total Construction | 995,000 | 2,505,000 |
| Engineering, Design, Planning, Inspection @40% | 398,000 | 1,002,000 |
| 9. Emergency response plan | 25,000 | 25,000 |
| 10. Pipe design manual | 20,000 | 20,000 |
| Total | $1,438,000 | $3,552,000 |

*Table 6-1. Seismic Improvement Program*

Based on the findings and assessments made in this report, it appears that an SIP budget of between $1,438,000 to $3,552,000 is suitable. Higher expenditures associated with anchorage of the large diameter tanks, addition of more local wells, addition of more local emergency generators, are probably not cost effective, assuming that the SCVWD and SFPUC supply reliability will be improved over the next ten years. The cost to replace vulnerable pipelines is not included in the above estimates, but is assumed to be part of Sunnyvale's long term CIP.

Figure 6-1 shows a conceptual upgrade to add anchorage for Central 1 (unanchored tank).

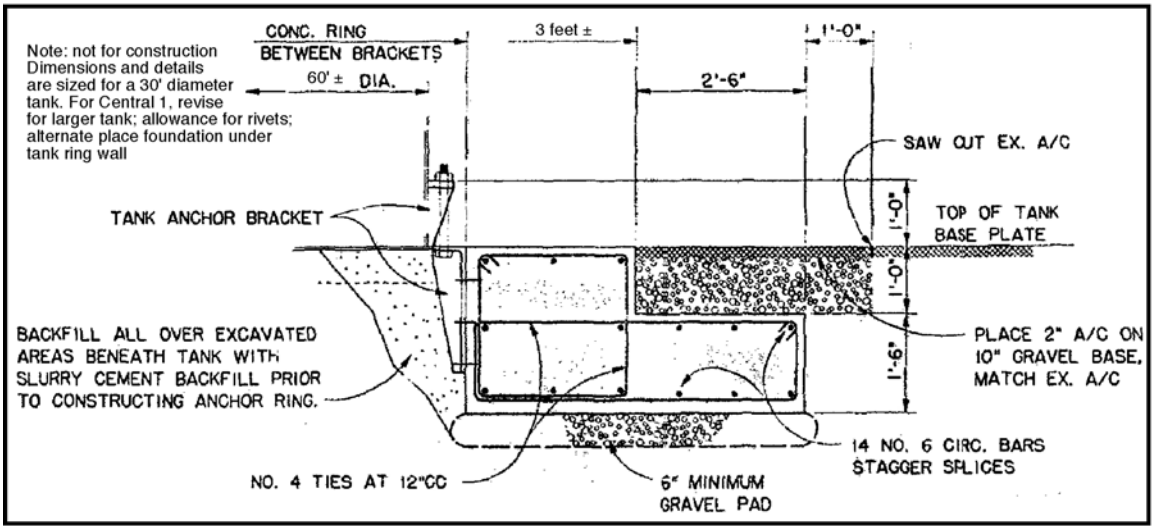



*Figure 6-1. New Anchorage for Central 1*

Adding anchorage for Central 2, Hamilton 1, 2, and 3 would involved adding anchor brackets (also called chairs) to the outside walls (possibly 16" tall); exposing the existing concrete ring walls and adding new concrete to them (the existing walls are too thin / light). Figure 6-2 shows a well anchored water tank.

*Figure 6-2. Anchorage Layout for Central 2, Hamilton 1, 2, 3 (example)*

*Figure 6-3. Flextend Hardware (EBAA) Installed for side Entry Pipe (Example)*

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**APPENDIX J**

City of Sunnyvale

2020 Urban Water Management Plan

Sunnyvale Municipal Code

## Chapter 12.24. WATER SYSTEM REGULATIONS

### 12.24.010. Rates fixed by resolution.

The city council of Sunnyvale may from time to time hereafter in its discretion, fix the rates for water sold to consumers within or without the corporate limits of the city of Sunnyvale, by resolution of the council. (Prior code § 11-1.06).

### 12.24.020. Meter reading—Payment of bills—Service discontinuance—Special service charges.

All meters shall be read as nearly as possible once every other month, with the exception of meters with commercial or industrial rating, which shall be read monthly. Billing periods shall as nearly as possible be bimonthly for nonindustrial meters, and monthly for industrially rated meters. Billing periods shall be staggered among the customers rather than on a uniform calendar monthly or bimonthly system for all customers. All bills for service are due and payable upon presentation. All bills must be paid to the Finance Department, 650 West Olive Avenue, Sunnyvale, on or before the twenty-fifth day after presentation. The procedure set forth in Chapter 12.50 of this code shall govern any discontinuation of service for failure to pay bills. A special services charge, at the rates hereafter fixed from time to time by resolution of the city council, shall be made for restoring said service. (3062-15 § 6; Ord. 2211-87 § 1; Ord. 2192-86 § 2; Ord. 955 § 1, 1961; prior code § 11-1.07).

### 12.24.030. Reading of meters—Computation of bills.

(a) All meters with an industrial rating shall be read as nearly as possible at monthly intervals. Opening and closing bills on meters with industrial ratings for water service for periods of less than thirty days shall be computed in accordance with the rate applicable to that service, but charges for the amount of water consumed shall be measured from the initial reading to the next regular reading or from the previous reading to the final reading, and other charges shall be prorated on the basis of the number of days of service in the billing period in question to the total number of days in that billing period.

(b) All meters not having an industrial rating shall be read as nearly as possible at bimonthly intervals. Opening and closing bills for water service on meters not having an industrial rating for periods of less than sixty days shall be computed in accordance with the rate applicable to that service, but charges for the amount of water consumed shall be measured from the initial reading to the next regular reading or from the previous reading to the final reading, and other charges shall be prorated on the basis of the number of days of service in the billing period in question to the total number of days in that billing period. (Ord. 2211-87 § 1; prior code 11-1.08).

### 12.24.040. Discontinuance for nonpayment at prior location.

A consumer's water service may be discontinued for nonpayment of a bill for water service rendered him or her at a previous location, provided said bill is not paid within thirty days after presentation at the new location. (Prior code § 11-1.09).

### 12.24.050. Rule violation—Service discontinuance.

Every person taking water shall be considered as having expressed his or her consent to be bound hereby, and whenever any one of the rules and regulations is violated, the right is reserved to shut off the water without notice. (Prior code § 11-1.10).

### 12.24.060. Dispute over bill.

In case a dispute should arise over the correctness of any bill rendered for water, the matter shall be presented to the city for adjustment pursuant to Chapter 12.50 of this code. (Ord. 2192-86 § 3; prior code § 11-1.11).

### 12.24.070. Consumer responsible for appliances—Right to refuse service.

(a) The city shall have the right of refusing to, or ceasing to deliver water to a consumer, if any part of the consumer's service appliances or apparatus shall at any time be unsafe, or if the utilization of water by means thereof shall be prohibited or forbidden under the authority of any law or municipal ordinance or regulation, and may refuse to serve until the consumer shall put such part in good and safe condition and comply with all the laws, ordinances and regulations applicable thereto.

(b) The city does not assume the duty of inspecting the consumer's service appliances or apparatus or any part thereof and assumes no liability therefor. The owners of premises taking water must keep their service pipe, stopcocks and all apparatus connected therewith on said premises in good repair at their own expense; and no claim shall be made against the city of Sunnyvale by reason of bursting or any other disarrangement of any service pipe or any apparatus or any appliance connected therewith.

(c) The consumer shall at his or her own risk and expense, furnish, install and keep in good safe condition, all apparatus and appliances which may be required for receiving, controlling, applying and utilizing such water and the city of Sunnyvale shall not be responsible for loss or damage caused by the improper installation of such apparatus or appliances, negligence, want of proper care, or wrongful act of the consumer or any of his or her agents, employees, or licensees on the part of the consumer in installing, maintaining, using, operating or interfering with any such apparatus or appliances. (Ord. 3062-15 § 7; prior code § 11-1.12).

### 12.24.080. Meters and appliances—Installation—Liability for damages.

(a) All meters shall be installed by or under the supervision of the city. Such meters, wherever practicable, shall be placed in suitable meter boxes, located in the sidewalk. When it is not practicable to place meters in the sidewalk, or in other words between the curb and property line, the meters shall be installed in some convenient place approved by the water department upon the consumer's premises, and so placed as to be at all times accessible for inspection, reading and testing.

(b) The city shall, at its own expense, furnish and install service pipe of suitable capacity, from its mains to the meter for service of premises abutting upon a public street, along which it has a water main. The necessity and convenience of constructing new mains and service therefrom shall be determined by the city council.

(c) All meters and appliances installed by the city at its expense, whether in a public street or upon the consumer's premises, for the purpose of delivering water to the consumer, shall continue to be the property of the city, and may be repaired, replaced or removed by the city at any time. The consumer shall exercise reasonable care to prevent the meters and appliances installed upon the premises, from being injured or destroyed, and shall refrain from interfering with same, and in case any defect therein shall be discovered, shall notify the water department thereof.

(d) Any damage occurring to a meter or other appliances or pipes owned by the city, caused by the carelessness or neglect of the consumer, including any damage which may result from hot water or steam from any boiler, or heater on consumer's premises, shall be paid for by the consumer on presentation of a bill therefor.

(e) The consumer shall install that portion of the service from the meter to his or her premises, the expense of same to be paid by the consumer, and said service shall be provided with a shut-off valve. The materials furnished by the consumer in the construction of such service extension, will, at all times, be and remain the property of the consumer, and when necessary, will be maintained and repaired by the consumer. (Ord. 3062-15 § 8; prior code § 11-1.13).

### 12.24.090. Separate meters required.

(a) In all cases in which water is served to a building occupied by different and independent consumers of water, independent services must be provided for each such independent consumer, unless the owner or other responsible representative of the occupants prefers to have all such independent consumers under one meter, in which case he or she shall assume the entire account and pay not less than the sum of the minimum rates for all such independent consumers.

(b) All separate premises, even though owned by the same consumer, shall have a separate meter.

(c) When separate houses or buildings are located upon the same premises and occupied by different and independent consumers, a separate meter must be provided for each house or building. (Prior code § 11-1.14).

### 12.24.100. Employees to connect or disconnect service—Acceptance of gratuities prohibited.

(a) Only duly authorized employees of the city are allowed to connect the consumer's service to, or disconnect the same from the city water mains, or supply pipes.

(b) All employees of the city are strictly forbidden to demand or accept any personal compensation or gratuity for services rendered any consumer. (Ord. 3062-15 § 9; prior code § 11-1.15).

### 12.24.110. Tampering with equipment prohibited.

No person or persons shall, without a written permit from the city, open or in any way tamper with or make any addition or alteration whatever to any street main, service connection, meter, stopcock, valve or aircock connected with the water mains. (Ord. 3062-15 § 10; prior code § 11-1.16).

### 12.24.115. Water theft prohibited.

(a) It is unlawful for any person to use, divert, receive or take water from the city water system from any public fire hydrant, blow-off valve, water main, water service lateral or other city facility or connection to a city facility, to which an authorized city metering device has not been installed or has been removed.

(b) It is unlawful for any person to use, divert, receive, or take water from the city water system without paying the full city charges for such water, such as by tampering with city property or facilities, removing a lock or plug that has been placed on consumer's service or meter, or by making an unauthorized connection to any city facilities or public fire hydrant.

(c) In addition to any other civil or criminal remedies authorized by law, any person who takes water in violation of this section shall be subject to a penalty that shall be set forth in a schedule of penalties established by resolution of the city council. If the person is a consumer of city water, the penalty may be added to his or her bill for water service and collected under the same rules and regulations.

(d) Any penalty imposed under this section may be appealed by filing a written notice of appeal with the city manager no later than ten days after receipt of the notice imposing the penalty. The city manager shall designate the hearing officer for the appeal hearing. The hearing shall be scheduled not less than fifteen calendar days and not more than sixty calendar days from the date that the appeal is filed. At the hearing, the party contesting the penalty shall be given the opportunity to testify and to present witnesses and evidence. After considering all of the testimony and evidence submitted at the hearing, the hearing officer shall issue a written decision to uphold or cancel the penalty and shall state in the decision the reasons for that decision. The decision of the hearing officer shall be final. (Ord. 3093-16 § 1).

### 12.24.120. Vacation of premises—Notice to discontinue service.

Each consumer about to vacate any premises supplied with service shall give notice of his or her intended removal in writing or as determined by the city at least two days prior thereto, specifying the date desired for service to be discontinued; otherwise he or she will be held responsible for all water furnished to such premises until the city has notice of such removal. (Ord. 3062-15 § 11; prior code § 11-1.17).

### 12.24.130. Meter tests.

(a) Any consumer may, upon not less than five days notice, require the city to test his or her water meter. A deposit to cover the reasonable cost of the test may be required as established from time to time by resolution of the city council. The amount of the deposit will be returned to the consumer if the meter is found to register outside of acceptable accuracy standards as established by American Water Works Association (AWWA) under conditions of normal operation, otherwise the amount of deposit will be retained by the city. A consumer shall have the right to require that the meter be tested in his or her presence, or if he or she so desires, in the presence of an expert or other representative appointed by the consumer. The consumer will be notified in advance of the time and place the test will be made.

(b) A report giving the name of the consumer, date of request, location of premises, the type, make, size and number of the meter, the date of removal, the date tested and the result of the test, will be supplied to the consumer within a reasonable time after the completion of the test.

(c) All meters will be tested at the time of installation, and no meter will be placed in service or allowed to remain in service which has an error in registration outside of acceptable accuracy standards established by American Water Works Association (AWWA) under conditions of normal operation. (Ord. 3062-15 § 12; Ord. 2490-94 § 2; Ord. 1822-76 § 1; prior code 11-1.18).

## 12.24.140. Meter test—Refund or rebilling.

(a) When a meter is found to be more than two percent fast, the city shall refund to the consumer the overcharge, based on the corrected meter readings for the period in which the meter was in use, not exceeding six months, unless it can be shown that the error was due to some cause, the date of which can be fixed, in this case, the overcharge shall be computed back to, but not beyond, such date.

(b) If, in the case of domestic or residential use, the meter upon test is found not to register, or to register less than seventy-five percent of the actual consumption, an average bill, or a bill for the water consumed, but not covered by the bill previously rendered for a period not to exceed three billing periods, may be rendered by the city to the consumer.

(c) If a meter for commercial service, upon test as herein provided, is found to register more than two percent slow, the water department may render a bill for water consumed, but not covered by bills previously rendered for a period not exceeding three billing periods. (Ord. 3062-15 § 13; prior code § 11-1.19).

## 12.24.150. Service failures or shortages—Nonliability of city—Notice of service interruption.

(a) The city will exercise reasonable care and diligence to furnish and deliver a continuous and sufficient supply of water to the consumer, and to avoid any shortage or interruption of delivery. The city will not be liable for the failure, interruption, shortage or insufficiency of supply, or any loss or damage occasioned thereby, during a fire or at any other time.

(b) The city, whenever it finds it necessary for the purpose of making repairs or improvements to its system, will have the right to suspend temporarily the delivery of water, but in all cases as reasonable notice thereof as circumstances will permit will be given to the consumers. (Ord. 3062-15 § 14; prior code § 11-1.20).

## 12.24.160. Temporary service.

(a) Water may be sold and supplied on a temporary service basis to consumers. As used in this chapter, temporary service refers to water service for crop irrigation or other agricultural uses, circuses, bazaars, fairs, temporary restaurants, construction works, and similar activities of a temporary nature.

(b) The applicant for such temporary service shall be required to pay to the city of Sunnyvale the actual costs of installing, maintaining, and removing any facilities necessary in connection with the furnishing of such service. The applicant for such temporary service shall not be required to pay the water frontage fees established by resolution of the city council and required to be paid by the owner or developer of property prior to the original connection of the property to the water system of the city of Sunnyvale, or if the uses of the property presently connected to the water system are enlarged, added to, or if further structures are constructed thereon. (Ord. 1456 § 1, 1968; prior code § 11-1.21).

## 12.24.170. Fire—Water shut-off—Use of hydrants—Right of ingress and egress.

(a) In case of fire or an alarm of fire, the city shall have the right to shut off water from any consumer or any number of consumers, without notice and to keep it shut off as long as it may be necessary.

(b) In case of fire or an alarm of fire, the use of fountains or yard or street sprinklers or house faucets is prohibited.

(c) No person shall, except in case of fire, use water from or tamper with any city hydrant without a permit from the city.

(d) Any duly authorized agent or employee of the city shall at all times have the right of ingress to and egress from the consumer's premises at all reasonable hours for any purpose reasonably connected with the furnishing of water and the exercise of any and all rights secured to the city by law. (Ord. 3062-15 § 15; prior code § 11-1.22).

### 12.24.180. Turning on water officially shut off deemed misdemeanor.

Only duly authorized employees of the city are allowed to turn on water to any consumer's premises. It shall constitute a misdemeanor for any person, other than an employee of the city, to turn on any water service that has been officially shut off for the violation of any of the rules and regulations of the city. (Ord. 3062-15 § 16; prior code § 11-1.23).

### 12.24.190. Right to limit amount of water.

The city shall have the right to limit the amount of water furnished to any consumer should circumstances seem to warrant such action, although no limit may be stated in the application or permit for such use. (Ord. 3062-15 § 18; prior code § 11-1.25).

### 12.24.200. Attaching wires to plumbing prohibited—Liability for damages.

All persons, firms or corporations are strictly forbidden to attach any ground wire or wires to any plumbing which is or may be connected to any service connection or main, and the city council may hold the owner of the premises liable for any damage to the property of the city occasioned by any such ground wire which is now or may hereafter be attached. (Prior code § 11-1.26).

### 12.24.210. Fire service connections—Detector meter required.

An applicant for a service larger than two inch in size for fire protection purposes will be required to furnish and install at his or her own expense a detector meter of a type approved by the National Board of Fire Underwriters, which meter shall be and remain the property of the applicant. Should the detector meter show any consumption of water except that used in time of fire, and for reasonable fire drill and tests of apparatus, the consumer shall pay for such water used at regular meter rates. (Prior code § 11-1.27).

### 12.24.220. Fire service pipe rules.

In all cases the city shall decide the size of the fire service pipe required, which shall be determined by the size of the street main, the available pressure on the main and the nature and capacity of the fire protection equipment within the building. In all cases where underwriter's pumps are to be installed, a suction pipe of sufficient internal area to deliver a quantity of water equal to the full rated capacity of the service pipe will be allowed, and no enlargement of said suction pipe inside the premises will be permitted. (Ord. 3062-15 § 19; prior code § 11-1.28).

### 12.24.230. Meter removal for non-use—Resetting charge.

Where a service has not been used for a period of six months the meter may be removed and a fee may be required for resetting the meter as established by resolution of the city council. (Ord. 3062-15 § 19; prior code § 11-1.29).

### 12.24.240. Special water contracts.

If any sale of water should be made under conditions such that the rates herein set forth are not applicable, the city may, with the approval of the city council, enter into a special contract with the consumer. (Ord. 3062-15 § 20; prior code § 11-1.30).

### 12.24.250. Damage to city property.

If any person destroys or damages any fire hydrant, water main or any other property owned by the city which is part of the city's system for water use and delivery, he or she shall be held responsible for the entire cost of replacing or repairing the same and the bill shall be due and payable on presentation. If said person is a consumer of city water, the bill for such costs may be added to his or her bill for water service and collected under the same rules and regulations. (Ord. 3062-15 § 21; prior code § 11-1.31).

## 12.24.260. Right to test privately owned meter.

If the director of environmental services has any reason to believe that any privately owned meter is not registering correctly, the city shall have the right to test such meter or require the owner to test the meter in the presence of city staff, as may be determined by the owner. (Ord. 3062-15 § 22; prior code § 11-1.32).

## 12.24.270. Meter service charges fixed by resolution.

The city council of the city of Sunnyvale, may, by resolution, from time to time hereafter, in its discretion, fix the rates for meter service charges to be paid by each applicant for water service, within or without the corporate limits of the city of Sunnyvale. (Prior code § 11-1.33).

## 12.24.280. Water, sewer and utility service—Refusal—Grounds.

The city may, in its discretion, refuse to supply water and sewage service to any applicant therefor, or may refuse to certify any applicant to the Pacific Gas and Electric Company for gas and/or electric service, who has not first obtained any permit, license or other clearance required to be obtained, in connection with the improvement for which service is sought by any ordinance of this city, the county of Santa Clara, or the laws of the state of California. (Ord. 3062-15 § 23; prior code § 11-3.01).

## 12.24.285. Construction hydrant meters.

(a) Permit Required. It is unlawful for any person to take water from a public fire hydrant without having first obtained a permit issued by the department of environmental services.

(b) Fee. At the time the application is filed with the director of environmental services, the applicant shall pay a fee sufficient to cover the cost of processing the application. The amount of the fee shall be set by resolution of the city council.

(c) Hydrant Meter. Any person taking water from a public hydrant shall utilize a hydrant meter rented from the department of environmental services. It is unlawful to tamper with or damage any portion of the construction hydrant meter device, the backflow unit, or any portion of the fire hydrant. Tampering with any portion of the hydrant meter backflow device is a violation of Section 12.28.290 of this code. If the hydrant meter or other city facilities are damaged, the applicant shall pay the full cost of repairs and/or replacement. If the hydrant meter is lost or stolen, the applicant shall pay the replacement cost of the hydrant meter as determined by the city. Service of water from the hydrant shall be immediately discontinued by the city if the backflow prevention device is removed or tampered with in any manner, if unprotected cross-connections exist on the premises, or if the customer fails to timely pay any fees or charges due hereunder. Service will not be restored until such conditions are corrected.

(d) Hydrant Meter Unreported Consumption. The city council may establish a monthly late fee or penalty that will be imposed on any person taking water through a hydrant meter who fails to report their water consumption by the tenth day of the month in accordance with the terms and conditions of the permit.

(e) Collection of Fees and Charges. If the customer is a consumer of city water, any fees or charges imposed under this section may be added to his or her bill for water service and collected under the same rules and regulations. Any person owing unpaid fees or charges under this section shall not be entitled to rent a hydrant meter until all such fees and charges are paid in full. (Ord. 3093-16 § 2).

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## Chapter 12.34. WATER CONSERVATION RESTRICTIONS

### 12.34.010. Purpose and application.

The purpose of this chapter is to identify and restrict nonessential water uses which, if allowed, would constitute wastage of the water supply of the city. The provisions of this chapter shall apply to all persons or entities using water obtained from the city of Sunnyvale both in and outside the city of Sunnyvale and within the city's water service area, and regardless of whether any person or entity using water has a contract for water service with the city. Use of water by the city itself shall be in conformance with a water conservation plan to be presented by the city manager to the city council for approval, and which shall essentially conform to the provisions of this chapter. This chapter is adopted pursuant to the provisions of Water Code Section 350, et seq., the city charter and the common law. (Ord. 2433-93 § 1).

### 12.34.020. Nonessential uses prohibited.

(a) To prevent the waste and unreasonable use of water and to promote water conservation, the following actions are hereby prohibited, except where necessary to address an immediate health or safety need or to comply with a term or condition in a permit issued by a state or federal agency:

(1) The use of broken or defective plumbing, sprinklers, watering or irrigation systems that permit the escape or leakage of potable water.

(2) The application of potable water to outdoor landscaping in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures.

(3) The use of potable water to irrigate outdoor landscaping between the hours of nine a.m. and six p.m. during daylight savings time except with a bucket or a hose that is fitted with a shut-off nozzle or device that causes it to cease dispensing water immediately when not in use.

(4) The use of potable water to irrigate outdoor landscaping more than fifteen minutes per day per station when using a landscape irrigation system or a watering device that is not continuously attended, except for landscape irrigation systems that exclusively use very low-flow drip-type irrigation systems when no emitter produces more than two gallons of water per hour, weather-based controllers, or stream rotor sprinklers that meet a seventy-one percent efficiency standard.

(5) The use of a hose that dispenses potable water to wash any motor vehicle, watercraft, mobilehome, or other vehicles or machinery unless the hose is fitted with a shut-off nozzle or device that causes it to cease dispensing water immediately when not in use.

(6) The use of potable water to wash sidewalks, driveways, filling station aprons, patios, parking lots, porches or other paved or hard surfaced areas.

(7) The use of potable water in a fountain or other decorative water feature unless the water is part of a recirculating system.

(8) The application of potable water to outdoor landscapes while it is raining or within forty-eight hours after measurable rainfall (0.20 inches).

(9) The serving of drinking water other than upon request in eating or drinking establishments, including, but not limited to, restaurants, hotels, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased.

(10) The use of potable water to irrigate ornamental turf on public street medians.

(11) The use of potable water to irrigate landscapes outside of newly constructed homes and buildings in a manner inconsistent with regulations or other requirements established by the California Building Standards Commission and the Department of Housing and Community Development.

(12) The installation of any single pass cooling process in new construction.

(b) To promote water conservation, operators of hotels and motels shall provide guests with the option of choosing not to have towels and linens laundered daily. The hotel or motel shall prominently display notice of this option in each guestroom using clear and easily understood language. (Ord. 3086-16 § 1; Ord. 3041-14 § 1; Ord. 2433-93 § 1).

### 12.34.030. Exceptions.

(a) The director of environmental services is hereby authorized to grant to any user an exception to the prohibitions set forth in Section 12.34.020, upon a finding by the director that such exception is necessary to prevent an emergency condition affecting the health, sanitation or fire protection of such user, and that the user to whom such adjustment or exception pertains has adopted or used all practicable water conservation measures.

(b) Exceptions permitted hereunder shall be made only upon written application submitted to the director setting forth a statement of justification for such exception. The director may attach conditions, specifications or other qualifying provisions to any exception granted. (Ord. 3041-14 § 2; Ord. 2433-93 § 1).

### 12.34.040. Penalty—Flow restricting devices.

(a) Upon a determination by the director of environmental services that a user has continuously or repeatedly violated or failed to comply with one or more provisions of Section 12.34.020, or of any conditions of any exception granted pursuant to the provisions of Section 12.34.030, the director may issue an order to cease and desist from continued or repeated violation, and further order such user to comply forthwith with such provisions or terms of exception, or otherwise to take appropriate remedial or preventive action. If after the issuance of such cease and desist order, such user continues to consume or use, or again consumes or uses water in violation of any such provision or condition of exception, the director may order the installation of a flow restricting device upon the water service line to the premises of such user. Such flow restricting device shall be installed and maintained for a period of not less than three days nor more than ten days for a first violation, and shall be installed and maintained for not less than ten days for each succeeding violation, and may be ordered to remain installed and maintained for a period of up to three months upon a finding by the director that any user is habitually in violation of any of the provisions of this chapter, or the provisions of any exception granted pursuant to Section 12.34.030.

(b) Prior to installation of any such flow restricting device, the director shall give written notice of intent to install such device, including the reasons for the proposed installation. The notice shall specify the date, time and place at which the user or other interested party may appear before the director to present any evidence or reasons why such installation should not occur. Instead of appearing, the user or other interested party may present written material to the director at or before the time specified. The installation of a flow restricting device shall not occur less than twenty-four hours after the time specified in the notice. The written notice shall be delivered personally, or by posting with the United States mail service, first class postage prepaid, certified mail, and addressed to the last known address of the user to whom given. Copies of the notice shall also be delivered personally or by mail as specified above, to the owner of the property on which the flow restrictor is proposed to be installed as shown on the last equalized assessment roll of the county assessor, county of Santa Clara, and to the person or entity shown on the latest city records as being responsible for payment of utility charges on such property, if either or both is different from the user to whom the notice is sent.

(c) There are hereby established, and there shall be imposed and levied charges in the amount of fifty dollars for each installation and fifty dollars for each removal of flow restricting devices under this section. (Ord. 3041-14 § 3; Ord. 2433-93 § 1).

### 12.34.050. Implementation.

The director of environmental services is authorized to delegate authority granted under this chapter to such deputies, officers, employees or agents of the city as the director shall designate, and to establish such rules, regulations and procedures, and to prepare or furnish such forms as the director deems necessary or appropriate to carry out the provisions of this chapter. (Ord. 3041-14 § 4; Ord. 2433-93 § 1).

### 12.34.060. Notices.

Except as otherwise provided, notices required to be given pursuant to the provisions of this chapter shall be in writing, may be combined with water service bills or other written communication, and shall be delivered personally, or by posting with the United States mail service, first class postage prepaid, and addressed to the last known address of the user to whom given, or to the owner of the premises to which the water service of such user pertains, shown on the last equalized assessment roll of the county assessor, county of Santa Clara. (Ord. 2433-93 § 1).

### 12.34.070. Violations.

It is unlawful for any person, firm, partnership, association, corporation or political entity to use water obtained from the water system of the city of Sunnyvale in violation of any provision of this chapter or in violation of the conditions of any exception granted pursuant to Section 12.34.040 of this chapter. Use of water by any user in accordance with the provisions of any exception granted by the director shall not be deemed in violation of this chapter. Violations of this chapter shall be punishable as infractions. (Ord. 2433-93 § 1).

### 12.34.080. Remedies cumulative.

The remedies and penalties provided for in this chapter shall be cumulative and not exclusive, and shall be in addition to any or all other remedies available to the city. (Ord. 2433-93 § 1).

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## Chapter 19.37. LANDSCAPING, IRRIGATION AND USEABLE OPEN SPACE

### 19.37.010. Purpose.

The purpose of this chapter is to ensure that adequate landscaped areas and usable open space are provided where applicable for all zoning districts; to promote the conservation and efficient use of water and to prevent the waste of this valuable resource; and to promote water conservation as one component of sustainable building practices. This chapter shall be construed to assure consistency with the requirements of the Water Conservation in Landscaping Act of the California Government Code, or any successor statute, and any applicable implementing regulations, as they exist at the time of enactment or as later amended. In addition to compliance with the provisions in this chapter, projects shall comply with stormwater management requirements set forth in Chapter 12.60. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

### 19.37.020. Applicability.

(a) Unless otherwise provided by this section, all lots in all zoning districts are subject to Section 19.37.040 (Minimum Landscaped Areas and Usable Open Space) and 19.37.120 (Landscaping and Irrigation Approval). The following types of projects are subject to certain provisions of this chapter as specified:

(1) Single-Family and Two-Family Dwelling New Construction. New landscaping installations of five hundred square feet or more in connection with the construction of a new single-family or two-family dwelling unit shall meet all requirements of this chapter. Such projects with less than five hundred square feet of landscaped area are subject only to Section 19.37.040 (Minimum Landscaped Area and Usable Open Space).

(2) New Landscaping Installations. New landscaping installations of five hundred square feet or more for any use except for existing single-family and two-family dwellings shall meet all requirements of this chapter. Such projects with less than five hundred square feet of landscaped area are subject only to Section 19.37.040 (Minimum Landscaped Area and Usable Open Space) and Section 19.37.120 (Landscaping and Irrigation Approval).

(3) Rehabilitated Landscapes. Projects to rehabilitate existing landscaped areas between one thousand square feet and two thousand five hundred square feet are subject to all requirements of this chapter, except that an irrigation audit is not required. Rehabilitated landscape projects on existing landscaped areas over two thousand five hundred square feet shall meet all requirements of this chapter. Rehabilitated landscape projects less than one thousand square feet are subject only to Section 19.37.040 (Minimum Landscaped Area and Usable Open Space) and Section 19.37.120 (Landscaping and Irrigation Approval).

(4) Graywater for Landscapes. Landscape projects of two thousand five hundred square feet or less using a graywater system that conforms to Title 16 and the California Plumbing Code or rainwater captured on site to meet all of its planting water needs are subject only to Section 19.37.110 (Irrigation System Design Requirements).

(b) Specific Plans, Precise Plans and other Specialized Plan Areas. Properties within a specific plan, precise plan or other specialized plan area are subject to the minimum landscaped area, usable open space, or modified frontage strip and buffer design requirements prescribed in those individual plans. All other requirements in this chapter apply to such projects.

(c) Exemptions. The following projects are exempt from this chapter:

(1) Individual single-family or two-family dwelling landscape projects that are not in connection with construction of a new dwelling unit, except that Section 19.37.040(e)(2) applies;

(2) Registered local, state or federal historical sites where landscaping establishes a historical landscaping style, as determined by the Heritage Preservation Commission, planning commission, or by any applicable public board or commission responsible for architectural review or historic preservation;

(3) Ecological restoration or mined-land reclamation projects that do not require a permanent irrigation system; or

(4) Community gardens, plant collections (as part of botanical gardens and arboretums open to the public), non-irrigated areas designated for non-development (e.g., open spaces and existing native vegetation), agricultural uses, commercial nurseries and sod farms. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.030. Definitions.

The following terms and definitions pertain to the water efficiency sections of this chapter:

"Applied water" means the portion of water supplied by the irrigation system to the landscaped area.

"Automatic irrigation controller" means an automatic timing device used to remotely control valves that operate an irrigation system using either evapotranspiration (weather-based) or soil moisture data.

"Certified professional" means a licensed landscape architect, a licensed landscape contractor, a licensed professional engineer, certified irrigation designer, or any other person authorized by the state to design a landscape or irrigation system, or a certified landscape irrigation auditor.

"Conversion factor (0.62)" means the number that converts acre-inches per acre per year to gallons per square foot per year.

"Drip irrigation" means any non-spray low volume irrigation system utilizing emission devices with a flow rate measured in gallons per hour. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

"Estimated total water use (ETWU)" means the total water used for the landscaped area as described in Section 19.37.050.

"ET adjustment factor (ETAF)" means a factor that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscaped area.

"Evapotranspiration rate" means the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specified time.

"Flow sensor" means an inline device installed at the supply point of the irrigation system that produces a repeatable signal proportional to flow rate, and connected to an automatic irrigation controller, or flow monitor capable of receiving flow signals and operating master valves and detecting high flow conditions created by system damage or malfunction.

"Friable" means a soil condition that is easily crumbled or loosely compacted down to a minimum depth per planting material requirements, so that the root structure of newly planted material is allowed to spread unimpeded.

"Graywater" means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Graywater" includes wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

"Hardscape" means any durable material (pervious and non-pervious) in a landscaped area, such as decks, patios or pedestrian walkways, and other non-irrigated elements which may include art work, benches, and bicycle parking.

"Hydrozone" means a portion of the landscaped area having plants with similar water needs and rooting depth. A hydrozone may be irrigated or non-irrigated.

"Irrigation audit" means an in depth evaluation of the performance of an irrigation system. An irrigation audit includes: inspection, system tune up, system test with distribution uniformity or emission uniformity, correction of any overspray or runoff that causes overland flow, and preparation of an irrigation schedule.

"Irrigation efficiency (IE)" means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices.

"Low water use plant" means a plant species whose water needs are compatible with local climate and soil conditions, and have a regionally adjusted plant factor of 0.0 through 0.3, per WUCOLS.

"Master shut-off valve" means an automatic valve installed at the irrigation supply point which controls water flow into the irrigation system.

"Maximum applied water allowance (MAWA)" means the upper limit of annual applied water for the established landscaped area, expressed in gallons per year.

"Mulch" means any organic material such as leaves, bark, straw, compost, or inorganic mineral materials such as rocks, gravel, and decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

"Native plant" means a plant indigenous to the coastal ranges of central and northern California, and more specifically, such plants that are suited to the ecology of the present or historic natural environment within the project's vicinity.

"No-water using plant" means a plant species with water needs that are compatible with local climate and soil conditions such that regular supplemental irrigation is not required to sustain the plant after it has become established.

"Plant factor" or "plant water use factor" is a factor, when multiplied by ETo (reference evapotranspiration), estimates the amount of water needed by plants.

"Precipitation rate" means the rate of application of water measured in inches per hour.

"Recreational area" means areas designated for active play, recreation or public assembly in parks, sports fields, picnic grounds, amphitheaters or golf courses course tees, fairways, roughs, surrounds and greens on any private property, excluding private single-family and two-family dwelling properties.

"Reference evapotranspiration" or "ETo" means a standard measurement of environmental parameters specific to the local climate which affect the water use of plants, expressed in inches per year, and used as the basis of calculating the maximum applied water allowance for local landscapes.

"Runoff" means water which is not absorbed by the soil or landscaping to which it is applied and flows from the landscaped area.

"Soil moisture sensing device" or "soil moisture sensor" means a device that measures the amount of water in the soil. The device may also suspend or initiate an irrigation event.

"Special landscaped area (SLA)" means an area of the landscaping dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, water features using recycled water, and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface.

"Turf" means a ground cover surface of mowed grass.

"Water feature" means a design element where open water performs an aesthetic or recreational function. Water features include ponds, lakes, waterfalls, fountains, artificial streams, spas, and swimming pools (where water is artificially supplied).

"WUCOLS" means the Water Use Classification of Landscape Species published by the University of California Cooperative Extension and the Department of Water Resources 2014. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.040. Minimum landscaped area and usable open space.

(a) Minimum Landscaped Area. Table 19.37.040 describes the minimum landscaped area and usable open space required by zoning district. In addition to the minimum landscaped area, areas not used for buildings, parking lot areas, driveways or pedestrian walkways shall be landscaped unless the review authority determines that landscaping is not necessary to achieve the purposes of this chapter. For projects not involving redevelopment of the entire site, the director of community development may allow less landscaped area than required by Table 19.37.040 if existing physical constraints on the site (such as structures, parking or circulation) limit the amount of landscaping that can be provided.

(b) Landscaped Buffer Required. A landscaped buffer is required for any property with a nonresidential use in a residential zoning district that abuts a residential use and for any use in a nonresidential zoning district which abuts a residential zoning district. Landscaped buffers must be designed to meet the following:

(1) Width. The buffer shall maintain a width of at least ten feet.

(2) Landscaping. The buffer shall include a planted screen of approved trees and shrubs which shall be placed along the length of the buffer at intervals not to exceed twenty feet; provided, however, that the approving body may grant exceptions as part of any discretionary permit when warranted by conditions on the property.

(3) Wall Design. The buffer shall include a decorative masonry wall six feet in height measured from the highest adjoining grade. When the adjacent nonresidential building is two stories or more in height, the decorative masonry wall

shall be eight feet measured from the highest adjoining grade. Where a residential use is permitted in a nonresidential zoning district, the wall shall be required on the residential property, unless a wall already exists.

(c) Landscaped Frontage Strip Required. A fifteen-foot wide landscaped frontage strip is required for all properties except for single-family properties which have a frontage on a public street. The frontage strip is measured from the inside edge of the public sidewalk, or if no sidewalk exists, from the curb. Frontage strip landscaping may be crossed by walkways and access drives.

(d) Usable Open Space Required. Usable open space is required for all duplex and multifamily residential properties as described in Table 19.37.040. Usable open space areas that meet the definition of landscaping may contribute towards the minimum landscaped area of the site. Required usable open space shall meet the requirements of Section 19.37.100 (Usable open space design requirements).

(e) Allowances and Limitations for Single-Family Uses and Single-Family Zoning Districts.

(1) Allowances for Single-Family Zoning Districts. Yards are not required to be landscaped in single-family zoning districts; however, the provisions of this chapter apply if landscaping is provided and meets the criteria in Section 19.37.020 (Applicability).

(2) Limitation on Paved Areas in the R-0 and R-1 Zoning Districts. Not more than fifty percent of the required front yard of any lot within an R-0 or R-1 zoning district shall be paved with asphalt, concrete cement, or any other impervious surface, except as may be required to meet off-street parking and access requirements of Chapter 19.46.

**Table 19.37.040**

**Minimum Landscaped Area and Usable Open Space by Zoning District**

| Zoning District | Usable Open Space | Other Landscaped Area | Parking Lot Landscaped Area | Total Landscaped Area |
|---|---|---|---|---|
| R-0 | N/A | N/A | N/A | N/A |
| R-1 | N/A | N/A | N/A | N/A |
| R-1.5 | N/A | N/A | N/A | N/A |
| R-1.7/PD | N/A | N/A | N/A | N/A |
| R-2 | 500 sq. ft./unit[1] | 850 sq. ft./unit | 20% of the parking lot area | Total minimum landscaped area is the combination of the minimum parking lot landscaped area and other landscaped area. In no case shall this total be less than 20% of the lot area. |
| R-3 | 400 sq. ft./unit | 425 sq. ft./unit | | |
| R-4 | 380 sq. ft./unit | 375 sq. ft./unit | | |
| R-5 | 380 sq. ft./unit | 375 sq. ft./unit | | |
| C-1 | N/A | 12.5% of floor area | | |
| C-2 | N/A | 12.5% of floor area | | |
| C-3 | N/A | 12.5% of floor area | | |
| C-4 | N/A | 12.5% of floor area | | |
| O | N/A | 10% of lot area | | |
| P-F | N/A | 10% of lot area | | |
| M-S | N/A | 10% of floor area | | |
| M-3 | N/A | 10% of floor area | | |

1 One thousand square feet of usable open space is required for a property with an accessory dwelling unit.

(Ord. 3105-16 § 6; Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.050. Water efficiency design requirements.

Water Efficiency in Design. Landscaped areas shall be designed to achieve water efficiency and shall be based on one of two options:

(a) Option 1—No Turf and Eighty Percent Water Conserving Plants. There shall be no turf or high water use plants in the landscaped areas, and at least eighty percent of the plants installed shall be native, low water use or no water use plants.

(b) Option 2—Water Budget Calculations. If the turf limitation option is not selected, a water budget calculation shall be prepared and shall adhere to the following requirements:

(1) Plant Factors. The plant factors shall be obtained from WUCOLS or an equivalent reference approved by the California Department of Water Resources. For areas that mix plants with different water uses, the plant factor calculation shall be based on the proportion of the respective plant factors, or based on the plant factor of the higher water using plant. Mixing high and low water use plants in the same hydrozone is prohibited. The plant factor ranges from 0.0 to 0.3 for low water use plants, from 0.4 to 0.6 for moderate water use plants, and from 0.7 to 1.0 for high water use plants.

(2) Water Features. All water features not using recycled water shall be included in the high water use hydrozone and temporarily irrigated areas shall be included in the low water use hydrozone.

(3) Special Landscaped Areas. All special landscaped areas (SLAs) shall be identified and their water use included in the water budget calculations. The reference evapotranspiration adjustment factor for SLAs shall not exceed 1.0.

(4) Reference Evapotranspiration Adjustment Factor. The reference evapotranspiration adjustment factor shall not exceed 0.55 for landscaped areas on residential properties and shall not exceed 0.45 for landscaped areas on nonresidential properties.

(5) Water Budget Calculation. The maximum applied water allowance (MAWA) for a landscape shall be calculated using the following equations:

For residential projects:

$$MAWA = (ETo)\ (0.62)\ [(0.55 \times LA) + (0.45 \times SLA)]$$

For nonresidential projects:

$$MAWA = (ETo)\ (0.62)\ [(0.45 \times LA) + (0.55 \times SLA)]$$

Where:

MAWA = Maximum applied water allowance (gallons per year)

ETo = Reference evapotranspiration (inches per year)

0.62 = Conversion factor (to gallons)

0.7 = Reference evapotranspiration adjustment factor (ETAF)

LA = Planted landscaped area including SLA and not including hardscapes (square feet)

0.45 = Additional water allowance for SLA in residential projects

0.55 = Additional water allowance for SLA in nonresidential projects

SLA = Special landscaped area (square feet)

(6) Estimated Total Water Use. Estimated total water use (ETWU) shall be calculated using the equation below. The sum of the ETWU calculated for all hydrozones shall not exceed the MAWA.

$$ETWU = (ETo)(0.62)\left(\frac{PF \times HA}{IE} + SLA\right)$$

Where:

ETWU = Estimated total water use per year (gallons)

ETo = Reference evapotranspiration (inches)

PF = Plant factor from WUCOLS

HA = Hydrozone area [high, medium, and low water use areas] (square feet)

SLA = Special landscaped area (square feet)

0.62 = Conversion factor

IE = Irrigation efficiency of 0.75 for overhead spray systems and 0.81 for drip irrigation systems

(Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.060. General planting, soil management and water feature design requirements.

(a) Plant Material. In addition to the requirements below, plant selection and installation shall be done in accordance with accepted horticultural industry practices.

(1) Variety. Landscaping shall include trees, shrubs, vines, flowers, ground covers or a combination thereof.

(2) Size at Time of Planting. Plant materials shall be sized and spaced to achieve immediate effect, in accordance with horticultural industry practices and at the discretion of the director of community development. Trees shall be of minimum fifteen gallon size. Twenty-four or thirty-six inch box trees may be required at the discretion of the director of community development.

(3) Number of Trees. There shall be one tree per one thousand square feet of required landscaped area in addition to required street trees and parking lot trees.

(4) Turf. Any allowable turf area shall be planted with tall fescue or similar turf requiring less water. Turf shall not be planted on slopes greater than ten percent where the toe of the slope is adjacent to an impermeable hardscape.

(b) Grouping of Plants. Plants with similar water needs shall be grouped (also described as a hydrozone). Areas that mix plants with different water uses may be allowed if a water budget is performed per Section 19.37.050 (Water Efficiency Design Requirements).

(c) Soil Management.

(1) Mulch. A minimum three-inch layer of mulch shall be applied on all exposed soil areas, except that up to five percent of the area may be left exposed if designed to provide a habitat for beneficial insects and other wildlife.

(2) Soil Amendments. Soil amendments shall be incorporated according to the soil conditions at the project site and based on what is appropriate for selected plants. Compacted soils shall be transformed to a friable condition. Compost shall be incorporated at a minimum rate of four cubic yards per one thousand square feet of planting area to a depth of six inches, unless the soil contains more than six percent of organic matter.

(3) Grading. If the project includes grading, the grading shall be designed to minimize soil erosion, runoff and water waste. The grading shall avoid soil compaction in planted landscaped areas.

(d) Water Features. Recirculating water systems shall be used for water features. Where available, recycled water shall be used for water features. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.070. Reserved.

## 19.37.080. Reserved.

## 19.37.090. Reserved.

## 19.37.100. Usable open space design requirements.

(a) Function. Useable open space must be designed to be accessible to, and usable for outdoor living, recreation or utility use.

(b) Applicability. The provisions of this section shall apply to all new multi-family residential development in R-3, R-4, and R-5 zoning districts.

(c) Location. Useable open space may not be located in any required front yard area for projects with a front yard setback variance or deviation. Otherwise, up to fifty percent of the required front yard area may be counted toward the useable open space requirement.

(d) Minimum Useable Open Space Dimensions and Area. Each useable open space area shall have at least a twelve foot dimension in any direction and a minimum area of two hundred square feet except for:

(1) Private balconies must have a minimum of seven feet in any direction and a minimum area of eighty square feet.

(2) Roofs, decks or porches must have a minimum of ten feet in any direction and a total of one hundred twenty square feet.

(e) Private Useable Open Space Required. In the R-4 and R-5 zoning districts, a minimum of eighty square feet per unit shall be designed as private useable open space. (Ord. 3142-19 § 2; Ord. 3082-16 § 1; Ord. 2918-10 § 3).

## 19.37.110. Irrigation system design requirements.

(a) Irrigation System Required. All landscaped areas shall have a permanent irrigation system, except for single-family detached and two-family dwellings.

(b) Irrigation Efficiency and Design. Irrigation systems shall be designed and maintained to meet the water needs of each hydrozone and the following requirements:

(1) Efficiency. Irrigation systems must meet or exceed an average landscaping irrigation efficiency of seventy-five percent for overhead spray systems and eighty-one percent for drip irrigation systems.

(2) Drip Irrigation. Bubbler or other low-flow, non-spray irrigation system shall be provided for trees and shrubs, mulched areas, areas with slope greater than ten percent (unless it can be demonstrated that no runoff or erosion will occur if other types of irrigation is used) and areas that are less than ten feet wide in any direction.

(3) Overhead Spray Irrigation. Overhead spray irrigation may be used for clustered shrub plantings and turf areas at least ten feet wide in any direction; however, it cannot be used for areas within two feet of a non-permeable surface unless it can be demonstrated that no runoff would occur, or the adjacent non-permeable surface is designed and constructed to drain entirely to landscaping.

(4) Valves. Each valve shall irrigate a hydrozone with similar site, slope, sun exposure, soil conditions and plant water needs. Valves and control circuits shall be separated based on the required rate and quantity of water used. Where feasible, trees shall be placed on separate valves from shrubs, groundcovers and turf. Manual shut-off valves are required. Master shut-off valves are required unless the irrigation system includes low pressure shut down features.

(5) Irrigation Controllers and Sensors. All irrigation controllers must utilize either evapotranspiration or soil moisture sensor data, and be capable of dual or multiple programming and capable of maintaining programming data in the event the primary power source is interrupted. Irrigation systems shall also incorporate sensors (rain, freeze, wind, etc.) that suspend or alter irrigation operation during unfavorable weather conditions.

(6) Pressure Regulators. Pressure regulators shall be installed if the water pressure is below or exceeds the recommended pressure of the irrigation devices.

(7) Spray Heads. Spray heads and other emission devices shall be selected based on what is appropriate for the plant type within the hydrozone. Spray heads must have matched precipitation rates within each circuit. All irrigation emission devices must meet the ANSI standard, ASABE/ICC 802-2014 “Landscape Irrigation Sprinkler and Emitter Standard.”

(8) Flow Sensors. Flow sensors are required for any landscaped areas of five thousand square feet or larger.

(c) Water Waste Prohibited. Water waste resulting from an inefficient irrigation system leading to runoff, low head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas such as walkways, roadways or structures is prohibited.

(d) Screening of Devices. Irrigation controllers and backflow devices shall be screened from public view.

(e) Scheduling. Irrigation must be scheduled between eight p.m. and ten a.m. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

### 19.37.120. Landscaping and irrigation approval.

(a) Permit Required. Except as otherwise provided in this chapter, no person shall install or modify any landscaped area without first obtaining approval of a miscellaneous plan permit, in accordance with the procedure described in Chapter 19.82, or as part of any discretionary permit the project is subject to pursuant to this title.

(b) Landscaping and Irrigation Plans Required. Landscaping and irrigation plans shall be required for any modification or installation of new landscaping that falls within the thresholds stated in this chapter. The plans shall provide the information necessary as determined by the director of community development to comply with the provisions of this chapter.

(c) Plan Preparation by Certified Professional. Landscaping and irrigation plans shall be prepared by, and bear the signature of, a certified professional, except for new landscaping installations or landscaping rehabilitation projects with less than two thousand five hundred square feet of landscaped area. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

### 19.37.130. Landscaping irrigation audit and maintenance.

(a) Irrigation Audit Required. Prior to approval of occupancy by a building official, a landscaping irrigation audit shall be conducted and an irrigation audit report shall be submitted for applicable projects described in Section 19.37.020 (Applicability).

(1) Audit by Third-Party Certified Professional. The landscaping irrigation audit shall be conducted and the report shall be prepared by a third party certified professional, and not by the entity who designed or installed the landscaping.

(2) Audit Report Content. The irrigation audit report shall include, but not be limited to: inspection, system tune-up, system test with distribution uniformity, correction of any overspray or runoff that causes overland flow, and preparation of an irrigation schedule.

(b) Submittal of Landscaping Maintenance Schedule. Prior to the final inspection by the building official, a regular maintenance schedule shall be submitted to the director of community development for review and approval. The maintenance schedule shall include, but not be limited to, routine inspection; adjustment and repair of the irrigation system and its components; aerating and dethatching turf areas; topdressing with compost; replenishing mulch; fertilizing; pruning; weeding in all landscaped areas; and removing obstructions to irrigation spray heads or other emission devices. Landscaping shall be maintained in accordance with the approved maintenance schedule.

(c) General Maintenance. Landscaping shall be maintained in compliance with the approved landscaping plan, and shall be maintained in a neat, clean and healthful condition. Removed landscaping shall be replaced with specimen plants to match the approved landscaping plan. (Ord. 3082-16 § 1; Ord. 2918-10 § 3).

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# APPENDIX K

City of Sunnyvale
2020 Urban Water Management Plan
Sunnyvale's Fiscal Year 2019/2020 Utility Fee Schedule

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## Section 1.01 - Water Service Fees

| Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|
| 799918 | 3055 | Water Meter Use Fees |

Service Charges: The service charges for each customer class who are billed monthly and bi-monthly shall be based on meter size. In mobile home developments where dwelling units are served by individual meters, and not by a master meter, the single family residential water service rate shall apply.

| Meter Size | Single Family | | Multi Family/Commercial | | Mobile Home Park | | Landscape | | Recycled Water | | Fire Line | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly | Bi-monthly | Monthly | Bi-monthly | Monthly | Bi-monthly | Monthly | Bi-monthly | Monthly | Bi-monthly | Monthly | Bi-monthly |
| **5/8" x 3/4"** | $14.05 | $28.10 | $23.55 | $47.10 | | | $32.68 | $65.36 | | | | |
| **3/4"** | $19.81 | $39.62 | $34.04 | $68.08 | | | $47.74 | $95.48 | | | | |
| **1"** | $31.31 | $62.62 | $55.02 | $110.04 | | | $77.86 | $155.72 | | | $3.59 | $7.18 |
| **1-1/2"** | $60.06 | $120.12 | $107.47 | $214.94 | | | $153.18 | $306.36 | $53.16 | $106.32 | $4.62 | $9.24 |
| **2"** | $94.55 | $189.10 | $170.44 | $340.88 | | | $243.54 | $487.08 | $85.07 | $170.14 | $5.87 | $11.74 |
| **3"** | | | $338.30 | $676.60 | $338.30 | $676.60 | $484.54 | $969.08 | $170.14 | $340.28 | $9.80 | $19.60 |
| **4"** | | | $527.17 | $1,054.34 | $527.17 | $1,054.34 | $755.63 | $1,511.26 | $265.84 | $531.68 | $17.02 | $34.04 |
| **6"** | | | $1,051.77 | $2,103.54 | $1,051.77 | $2,103.54 | $1,508.72 | $3,017.44 | $531.70 | $1,063.40 | $35.64 | $71.28 |
| **8"** | | | $1,681.31 | $3,362.62 | $1,681.31 | $3,362.62 | $2,412.43 | $4,824.86 | $850.71 | $1,701.42 | $60.46 | $120.92 |
| **10"** | | | $4,409.27 | $8,818.54 | $4,409.27 | $8,818.54 | | | $2,233.11 | $4,466.22 | $93.53 | $187.06 |

## Section 1.02 - Water Within City Limits

| Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|
| 799918 | 3056 | Water Sales - Metered |

Water sold to consumers within the corporate limits of the City of Sunnyvale shall be sold at the rates specified. All users shall pay a water charge for each one-hundred cubic feet (equal to 748 gallons), or part thereof, of water as follows. In residential developments where two (2) or more dwelling units are served by a common meter, the upper limit (in cubic feet) of each rate block shall be multiplied by the dwelling units served by the common meter in calculating the rates to be applied to water usage monitored by the common meter. In such case, the lower limit of each rate block shall be one (1) cubic foot over the upper limit of the next lower rate block.

| Single Family Residential/Mobile Home | Tiered Rate Thresholds (CCF) | | Volume Rates by Tier (per CCF) | |
|---|---|---|---|---|
| | Tier 1 | Tier 2 | Tier 1 | Tier 2 |
| Monthly | 0-5 | 6 + | $4.39 | $5.36 |
| Bi-monthly | 0-10 | 11 + | $4.39 | $5.36 |

| All Other Customer Classes | Rate/CCF |
|---|---|
| Multi- Family Residential | $4.85 |
| Commercial | $4.85 |
| Landscape | $4.85 |
| Institutional | $4.85 |
| | |
| Recycled Water | |
| Landscape | $4.37 |
| Institutional | $4.37 |

## Section 1.03 - Water Outside the City Limits

| Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|
| 799918 | 3056 | Water Sales - Metered |

The charges for all water, except reclaimed water, delivered through water meters to consumers outside the corporate limits of the City shall be equal to the charges set forth in Sections 1.01 and 1.02.

## Section 1.04 - Tampering with Equipment Prohibited

| Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|
| 799918 | 4102 | Damage to City Property |

No person or persons shall, without a written permit from the city, open or in any way tamper with or make any addition or alteration whatever to any street main, service connection, meter, stopcock, valve or aircock connected with the water mains. A charge for associated costs of labor, materials for repair or replacement, as the case may be, plus a 15% administrative charge may be included with the water service bill and collected under the same rules and regulations.

| | Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|---|
| **Section 1.05 - Residential Wastewater Fees** | 799921 | 3066 | City Sewer Fees |

The monthly rate for wastewater service for residential users shall be the following charge for each dwelling unit.

| Customer Class | Monthly | Bi-monthly |
|---|---|---|
| | | |
| Single Family | $51.33 | $102.66 |
| All other residential | $35.54 | $71.08 |
| | | |

| | Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|---|
| **Section 1.06 - Commercial Wastewater Fees** | 799921 | 3066 | City Sewer Fees |

The monthly rate for wastewater service for each commercial user shall be the following charge for each one hundred (100) cubic feet or fraction thereof of sanitary sewage and waste discharge from the premises.

| Customer Class | Per 100 cubic feet |
|---|---|
| | |
| Low Strength | $4.93 |
| Standard Strength | $5.45 |
| High Strength | $9.42 |
| | |

| | Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|---|
| **Section 1.07 - Significant Industrial User Sewer Charges*** | 799921 | 3066 | City Sewer Fees |

The monthly rate for wastewater service for all significant industrial users for each one hundred (100) cubic feet or fraction thereof, of sanitary sewage and waste discharge from the premises shall be the annual total flow in hundred cubic feet divided into the sum of the following:

| Wastewater Characteristics | |
|---|---|
| | |
| Per 1,000,000 gallons of sewage discharged | $5,126.69 |
| Per 1,000 pounds of suspended solids discharged | $1,847.56 |
| Per 1,000 pounds of total organic carbon discharged | $2,433.35 |
| Per 1,000 pounds of ammonia nitrogen discharged | $7,318.31 |
| | |

| | Charge Code | Object Level 3 | Title (Obj. Lvl. 3) |
|---|---|---|---|
| **Section 1.08 - Wastewater Outside the City Limits** | 799921 | 3066 | City Sewer Fees |

The charges for all wastewater services provided to consumers outside the corporate limits of the City shall be equal to the charges set forth in Sections 1.04, 1.05 and 1.06.

* Minimum charge per 100 cubic feet for charges calculated in Section 1.07 is equivalent to the Standard Strength rate in Section 1.06

**APPENDIX L**

City of Sunnyvale

2020 Urban Water Management Plan

Resolution for Adoption of the UWMP and WSCP

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# RESOLUTION NO. 1066-21

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SUNNYVALE ADOPTING THE 2020 URBAN WATER MANAGEMENT PLAN TO BE SUBMITTED TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES**

WHEREAS, the California Legislature has enacted the Urban Water Management Planning Act, California Water Code Sections 10610 -10656 and 10608, as amended, which requires every urban water supplier providing water to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare an urban water management plan ("Plan") that has as its primary objective the conservation and efficient use of water; and

WHEREAS, the City of Sunnyvale ("City"), a municipal utility and chartered city, is an urban water supplier providing water to a population over 156,500; and

WHEREAS, the Plan must be reviewed at least once every five years by the City, which must amend the Plan, as necessary, after it has conducted a review; and

WHEREAS, the preparation of the updated Plan has been coordinated with other public agencies to the extent practicable; and

WHEREAS, the Plan must be adopted by July 1, 2021, after it is first made available for public inspection and a public hearing is noticed and held, and it must be filed with the California Department of Water Resources within thirty days of adoption; and

WHEREAS, the Plan was presented to the City’s Planning Commission on May 24, 2021; and

WHEREAS, a noticed public hearing on the draft Plan was held by the City Council on June 29, 2021, at which time public comments were heard and considered.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SUNNYVALE THAT:

1. The Council hereby adopts the 2020 Urban Water Management Plan of the City of Sunnyvale, which shall be filed with the City Clerk. The City Manager is hereby authorized and directed to file the 2020 Urban Water Management Plan of the City of Sunnyvale with the California Department of Water Resources and the State Library.

2. The Council finds and determines that, under the California Water Code Section 10652, the adoption of the Plan and the WSCP and this Resolution does not constitute a project under the California Environmental Quality Act, and no environmental assessment is required.

Adopted by the City Council at a regular meeting held on June 29, 2021, by the following vote:

AYES: KLEIN, HENDRICKS, LARSSON, MELTON, FONG, CISNEROS, DIN
NOES: NONE
ABSTAIN: NONE
ABSENT: NONE
RECUSAL: NONE

ATTEST:

DocuSigned by:
663E57B921394E1...

DAVID CARNAHAN
City Clerk
(SEAL)

APPROVED:

DocuSigned by:
36C5F28A37A9448...

LARRY KLEIN
Mayor

APPROVED AS TO FORM:

DocuSigned by:
4831B06AAB76435...

JOHN A. NAGEL
City Attorney

# RESOLUTION NO. 1067-21

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SUNNYVALE ADOPTING THE 2020 WATER SHORTAGE CONTINGENCY PLAN INCLUDED IN THE URBAN WATER MANAGEMENT PLAN TO BE SUBMITTED TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES**

WHEREAS, the California Legislature has enacted the Urban Water Management Planning Act, California Water Code Sections 10610-10656 and 10608, as amended, which requires every urban water supplier providing water to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare an urban water management plan ("UWMP") that has as its primary objective the conservation and efficient use of water; and

WHEREAS, the California Water Code requires urban water suppliers to prepare a Water Shortage Contingency Plan (WSCP) to be included in its UWMP; and

WHEREAS, the WSCP must be adopted, along with the UWMP, by July 1, 2021, after it is first made available for public inspection and a public hearing is noticed and held, and it must be filed with the California Department of Water Resources within thirty days of adoption; and

WHEREAS, the draft WSCP was presented to the City's Planning Commission on May 24, 2021; and

WHEREAS, a noticed public hearing on the WSCP, included in the UWMP, was held by the City Council on June 29, 2021, at which time public comments were heard and considered.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SUNNYVALE THAT:

1. The Council hereby adopts the 2020 Water Shortage Contingency Plan of the City of Sunnyvale, included in its UWMP, which shall be filed with the City Clerk. The City Manager is hereby authorized and directed to file the 2020 Water Shortage Contingency Plan of the City of Sunnyvale, included in the UWMP, with the California Department of Water Resources and the State Library.

2. The Council finds and determines that, under the California Water Code Section 10652, the adoption of the Plan and the WSCP and this Resolution does not constitute a project under the California Environmental Quality Act, and no environmental assessment is required.

Adopted by the City Council at a regular meeting held on June 29, 2021, by the following vote:

| | |
|---|---|
| AYES: | KLEIN, HENDRICKS, LARSSON, MELTON, FONG, CISNEROS, DIN |
| NOES: | NONE |
| ABSTAIN: | NONE |
| ABSENT: | NONE |
| RECUSAL: | NONE |

ATTEST:

DocuSigned by:

663E57B921394E1...

DAVID CARNAHAN
City Clerk

(SEAL)

APPROVED:

DocuSigned by:

36C5F28A37A9448...

LARRY KLEIN
Mayor

APPROVED AS TO FORM:

DocuSigned by:

4831B06AAB76435...

JOHN A. NAGEL
City Attorney

**APPENDIX M**

City of Sunnyvale
2020 Urban Water Management Plan
Required 2020 UWMP Tables

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| Submittal Table 2-1 Retail Only: Public Water Systems | | | |
|---|---|---|---|
| Public Water System Number | Public Water System Name | Number of Municipal Connections 2020 | Volume of Water Supplied 2020 * |
| *Add additional rows as needed* | | | |
| CA4310014 | City of Sunnyvale | 28,343 | 19,906 |
| | **TOTAL** | 28,343 | 19,906 |
| **** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.* | | | |
| NOTES: Volume of water supplied within City limits. | | | |

| Submittal Table 2-2: Plan Identification | | | |
|---|---|---|---|
| **Select Only One** | **Type of Plan** | | **Name of RUWMP or Regional Alliance**<br>*if applicable*<br>(select from drop down list) |
| ☑ | **Individual UWMP** | | |
| | ☐ | Water Supplier is also a member of a RUWMP | |
| | ☐ | Water Supplier is also a member of a Regional Alliance | |
| ☐ | **Regional Urban Water Management Plan (RUWMP)** | | |
| NOTES: | | | |

| Submittal Table 2-3: Supplier Identification | |
|---|---|
| Type of Supplier (select one or both) | |
| ☐ | Supplier is a wholesaler |
| ☑ | Supplier is a retailer |
| Fiscal or Calendar Year (select one) | |
| ☑ | UWMP Tables are in calendar years |
| ☐ | UWMP Tables are in fiscal years |
| If using fiscal years provide month and date that the fiscal year begins (mm/dd) | |
| | |
| Units of measure used in UWMP * (select from drop down) | |
| Unit | AF |
| **** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.* | |
| NOTES: | |

| Submittal Table 2-4 Retail: Water Supplier Information Exchange |
| --- |
| The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631. |
| Wholesale Water Supplier Name |
| *Add additional rows as needed* |
| San Francisco Public Utilities Commission (SFPUC) |
| Santa Clara Valley Water District (Valley Water) |
| NOTES: |

**Submittal Table 3-1 Retail: Population - Current and Projected**

| Population Served | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| | 156,503 | 165,436 | 174,880 | 184,862 | 195,414 |

NOTES: Department of Finance 2020 estimate and 2025-2040 projections based on the 2010-2020 historical annual growth rate of 1.12%.

| Submittal Table 4-1 Retail: Demands for Potable and Non-Potable [1] Water - Actual | | | |
|---|---|---|---|
| Use Type | 2020 Actual | | |
| **Drop down list**<br>May select each use multiple times<br>These are the only Use Types that will be recognized by the WUEdata online submittal tool | Additional Description<br>(as needed) | Level of Treatment When Delivered<br>Drop down list | Volume [2] |
| Add additional rows as needed | | | |
| Single Family | | Drinking Water | 6,285 |
| Multi-Family | | Drinking Water | 5,614 |
| Commercial | Commercial/Industrial (combined) | Drinking Water | 3,364 |
| Institutional/Governmental | | Drinking Water | 229 |
| Landscape | Irrigation | Drinking Water | 2,233 |
| Other Potable | Firelines | Drinking Water | 11 |
| Losses | | Drinking Water | 1,457 |
| | | **TOTAL** | 19,193 |

[1] *Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-4.* [2] *Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Water loss is estimated as the difference between actual water sales and water supplied.

**Submittal Table 4-2 Retail: Use for Potable and Non-Potable[1] Water - Projected**

| Use Type | Additional Description (as needed) | Projected Water Use[2] *Report To the Extent that Records are Available* | | | |
|---|---|---|---|---|---|
| **Drop down list** May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool | | 2025 | 2030 | 2035 | 2040 |
| Add additional rows as needed | | | | | |
| Single Family | | 5,884 | 5,939 | 7,234 | 7,805 |
| Multi-Family | | 5,301 | 5,295 | 6,379 | 6,835 |
| Commercial | Commercial/Industrial (combined) | 4,111 | 4,257 | 4,583 | 4,770 |
| Institutional/Governmental | | 280 | 289 | 362 | 395 |
| Landscape | Irrigation | 2,346 | 2,471 | 2,702 | 2,843 |
| Other Potable | Firelines | 7 | 7 | 9 | 9 |
| Losses | | 1,358 | 1,381 | 1,632 | 1,729 |
| | **TOTAL** | 19,287 | 19,639 | 22,901 | 24,386 |

[1] *Recycled water demands are NOT reported in this table. Recycled water demands are reported in Table 6-4.*

[2] *Units of measure (AF, CCF, MG) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Projected system losses are 7% of projected potable demand. Projected demand from DSS Model with passive conservation categorized by customer use type.

| Submittal Table 4-3 Retail: Total Water Use (Potable and Non-Potable) | | | | | |
|---|---|---|---|---|---|
| | 2020 | 2025 | 2030 | 2035 | 2040 |
| Potable Water, Raw, Other Non-potable *From Tables 4-1R and 4-2 R* | 19,193 | 19,287 | 19,639 | 22,901 | 24,386 |
| Recycled Water Demand[1] *From Table 6-4* | 713 | 896 | 1,010 | 1,120 | 1,232 |
| **TOTAL WATER USE** | 19,906 | 20,183 | 20,649 | 24,021 | 25,618 |

*[1] Recycled water demand fields will be blank until Table 6-4 is complete*

*[2] Long term storage means water placed into groundwater or surface storage that is not removed from storage in the same year. Supplier **may** deduct recycled water placed in long-term storage from their reported demand. This value is manually entered into Table 4-3.*

NOTES: Projected recycled water is based on anticipated recycled water development. Recycled water demand includes recycled water and any potable water added to the recycled water system. Total water use represents water use within the City's service area.

| Submittal Table 4-4 Retail: Last Five Years of Water Loss Audit Reporting | |
|---|---|
| Reporting Period Start Date (mm/yyyy) | Volume of Water Loss [1,2] |
| 01/2016 | 866 |
| 01/2017 | 1122 |
| 01/2018 | 768 |
| 01/2019 | 1172 |
| 01/2020 | 1457 |

[1] *Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.* [2]
***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: "Volume of Water Loss" values for 2016-2019 were reported to DWR (https://wuedata.water.ca.gov/awwa_plans). Water loss for 2020 is estimated as the difference between actual water sales and water supplied.

| Submittal Table 4-5 Retail Only: Inclusion in Water Use Projections | |
|---|---|
| **Are Future Water Savings Included in Projections?**<br>(Refer to Appendix K of UWMP Guidebook)<br>*Drop down list (y/n)* | Yes |
| If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found. | Section 4.3 |
| **Are Lower Income Residential Demands Included In Projections?**<br>*Drop down list (y/n)* | Yes |
| NOTES: | |

**Submittal Table 5-1 Baselines and Targets Summary**
**From SB X7-7 Verification Form**
*Retail Supplier or Regional Alliance Only*

| Baseline Period | Start Year * | End Year * | Average Baseline GPCD* | Confirmed 2020 Target* |
|---|---|---|---|---|
| 10-15 year | *1995* | *2004* | *174* | *139* |
| 5 Year | *2003* | *2007* | *167* | |

**All cells in this table should be populated manually from the supplier's SBX7-7 Verification Form and reported in Gallons per Capita per Day (GPCD)*

NOTES: Method 1 2020 minimum water use reduction based on 80% of the 10-year baseline.

| **Submittal Table 5-2: 2020 Compliance From SB X7-7 2020 Compliance Form**<br>*Retail Supplier or Regional Alliance Only* | | | | |
|---|---|---|---|---|
| **2020 GPCD** | | | 2020 Confirmed Target GPCD* | Did Supplier Achieve Targeted Reduction for 2020? Y/N |
| Actual 2020 GPCD* | 2020 TOTAL Adjustments* | Adjusted 2020 GPCD* *(Adjusted if applicable)* | | |
| *115* | *0* | *115* | *139* | *Y* |
| **All cells in this table should be populated manually from the supplier's SBX7-7 2020 Compliance Form and reported in Gallons per Capita per Day (GPCD)* | | | | |
| NOTES: | | | | |

| Submittal Table 6-1 Retail: Groundwater Volume Pumped | | | | | | |
|---|---|---|---|---|---|---|
| ☐ | Supplier does not pump groundwater.<br>The supplier will not complete the table below. | | | | | |
| ☐ | All or part of the groundwater described below is desalinated. | | | | | |
| Groundwater Type<br>***Drop Down List***<br>*May use each category multiple times* | Location or Basin Name | 2016* | 2017* | 2018* | 2019* | 2020* |
| *Add additional rows as needed* | | | | | | |
| Alluvial Basin | Santa Clara Plain Subarea | 154 | 118 | 105 | 92 | 87 |
| | **TOTAL** | 154 | 118 | 105 | 92 | 87 |
| **** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.* | | | | | | |
| NOTES: | | | | | | |

| Submittal Table 6-2 Retail: Wasteater Collected Within Service Area in 2020 | | | | | | |
|---|---|---|---|---|---|---|
| ☐ | There is no wastewater collection system. The supplier will not complete the table below. | | | | | |
| | Percentage of 2020 service area covered by wastewater collection system *(optional)* | | | | | |
| **Wastewater Collection** | | | **Recipient of Collected Wastewater** | | | |
| Name of Wastewater Collection Agency | Wastewater Volume Metered or Estimated? *Drop Down List* | Volume of Wastewater Collected from UWMP Service Area 2020 * | Name of Wastewater Treatment Agency Receiving Collected Wastewater | Treatment Plant Name | Is WWTP Located Within UWMP Area? *Drop Down List* | Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List* |
| City of Sunnyvale | Metered | 14,332 | City of Sunnyvale | Sunnyvale Water Pollution Control Plant | Yes | No |
| **Total Wastewater Collected from Service Area in 2020:** | | 14,332 | | | | |

**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3* **.**

NOTES:

| Submittal Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2020 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ▫ | **No wastewater is treated or disposed of within the UWMP service area.** The supplier will not complete the table below. | | | | | | | | | | |
| Wastewater Treatment Plant Name | Discharge Location Name or Identifier | Discharge Location Description | Wastewater Discharge ID Number *(optional)* [2] | Method of Disposal *Drop down list* | Does This Plant Treat Wastewater Generated Outside the Service Area? *Drop down list* | Treatment Level *Drop down list* | **2020 volumes** [1] | | | | |
| | | | | | | | Wastewater Treated | Discharged Treated Wastewater | Recycled Within Service Area | Recycled Outside of Service Area | Instream Flow Permit Requirement |
| Sunnyvale Water Pollution Control Plant | Lower South Bay of San Francisco Bay | Discharged via the Moffett Channel and Guadalupe Slough | | Bay or estuary outfall | No | Tertiary | 14,332 | 12,183 | 713 | 281 | |
| | | | | | | **Total** | 14,332 | 12,183 | 713 | 281 | 0 |

[1] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.
[2] If the **Wastewater Discharge ID Number** is not available to the UWMP preparer, access the SWRCB CIWQS regulated facility website at https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?inCommand=reset&reportName=RegulatedFacility

NOTES: Effluent flows do not include No. 3 water or backwash water. No. 3 water is used in several plant processes, including polymer dilution, washdown water, Syagro dewatering, and heat loop/engine cooling. Total volume recycled within the service area includes recycled water and potable water delivered through the recycled water system. Recycled water produced at the WPCP accounts for approximately 38% of total usage. Recycled water services outside City limits include Moffett Field and the Apple® Campus 2. The City does not currently have instream flow requirements.

**Submittal Table 6-4 Retail: Recycled Water Direct Beneficial Uses Within Service Area**

| ▫ | Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below. |
|---|---|
| Name of Supplier Producing (Treating) the Recycled Water: | City of Sunnyvale |
| Name of Supplier Operating the Recycled Water Distribution System: | City of Sunnyvale |
| Supplemental Water Added in 2020 (volume) *Include units* | 611 AF |
| Source of 2020 Supplemental Water | Potable Water |

| Beneficial Use Type *Insert additional rows if needed.* | **Potential** Beneficial Uses of Recycled Water (Describe) | Amount of **Potential** Uses of Recycled Water (Quantity) *Include volume units* [1] | General Description of 2020 Uses | Level of Treatment *Drop down list* | 2020 [1] | 2025 [1] | 2030[1] | 2035[1] | 2040[1] |
|---|---|---|---|---|---|---|---|---|---|
| Landscape irrigation (exc golf courses) | | | Parks, Green Belts, Schools, etc. | Tertiary | 521 | 486 | 586 | 681 | 779 |
| Golf course irrigation | | | Fairway Irrigation | Tertiary | 65 | 293 | 293 | 293 | 293 |
| Commercial use | | | Dual Plumbing | Tertiary | 102 | 90 | 101 | 112 | 123 |
| Industrial use | | | Cooling | Tertiary | 25 | 27 | 30 | 34 | 37 |
| | | | | **Total:** | 713 | 896 | 1,010 | 1,120 | 1,232 |
| | | | | **2020 Internal Reuse** | 440 | | | | |

[1] ***Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Internal reuse is disinfected secondary recycled water diverted for WPCP process prior to recycled water distribution system. This is not counted towards Statewide Recycled Water volume. Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2).

| Submittal Table 6-5 Retail: 2015 UWMP Recycled Water Use Projection Compared to 2020 Actual | | |
|---|---|---|
| ☐ | Recycled water was not used in 2015 nor projected for use in 2020. The supplier will not complete the table below. If recycled water was not used in 2020, and was not predicted to be in 2015, then check the box and do not complete the table. | |
| **Beneficial Use Type** | **2015 Projection for 2020** [1] | **2020 Actual Use**[1] |
| *Insert additional rows as needed.* | | |
| Agricultural irrigation | | |
| Landscape irrigation (exc golf courses) | 715 | 521 |
| Golf course irrigation | 290 | 65 |
| Commercial use | 331 | 102 |
| Industrial use | 120 | 25 |
| **Total** | 1,456 | 713 |

[1] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.

NOTE: Recycled water use within service area. Although the expected expansion of recycled water was not realized in the last five years, recycled water use has stayed consistent with 2015 recycled water use (717 AF).

| Submittal Table 6-6 Retail: Methods to Expand Future Recycled Water Use | | | |
|---|---|---|---|
| ☑ | Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation. | | |
| Section 6.4.5 | Provide page location of narrative in UWMP | | |
| Name of Action | Description | Planned Implementation | Expected Increase in Recycled Water Use * |
| *Add additional rows as needed* | | | |
| | | **Total** | 0 |
| ***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.* | | | |
| NOTES: | | | |

| Submittal Table 6-7 Retail: Expected Future Water Supply Projects or Programs | | | | | | |
|---|---|---|---|---|---|---|
| ☐ | No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below. | | | | | |
| ☑ | Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format. | | | | | |
| Section 6.7 | Provide page location of narrative in the UWMP | | | | | |
| Name of Future Projects or Programs | Joint Project with other suppliers? | | Description (if needed) | Planned Implementation Year | Planned for Use in Year Type<br>*Drop Down List* | Expected Increase in Water Supply to Supplier*<br>*This may be a range* |
| | *Drop Down List (y/n)* | *If Yes, Supplier Name* | | | | |
| *Add additional rows as needed* | | | | | | |
| ***Units of measure (AF, CCF, MG)** *must remain consistent throughout the UWMP as reported in Table 2-3.* | | | | | | |
| NOTES: | | | | | | |

| Submittal Table 6-8 Retail: Water Supplies — Actual | | | | | |
|---|---|---|---|---|---|
| Water Supply | Additional Detail on Water Supply | 2020 | | | |
| **Drop down list** May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool | | Actual Volume* | Water Quality Drop Down List | Total Right or Safe Yield* (optional) | |
| Add additional rows as needed | | | | | |
| Purchased or Imported Water | SFPUC | 11,052 | Drinking Water | 14,100 | |
| Purchased or Imported Water | Valley Water | 8,665 | Drinking Water | 9,200 | |
| Groundwater (not desalinated) | City owned and operated wells | 87 | Drinking Water | 8,000 | |
| Recycled Water | Recycled water produced | 383 | Recycled Water | | |
| | **Total** | 20,187 | | 31,300 | |
| ***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.* | | | | | |
| NOTES: Approximately 611 AF of purchased potable water was added to the recycled water distribution system. Contractual volumes from Valley Water vary from year to year. Although 383 AF of recycled water was produced at the WPCP, approximately 611 AF of purchased potable water from SFPUC was added to the recycled water distribution system, making the total recycled water demand 994 AF. Approximately 713 AF was distributed within City limits, with the remaining 281 AF distributed to services outside City limits (Moffett Field and the Apple® Campus 2). | | | | | |

| Submittal Table 6-9 Retail: Water Supplies — Projected | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Water Supply | Additional Detail on Water Supply | Projected Water Supply * Report To the Extent Practicable | | | | | | | |
| | | 2025 | | 2030 | | 2035 | | 2040 | |
| **Drop down list** May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool | | Reasonably Available Volume | Total Right or Safe Yield (optional) | Reasonably Available Volume | Total Right or Safe Yield (optional) | Reasonably Available Volume | Total Right or Safe Yield (optional) | Reasonably Available Volume | Total Right or Safe Yield (optional) |
| Add additional rows as needed | | | | | | | | | |
| Purchased or Imported Water | SFPUC | 14,100 | | 14,100 | | 14,100 | | 14,100 | |
| Purchased or Imported Water | Valley Water | 9,215 | | 9,338 | | 11,226 | | 11,923 | |
| Groundwater (not desalinated) | Wells | 8,000 | | 8,000 | | 8,000 | | 8,000 | |
| Recycled Water | | 896 | | 1,010 | | 1,120 | | 1,232 | |
| | **Total** | 32,211 | 0 | 32,448 | 0 | 34,446 | 0 | 35,255 | 0 |

***Units of measure (AF, CCF, MG)** *must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Total available supply from SFPUC reflects the City's contractual agreement. The City can purchase additional available water from Valley Water during non-dry years when water is available. Although the City expects to pump approximately 112 AFY, the total safe yield of groundwater is 8,000 AFY.

| Submittal Table 7-1 Retail: Basis of Water Year Data (Reliability Assessment) | | | | |
|---|---|---|---|---|
| **Year Type** | **Base Year** If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 2019-2020, use 2020 | **Available Supplies if Year Type Repeats** | | |
| | | ☐ | Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location ___________________________ | |
| | | ☑ | Quantification of available supplies is provided in this table as either volume only, percent only, or both. | |
| | | **Volume Available *** | | **% of Average Supply** |
| Average Year | 2015 | | | 100% |
| Single-Dry Year | 1977 | | | 88% |
| Consecutive Dry Years 1st Year | 1988 | | | 89% |
| Consecutive Dry Years 2nd Year | 1989 | | | 89% |
| Consecutive Dry Years 3rd Year | 1990 | | | 73% |
| Consecutive Dry Years 4th Year | 1991 | | | 74% |
| Consecutive Dry Years 5th Year | 1992 | | | 74% |

*Supplier may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If a Supplier uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.*

***Units of measure (AF, CCF, MG** ) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: All base years are consistent with Valley Water. Available supplies reflect all City sources.

| Submittal Table 7-2 Retail: Normal Year Supply and Demand Comparison | | | | |
|---|---|---|---|---|
| | 2025 | 2030 | 2035 | 2040 |
| Supply totals<br>(*autofill from Table 6-9)* | 32,211 | 32,448 | 34,446 | 35,255 |
| Demand totals<br>*(autofill from Table 4-3)* | 20,183 | 20,649 | 24,021 | 25,618 |
| Difference | 12,028 | 11,799 | 10,425 | 9,637 |
| NOTES: Projected demands include passive conservation. Includes potable and recycled water. Includes total groundwater well capacity. | | | | |

| Submittal Table 7-3 Retail: Single Dry Year Supply and Demand Comparison | | | | |
|---|---|---|---|---|
| | 2025 | 2030 | 2035 | 2040 |
| Supply totals* | 27,135 | 27,372 | 29,370 | 30,038 |
| Demand totals* | 20,183 | 20,649 | 24,021 | 25,618 |
| Difference | 6,952 | 6,723 | 5,349 | 4,420 |

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Includes interruption from SFPUC due to Bay-Delta Plan in 2023 and Tier Two reduction plan. Projected demands include passive conservation. Includes total groundwater well capacity.

## Submittal Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison

| | | 2025* | 2030* | 2035* | 2040* |
|---|---|---|---|---|---|
| First year | Supply totals | 27,135 | 27,372 | 29,370 | 30,038 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | Difference | 6,952 | 6,723 | 5,349 | 4,420 |
| Second year | Supply totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | Difference | 5,683 | 5,454 | 3,939 | 3,151 |
| Third year | Supply totals | 25,866 | 26,103 | 27,960 | 28,769 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | Difference | 5,683 | 5,454 | 3,939 | 3,151 |
| Fourth year | Supply totals | 25,866 | 26,103 | 27,960 | 27,923 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | Difference | 5,683 | 5,454 | 3,939 | 2,305 |
| Fifth year | Supply totals | 25,866 | 26,103 | 27,396 | 27,923 |
| | Demand totals | 20,183 | 20,649 | 24,021 | 25,618 |
| | Difference | 5,683 | 5,454 | 3,375 | 2,305 |

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:

## Submittal Table 7-5: Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b)

| 2021 | Total |
|---|---|
| Total Water Use | 19,952 |
| Total Supplies | 27,248 |
| Surplus/Shortfall w/o WSCP Action | 7,296 |
| **Planned WSCP Actions** (use reduction and supply augmentation) | |
| WSCP - supply augmentation benefit | 0 |
| WSCP - use reduction savings benefit | 0 |
| Revised Surplus/(shortfall) | 7,296 |
| Resulting % Use Reduction from WSCP action | 0% |

| 2022 | Total |
|---|---|
| Total Water Use | 19,998 |
| Total Supplies | 27,470 |
| Surplus/Shortfall w/o WSCP Action | 7,472 |
| **Planned WSCP Actions** (use reduction and supply augmentation) | |
| WSCP - supply augmentation benefit | 0 |
| WSCP - use reduction savings benefit | 0 |
| Revised Surplus/(shortfall) | 7,472 |
| Resulting % Use Reduction from WSCP action | 0% |

| 2023 | Total |
|---|---|
| Total Water Use | 20,045 |
| Total Supplies | 22,605 |
| Surplus/Shortfall w/o WSCP Action | 2,561 |
| **Planned WSCP Actions** (use reduction and supply augmentation) | |
| WSCP - supply augmentation benefit | 0 |
| WSCP - use reduction savings benefit | 0 |
| Revised Surplus/(shortfall) | 2,561 |
| Resulting % Use Reduction from WSCP action | 0% |

| 2024 | Total |
|---|---|
| Total Water Use | 20,091 |
| Total Supplies | 22,715 |
| Surplus/Shortfall w/o WSCP Action | 2,625 |
| **Planned WSCP Actions** (use reduction and supply augmentation) | |
| WSCP - supply augmentation benefit | 0 |
| WSCP - use reduction savings benefit | 0 |
| Revised Surplus/(shortfall) | 2,625 |
| Resulting % Use Reduction from WSCP action | 0% |

| 2025 | Total |
|---|---|
| Total Water Use | 20,183 |
| Total Supplies | 22,825 |
| Surplus/Shortfall w/o WSCP Action | 2,642 |
| **Planned WSCP Actions** (use reduction and supply augmentation) | |
| WSCP - supply augmentation benefit | 0 |
| WSCP - use reduction savings benefit | 0 |
| Revised Surplus/(shortfall) | 2,642 |
| Resulting % Use Reduction from WSCP action | 0% |

**Submittal Table 8-1**
**Water Shortage Contingency Plan Levels**

| Shortage Level | Percent Shortage Range | Shortage Response Actions (*Narrative description)* |
|---|---|---|
| 1 | Up to 10% | •Increase public information campaigning<br>•Increase educational programs |
| 2 | Up to 20% | •Voluntary conservation<br>•Reduce irrigation |
| 3 | Up to 30% | •Allocations and mandatory conservation<br>•Required reductions<br>•Drought surcharges and increased rates<br>•Flow restrictors<br>•Increase production monitoring |
| 4 | Up to 40% | •Require additional reductions<br>•Additional drought surcharges<br>•Reduce system flushing<br>•Repair leaks immediately<br>•Increase production monitoring |
| 5 | Up to 50% | •No new landscaping or building permits<br>•Restrict landscape irrigation<br>•24-hour leak repair<br>•Increase use of non-potable water |
| 6 | >50% | •No new landscaping or building permits<br>•Restrict landscape irrigation<br>•24-hour leak repair<br>•Increase use of non-potable water |

NOTES:

| Submittal Table 8-2: Demand Reduction Actions | | | | |
|---|---|---|---|---|
| Shortage Level | Demand Reduction Actions<br>***Drop down list***<br>*These are the only categories that will be accepted by the WUEdata online submittal tool. Select those that apply.* | How much is this going to reduce the shortage gap?<br>*Include units used (volume type or percentage)* | Additional Explanation or Reference<br>*(optional)* | Penalty, Charge, or Other Enforcement?<br>***For Retail Suppliers Only***<br>*Drop Down List* |
| *Add additional rows as needed* | | | | |
| All | CII - Restaurants may only serve water upon request | ≤ 10% | | No |
| All | Landscape - Limit landscape irrigation to specific times | ≤ 10% | Prohibit sprinkler irrigation between the hours of 9AM - 6PM when daylight savings is in effect | No |
| All | Landscape - Limit landscape irrigation to specific times | ≤ 10% | Prohibit irrigating for more than 15 minutes per day each station | No |
| All | Other | ≤ 10% | Prohibit allowing plumbing fixtures to leak | No |
| All | Other | ≤ 10% | Prohibit using potable water in a manner where it floods premises and runs off into the | No |
| All | Other | ≤ 10% | Prohibit using a hose to wash vehicles without a shut off valve | No |
| All | Other | ≤ 10% | Prohibit using a hose to wash driveways, sidewalks (except for health and safety) | No |
| All | Landscape - Limit landscape irrigation to specific times | ≤ 10% | Prohibit irrigation with potable water during and within 48 hours after measurable rainfall | No |
| All | Landscape - Other landscape restriction or prohibition | ≤ 10% | Prohibit irrigation with potable water of ornamental turf on public street medians | No |
| All | CII - Lodging establishment must offer opt out of linen service | ≤ 10% | | No |
| All | Water Features - Restrict water use for decorative water features, such as fountains | ≤ 10% | Prohibit use of decorative fountains without recirculation | No |
| All | Other | ≤ 10% | Prohibit installation of single pass cooling process in new construction | No |
| 1-6 | Expand Public Information Campaign | 10-50% | Expand public information campaign which includes water use surveys and promoting available rebate programs such as turf replacement, water use efficiency devices, or conversion to recycled water if available | No |
| 1-6 | Other | 10-50% | Enforce permanent water use restriction Ordinance (Muni Code 12.34.020) | No |
| 1-6 | Decrease Line Flushing | 10-50% | Decrease hydrant/line flushing (unless for public health or safety) | No |
| 2-6 | Increase Water Waste Patrols | 20-50% | Increase water waste patrols and enforcement of permanent water use restriction Ordinance (Muni Code 12.34.020) | Yes |
| 2-6 | Reduce System Water Loss | 20-50% | | Yes |

| Shortage Level | Demand Reduction Actions ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool. Select those that apply.* | How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)* | Additional Explanation or Reference *(optional)* | Penalty, Charge, or Other Enforcement? ***For Retail Suppliers Only*** *Drop Down List* |
|---|---|---|---|---|
| 3-6 | Landscape - Limit landscape irrigation to specific days | 30-50% | Prohibit irrigation of ornamental landscapes with potable water more than two days per week | Yes |
| 3-6 | Other - Prohibit vehicle washing except at facilities using recycled or recirculating water | 30-50% | | Yes |
| 3-6 | Other | 30-50% | Implement or modify drought rate structure or surcharge | Yes |
| 3-6 | Increase Frequency of Meter Reading | 30-50% | | Yes |
| 4-6 | Other | 40-50% | Water allocation may be imposed | Yes |
| 4-6 | Other | 40-50% | Prohibit new installations of lawns | Yes |
| 4-6 | Other | 40-50% | Prohibit irrigating with potable water of golf courses except for tees and greens | Yes |
| 4-6 | Water Features - Restrict water use for decorative water features, such as fountains | 40-50% | Prohibit use of decorative fountains | Yes |
| 4-6 | Other water feature or swimming pool restriction | 40-50% | Prohibit new swimming pool or pond construction | Yes |
| 4-6 | Other water feature or swimming pool restriction | ≥ 50% | Prohibit filling or refilling swimming pools | Yes |
| 5-6 | Other | ≥ 50% | Moratorium or net zero demand increase on new connections | Yes |
| 5-6 | Other water feature or swimming pool restriction | ≥ 50% | Prohibit new swimming pool or pond construction | Yes |
| 5-6 | Other water feature or swimming pool restriction | ≥ 50% | Prohibit filling or refilling swimming pools | Yes |
| 5-6 | Landscape - Limit landscape irrigation to specific days | ≥ 50% | Prohibit outdoor watering December through March | Yes |
| 5-6 | Landscape - Prohibit certain types of landscape irrigation | ≥ 50% | Prohibit watering turf, grass or dichondra lawns (can provide minimal water for sports playing fields) | Yes |
| 6 | Landscape - Prohibit certain types of landscape irrigation | > 50% | Prohibit landscape irrigation with potable water of any City-owned premises or businesses where recycled water is available for connection | Yes |
| 6 | Landscape - Other landscape restriction or prohibition | > 50% | Prohibit irrigation of ornamental landscapes with potable water | Yes |
| 6 | Landscape - Other landscape restriction or prohibition | > 50% | Prohibit watering turf, grass or dichondra lawns with potable water including sports and playing fields and tees and greens for golf courses | Yes |
| NOTES: | | | | |

| Submittal Table 8-3: Supply Augmentation and Other Actions | | | |
|---|---|---|---|
| Shortage Level | Supply Augmentation Methods and Other Actions by Water Supplier<br>***Drop down list***<br>*These are the only categories that will be accepted by the WUEdata online submittal tool* | How much is this going to reduce the shortage gap? *Include units used (volume type or percentage)* | Additional Explanation or Reference *(optional)* |
| *Add additional rows as needed* | | | |
| Stage 1 | Other Actions (describe) | 10% | Increase groundwater use if needed |
| Stage 2 | Other Actions (describe) | 20% | Increase groundwater use if needed, SFPUC, and/or Valley Water to supplement supply that is deficient |
| Stage 3 | Other Actions (describe) | 30% | Increase groundwater use if needed, SFPUC, and/or Valley Water to supplement supply that is deficient |
| Stage 4 | Other Actions (describe) | 40% | Increase groundwater use if needed, SFPUC, and/or Valley Water to supplement supply that is deficient |
| Stage 5 | Other Actions (describe) | 50% | Increase groundwater use if needed, SFPUC, and/or Valley Water to supplement supply that is deficient |
| Stage 6 | Other Actions (describe) | 60% | Increase groundwater use if needed, SFPUC, and/or Valley Water to supplement supply that is deficient |
| NOTES: | | | |

| Submittal Table 10-1 Retail: Notification to Cities and Counties | | |
|---|---|---|
| City Name | 60 Day Notice | Notice of Public Hearing |
| *Add additional rows as needed* | | |
| City of Hayward | Yes | Yes |
| City of Milpitas | Yes | Yes |
| City of Mountain View | Yes | Yes |
| City of Palo Alto | Yes | Yes |
| City of Santa Clara | Yes | Yes |
| City of Brisbane | Yes | Yes |
| City of Burlingame | Yes | Yes |
| City of Daly City | Yes | Yes |
| City of Menlo Park | Yes | Yes |
| City of Millbrae | Yes | Yes |
| City of Redwood City | Yes | Yes |
| City of San Bruno | Yes | Yes |
| City of East Palo Alto | Yes | Yes |
| City of San Jose | Yes | Yes |
| City of Foster City | Yes | Yes |

| County Name<br>*Drop Down List* | 60 Day Notice | Notice of Public Hearing |
|---|---|---|
| *Add additional rows as needed* | | |
| Alameda County | Yes | Yes |
| Santa Clara County | Yes | Yes |

NOTES: Additional notified agencies:
-Stanford University
-Purissma Hills Water District
-Town of Hillsborough
-Coastside County Water District
-Santa Clara Valley Water District
-Mid-Peninsula Water District
-North Coast County Water District
-Westborough Water District
-California Water Service Company
-San Jose Water Company
-Bay Area Water Supply & Conservation Agency
-San Francisco Public Utilities Commission

***Urban Water Supplier:*** *City of Sunnyvale*

**Water Delivery Product** (If delivering more than one type of product use Table O-1C)

*Retail Potable Deliveries*

| Table O-1B: Recommended Energy Reporting - Total Utility Approach | | | | |
|---|---|---|---|---|
| Enter Start Date for Reporting Period | 10/1/2019 | Urban Water Supplier Operational Control | | |
| End Date | 9/29/2020 | | | |
| Is upstream embedded in the values reported? | | Sum of All Water Management Processes | Non-Consequential Hydropower | |
| *Water Volume Units Used* | *AF* | Total Utility | Hydropower | Net Utility |
| *Volume of Water Entering Process (volume unit)* | | *19193* | *0* | *19193* |
| *Energy Consumed (kWh)* | | *151027* | *0* | *151027* |
| *Energy Intensity (kWh/volume)* | | *7.9* | *0.0* | *7.9* |

**Data Quality** *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

*Estimate*

**Data Quality Narrative:**

For the purposes of this UWMP, energy consumption from utility bills was analyzed to determine the quantity of energy used for water management processes. Monthly PG&E billing data for the City's six wells (Hamilton Wells 2 and 3, Serra, Ortega, Westmoor, and Raynor) and the Hamilton Well Pump Station were used to determine metered electric usage for 2020. Since wells and pumps were combined on the utility bills, energy use from all wells and pumps is totaled as a lump sum for all potable water management processes.

**APPENDIX N**

City of Sunnyvale

2020 Urban Water Management Plan

2020 UWMP Checklist

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# Appendix N: UWMP Checklist

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
|---|---|---|---|
| 10615 | A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. | Introduction and Overview | Section 1 |
| 10630.5 | Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter. | Summary | Section 1.1 |
| 10620(b) | Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier. | Plan Preparation | Section 2 and Section 10 |
| 10620(d)(2) | 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. | Plan Preparation | Section 2.3 and Appendix A |
| 10642 | 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 and contingency plan. | Plan Preparation | Section 10.3 and Appendix L |
| 10631(h) | Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source. | System Supplies | Section 4.2.4 and Appendix D |
| 10631(a) | Describe the water supplier service area. | System Description | Section 3.4 |
| 10631(a) | Describe the climate of the service area of the supplier. | System Description | Section 3.3 |
| 10631(a) | Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045. | System Description | Section 3.4 |
| 10631(a) | Describe other social, economic, and demographic factors affecting the supplier's water management | System Description | Section 3.5 |
| 10631(a) | Indicate the current population of the service area. | System Description and Baselines and Targets | Section 3.4 |
| 10631(a) | Describe the land uses within the service area. | System Description | Section 3.6 |
| 10631(d)(1) | Quantify past, current, and projected water use, identifying the uses among water use sectors. | System Water Use | Section 4.2 |
| 10631(d)(3)(C) | Retail suppliers shall provide data to show the distribution loss standards were met. | System Water Use | Section 4.2.2 |
| 10631(d)(4)(A) | In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws. | System Water Use | Section 4.3 |
| 10631(d)(4)(B) | Provide citations of codes, standards, ordinances, or plans used to make water use projections. | System Water Use | Section 4.2.4, Section 4.3, and Appendix C |
| 10631(d)(3)(A) | Report the distribution system water loss for each of the 5 years preceding the plan update. | System Water Use | Section 4.2.2 |
| 10631.1(a) | Include projected water use needed for lower income housing projected in the service area of the supplier. | System Water Use | Seection 4.4 |
| 10635(b) | Demands under climate change considerations must be included as part of the drought risk assessment. | System Water Use | Section 4.5 |
| 10608.20(e) | Retail suppliers shall 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. | Baselines and Targets | Section 5 |
| 10608.24(a) | Retail suppliers shall meet their water use target by December 31, 2020. | Baselines and Targets | Section 5.4 |

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
|---|---|---|---|
| 10608.24(d)(2) | If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment. | Baselines and Targets | Section 5.4 |
| 10608.22 | Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100. | Baselines and Targets | Section 5.3 |
| 10608.4 | Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form. | Baselines and Targets | Section 5.4 and Appendix E |
| 10631(b)(1) | Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought. | System Supplies | Section 7, Section 6.8, and Section 6.10 |
| 10631(b)(1) | Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, *including changes in supply due to climate change.* | System Supplies | Section 7, Section 6.8, and Section 6.10 |
| 10631(b)(2) | When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies. | System Supplies | Section 6.8 |
| 10631(b)(3) | Describe measures taken to acquire and develop planned sources of water. | System Supplies | Section 6.7 and Section 6.8 |
| 10631(b) | Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045. | System Supplies | Section 6.8 |
| 10631(b) | Indicate whether groundwater is an existing or planned source of water available to the supplier. | System Supplies | Section 6.2 |
| 10631(b)(4)(A) | Indicate whether a groundwater sustainability plan or groundwater management plan has 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. | System Supplies | Section 6.2.2 and Appendix F |
| 10631(b)(4)(B) | Describe the groundwater basin. | System Supplies | Section 6.2.1 |
| 10631(b)(4)(B) | Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump. | System Supplies | Section 6.2.1 |
| 10631(b)(4)(B) | For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions. | System Supplies | Section 6.2 |
| 10631(b)(4)(C) | 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 | System Supplies | Section 6.2.2 and Figure 6-1 |
| 10631(b)(4)(D) | Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped. | System Supplies | Section 6.2.2 and Figure 6-1 |
| 10631(c) | Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis. | System Supplies | Section 6.6 |
| 10633(b) | 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. | System Supplies (Recycled Water) | Section 6.4.1 |
| 10633(c) | Describe the recycled water currently being used in the supplier's service area. | System Supplies (Recycled Water) | Section 6.4.3 and Section 6.4.4 |

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
|---|---|---|---|
| 10633(d) | Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses. | System Supplies (Recycled Water) | Section 6.4.4 and Section 6.4.5 |
| 10633(e) | Describe 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. | System Supplies (Recycled Water) | Section 6.4.4 |
| 10633(f) | Describe the actions 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. | System Supplies (Recycled Water) | Section 6.4.6 |
| 10633(g) | Provide a plan for optimizing the use of recycled water in the supplier's service area. | System Supplies (Recycled Water) | Section 6.4.6 |
| 10631(g) | Describe desalinated water project opportunities for long-term supply. | System Supplies | Section 6.5 |
| 10633(a) | Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods. | System Supplies (Recycled Water) | Section 6.4.1 |
| 10631(f) | Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years. | System Supplies | Section 6.7, Section 7.3, and Section 7.4 |
| 10631.2(a) | The UWMP must include energy information, as stated in the code, that a supplier can readily obtain. | System Suppliers, Energy Intensity | Section 6.9 |
| 10634 | Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability | Water Supply Reliability Assessment | Section 7.1.1 |
| 10620(f) | Describe water management tools and options to maximize resources and minimize the need to import water from other regions. | Water Supply Reliability Assessment | Section 7.1 and 7.2 |
| 10635(a) | Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive 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. | Water Supply Reliability Assessment | Section 7.2 and 7.3 |
| 10635(b) | Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply | Water Supply Reliability Assessment | Section 7.4 |
| 10635(b)(1) | Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years. | Water Supply Reliability Assessment | Section 7.4.1 |
| 10635(b)(2) | Include a determination of the reliability of each source of supply under a variety of water shortage conditions. | Water Supply Reliability Assessment | Section 7.4.2 |
| 10635(b)(3) | Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period. | Water Supply Reliability Assessment | Section 7.4.3 |
| 10635(b)(4) | Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria. | Water Supply Reliability Assessment | Section 7.3 and Section 7.4 |
| 10632(a) | Provide a water shortage contingency plan (WSCP) with specified elements below. | Water Shortage Contingency Planning | Section 8 |
| 10632(a)(1) | Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP | Water Shortage Contingency Planning | Section 8.1 |
| 10632(a)(10) | Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented. | Water Shortage Contingency Planning | Section 8.6, Section 8.10, and Section 8.11 |

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
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| 10632(a)(2)(A) | Provide the written decision- making process and other methods that the supplier will use each year to determine its water reliability. | Water Shortage Contingency Planning | Section 8.2.1 |
| 10632(a)(2)(B) | Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code. | Water Shortage Contingency Planning | Section 8.2.2 |
| 10632(a)(3)(A) | Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply. | Water Shortage Contingency Planning | Section 8.3.4, Section 8.8 |
| 10632(a)(3)(B) | Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories. | Water Shortage Contingency Planning | Section 8.3.4 |
| 10632(a)(4)(A) | Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions. | Water Shortage Contingency Planning | Section 8.4, Table 8-12 |
| 10632(a)(4)(B) | Specify locally appropriate demand reduction actions to adequately respond to shortages. | Water Shortage Contingency Planning | Section 8.4, Table 8-11 |
| 10632(a)(4)(C) | Specify locally appropriate operational changes. | Water Shortage Contingency Planning | Section 8.4 |
| 10632(a)(4)(D) | Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions are appropriate to local conditions. | Water Shortage Contingency Planning | Section 8.4 |
| 10632(a)(4)(E) | Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action. | Water Shortage Contingency Planning | Section 8.4, Table 8-11 |
| 10632.5 | The plan shall include a seismic risk assessment and mitigation plan. | Water Shortage Contingency Plan | Section 8.9 and Appendix I |
| 10632(a)(5)(A) | Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages. | Water Shortage Contingency Planning | Section 8.4 |
| 10632(a)(5)(B)<br>10632(a)(5)(C) | Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications. | Water Shortage Contingency Planning | Section 8.4 |
| 10632(a)(6) | Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP. | Water Shortage Contingency Planning | Section 8.4, Section 8.5, and Section 8.10 |
| 10632(a)(7)(A) | Describe the legal authority that empowers the supplier to enforce shortage response actions. | Water Shortage Contingency Planning | Section 8.10 |
| 10632(a)(7)(B) | Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3. | Water Shortage Contingency Planning | Section 8.4 |
| 10632(a)(7)(C) | Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency. | Water Shortage Contingency Planning | Section 8.10 |
| 10632(a)(8)(A) | Describe the potential revenue reductions and expense increases associated with activated shortage response actions. | Water Shortage Contingency Planning | Section 8.7 |
| 10632(a)(8)(B) | Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions. | Water Shortage Contingency Planning | Section 8.7 |
| 10632(a)(8)(C) | Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought | Water Shortage Contingency Planning | Section 8.6 |

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
|---|---|---|---|
| 10632(a)(9) | Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance. | Water Shortage Contingency Planning | Section 8.6 |
| 10632(b) | Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas. | Water Shortage Contingency Planning | Section 8.4, Table 8-11 |
| 10635(c) | Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR. | Plan Adoption, Submittal, and Implementation | Section 8.11 |
| 10632(c) | Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan. | Water Shortage Contingency Planning | Section 8.11 |
| 10631(e)(1) | Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code. | Demand Management Measures | Section 9 |
| 10608.26(a) | Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance). | Plan Adoption, Submittal, and Implementation | Section 10 |
| 10621(b) | Notify, at least 60 days prior to the public hearing, 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. Reported in Table 10-1. | Plan Adoption, Submittal, and Implementation | Section 10.2 |
| 10621(f) | Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021. | Plan Adoption, Submittal, and Implementation | Section 10.5 |
| 10642 | Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan. | Plan Adoption, Submittal, and Implementation | Appendix A, and Appendix L |
| 10642 | The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. | Plan Adoption, Submittal, and Implementation | Section 10.3 |
| 10642 | Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified. | Plan Adoption, Submittal, and Implementation | Appendix L |
| 10644(a) | Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library. | Plan Adoption, Submittal, and Implementation | Section 10.6 |
| 10644(a)(1) | Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption. | Plan Adoption, Submittal, and Implementation | Section 10.6 |
| 10644(a)(2) | The plan, or amendments to the plan, submitted to the department shall be submitted electronically. | Plan Adoption, Submittal, and Implementation | Section 10.5 |
| 10645(a) | Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours. | Plan Adoption, Submittal, and Implementation | Section 10.6 |
| 10645(b) | Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours. | Plan Adoption, Submittal, and Implementation | Section 10.6 |
| 10621(c) | If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings. | Plan Adoption, Submittal, and Implementation | Not applicable |

| Water Code Section | Summary as Applies to UWMP | Subject | 2020 UWMP Location |
|---|---|---|---|
| 10644(b) | If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption. | Plan Adoption, Submittal, and Implementation | Section 10.5 |

HydroScience is a civil engineering firm that plans, designs, and manages the construction of water, wastewater, and recycled water projects. With offices in San Jose, Berkeley, Concord, and Sacramento, we understand and address the complex water and wastewater needs of Northern California.





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