CITY OF PALO ALTO
UTILITIES

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2015
URBAN WATER MANAGEMENT PLAN

JUNE 2016

Cover photo courtesy of Catherine Elvert – Rancheria Falls above the Hetch Hetchy Reservoir

City of Palo Alto Utilities

2015
Urban Water Management Plan

June 2016

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List of Acronyms

AF	Acre Feet
ABAG	Association of Bay Area Governments
AF/Y	Acre Feet per Year
BAWAC	Bay Area Water Agencies Coalition
BAWSCA	Bay Area Water Supply and Conservation Agency
BCA	Baseline Consumption Allowance
BMP	Best Management Practices
CAFR	City Audited Financial Report
CALTRANS	California Department of Transportation
ccf	Centi Cubic Feet (hundred cubic feet)
CCSF	City and County of San Francisco
CEE	Consortium for Energy Efficiency
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
COM	Commercial
CPAU	City of Palo Alto Utilities
CUWCC	California Urban Water Conservation Council
DHS	Department of Health Services
DSM	Demand Side Management
DMM	Demand Management Measures
DSS	Demand Side Management Least Cost Planning Decision Support System
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ET	Evapotranspiration
ETO	Reference Evapotranspiration
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
gpm	Gallons per minute
HET	High Efficiency Toilets
ICI	Industrial Commercial and Institutional
WIRP	Integrated Resource Plan
IRWMP	Integrated Regional Water Management Plan
IT	Information Technology
IWSAP	Interim Water Shortage Allocation Plan
MF	Multi-family
mg/L	Milligrams per liter
MGD	Million Gallons per Day
MOU	Memorandum of Understanding
O&M	Operations and Maintenance

OES	Office of Emergency Services
RWQCP	Palo Alto Regional Water Quality Control Plant
PEIR	Program Environmental Impact Report
RWS	Regional Water System
SCVWD	Santa Clara Valley Water District
SF	Single-family
SFPUC	San Francisco Public Utilities Commission
SFWD	San Francisco Water Department
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TRC	Total Resource Cost
UAC	Utilities Advisory Commission
UER	Utilities Emergency Response
ULF	Ultra Low Flow
ULFT	Ultra Low Flow Toilet
URS	United Research Services, Consultant Firm
UWMP	Urban Water Management Plan
WIRP	Water Integrated Resource Plan
WPL	West Pipeline
WSA	Water Supply Agreement
WSAP	Water Shortage Allocation Plan
WSIP	Water System Improvement Program
WSMP	Water Supply Master Plan

City of Palo Alto Utilities
2015 Urban Water Management Plan

Contact Sheet

Date plan submitted to the Department of Water Resources: June 9, 2016

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Utility services provided by the City include: **electric, natural gas, commercial fiber, refuse, recycled water, storm drain, wastewater collection, treatment and disposal.**

Is This Agency a Bureau of Reclamation Contractor? **No** Is This Agency a State Water Project Contractor? **No**

Section 1 – Plan Development and Adoption

Plan Structure

The City of Palo Alto (City) has not experienced significant changes in the water supply distribution system and reliability since the preparation of the 2010 Urban Water Management Plan (UWMP), and has determined the 2010 UWMP provided sufficient guidance to meet the City's needs during the 2010 UWMP cycle. For the 2015 UWMP report, the City has updated the 2010 UWMP and addressed any changes to the UWMP Act since 2010 as outlined in Appendix C of the Department of Water Resources (DWR) UWMP Guidebook.

Plan Adoption

The City began preparing this update of its Urban Water Management Plan in winter 2015. The updated plan will be considered by City Council before June 30, 2016 and submitted to the California Department of Water Resources within 30 days of Council adoption. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning) as well as requirements of the California Water Code Division 6, Part 2.55 (Water Conservation Bill of 2009).

Public Participation

The City actively encourages community participation in its urban water management planning efforts. The City held public hearings before the Utilities Advisory Commission (UAC) and City Council prior to adoption. An UWMP webpage (www.cityofpaloalto.org/UWMP) was created to educate the public about the UWMP process, provide outreach for public meetings and opportunities to participate, as well as to make available background materials on the City's urban water management planning activities. Table 2 lists the notified agencies, and Appendix B includes samples of public participation notices.

Table 1: Calendar for Adoption

Date	Meeting/Activity	Topic
April 12 2016	Utilities Advisory Commission	Review and Recommendation on UWMP
April 29, 2016 May 6, 2016	Published Notice of Public Hearing	Newspaper (Council meeting) on UWMP
		Newspaper (Council meeting) on SBx7-7 Reductions
May 16, 2016	City Council	Review and Discussion on SBx7-7 Reduction Targets
		Review and Adoption of UWMP
June 9, 2016	Final UWMP and Council Resolution	Submitted to DWR
July 1, 2016	Final UWMP and Council Resolution	Available to the Public

Appendix B contains samples of the public participation notices the City sent in compliance with Water Code 10621(b), 10620(d)(2), and 10642. A sample notice of the City Council meeting will be added to the Final Draft UWMP that will be presented to Council for approval.

The City's Utilities Advisory Commission (UAC) provides advice to the City Council on: the acquisition and development of electric, gas and water resources; joint action projects with other public or private entities which involve electric, gas or water resources; wastewater collection and fiber optic issues; environmental implications of electric, gas or water utility projects, as well as conservation and demand management. The UAC meets monthly and reviews the activities of the various utility services. One of the primary tasks of the UAC is to assist with the review and development of long-term plans for the City's utilities. The UAC meetings are open to the public and agendas are posted for public review prior to each meeting. The draft schedule for approval of the 2015 UWMP provides the opportunity for the UAC to review and comment on the Draft UWMP prior to submittal to the City Council for final approval.

In addition to the review of the UWMP, the UAC has been very active in the review of several other water supply and water management documents. Since the adoption of the 2010 UWMP, this review during public meetings has included discussion and presentations on the following:

- Preliminary Assessment of Water Resource Alternatives (February 2013)
- Update on Emergency Water Supply and Storage Project and its Role in the City's Overall Emergency Response Capabilities (March 2013)
- Discussion of Potential Transfer of a Portion of the City's Individual Supply Guarantee (October 2013)
- Water utility Cost and Consumption Benchmarking Report (January 2014)
- Drought Rate Design Guidelines (September 2014)
- Demand Side Management Annual Report (May 2015)

- Activation of Drought Rates in Response to Mandatory Water Restrictions (June 2015)
- Certification of the Recycled Water System Expansion Environment Impact Report (September 2015)
- Monthly Drought Updates (May 2014 to present)

Agency Coordination

Law

California Water Code section 10620[1] (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(d) (1) An urban water supplier may satisfy the requirement of this part by participation in area wide regional, watershed, or basis wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall 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.

Internal City Coordination

Many members of City staff were involved to coordinate development of this plan, including representatives from all divisions of the City of Palo Alto Utilities Department (CPAU) and other City departments including Planning and Community Environment; the City Manager's Office; the City Attorney's Office; and Public Works (Palo Alto Regional Water Quality Control Plant). The UWMP is coordinated with other City planning and policy level documents to ensure the water policy direction in the UWMP informs future decisions within the City of Palo Alto, including the Urban Forest Master Plan and the Comprehensive Plan Update.

Since completion of the 2010 UWMP, CPAU has completed several important water supply and planning milestones, including:

- **Recycled Water Expansion Project Environmental Impact Report (EIR) Certification (September 2015) –** Palo Alto City Council certification of the EIR was a major step in the effort to expand the use of recycled water in the city.
- **City of Palo Alto Emergency Water Supply and Storage Project Completion (December 2013)** – The City constructed a 2.5 million gallon underground water reservoir and pump station in Palo Alto to meet emergency water supply and storage needs. In addition to this water reservoir, the three new emergency wells were completed and the five existing wells and the existing Mayfield Pump Station were upgraded.
- **The Water Shortage Implementation Plan (June 2015) –** In Response to the SWRCB Emergency Water Use Regulation, the Palo Alto City Council passed a resolution that

[1] Unless noted, all statutory references herein are to the California Water Code.

included a new Water Shortage Implementation Plan and put into place restrictions for a Stage II water shortage.

- **Drought Rate Design and Implementation:** In response to the water utility revenue reduction resulting from water conservation, the City Council approved drought rate design guidelines (December 2014) and the approved implementation of drought surcharges as part of the water rates (August 2015).

The completion of the plans and agreements listed above required the cooperation of all divisions within the CPAU and several other departments within the City. Data and information from these reports was used in this document.

Interagency Coordination

The City is an active member of the California water community and coordinated with a number of agencies in preparation of its UWMP. The City is particularly active in the following organizations:

- The City is a very active member of the Bay Area Water Supply and Conservation Agency (BAWSCA). The BAWSCA members, including the City, receive water from the City and County of San Francisco through a contract that is administered by the SFPUC.
- The City is represented on the Santa Clara Valley Water District (SCVWD) Commission, the SCVWD Water Retailers Group, the SCVWD Recycled Water Subcommittee, and the SCVWD Water Conservation Subcommittee group.
- The City has actively participated on several initiatives in relation to the SFPUC, including:
    - Preparation of the SFPUC's Program EIR for its Water System Improvement Program (WSIP)
    - The Interim Supply Limitation imposed by the SFPUC during adoption of the WSIP to limit deliveries from the regional system until 2018.
- Through BAWSCA, the City is represented in the Bay Area Water Agencies Coalition (BAWAC), a group of the seven largest water agencies in the Bay Area. BAWAC was established to develop regional water planning objectives, coordinate projects and programs that would meet the regional objectives to improve water supply reliability and water quality, and document, coordinate and communicate existing and planned programs and activities being implemented in the Bay Area region in the areas of water use efficiency and water treatment.
- The City has been a signatory to the Memorandum of Understanding Regarding Urban Water Conservation with the California Urban Water Conservation Council since 1992.
- The City is a member of the Bay Area Water Conservation Coordinators group, a consortium of water conservation professionals formed to discuss and share policy and program implementation strategies and research.
- The City is a member of the WateReuse Association, an organization of governmental, non-profit and private sector entities working together to encourage increased recycled water use in California.

- The City is a member of the Consortium for Energy Efficiency (CEE), through which water and power agencies strive to evaluate and promote water and energy efficient appliances and technologies.
- The City is a member of the Alliance for Water Efficiency.
- The City is a Partner in the Environmental Protection Agency's (EPA) WaterSense program, which promotes water efficient products and assists utilities in marketing its programs for water use efficiency.
- The City Council adopted the Ahwahnee Water Principles for Resource Efficient Land Use on October 17, 2005.[2] These principles were developed by the Local Government Commission, a nonprofit, nonpartisan organization working to create healthy, walkable, and resource-efficient communities.
- The City is a member of the Bay Area Clean Water Agencies (BACWA). BACWA members work together to carry out mutually beneficial projects, and to share scientific, economic and other information about the San Francisco Bay environment.
- The City is a member of the Western Recycled Water Coalition (WRWC), an organization that pursues highly leveraged, locally managed projects that will help ensure the security of water supplies.
- The City is a participant in the Bay Area Integrated Regional Water Management Plan (IRWMP) working to coordinate and improve water supply reliability, protect water quality, manage flood protection, maintain public health standards, protect habitat and watershed resources, and enhance the overall health of the Bay.

The City continually coordinates water-planning activities that support and inform the City's creation of this UWMP with neighboring communities and water agencies.

The Water Supply Master Plan - One early example of interagency coordination and planning was the development of the Water Supply Master Plan (WSMP). From 1996 through 1999, the BAWSCA agencies, the SFPUC, and the SCVWD worked cooperatively to develop a WSMP. A Palo Alto representative was on the steering committee for this project. The WSMP is intended to address the future water supply needs of the water agencies and 2.3 million people, who are served via the SFPUC water system. On April 25, 2000 the SFPUC formally adopted the WSMP including the implementation schedule for identified, selected projects.

Water Integrated Resource Plan (WIRP) - The City has evaluated all its water supply alternatives in an effort to determine what long-term direction the City should take for water resource planning. In 2000, this effort resulted in the City's publication of a document[3] describing in detail all the identified alternatives. Besides BAWSCA, the agencies that have received this document include: the City of Mountain View, Alameda County Water District, Stanford University, the City of San Jose, California Water Company, the City of Redwood City,

[2] Staff Report CMR:367:05: http://www.cityofpaloalto.org/civicax/filebank/documents/5859
[3] Preliminary Assessment of Water Resources: http://www.cityofpaloalto.org/civicax/filebank/documents/25619

the City of Daly City, the Purissima Hills Water District, the City of Santa Clara, the City of Milpitas and the City of Sunnyvale. In addition, the City continuously interacts with the 26 other BAWSCA agencies in the development of water efficiency programs to be implemented regionally, as well as the regional evaluation of water supply alternatives.

In 2013, the City initiated development of a new WIRP by producing a water supply Preliminary Assessment[4]. This report will provide the basis for an updated WIRP planned for 2016.

Integrated Regional Water Management Plan – The Association of Bay Area Government (ABAG) convened a broad-based group of stakeholders to develop an Integrated Regional Water Management Plan (IRWMP) for the Bay Area. The Bay Area IRWMP will facilitate regional cooperation on issues of water supply, quality and reliability, water recycling and conservation, storm water and flood water management, wetlands and habitat restoration and creation, recreation and access. The plan was finalized in November 2006.

The City was involved in the development of the Bay Area IRWMP on the water supply and reliability areas through BAWSCA's representation in BAWAC. In addition, the City also coordinates water recycling and wastewater for the IRWMP implementation through the City's membership in the Bay Area Clean Water Agencies (BACWA).

BAWSCA Long Term Water Reliable Water Supply Strategy - The BAWSCA agencies identified a need for dry year supplies to meet future demands. The study, completed in February 2015 identified cost-effective regional and local projects that will meet individual BAWSCA member needs. One of the projects included in the strategy is the City's Phase 3 recycled water project to serve the Stanford Research Park.

Palo Alto Regional Water Quality Control Plant Long Range Facilities Plan - Palo Alto's Regional Water Quality Control Plant (RWQCP) has been in operation since 1934 and now serves the six communities of Palo Alto, East Palo Alto, Mountain View, Stanford, Los Altos and Los Altos Hills. Aging equipment, new regulatory requirements, and the movement to full sustainability will require rehabilitation, replacement and new processes. The Long Range Facilities Plan was completed in October 2012. Major recommendations in the plan were modeling influent sewer flows, continuing source control and flow reduction efforts, rehabilitating and replacing critical infrastructure, and preparing for regulatory action. In addition, it was recommended the plant be positioned for a possible increase in recycled water demand by reserving space on site for reverse osmosis facilities and being prepared to implement additional storage and pumping capabilities.

Santa Clara Valley Water District Water Supply and Infrastructure Master Plan - The City participated with other stakeholders in the preparation of a 2012 Master Plan to address long range water supply and reliability needs in Santa Clara County. The Water Master Plan includes

[4] Report to the UAC, February 2013: http://www.cityofpaloalto.org/civicax/filebank/documents/33029

an implementation program that schedules projects based on finances, risk, and water supply and infrastructure needs.

The City coordinated the 2015 update of the Urban Water Management Plan with the following agencies:

Table 2: Coordination with Appropriate Agencies

AGENCIES	Participated in Plan development	Sent notice of Plan preparation	Commented on the draft	Attended public meetings	Contacted for assistance	Received copy of draft	Sent notice of public hearing	Not involved / No information
SFPUC	X	X			X		X	
BAWSCA	X	X			X		X	
SCVWD	X	X					X	
City of East Palo Alto		X					X	
City of Mountain View		X					X	
City of Menlo Park		X					X	
Purissima Hills Water District		X					X	
City of Redwood City		X					X	
Stanford University		X					X	
All other BAWSCA agencies		X					X	
County of Santa Clara		X					X	

Section 2 – Service Area

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available….

Demographics

Palo Alto is located in northern Santa Clara County approximately 35 miles south of the City of San Francisco. The City's population in 2015 was approximately 67,400[5]. The City is roughly 26 square miles in area and is a part of the San Francisco Bay metropolitan area. The City is one of the area's most desirable residential communities with approximately 28,500[6] housing units. The City's desirability is partly due to the excellent public schools, comprehensive municipal services, shopping, restaurants and the community's aesthetics.

The City is considered the birthplace of the high technology industry and the Silicon Valley. Located directly adjacent to the City is Stanford University, which attracts major corporations from around the world. The City's 630-acre Stanford Research Park includes among its tenants such prestigious and innovative high-tech leaders as Hewlett-Packard, Varian, Tesla Motors, and VMware. The City has approximately 27 million square feet of non-residential floor-space, 36 parks and preserves (comprising 157 acres of urban parks and 3,752 acres of open space), tennis courts (51), community centers (4), theaters (3), swimming pools (1), nature centers (3), athletic centers (4), a golf course, an art center, and a junior museum and zoo[7].

Table 3 shows the population and employment projections for the City from 2015 to 2040 based on Association of Bay Area Governments (ABAG) 2013 projections. The City relied on ABAG population and employment projections for the 2005 and 2010 UWMPs and several recent water supply and demand forecasts and continues to primarily rely on ABAG projections in this plan[8]. According to these projections, total expected 2015-2040 population growth is about 26%, or about 0.9% per year on average. Total expected growth in employment from 2015 to 2040 is 23%, or 0.8% per year on average.

[5] Association of Bay Area Governments – Projections 2013
[6] City of Palo Alto 2015-2023 Housing Element
[7] City of Palo Alto 2014-2015 Comprehensive Annual Financial Report (CAFR)
[8] The City is in the process of updating its Comprehensive Plan which will include updated population projections.

Table 3: Population – Current and Projected

	2015	2020	2025	2030	2035	2040
Service Area Population	67,400	70,500	73,700	77,100	80,800	84,600
Five Year Precent Increase		4.6%	4.5%	4.6%	4.8%	4.7%
Total Employment	96,900	104,820	107,870	110,940	115,110	119,470
Five Year Precent Increase		8.2%	2.9%	2.8%	3.8%	3.8%

Climate Characteristics

The City enjoys a mild climate surrounded by the San Francisco Bay on the east, and coastal mountains on the west. The monthly average temperature, rainfall and ETO (Reference Evapotranspiration) for the area are presented in Table 4 below.

Table 4: Climate

Climate				
	Standard Monthly Average ETO[9]	**Average Rainfall (inches)[10]**	**Average Max Temperature (degrees F)[11]**	**Average Min Temperature (degrees F)**
Jan	1.4	3.2	57.4	38.5
Feb	1.9	2.9	61.1	41.3
Mar	3.4	2.3	64.2	43.1
Apr	4.4	1.0	68.4	44.7
May	5.5	0.4	72.9	48.5
Jun	6.0	0.1	77.4	52.5
Jul	6.2	0.0	78.4	54.9
Aug	5.5	0.1	78.4	54.8
Sep	4.4	0.2	78.3	52.6
Oct	3.1	0.7	73.0	48.0
Nov	1.7	1.7	64.3	42.6
Dec	1.3	2.7	57.8	38.2

[9] Average ETO data for closest active station (Hayward) reported by CIMIS website http://www.cimis.water.ca.gov/
[10] Average rainfall data for Palo Alto reported by NOAA website http://www.wrcc.dri.edu/
[11] Average temperature data for Palo Alto reported by NOAA website http://www.wrcc.dri.edu/

Section 3 – System Supplies

Law

10631 (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five year increments described in subdivision (a)…..

Historical Background

The water utility was established on May 9, 1896, two years after the City was incorporated. Local water companies were bought out at that time with a $40,000 bond approved by the voters of the 750-person community. These private water companies operated one or more shallow wells to serve the nearby residents. The City grew and the well system expanded until nine wells were in operation in 1932.

In December 1937, the City signed a 20-year contract with the City and County of San Francisco, administered by the San Francisco Water Department (SFWD), for water deliveries from the newly constructed pipeline bringing Hetch Hetchy water from Yosemite to the Bay Area. Water deliveries from San Francisco commenced in 1938 and well production declined to less than half of the total citywide water demand.

A 1950 engineering report noted, "the capricious alternation of well waters and the SFWD water . . . has made satisfactory service to the average consumer practically impossible." However, groundwater production increased in the 1950s, leading to lower groundwater tables and water quality concerns. In 1962, a survey of water softening costs to City customers determined that the City should purchase 100% of its water supply needs from the SFWD. A 20-year contract was signed with San Francisco, and the City's wells were placed in a standby condition. The SFWD later became known as the SFPUC. Since 1962 (except for some very short periods) the City's entire supply of potable water has come from the SFPUC.

BAWSCA is comprised of SFPUC's 26 wholesale customers. The City largely works through BAWSCA to manage its SFPUC contract and to interact with the SFPUC.

In 1993, the City completed a Water Integrated Resources Plan (WIRP). This IRP was completed because the City was facing a decision regarding participation in a recycled water project. In the 1993 IRP, the City calculated the value of recycled water for water supply. At that time, the City decided not to participate in the recycled water project because the costs exceeded the benefits of the project.

In 1999, the City began to prepare a new Water Integrated Resources Plan (WIRP). As a first step, staff completed a high level overview of each of the City's water resource options and helped identify the most promising alternatives to be further analyzed in subsequent phases. The second phase in the WIRP process was the development and evaluation of water supply

portfolios so policy makers can determine the proper balance between cost, quality, reliability, and environmental factors. At the conclusion of the second phase of the WIRP in 2003, several pieces of missing information were identified that needed to be further developed in order to further analyze the City's water resource options and alternatives.

The WIRP work has been coordinated with infrastructure work by the City to increase the distribution system reliability. Under a contract with the City, Carollo Engineers completed several studies of the water distribution system. These studies are discussed in Section 3, "System Supplies," under the heading "Groundwater."

The City and other Santa Clara County water retailers coordinated with the SCVWD to examine extending the SCVWD West Pipeline (WPL) that currently ends at Miramonte Road and Foothills Expressway to a point in Palo Alto to serve the City and other neighboring water agencies. In addition, the study examined creating an intertie between the WPL and the SFPUC's Bay Division Pipelines at Page Mill Road. The SCVWD West Pipeline Conceptual Evaluation, completed in March 2003, concluded that the conceptual projects were constructible, but that no decisions could be made until SCVWD concluded additional studies. These ongoing studies include the SCVWD project to evaluate its system reliability, asset management program, and Water Treatment Plant Master Plan Project. These studies, completed in the fall of 2004, concluded that extending the WPL to serve the City could not be justified from a county-wide reliability aspect when evaluated against more cost-effective alternatives.

The information obtained from the studies completed on the groundwater and SCVWD's conceptual study on the WPL Extension was used to characterize the supply options examined in the WIRP.

In mid-2003, the WIRP concluded, based on available information, that supplies from the SFPUC are adequate in normal years, but additional supplies are needed in drought years to avoid shortages. Additionally, the WIRP contained a recommendation not to seek additional supplies for use on a continuous basis unless there is another benefit that can be identified. As a result, the City did not pursue a connection to the SCVWD's treated water line for ongoing water needs nor evaluate further the use the wells on a continuous basis. The WIRP noted that expanded use of water efficiency programs and recycled water might be worthwhile for the environmental benefits and to reduce the drought-time deficit.

Based on the WIRP analysis, the City Council adopted a set of WIRP guidelines in December 2003[12]. The WIRP guidelines include:

1. **Preserve and enhance SFPUC supplies**
   With respect to the City's primary water supply source, the SFPUC, continue to actively participate in the BAWSCA to assist in achieving BAWSCA's stated goal: "A reliable supply of water, with high quality, and at a fair price."

[12] See City Manager Report 547:03: http://www.cityofpaloalto.org/cityagenda/publish/cmrs/2732.pdf

2. **Advocate for an interconnection between SFPUC and the SCVWD**
   Work with SCVWD and the SFPUC to pursue the extension of the SCVWD's West Pipeline to an interconnection with the SFPUC Bay Division Pipelines 3&4. Continue to reevaluate the attractiveness of a connection to an extension of the SCVWD's West Pipeline.
3. **Actively participate in development of cost-effective regional recycled water plans**
   Re-initiate discussions with the owners of the Palo Alto RWQCP on recycled water development. In concert with the RWQCP owners, conduct a new feasibility study for recycled water development. Since the feasibility of a recycled water system depends upon sufficient end-user interest, determine how much water Stanford University and the Stanford Research Park would take.
4. **Focus on water DSM programs to comply with BMPs**
   Continue implementation of water efficiency programs with the primary focus to achieve compliance with the Best Management Practices (BMPs) promoted by the California Urban Water Conservation Council.
5. **Maintain emergency water conservation measures to be activated in case of droughts**
   Review, retain, and prioritize CPAU's emergency water conservation measures that would be put into place in a drought emergency.
6. **Retain groundwater supply options in case of changed future conditions**
   Using groundwater on a continuous basis does not appear to be attractive at this time due to the availability of adequate, high quality supplies from the SFPUC in normal years. However, SFPUC supplies are not adequate in drought years and circumstances could change in the future such that groundwater supplies could become an attractive, cost-effective option. Examples of changing circumstances could be that the amount of water available from the SFPUC system is reduced due to regulatory or other actions. CPAU should retain the option of using groundwater in amounts that would not result in land surface subsidence, saltwater intrusion, or migration of contaminated plumes.
7. **Survey community to determine its preferences regarding the best water resource portfolio**
   Seek feedback from all classes of water customers on the question of whether to use groundwater during drought to improve drought year supply reliability. At the same time, seek feedback on the appropriate level of water treatment for groundwater if it is to be used during drought. Survey all classes of water customers to determine their preferences as to the appropriate balance between cost, quality, reliability, and environmental impact.

Since the major WIRP conclusion was that SFPUC supplies are adequate except in drought years, the focus turned to the options to reduce the supply deficit during droughts. These options include using groundwater, connecting to the SCVWD's treated water pipeline, developing recycled water, and expanding water efficiency programs. The goal was to find the proper balance between the key factors of cost, availability in a drought, water quality, and environmental impacts in determining the best portfolio for the community.

Following Council's adoption of the WIRP Guidelines, and to gain insight into the question of whether to use groundwater as supplemental supply in droughts, the City surveyed its residential customers. Respondents were asked to rank three options for water supply in a drought:

A. Blend Groundwater – Blend the groundwater with water from SFPUC in droughts. Water customers would still need to cut back water usage by 10% in droughts.
B. No Groundwater – Use no groundwater during droughts. Instead, community is subjected to larger water usage cutbacks in droughts (20% cutback).
C. Treat Groundwater – Highly treat the groundwater (reverse osmosis treatment) before introducing it into distribution system. Water customers would still need to cut back water usage by 10% in droughts.

Survey respondents generally preferred Options B (no groundwater) and C (treat groundwater), but Option A (blend groundwater) was not soundly rejected. Based on the survey, any of the three options would probably be accepted by the City's water customers under drought conditions.

Based on the WIRP and the results of the community survey, staff made the following conclusions and recommendations in June 2004:

1. Do not install advanced treatment systems for the groundwater at this time. This option is simply too expensive, both in capital and in operating costs.
2. Blending at an SFPUC turnout is the best way to use groundwater as a supplemental drought time supply while maintaining good water quality.
3. Staff should await the conclusion of the environmental review process for selecting any new emergency well sites before developing a recommendation on whether to use groundwater in droughts. In the selection process for new well sites, the costs for blending with SFPUC water in droughts should be considered. The least expensive location is a well at El Camino Park due to its proximity to an SFPUC turnout.
4. Actively participate in the development of long-term drought supply plans with SFPUC and BAWSCA.
5. Continue in the efforts identified in the Council-approved WIRP Guidelines:

a. Evaluate a range of demand-side management (DSM) options for their ability to reduce long-term water demands;
b. Evaluate feasibility of expanding the use of recycled water; and
c. Maintain emergency water conservation measures to be activated in case of droughts.

While groundwater is a potential supply source for the City, at this time it is not considered to be an existing nor planned water supply source. The City has now completed the Emergency Water Supply and Storage project, which provides the City the flexibility to rely on groundwater during a drought if necessary. At this point the City Council has not directed staff to begin using groundwater as a supplemental drought supply.

Table 5 below shows the current and planned water supply sources for the City for normal years. As required by 10631(j), this information has been provided to the SFPUC, the City's wholesale supplier.

Table 5: Current and Planned Water Supply Sources

Water Supply Sources in AFY	2015 (actual)	2020	2025	2030	2035
SFPUC[13]	10,732	11,892	11,428	11,148	10,895
Local Groundwater	0	0	0	0	0
Local Surface Water	0	0	0	0	0
Recycled Water	845	850	850	850	850
Transfers in or out	0	0	0	0	0
Exchanges in or out	0	0	0	0	0
Desalination	0	0	0	0	0
Other Sources	0	0	0	0	0
Total	11,577	12,742	12,278	11,998	11,745

SFPUC Supply

Description of SFPUC Regional Water System

Palo Alto receives water from the City and County of San Francisco's Regional Water System (RWS), operated by the SFPUC. This supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties.

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

The SFPUC serves its retail and wholesale water demands with an integrated operation of local Bay Area water production and imported water from the Hetch Hetchy Reservoir. In practice, the local watershed facilities are operated to capture local runoff.

Water Supply Agreement

In July 2009, the wholesale customers and San Francisco adopted the Water Supply Agreement[14] (WSA), which includes a Water Shortage Allocation Plan (WSAP) to allocate water from the Regional Water System (RWS) to retail and wholesale customers during system-wide shortages of 20 percent or less. The WSAP has two components:

[13] Data from internal forecasting model except for 2015 actual usage data

[14] Palo Alto City Council approved the WSA in June 2009 – See City Manager Report 269:09: http://www.cityofpaloalto.org/civicax/filebank/documents/15985

1. The Tier One Plan, which allocates water between San Francisco and the wholesale customers collectively; and
2. The Tier Two Plan, which allocates the collective wholesale customer share among the wholesale customers.

Tier One Drought Allocations

The Tier One Plan allocates water between San Francisco and the wholesale customers collectively based on the level of shortage:

Table 6: 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 and between wholesale customers themselves. In addition, water "banked" by a wholesale customer, through reductions in usage greater than required, may also be transferred.

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 San Francisco and the wholesale customers to achieve necessary water use reductions during drought periods. During the current drought to date, the SFPUC has requested, but has not mandated, a 10 percent system-wide reduction since January 2014. The SFPUC has not yet been compelled to declare a water shortage emergency and implement the Tier One Plan because its customers have exceeded the 10 percent voluntary system-wide reduction in conjunction with the state-wide mandatory reductions assigned by the State Water Resources Control Board.

Tier Two Drought Allocations

The wholesale customers have negotiated and adopted the Tier Two Plan[15], the second component of the WSAP, which allocates the collective wholesale customer share among each

[15] Palo Alto's City Council adopted the Tier Two Water Shortage Allocation Plan in February 2011. See Staff Report 1308: http://www.cityofpaloalto.org/civicax/filebank/documents/40970

of the 26 wholesale customers. This Tier Two allocation is based on a formula that takes into account multiple factors for each wholesale customer including:

- Individual Supply Guarantee (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 millions of gallons per day (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.

The current Tier Two Plan will expire in 2018 unless extended by the wholesale customers.

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. Palo Alto's ISG is 17.07 MGD, or approximately 19,118 acre feet per year.

2018 Interim Supply Limitation
As part of its adoption of the Water System Improvement Program (WSIP) in October 2008, discussed separately herein, the SFPUC adopted a water supply limitation, the Interim Supply Limitation (ISL), which limits sales from San Francisco's RWS watersheds to an average annual delivery of 265 MGD through 2018.

All 26 wholesale customers and San Francisco are subject to the ISL. The wholesale customers' collective allocation under the ISL is 184 MGD and San Francisco's is 81 MGD. Although the wholesale customers did not agree to the ISL, as further discussed below, the WSA provides a framework for administering the ISL.

Interim Supply Allocations
The ISAs refer to San Francisco's and each individual wholesale customer's share of the ISL. On December 14, 2010, the SFPUC established each agency's ISA through 2018[16]. In general, the SFPUC based the wholesale customer allocations on the lesser of the projected fiscal year 2018 purchase projections or Individual Supply Guarantees. The ISAs are effective only until December 31, 2018 and do not affect the Supply Assurance or the ISGs, both discussed separately herein. San Francisco's ISA is 81 MGD. Palo Alto's ISA is 14.70 MGD or approximately 16,464 acre feet per year. Palo Alto does not anticipate exceeding the ISA before the ISL period ends in 2018.

As stated in the WSA, the wholesale customers do not concede the legality of the SFPUC's establishment of the ISAs and Environmental Enhancement Surcharge, discussed below, and expressly retain the right to challenge either or both, if and when imposed, in a court of competent jurisdiction.

Environmental Enhancement Surcharge
As an incentive to keep RWS deliveries below the ISL of 265 MGD, the SFPUC adopted an Environmental Enhancement Surcharge for collective deliveries in excess of the ISL effective at the beginning of fiscal year 2012. This volume-based surcharge would be unilaterally imposed by the SFPUC on individual wholesale customers and San Francisco retail customers, when an agency's use exceeds its ISA and when sales of water to the wholesale customers and San Francisco retail customers, collectively, exceeds the ISL of 265 MGD. Actual charges would be determined based on each agency's respective amount(s) of excess use over their ISA. As of the end of 2015, no Environmental Enhancement Surcharges have been levied.

2018 SFPUC Decisions
In the WSA, there are three decisions the SFPUC committed to making before 2018 that will affect water supply development:

- Whether or not to make the cities of San Jose and Santa Clara permanent customers,

[16] An informational report on the Interim Supply Limitation was provided to the City Council in February 2011. See Staff Report 1321: https://www.cityofpaloalto.org/civicax/filebank/documents/26211

- Whether or not to supply the additional unmet supply needs of the wholesale customers beyond 2018, and
- Whether or not to increase the wholesale customer Supply Assurance above 184 MGD.

Additionally, there have been recent changes to instream flow requirements and customer demand projections that will affect water supply planning beyond 2018. As a result, the SFPUC has developed a Water Management Action Plan (Water MAP) to provide necessary information to address the 2018 decisions and to begin developing a water supply program for the 2019 to 2035 planning horizon. The water supply program will enable the SFPUC to continue to meet its commitments and responsibilities to wholesale and retail customers, consistent with the priorities of the SFPUC.

The SFPUC plans to take the water MAP to its Commission in June 2016. The discussion resulting from the questions described in the Water MAP will help guide the water supply planning objectives through 2035. While the Water MAP is not a water supply program, it presents pertinent information that will help develop the SFPUC's future water supply planning program. At this time, and for purposes of long-term planning, it is assumed that deliveries from the RWS to San Francisco's wholesale customers will not exceed 184 MGD.

BAWSCA and Its Role

BAWSCA provides regional water reliability planning and conservation programming for the benefit of its 26 member agencies that purchase wholesale water supplies from the San Francisco Public Utilities Commission. Collectively, the BAWSCA member agencies deliver water to over 1.74 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 2015 UWMP updates is to work with its member agencies and the SFPUC to seek consistency among the multiple documents being developed.

As a member of BAWSCA, the City is formally represented on the BAWSCA Board of Directors on matters involving decision-making, policy setting and issues of interest to the BAWSCA members. On the staff level, the City participates on several advisory and policy committees, including the Water Quality Committee and the Technical Advisory Committee. Staff also represents the City with the other BAWSCA members on other issues that may arise from time to time.

Regional Water Demand and Conservation Projections

In September 2014, 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. The Demand Study projections were incorporated into BAWSCA's Long-Term Reliable Water Supply Strategy (Strategy) discussed below.

Through the Demand Study process, BAWSCA and the wholesale customers (1) quantified the total average-year water demand for each BAWSCA member agency through 2030, (2) quantified passive and active conservation water savings potential for each individual wholesale customer through 2040, and (3) identified conservation programs for further consideration for regional implementation by BAWSCA. The Demand Study projected that by 2040 the collective active conservation efforts of the wholesale customer's would yield an additional 16 MGD in savings beyond what has already been achieved for the BAWSCA service area. Based on the revised water demand projections, the identified water conservation savings, and other actions, the collective purchases of the BAWSCA member agencies from the SFPUC are projected to stay below 184 MGD (206,080 AF/Y) through 2018.

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. The City utilized that model to estimate water use reduction from future demand-side programs.

Long Term Reliable Water Supply Strategy

BAWSCA's Strategy was developed to quantify the water supply reliability needs of the BAWSCA member agencies through 2040, identify the water supply management projects and/or programs (projects) that could be developed to meet those needs, and prepare an implementation plan for the Strategy's recommendations. Successful implementation of the Strategy is critical to ensuring that there will be sufficient and reliable water supplies for the BAWSCA member agencies and their customers in the future.

Phase II of the Strategy was completed in February 2015 with release of the Strategy Phase II Final Report. The water demand analysis done during Phase II of the Strategy resulted in the following key findings:

- There is no longer a regional normal year supply shortfall.
- There is a regional drought year supply shortfall of up to 43 MGD.

In addition, the project evaluation analysis done during Phase II of the Strategy resulted in the following key findings:

- Water transfers score consistently high across the various performance measures and within various portfolio constructs and thus represent a high priority element of the Strategy.
- Desalination also potentially provides substantial yield, but its high effective costs and intensive permitting requirements make it a less attractive drought year supply alternative. However, given the limited options for generating significant yield for the

region, desalination warrants further investment in information as a hedge against the loss of local or other imported supplies.

- The other potential regional projects provide tangible, though limited, benefit in reducing dry year shortfalls given the small average yields in drought years[17].

BAWSCA is now implementing 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 efficiently and cost-effectively.

Due to the size of the supply and reliability need, and the uncertainty around yield of some Strategy projects, BAWSCA will need to pursue multiple actions and projects in order to provide some level of increased water supply reliability for its member agencies. On an annual basis, BAWSCA will reevaluate Strategy recommendations and results in conjunction with development of the work plan for the following year. In this way, actions can be modified to accommodate changing conditions and new developments.

Alternative Water Supply Analysis

In anticipation of extended periods of drought and mandatory potable water reduction imposed by the State, the City is evaluating a wide range of alternative water supplies. Recycled water and groundwater are two such resources that are interrelated in their development and potential. Therefore, the City is taking an integrated approach to evaluating non-potable recycled water, shallow aquifer groundwater, deep aquifer groundwater, Direct Potable Reuse (DPR) and Indirect Potable Reuse (IPR). The end product will be a recycled water strategic plan for the most flexible and robust use of these resources. In addition, the City, through BAWSCA, has been working on a water transfer opportunity. Each is discussed in more detail below.

Transfer or Exchange Opportunities

Law

10631 (d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

[17] While specific projects were not developed or evaluated for the Strategy, regional discussions on indirect/direct potable reuse have accelerated dramatically in the last year, making this a water supply management project BAWSCA is tracking closely.

Because the existing San Francisco regional water system does not have sufficient supplies in dry years, dry-year water transfers are potentially an important part of future water supplies. As a result, in February 2011, the Palo Alto City Council approved a new Water Shortage Implementation Plan to allocate water between the BAWSCA members. This plan includes the ability to transfer water allocated to the BAWSCA agencies between BAWSCA members during drought periods. All the BAWSCA agencies adopted the Plan by April 2011. In addition, BAWSCA is investigating water transfer opportunities as part of the Long Term Reliable Water Supply Strategy discussed above.

Groundwater

Deep Aquifer Groundwater

The City is located in Santa Clara County. SCVWD is the groundwater management agency in Santa Clara County as authorized by the California legislature under the SCVWD Act, California Water Code Appendix, Chapter 60. The 2012 Groundwater Management Plan, which was adopted by the District Board of Directors in July 2012, describes the district's groundwater basin management objectives and the strategies, programs, and activities that support those objectives.

In September 2014, Governor Brown signed the Sustainable Groundwater Management Act (SGMA) to promote the local, sustainable management of groundwater supplies. SGMA requires sustainable groundwater management for all medium and high priority basins in California. SGMA identifies the District as the exclusive groundwater management agency for Santa Clara County. The District actively manages the Santa Clara sub-basin, designated as medium priority by the California Department of Water Resources. The groundwater basins in Santa Clara County are not adjudicated nor have the basins been identified by the Department of Water Resources as being in overdraft.

Although groundwater resources, particularly in South Santa Clara County, have been heavily relied upon during the last four years of drought, groundwater levels throughout the county are generally good, as potable water demand has been reduced and as SCVWD efforts to prevent groundwater basin overdraft, curb land surface subsidence, and protect water quality have been largely successful.

The groundwater quality of the City's wells is considered fair to good quality, though significantly less desirable in comparison to SFPUC's supplies. The groundwater is approximately six times higher in total dissolved solids (TDS) and hardness than SFPUC's supplies. The City has not pumped groundwater since 1991, and, although not a planned future water supply source, groundwater is an available alternative that is evaluated and reviewed on a regular basis.

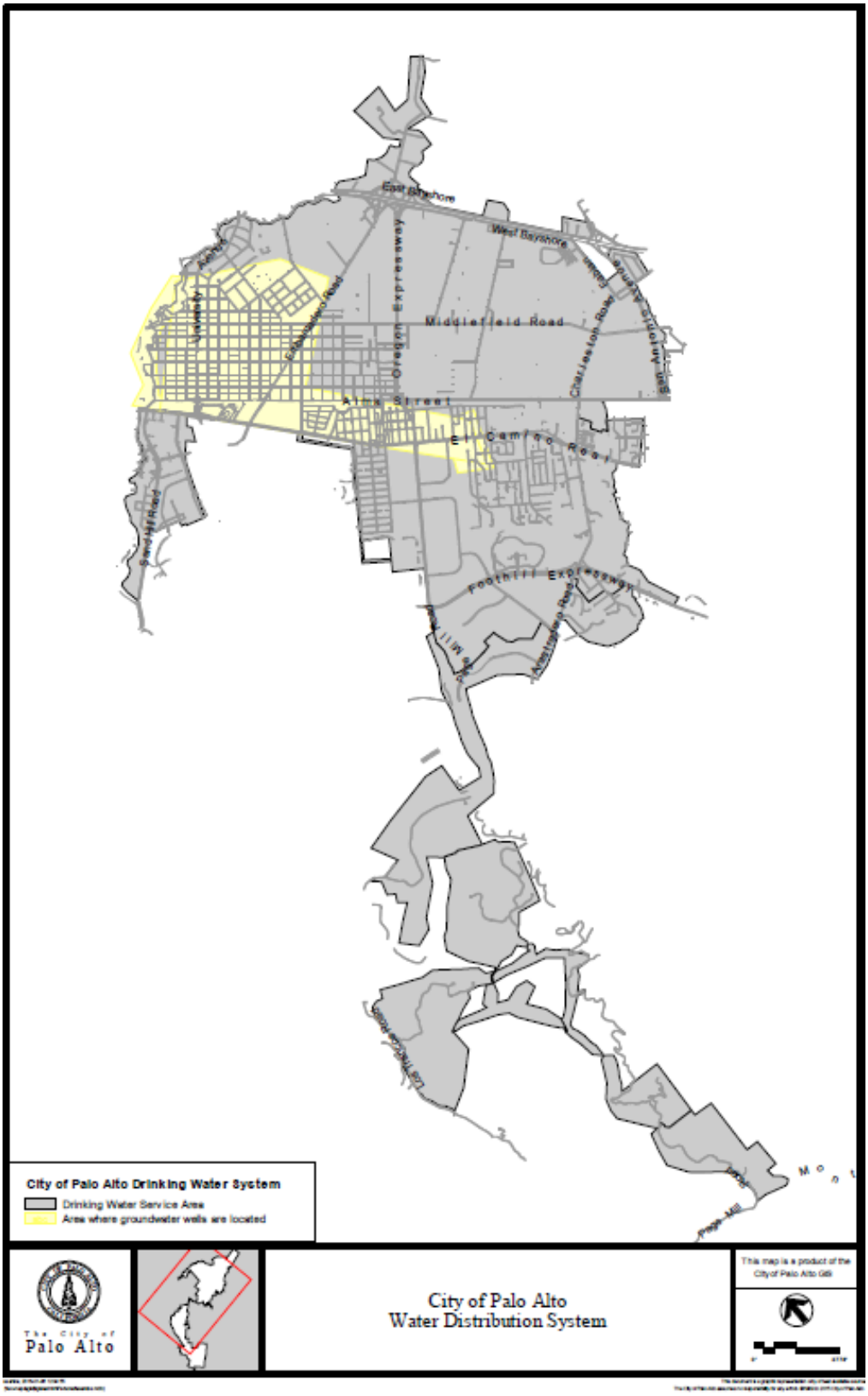
Five wells were constructed in Palo Alto in the mid-1950s and were operated continuously until 1962. In 1988, the wells were operated to provide supplemental supplies while SFPUC

implemented mandatory rationing. Two of the wells were operated for about a month and a half in 1991 when it appeared that the City was facing a severe (45%) cutback requirement. Besides normal annual operational testing, the wells have not been used since 1991.

From 1999 to 2003, the City completed numerous studies that provided significant analysis of City-owned wells and the local distribution system. The analysis is discussed in detail in the 2005 UWMP. The results of the studies provided a significant amount of information regarding the costs and operational issues of wells for emergency use, drought-only supply and full-time operation.

Since the publication of the 2010 UWMP, the City completed the Emergency Water Supply and Storage Project. The project consisted of the repair and rehabilitation of the five existing wells, construction of three new wells, and construction of a 2.5 million gallon storage reservoir and associated pump station, and other upgrades to the water distribution system. The Emergency Water Supply and Storage Project's primary goal was to correct the deficiency in the City's emergency water supply. The well system can now support a minimum of eight hours of normal water use at the maximum day demand level and four hours of fire suppression at the design fire duration level. The groundwater system may also be used to a limited extent for water supply during drought conditions (up to 1,500 acre feet per year), and is capable of providing normal wintertime supply needs during extended shutdowns of the SFPUC system. Up to 11,000 gpm of reliable well capacity is available for emergency use as well as 13 million gallons (MG) of storage. Figure 1 shows the potential groundwater use area in the City's service territory.

Figure 1: Potential Groundwater Use Area



In April 2010, the California Department of Public Health[18] (CDPH) approved a permit amendment to add the new Library/Community Center Well and the Eleanor Pardee Park Wells to the City's existing water supply permit. CDPH permitted the new El Camino Park well in 2014. As part of the permit process, all three wells were tested for primary and secondary drinking water quality standards. The results of the test indicate the wells currently meet primary and secondary water quality standards, but the potential remains for exceedance of secondary standards for manganese, iron and TDS. The wells are planned to remain as standby sources, and no additional treatment to ensure compliance with secondary standards is required at this point.

In an emergency situation, the City can provide emergency chlorination treatment at several of the well sites, including the Library/Community, Eleanor Pardee, Hale, Peers, and Rinconada wells.

The City has identified the wells as a potential supply source for use during a prolonged drought. As specified in the EIR for the Emergency Water Supply and Storage Project, concern about prolonged groundwater pumping in the area resulted in a maximum production limitation of 1,500 AFY during a drought[19]. If the wells were to be used as a dry year supply option, coordination with CDPH would be needed to ensure necessary treatment is in place to meet regulatory standards. In addition, several other issues need to be addressed prior to the use of the wells during a drought, including the capital costs of any treatment or blending upgrades, water quality compared to the City's SFPUC source and customer acceptance, SCVWD groundwater production costs, and the exact mechanism for how groundwater would form a part of any drought response portfolio.

Groundwater may hold some advantages in the long term for the City and may be useful during water supply shortage events. However, a water supply portfolio that includes potable groundwater does not benefit under the type of potable water reductions mandated by the State Water Resources Control Board (SWRC) in 2015. Under those regulations, the City was required to reduce potable water consumption by 24% regardless of the supply source.

As the City considers groundwater to supplement potable water supplies during water supply shortages or as a long-term water supply source, a better understanding of the hydrology in north Santa Clara County is imperative. To that end, the City is working with the SCVWD to gather data regarding private well use within the City and to develop a model of the shallow and deep aquifers, particularly focusing on potential recharge zones and the connectivity between the aquifers. Results of this effort will be used to inform the both the evaluation of groundwater as a long-term supply source and the overall recycled water supply strategy with respect to the potential for IPR.

[18] CDPH issues and has the authority to revise domestic water supply permits pursuant to Health and Safety Code section 116525 (City of Palo Alto permit #4210009 and # 4310009)

[19] Final EIR, City of Palo Alto Emergency Water Supply and Storage Project, SCH #2006022038

Shallow Aquifer Groundwater

The drought and resulting water use restriction have increased public concern over basement construction groundwater pumping in Palo Alto. Concerns range from the apparent wasting of water by discharging to storm drains, potential impacts on groundwater elevation and flow volume, as well as potential impacts on neighboring properties, such as subsidence and cracks, and impacts on trees and other landscaping.

Basement construction is often required for non-residential, mixed use and multifamily residential buildings, particularly if underground parking is involved. Additionally, the high value of land and housing in the City has resulted in more residential property owners seeking to increase the size of their single family homes by constructing basements. Basement construction groundwater pumping occurs when a basement is constructed in areas of shallow groundwater, typically in the neighborhoods closer to the bay or near current or former creek beds. Dewatering continues until enough of the house has been constructed to keep the basement in place.

While the City has long regulated several aspects of basement groundwater pumping for both residential and commercial sites, recent public concern over the appearance of wasted water resulted in Council's adoption of several new requirements for builders. Where groundwater pumping is needed, builders must install a fill station and submit a Groundwater Use Plan describing how use of the pumped groundwater will be maximized.

On February 1, 2016[20], Council approved the following additional requirements and actions:

- Public outreach to encourage greater fill station use;
- Increased outreach on the water cycle and value of fresh water flows to storm drains, creeks and bay;
- Additional requirements for Groundwater Use Plans such as maximizing on-site water reuse (e.g. watering on-site and nearby vegetation), providing water truck hauling service for neighbor and City landscaping, and piping to nearby parks or major users where feasible;
- Expansion of fill station specifications to address water pressure issues from multiple concurrent users, including separate pumps for neighbors where needed and sidewalk bridges for hoses to reduce tripping hazards; and
- Submission of a determination of the effects of groundwater pumping on nearby buildings, infrastructure, trees, or landscaping.

The shallow and deep aquifer research described in the section above and to be undertaken by the City in coordination with the SCVWD will provide valuable insight to the relationship between the aquifers in the north part of Santa Clara County.

[20] See Staff Report 6478: http://www.cityofpaloalto.org/civicax/filebank/documents/50690

Water Recycling

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> (a) A description of the wastewater collection and treatment systems in the supplier's service area…

The City operates the Regional Water Quality Control Plant (RWQCP), a wastewater treatment plant, for the East Palo Alto Sanitary District, Los Altos, Los Altos Hills, Mountain View, Palo Alto, and Stanford University. Wastewater from these communities is treated by the RWQCP prior to discharge to the Bay. Approximately 220,000 people live in the RWQCP service area. Of the wastewater flow to the RWQCP, about 60 percent is estimated to come from residences, 10 percent from industries, and 30 percent from commercial businesses and institutions. The RWQCP uses physical, biological, and chemical treatment to remove about 99 percent of the solids and organic materials from influent wastewater.

In 1992, the City and the other RWQCP partners completed a Water Reclamation Master Plan (Master Plan). This Master Plan identified a five-year, three-stage implementation for recycled water development in the service area of the RWQCP.

In 1995, City Council certified the final PEIR for the Master Plan projects. At the same time, the City decided not to pursue any of the recommended expansion stages of a water recycling system as the cost of the projects could not be justified. In addition, Council adopted a Water Recycling Policy, which includes continuation of the existing recycled water program and monitoring of the conditions that would trigger an evaluation of the Master Plan projects studied in the Program EIR. The Water Recycling Policy described five conditions that would trigger evaluation of the Master Plan projects:

1. Changes in the RWQCP discharge requirements;
2. Increased mass loading to the RWQCP;
3. Requests from partner agencies or other local agencies;
4. Availability of federal or other funds; and
5. Water supply issues – Issues which may lead to an increase in the value of recycled water from a water supply perspective include:
   a. Water supply shortages;
   b. Regulatory or legislative initiatives; or
   c. Advanced treatment for potable reuse.

Recycled Water Market Survey

Since the Council adopted the Water Recycling Policy in 1995, several factors have altered the feasibility of recycled water use in the City, including the following:

- The SFPUC has nearly finished implementing the WSIP to repair and improve the regional water system's infrastructure. This $4.8 billion program has resulted in steadily increasing wholesale water rates. Wholesale water rates are projected to double from the current (FY 2016) rates of $1,800/AF to nearly $2,500/AF in FY 2020. In addition, the current drought and state-mandated potable water use reductions have negatively impacted water sales that will result in additional upward pressure on supply costs. At these prices, and considering the local benefits of a recycled water supply source, recycled water is increasingly competitive with the cost of SFPUC water;

- The RWQCP completed a project to replace an existing deteriorating pipeline to Shoreline Golf Course in Mountain View and to extend the pipeline to the Mountain View-Moffett area. The pipeline replacement restored the golf course connection and provides recycled water services to the Shoreline community. CPAU paid $1 million of the cost for this pipeline to ensure the pipeline will be sized to meet possible future needs in the City. In addition, CPAU has committed to pay another $1 million if and when it taps into the new pipeline; and

- There are potential partners for expanding the use of recycled water in the City. Since there is a regional benefit to maximizing local sources, neighboring communities and the Bay Area at large may wish to participate financially in an expansion of recycled water use in the City, especially if there are no feasible sites in their own communities.

In 2005, the City engaged a consultant to complete a Recycled Water Market Survey (Market Survey). Completed in 2006[21], the objectives of the study were to review and update the list of potential recycled water users identified in the 1992 Master Plan and to update the estimated recycled water use potential and the cost estimates for the delivery of recycled water. The Market Survey included site investigations, market analysis, conceptual project design, and preparation of a preliminary financing and revenue plan.

In December 2008, the City completed the Recycled Water Facility Plan investigating the expansion of the regional recycled water system to serve areas in Palo Alto[22]. As described in the narrative regarding potential future uses for recycled water, in September 2015, City Council certified the project EIR for the expansion of the City's recycled water system to serve the Stanford Research Park.

Participation in Regional Recycled Water Planning

The City has participated in various regional recycled water planning initiatives.

[21] The report was provided to the UAC in October 2006 and the Council in November 2006: http://www.cityofpaloalto.org/cityagenda/publish/uac-meetings/documents/Item1AttachmentARecycledWaterMarketSurveyfinalreport.pdf

[22] Report provided to the UAC in March 2009: http://www.cityofpaloalto.org/civicax/filebank/documents/14932. The executive summary of the report provided to Council in April 2009 in informational Staff Report 203:09: http://www.cityofpaloalto.org/civicax/filebank/documents/15501

- The City is a stakeholder in the ABAG-led effort to secure grant funding for a Bay Area Integrated Regional Water Management Plan (IRWMP) and for projects identified in that IRWMP.
- CPAU and the partners of the RWQCP assisted in the funding of a project to build a new recycled water pipeline from the RWQCP to Mountain View. The project was completed in summer 2009. This project does not have new connections to end uses in the City, but the pipeline is sized to accommodate future expansion of recycled water use in the City.
- The City is a member of the California WateReuse Association, which helps promote and implement water recycling in California.
- The City is a member of the Bay Area Recycled Water Coalition, a group of regional recycled water project proponents that advocate for and seek funding from the Federal Bureau of Reclamation under Title 16.
- The City is a member of Bay Area Clean Water Agencies, a group of wastewater treatment plants that advocate and seek funding from State propositions and State Revolving Fund loans.
- The City actively participates on the SCVWD recycled Water Subcommittee. The Committee is a group of recycled water retailers and wholesalers that meets bimonthly to discuss issues and challenges surrounding the use and promotion of recycled water.
- The City is working with the SCVWD to explore possible funding mechanisms to expand the City's recycled water system in Palo Alto and to East Palo Alto. The City of Palo Alto is currently a member of the Joint Recycled Water Task Force with the Santa Clara Valley Water District which seeks future recycled water expansion projects.

Wastewater Collection and Treatment in Palo Alto

The City's wastewater flows to the RWQCP. The RWQCP is an EPA award winning Class V tertiary treatment facility featuring primary treatment (bar screening and primary sedimentation), secondary treatment (fixed film reactors, conventional activated sludge, clarification and filtration), and tertiary treatment (filtration through a sand and coal filter and UV disinfection). Through these treatments, 99% of ammonia, organic pollutants, and solid pollutants are removed. While the plant was not designed to remove metals, the treatment process through optimization has reduced the quantity of mercury, silver, and lead by 90%. The removal rates for other heavy metals range from 20 to 85%.

The plant's discharge meets very high standards that are among the most stringent discharge standards in the nation. The quality of the water leaving the plant approaches the standards for drinking water. Table 7 provides some data on the RWQCP. A full description of the treatment facility is included in the 1992 Water Reclamation Master Plan and is not reproduced here.

Table 7: Wastewater Treatment

Treatment Plant Name	Location (City)	Average Daily Flow (2015)	Maximum Daily Flow (2015)	Year of Planned Build-out	Planned Maximum Daily Volume
RWQCP	City of Palo Alto	21,616 AF	55,000 AF	Plant built out	90,000 AF = Maximum Design Daily Flow 44,000 AF = Average Design Daily Flow (Dry weather capacity)

Wastewater Generation, Collection & Treatment

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> (a) A […] quantification of the amount of wastewater collected and treated…
>
> (b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

Palo Alto Regional Water Quality Control Plant (RWQCP)

The RWQCP has an average dry weather flow design capacity of 39 MGD (43,680 AF/Y) with full tertiary treatment, and a peak wet weather flow capacity of 80 MGD (89,600 AF/Y) with full secondary treatment. Current average flows are approximately 19 MGD (21,280 AF/Y). The plant capacity is sufficient for current dry and wet weather loads and for future load projections. There are no plans for expansion of the plant or to "build-out" the plant.

All of the wastewater treated at the RWQCP can be recycled. As shown in Table 8, the plant already has some capability to produce recycled water that meets the Title 22 unrestricted use standard (approximately 4.5 MGD of capacity). Current production is about 25% of capacity.

Table 8: Wastewater Collected and Treated – AF

	2015	2020	2025	2030	2035	2040
Waste Water Collected and Treated	21,616	21,280	21,280	21,280	21,280	21,280
Recycled Water Available if Full Capacity is Used	5,040	5,040	5,040	5,040	5,040	5,040

Wastewater Disposal and Recycled Water Uses

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:

(c) A description of the recycled water currently being used in the supplier's service area, including but not limited to, the type, place and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) 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 pursuant to this subdivision.

Disposal of Wastewater

Current and future City of Palo RWQCP discharges of treated wastewater to the San Francisco Bay are shown in Table 9.

Table 9: Disposal of Wastewater (non-recycled) – AF

Method of Disposal	2015	2020	2025	2030	2035	2040
Discharged to San Francisco Bay	19,759	18,676	18,676	18,676	18,676	18,676
Discharged to Bay by way of Emily Renzel Marsh	629	1,344	1,344	1,344	1,344	1,344

Recycled Water Currently Used

The recycled water produced by the RWQCP in FY 2015 was used for the following:

- Trucked water mostly for irrigation with some construction dust control (25 AF)
- Irrigation water for Palo Alto Parks (28 AF)
- Irrigation water for the Palo Alto Municipal Golf Course (166 AF)
- Water for the Duck Pond (29 AF)
- Irrigation water for CalTrans freeway landscape medians (11 AF)
- The pipeline serving Shoreline Park and other customers in Mountain View (410 AF)
- Water for irrigation in and around the RWQCP and in processes at the plant itself. The amount of recycled water that replaces potable water for this use (560 AF). That usage is about 112 AF/Y for landscape irrigation and about 448 AF/Y for industrial use. Total industrial water use for the plant is about 1,960 AF/Y. Because the water is recirculated through the plant, it was assumed approximately 20% of the total water use is newly recycled water, the amount of fresh water that would need to be continuously added if recycled water was not available.

Due to the drought, actual recycled water use in Palo Alto in 2015 was slightly lower than the projection in the 2010 UWMP (818 AF versus 850 AF).

Potential Uses of Recycled Water

On September 28, 2015 the Palo Alto City Council adopted a resolution certifying the EIR for an expansion of the existing recycled water distribution system[23]. The primary objectives of extending the recycled water pipeline would be:

1. To allow the City to maximize recycled water as a supplemental water source, thereby improving potable water supply reliability by conserving drinking water, which is currently used for irrigation and other non-potable uses;
2. To provide a dependable, drought-proof locally controlled non-potable water source;
3. To increase recycled water use from the RWQCP and reduce discharge to San Francisco Bay; and
4. To reduce reliance on imported water.

The potential uses in Palo Alto for recycled water are shown in Table 10 below. The table shows current use continuing for 2015 and the most recently-assessed potential for expansion is shown in the totals for 2020 and beyond. A business plan for the recycled water distribution system expansion project, the Phase 3 expansion (discussed in more detail below), will include an updated analysis of potential uses for the water as well as a determination with regard to the technical and economic feasibility of serving those uses. The potential landscape use increase starting in 2020 in Table 10 reflects the possibility of the Phase 3 recycled water system expansion. As noted in the groundwater discussion above but not included in Table 10, recycled water is also being considered for indirect potable reuse.

Table 10: Potential Future Use of Recycled Water in Palo Alto- AFY

Treatment	Type of Use	2015 (Actual)	2020	2025	2030	2035
Tertiary treatment plus additional disinfection (Title 22 unrestricted use standard)	Agriculture	0	0	0	0	0
	Landscape (no golf courses)	175	1,072	1,072	1,072	1,072
	Golf Course	166	196	196	196	196
	Industrial	448	448	448	448	448
	Groundwater Recharge	0	0	0	0	0
	Palo Alto Duck Pond	29	34	34	34	34
	Total	818	1,750	1,750	1,750	1,750

Recycled Water Facility Plan

Following completion of the recycled Water Market Survey, the City applied for and secured grant funding for the project planning from the SWRCB through the Regional Water Recycling Facilities Planning Grant Program. The grant provided a 50% cost share with the City for up to $75,000 to fund the preparation of a Facilities Plan for the recycled water project. The purpose of the Facility Plan was fourfold:

1. Define recycled water alternatives (i.e. reuse sites and demands, distribution alignment, sizing, construction alternatives, etc) and identify a recommended project;

[23] See Staff Report 6071: http://www.cityofpaloalto.org/civicax/filebank/documents/49059

2. Develop a realistic funding strategy for the recommended project;
3. Develop an implementation strategy for the recommended project; and
4. Provide the basis for any future State and Federal grant requests for the recommended project.

The City engaged a consultant in April 2007 to assist in preparing the Facility Plan. Based on the analysis in the Facility Plan, the report identified a recommended project to serve customers in the Stanford Research Park area and potentially offset the need to import approximately 900 AFY of potable water. Figure 2: below illustrates the areas currently being provided recycled water (Phases 1 and 2) and the future potential Phase 3 project to serve the Stanford Research Park.

Figure 2: Phase 3 Recycled Water Project

The Facility Plan provided a comprehensive analysis of the Stanford Research Park project, including detailed costs estimates. The Facility Plan identified a gross project cost of approximately $2700/AF (2007 dollars), as compared to a current SFPUC projection in 2020 of approximately $2,500/AF. Potential grant and low cost financing opportunities may decrease the project cost to Palo Alto.

In December 2008, the Facility Plan was deemed complete by the State Water Resources Control BoardThe City is in the process of developing a Recycled Water Strategic Plan that will include an assessment of all possible scenarios for recycled water in Palo Alto.

Encouraging Recycled Water Use

Law

> 10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:
>
> (f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

The City encourages Recycled Water usage in the following ways:

- Participating in the Integrated Regional Water Management Plan process
- Encouraging businesses and City departments to utilize the existing recycled water capability within the City
- Participating as an active member of the WateReuse Association, including hosting meetings of the Northern California Chapter of the Association
- Offering recycled water for free to users willing to pick it up at the RWQCP by truck
- Adoption of the Recycled water Mandatory Use Ordinance
- Adoption of the Salinity Reduction Policy

Current and Proposed Actions to Encourage Use of Recycled Water

Since completion of the 2010 UWMP, the City has continued to pursue several approaches to encourage recycled water use. If the Phase 3 recycled water expansion project is approved by City Council, the actions taken by the City to encourage the use of recycled water are estimated to increase recycled water use by approximately 900 AF/Y, more than twice the volume used today.

In May 2008, the City approved a Mandatory Use Ordinance to require customers to prepare for recycled water delivery in the future[24]. For most new construction and some renovations that meet certain criteria, the applicant must install dual-plumbing and prepare the site for irrigation with recycled water. Compliance with the ordinance is administered through the

[24] City of Palo Alto Municipal Code, Title 16, Chapter 16.12. The Ordinance applies to non-residential customers. The City has no plans to provide recycled water to residential customers.

permit process with the Building Department. CPAU provides plan review services of landscape and irrigation design plans, in order to ensure compliance with outdoor water efficiency and recycled water requirements.

The City Council approved a Salinity Reduction Policy[25] in January 2010 to address the elevated salinity levels in the recycled water. The policy identified inflow and infiltration as a likely contributor to the elevated salinity levels, and provided a target salinity level based on minimum inflow and infiltration into the wastewater collection system. As a result, several steps were implemented to lower the TDS levels in the recycled water:

- The RWQCP continues to monitor potential saltwater intrusion "hotspots" and communicate the results to the RWQCP partners;
- The RWQCP tracks salinity data and perform other investigative work to support the effort;
- CPAU coordinated implementation of the Sanitary Sewer Management Plan to manage the Palo Alto wastewater collection system and identify inflow and infiltration reduction actions; and
- The RWQCP developed a plan to coordinate salinity reduction activities with the RWQCP partners and prepare for expanded recycled water application. This plan[26] was coordinated with the SCVWD, which has jurisdiction over the groundwater basins in Santa Clara County.

Nevertheless, customer concerns regarding potential negative effects of recycled water on redwood trees and other sensitive plants led the City to identify several mitigation measures in the EIR if the City is unable to meet the goal for a TDS of 650 mg/l by project start-up:

- The City may utilize its existing Recycled Water Ordinance exemption process to exempt redwood trees and/or other salt sensitive species from the use of recycled water;
- The City may blend recycled water and other lower salinity water prior to application; and/or
- The City may treat recycled water to reduce TDS prior to application, or shortly thereafter.

Additionally, the City is initiating a feasibility analysis to treat and blend recycled water prior to delivery. The feasibility analysis is also supported by the City of Mountain View, a RWQCP partner agency, since it already uses the recycled water and has an interest in improving the water quality of the recycled water it delivers.

Recycled Water Optimization Plan

Law

[25] City Council Resolution 9035: http://www.cityofpaloalto.org/civicax/filebank/documents/21246
[26] The SCVWD updated its groundwater management plan in 2012

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.

The City continues to create a plan for optimizing the use of recycled water. Completion of the Recycled Water Market Survey, the Facility Plan, and the EIR are steps in that direction. The City expects that the costs of implementing expanded recycled water use can be reduced through a combination of regional coordination and state and federal matching funds.

RWQCP Long Range Facilities Plan

The City of Palo Alto Public Works Department completed a Long Range Facilities Plan for the Palo Alto RWQCP. Aging equipment, new regulatory requirements, and the movement to full sustainability will require rehabilitation, replacement and new processes. The Long Range Facilities Plan maps out these changes and focuses on biosolids treatment and disposal, waste-to-energy technologies, energy use, major pipeline repairs, recycled water treatment, carbon footprint impacts, and the best alternatives for rehabilitation, replacement or improvement.

BAWSCA Long Term Reliable Water Supply Strategy

Palo Alto was a participating agency on the BAWSCA Long Term Reliable Water Supply Strategy. The Long Term Reliable Water Supply Strategy evaluated potential new supply sources to meet normal and dry year BAWSCA member needs. The City's Phase 3 recycled water expansion project was included in the plan.

Indirect Potable Reuse

The City is working with the SCVWD, the principle agency responsible for the groundwater in Santa Clara County, to gather data and study the potential for IPR in the North County. The City also anticipates that the SCVWD's Water Supply and Infrastructure Master Plan will evaluate IPR as part of any future supply portfolio. The recycled water expansion project is an asset that could potentially benefit aquifer recharge activities.

Desalinated Water

Law

10631 A plan shall be adopted . . . that shall do all of the following:

(h) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

Development of desalinated water is not feasible at this time. In its Long Term Reliable Water Supply Strategy, BAWSCA considered a wide range of desalination projects, ranging in size from 1 MGD to 20 MGD, and ranging in type from brackish groundwater to an ocean water open

intake. Two types of projects were included in the final report: 1) a project that produces 15 MGD of water sourced from an open intake in San Francisco Bay; and 2) a project that produces up to 6.5 MGD from brackish water sourced from either shallow vertical brackish groundwater wells or horizontal directionally drilled (HDD) wells extracting higher salinity brackish groundwater from under the Bay. BAWSCA is committed to facilitating desalination partnerships and pursuing outside funding for related studies.

The City is currently aware of one regional collaborative effort between different water agencies to evaluate a large scale Bay Area desalination project, The Bay Area Regional Desalination Project. The Bay Area Regional Desalination Project is a collaboration between the East Bay Municipal Utility District, SCVWD, the SFPUC, Contra Costa Water District, and Zone 7 Water Agency to jointly explore developing the feasibility of a regional desalination facility that could directly or indirectly benefit 5.4 million San Francisco Bay Area residents and businesses served by these agencies.

Section 4 – Water Demand

Law

10631 (e)

(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; (I) Agricultural; and (J) Distribution system water loss.

(2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

(3)
(A) For the 2015 urban water management plan update, the distribution system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss shall be quantified for each of the five years preceding the plan update.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

10631.1 (a) include projected water use for single-family and multi-family residential housing for lower income households, as identified in the housing element of any City, County, or City and County in the service area of the supplier.

10608.2 Provide baseline daily per capita water use target, interim urban water use target, and compliance daily per capita water use, along with the basis for determining those estimates.

Water Usage

Although the City has experienced several drought periods since 1975, the current drought has had a particularly profound effect on City and customer attitudes regarding water. The current state-mandated water use reductions resulted in large numbers of landscape conversion projects as well as a dramatic shift in customer behavior regarding water use. In addition, new construction in every sector is subject to increasingly stringent regulations regarding water-using appliances and fixtures.

Demand Projections
Incorporating the profound effects of the current drought and state-imposed mandatory potable water use reductions presented an additional challenge when developing the water

demand projections for this 2015 UWMP. A model developed in-house was used to forecast SFPUC purchases assuming the continuation of the City's existing Demand Management Measures (DMMs). Water savings from future DMMs were developed using the same end use model that was used to develop the projections in the 2010 UWMP.

The City developed baseline projections for the purchased SFPUC water using an econometric model built in-house. The model uses historical water usage data as well as assumptions regarding population, economic growth, and development. Current DMMs are implicitly considered in the model. Breaking down demand at the end-use level was accomplished by applying the 2015 water use percentages for each type of water service account (single-family, multi- family, commercial, irrigation, etc.) to the total projected demand.

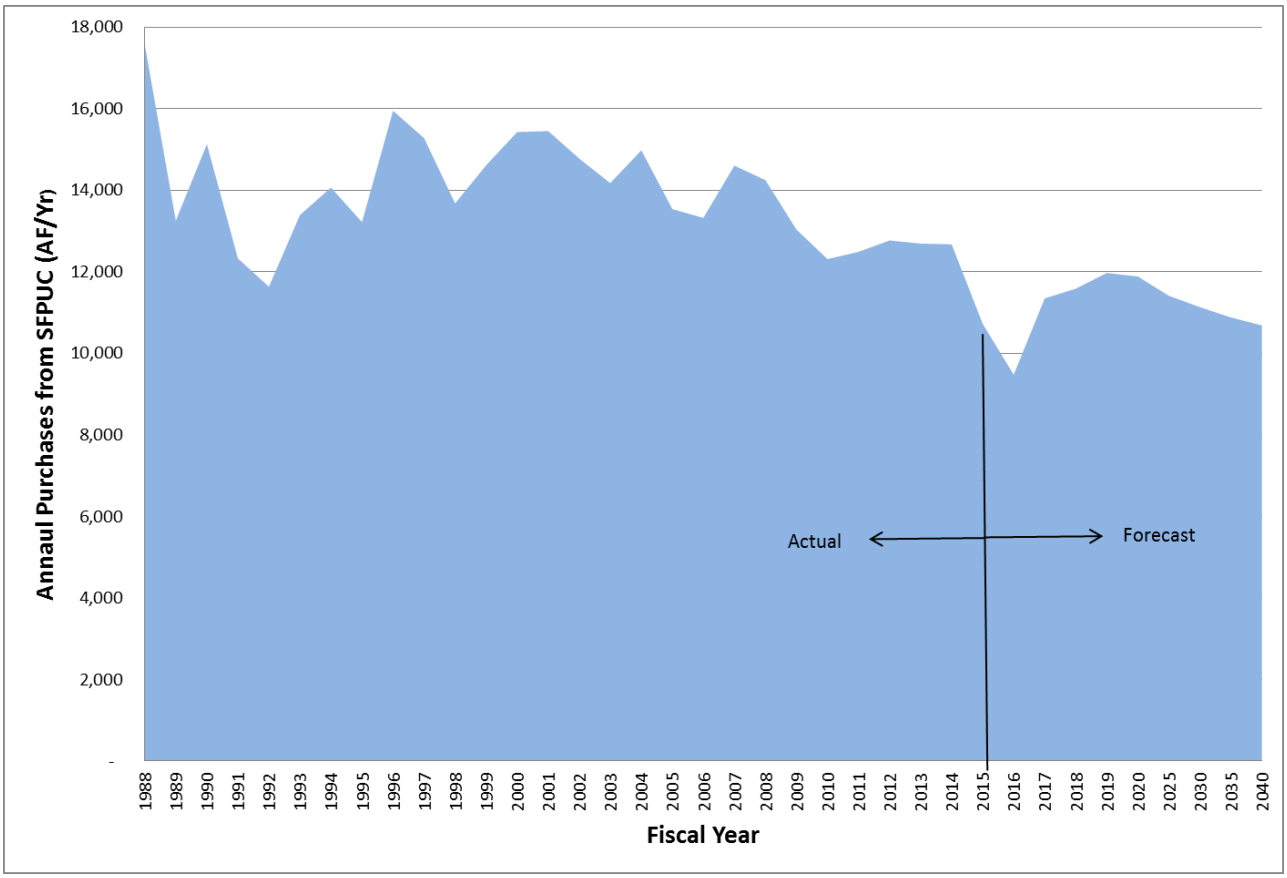
The end use model (also known as the Demand Side Management Least Cost Planning Decision Support System, or DSS model) was used to forecast the impact of future DMMs discussed in detail in Section 5 of this report.

Figure 3: below shows the City's potable water use since 1988 and a projection of water supplies through 2040. Present water consumption at its lowest level in the more than 25-year history. The reduction in current water consumption is the result of state mandated water reductions and permanent water conservation measures implemented during the past 25 years.

Under the current drought to date, the SFPUC has called for, but has not mandated, a 10% system-wide reduction since January 2014. SFPUC has not yet been compelled to impose mandatory system-wide rationing because its customers have exceeded the 10 percent voluntary system-wide reduction as a result of the state-wide mandatory reductions imposed by the State Water Resources Control Board.

The SWRCB required the City to reduce potable water use by 24% for the period June 2015 through October 2016 compared to usage in 2013. As of the end of calendar year 2015, the City is on track to meet or exceed that reduction target. Because many permanent water use changes including landscape conversion has occurred as a result of rebate programs and public outreach, and because the City detects a shift in the community's attitude regarding water use, the City's water consumption is forecast to remain relatively stable in the future, with slight increases due to a post-drought rebound and continued increases in economic development and population. By 2025, it is predicted that the overall trend of decreasing per capita water use will resume.

Figure 3: Water Supply Purchases – Actual and Forecast



Water Sales

Total water sales decreased by 11%, from 11,375 AF/Y to 10,177 AF/Y between 2010 and 2015. Table 11 shows historical and projected sales by customer type before and after incorporating the impact of planned DMMs discussed in Section 5 – Demand Management Measures. Table 12 shows the number of accounts in each category, and Table 13 shows the sales per account for each customer type. The City does not have sales to other agencies, agricultural use, or saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

Table 11: Historical and Projected Water Sales – by Customer Type

AF/Y	2010	2015	2020	2025	2030	2035	2040
Single Family	5,372	4,554	4,972	4,829	4,712	4,605	4,523
Multifamily	1,685	1,530	1,670	1,622	1,583	1,547	1,519
Commercial	1,942	1,911	2,086	2,026	1,977	1,932	1,898
Industrial	705	397	434	421	411	402	394
Institutional	368	357	390	379	370	361	355
Other	4	3	3	3	3	3	3
Landscape	1,012	1,163	1,269	1,233	1,203	1,176	1,155
Government	288	263	287	279	272	266	261
Total Water Sales	11,375	10,177	11,111	10,793	10,530	10,292	10,108
Future DMM				123	121	120	119
Net Water Sales	11,375	10,177	11,111	10,669	10,409	10,172	9,989

Table 12: Historical and Projected Water Accounts – by Customer Type

	2010	2015	2020	2025	2030	2035	2040
Single Family	14,659	15,029	15,179	15,210	15,240	15,271	15,301
Multifamily	2,058	1,923	1,923	1,923	1,923	1,923	1,923
Commercial	1,245	1,494	1,494	1,494	1,494	1,494	1,494
Industrial	139	91	91	91	91	91	91
Institutional	42	50	50	50	50	50	50
Other	535	669	669	669	669	669	669
Landscape	289	371	371	371	371	371	371
Government	171	236	236	236	236	236	236
Total Water Acounts	19,139	19,863	20,014	20,044	20,075	20,105	20,136

Table 13: Historical and Project Water Sales per Account

	2010	2015	2020	2025	2030	2035	2040
Single Family	0.366	0.303	0.328	0.318	0.309	0.302	0.296
Multifamily	0.819	0.795	0.868	0.843	0.823	0.804	0.790
Commercial	1.560	1.279	1.396	1.356	1.323	1.293	1.270
Industrial	5.065	4.348	4.747	4.611	4.499	4.397	4.319
Institutional	8.673	7.148	7.804	7.580	7.396	7.228	7.099
Other	0.007	0.004	0.004	0.004	0.004	0.004	0.004
Landscape	3.497	3.132	3.419	3.321	3.240	3.167	3.111
Government	1.686	1.115	1.217	1.183	1.154	1.128	1.108
Total Use per Account	0.594	0.512	0.555	0.538	0.525	0.512	0.502

Use per account decreased for every customer type from 2010 to 2015. Overall water use per account decreased by 14%. During this period, water use per account decreased by 17% for single family residences, 3% for multifamily, 18% for commercial, 14% for industrial, 18% for public facilities, 10% for irrigation customers and 34% for City facilities.

Share of Total Consumption by Customer Type

In 2015 residential and multi-family water sales were responsible for 60% of total water consumption in the City. The business sectors including commercial and industrial customers consume 23%, while irrigation customers consumed 11%. Public and City facilities consume the

remaining 6%. The relative share of water consumed has not changed significantly between customer types since 2010. Figure 4 and Figure 5 below show the breakdown of consumption by customer type for 2010 and 2015.

Figure 4: 2010 Water Sales by Customer Class

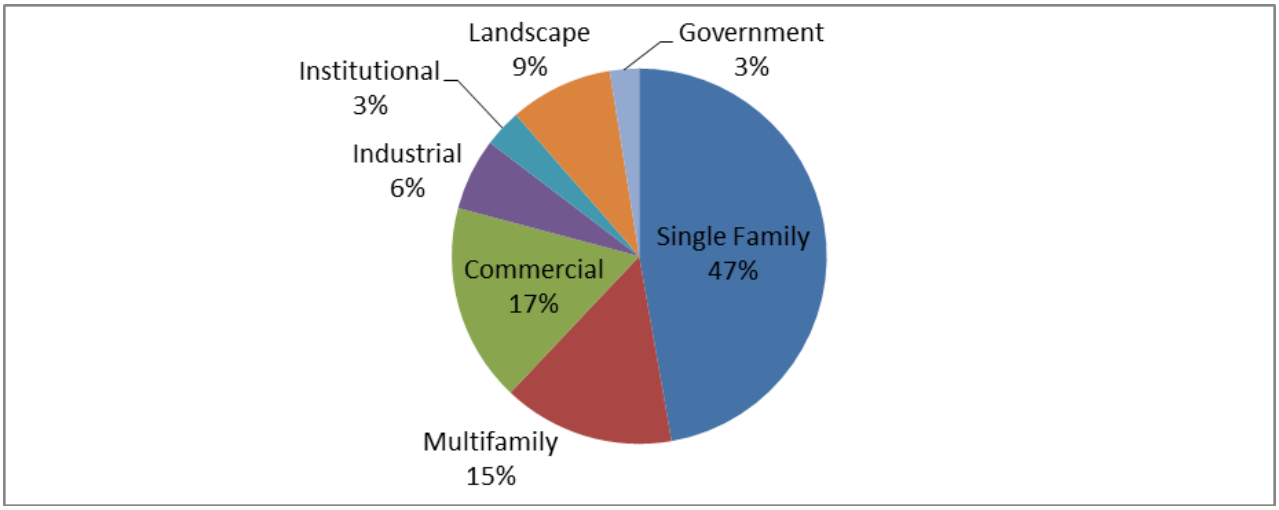
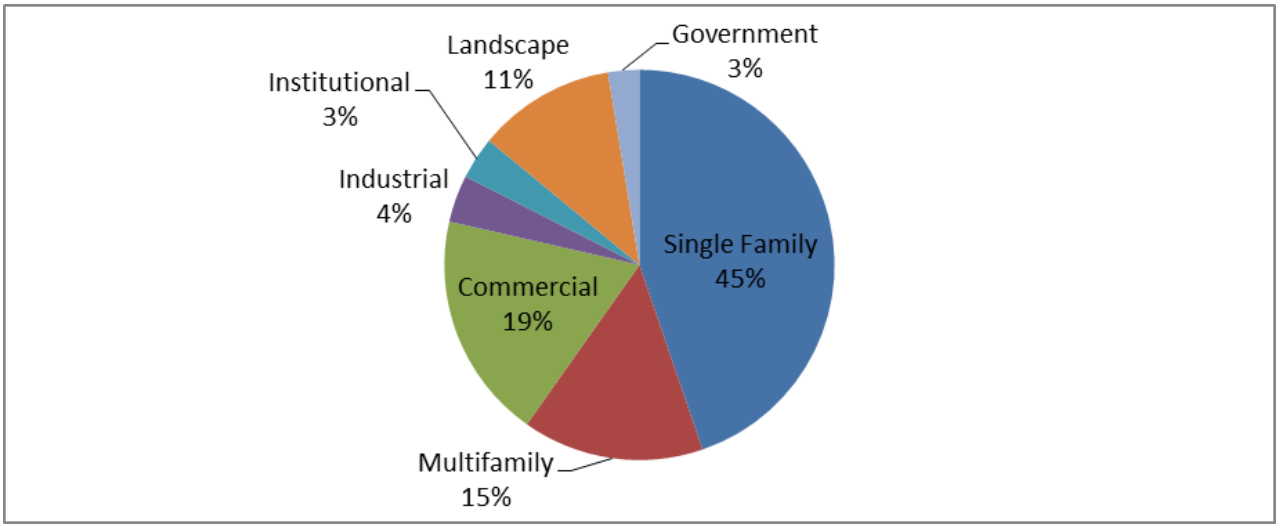


Figure 5: 2015 Water Sales by Customer Class



Sales to Other Agencies

The City has not, and does not plan to, sell water supplies to other agencies.

Additional Water Uses - Recycled Water Use

Recycled water use is discussed in Section 3, "System Supplies," under the heading "Water Recycling." Past use and future recycled water use projections are presented in Table 14 below. Although the City is exploring an expansion of its recycled water system, the Council has not made a commitment to expand the use of recycled water in the City and, therefore, the table reflects no increase in the use of recycled water in the future. The 2010 UWMP projected

future recycled water use to be 850 AF/Y. Actual use in 2015 was slightly lower (818 AF) resulting from drought-related water use reductions.

Table 14: Recycled Water Use (AF/Y)

	2010	2015	2020	2025	2030	2035	2040
Water Trucks	7	25	29	29	29	29	29
Palo Alto Parks	20	39	31	31	31	31	31
Golf Course	167	166	196	196	196	196	196
Duck Pond	56	29	34	34	34	34	34
RWQCP	560	560	560	560	560	560	560
Total	810	818	850	850	850	850	850

Non-Revenue Water/Water Loss

Non-Revenue water, or unaccounted-for water, is the difference between the amount of water purchased and the amount sold to customers. Non-revenue water typically amounts to about 7% of total purchases. From CY 2005 to 2008, the City's non-revenue water volumes significantly increased, with a peak in CY 2006 of 12.45%. In response, the City initiated a comprehensive leak detection, meter locating and meter calibration program. As of 2009, the non-revenue water volumes have returned to expected levels. Appendix C contains the water loss audit report for the most recent year of date, FY 2014. Real losses in that year, as per the audit, were 563 AF.

Table 15 presents the historical and projected non-revenue volumes for the City's water system.

Table 15: Non-Revenue Water (AF/Y)

	2010	2015	2020	2025	2030	2035	2040
Non-Revenue Water	936	547	772	742	724	707	694

Total Water Use

Table 16 shows total water use in the City.

Table 16: Total Water Use (AF/Y)

	2010	2015	2020	2025	2030	2035	2040
Retail Sales	11,375	10,177	11,111	10,669	10,409	10,172	9,989
Non-Revenue Water	936	547	772	742	724	707	694
Recycled Water	810	818	850	850	850	850	850
Total	13,121	11,542	12,733	12,261	11,982	11,729	11,534

Projected Low to Moderate Income Water Use

Palo Alto was one of the first jurisdictions in California to establish an official low to moderate income housing requirement in 1974. The Below Market Rate (BMR)[27] program now requires

[27] City of Palo Alto Comprehensive Plan, Chapter 4 – Housing Element

developers of projects with five or more units to comply with the City's BMR requirements. The BMR program objective is to obtain actual housing units or buildable parcels within each development rather than off-site units or in-lieu payments. At least 15% of the housing units developed in a project involving fewer than five acres of land must be provided as BMR units. Projects involving the development of five or more acres must provide at least 20% of all units developed as BMR units. (Projects that cause the loss of existing rental housing may need to provide a 25 percent BMR component). The BMR units must be comparable to other units in the development.

Due to the BMR requirements and the cost of housing in Palo Alto, the City has few single-family BMR units and does not anticipate this will change in the future. Approximately 2058 units in the City meet lower income levels as defined in Section 50079.5 of the California Health and Safety code[28]. Of these, 456 rental and ownership units, or 1.5% of the total housing units meet the BMR requirements. The remaining 1,602 units, or 5.4% of total housing units, are subsidized housing.[29]

For purposes of the current lower income projections, the 2015 UWMP assumes:

- 2,058 units out of the total housing stock in 2015 are considered affordable housing as determined by the classification of very low to moderate incomes.
- Affordable housing units in Palo Alto are categorized as multi-family.
- An average of 2.43[30] individuals per multi-family unit. This is approximately 5,000 individuals or 7% of the total population in 2015.
- Multi-family usage in Palo Alto averages 75 GPCD (from the end use model).
- An additional of 527 units will be added for each 5-year increment in the planning horizon.[31]

Table 17: Projected Low Income Water Demands (AF)

	2015	2020	2025	2030	2035
Single-family Residential	0	0	0	0	0
Munti-family Residential	420	528	635	743	850
Total	420	528	635	743	850

The City anticipates the current low income BMR program will remain in effect in its current form for the foreseeable future. Future housing and population projections inherently assume that increases in housing stock will include growth in lower income households through the

[28] The difference between the total BMR units and the units that meet the requirements in the UWMP Act is due to the inclusion of additional units that meet 81% to 120% of the Average Median Income in Santa Clara County. The City provides these additional units in recognition of high cost of housing in Palo Alto.

[29] Current figures provided by the City of Palo Alto Planning Department.

[30] U.S. Census Bureau, 2010, assumes an average of 2.43 persons per multi-family dwelling unit.

[31] Affordable Housing Forecast estimates includes "Very Low", "Low", and "Moderate" based on State Housing & Community Development (HCD) Regional Housing Needs Allocation (RHNA) income definitions. Forecast estimates are derived from average of "need" for the City of Palo Alto per income category for the last three RHNA cycles (1998-2006, 2007-2014, & 2015-2023). Average "Very Low" – 26%, Average "Low" – 16%, & Average "Moderate" – 20%.

BMR program. Based on future projected demand forecasts shown in Table 11, the City expects to have ample water supplies to meet all customers' demands during a normal year. During a drought, the City will follow the steps outlined in Section 8 (Water Shortage Contingency Plan). The Water Shortage Contingency Plan addresses the City's response depending on the severity of the drought. The City will implement measures to maximize potential savings while at the same time minimizing the impact to the wellbeing of the citizens and businesses in Palo Alto. As part of this process, the City Council will have an opportunity to balance the needs of different customer classes with the need to achieve meaningful reductions[32].

Water Conservation Bill of 2009

The Water Conservation Bill of 2009 (SBx7-7) was enacted in November 2009. It requires water suppliers to reduce the statewide average per capita daily water consumption by 20% by December 31, 2020. To monitor the progress towards achieving the 20% by 2020 target, the bill also requires urban retail water providers to reduce per capita water consumption 10% by 2015. Water agencies that are not in compliance with the provisions of the bill could be ineligible for State grants and/or a low cost financing program.

Water suppliers have some flexibility in setting and revising water use targets leading up to the 2020 compliance period, including:

- A water supplier may set its water use target and comply individually, or as part of a regional[33] alliance. The City is in discussions with BAWSCA and SCVWD regarding a potential future alliance with other water agencies.
- A water supplier may revise its water use target in its 2015 or 2020 urban water management plan or in an amended plan.
- A water supplier may change the method it uses to set its water use target and report through an amendment to the 2010 plan or in its 2015 urban water management plan. Urban water suppliers are not permitted to change target methods after they have submitted their 2015 urban water management plan.

SBx7-7 provided four potential compliance methods that are summarized below:

1. 80% of the urban water user's baseline gallons per capita per day (GPCD) water use;
2. The per capita daily water use that is estimated using several performance measures, subdivided between different customer classes;

[32] Water Utilities typically do not possess income information for their customers and are limited in their ability to offer differential rate treatment for low income customers due to Proposition 218 restrictions. During a drought, it is more common for water utilities to differentiate between customers in a Class based on water usage patterns and relative efficiency. For example, accounts with extremely low water use could be exempted from penalty rate treatment.

[33] SBx7-7 allows entities to comply individually or as a group. The intent of this provision is to ensure there is equity among small agencies and large water agencies or districts that serve large areas that may span different socioeconomic and evapotranspiration zones.

3. Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009); or
4. A method that was identified and developed by the department, through a public process, and released on December 31, 2010. The fourth method uses a combination of metered sales data and achieved water use reductions across the different customer classes.

The City Council, by Resolution 9174, adopted a compliance methodology based on the first option, or 80% of an urban water user's baseline GPCD. Under this methodology, the City is required to prepare the following calculations for compliance purposes:

- *Baseline daily per capita water use* — The City must determine for baseline purposes how much water is used within an urban water supplier's distribution system area on a per capita basis. It is determined using water use and population estimates from a defined range of years. For the City, the range selected is from fiscal year 1995 to 2004 (Table 18).
- *Urban water use target* — The value is equal to 80% of the baseline daily per capita water use value.
- *Interim urban water use target* — The planned daily per capita water use in 2015 is halfway between the baseline daily per capita water use and the urban water use target.
- *Compliance daily per capita water use* – The gross water use during the final year of the reporting period, reported in gallons per capita per day. This value will be adjusted during the 2015 and 2020 compliance period based on actual usage data.

Table 18 illustrates the methodology to calculate the 10-year average baseline per capita[34] water use.

Table 18: Baseline Daily Per Capita Water Use for 10-year period (1995 through 2004)

Fiscal Year	Distribution System Population	Daily System Gross Water Use (MG)
1995	56,647	203.8
1996	56,885	220.8
1997	57,420	203.8
1998	57,868	203.8
1999	58,136	198.2
2000	58,467	203.7
2001	59,334	199.6
2002	60,028	209.1
2003	59,930	202.5
2004	59,894	251.1
Baseline Daily Per Capita Water Use		**225.3**

[34] US Census

Based on future water use and population growth projections, Table 19 summarizes Palo Alto's 2010 UWMP SBx7-7 target and compliance goals.

Table 19: 2015 UWMP SBx7-7 Performance Metrics (gallons per capita per day)

	2015	2020
Baseline GPCD	225.3	225.3
Target GPCD	202.8	180.3
Actual/Projected GPCD	142.0	150.5

The City met the interim 2015 SBx7-7 target and is projected to meet the 2020 target. As stated previously in this section, an urban water retailer has the flexibility to adjust the compliance target and to adjust the methodology in 2015. The City is continuing to apply the baseline per capita daily water use methodology. After 2015, the urban water supplier may not adjust the methodology, but there is the potential to adjust the compliance target as more current water use data becomes available. In addition, an agency that is at risk of non- compliance may, under limited circumstances[35], seek to adjust its compliance daily per capita water use. Eligible circumstances include:

- Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period;
- Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period; and
- Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

Measures, Programs and Policies to Achieve SBx7-7 Water Targets

Table 19 provides a preliminary analysis of the City's SBx7-7 metrics, and the data shows the City will far surpass the water use reduction goal. The City will continue to monitor progress, however, and make program adjustments if needed. Potential adjustment to meet any shortfall could include the following:

- The City is currently evaluating an extension of the current recycled water system to serve customers in the Stanford Research Park area. This project was discussed in Section 3, but has not been included in the long-term water use projection identified in the 2015 UWMP, largely due to the uncertainties surrounding project feasibility. Full build-out of the project would result in an anticipated yield of approximately 900 AFY[36]
- The City is committed to promoting all cost-effective conservation programs that meet both the City's water reduction goals and community interest. Palo Alto shifts emphasis between different conservation programs depending on various factors, including community acceptance. Over time, the program mixture may change, though the overall savings goals will remain constant.

[35] CA Water Code; Section 10608.24

[36] City of Palo Alto Recycled Water Facility Plan, June 2008

Economic Impacts of SBx7-7 Compliance

There are no incremental economic impacts associated with SBx7-7 compliance at this time because it is anticipated the City will meet the target. The decision to implement additional conservation measures in the future will not necessarily depend on the need to comply with SBx7-7; Palo Alto typically evaluates all measures that are cost effective compared to the incremental cost of purchasing additional water supplies from the SFPUC system[37].

[37] DMMs discussed in Section 5

Section 5 – Demand Management Measures

Law

> 10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
>
> (1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.
>
> (B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures: (i) Water waste prevention ordinances. (ii) Metering. (iii) Conservation pricing. (iv) Public education and outreach. (v) Programs to assess and manage distribution system real loss. (vi) Water conservation program coordination and staffing support. (vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.
>
> 10620 (f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

The City is committed to support conservation and efficient use of its water supply. It is the goal of the City to continue to look for opportunities, innovative technologies, and cost-effective programs that best utilize the City's water conservation budget. The City has been working with other Bay Area Water Supply and Conservation Agency (BAWSCA) members, the Santa Clara Valley Water District (SCVWD), and other water agencies in the Bay Area to implement Best Management Practices (BMPs) related to water conservation programs.

The California Water Code Section 10631 (f) requires that an urban retail water supplier provide descriptions that addresses the nature and extent of the following DMMs that have been implemented over the past five years and/or will be implemented to achieve its water use target pursuant to SBx7-7:

A. Water waste prevention ordinance.
B. Metering.
C. Conservation pricing.
D. Public education and outreach.
E. Programs to asses and manage distribution system real loss.
F. Water conservation program coordination and staff support.
G. Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

In addition, the DMMs described below are water management tools and options used by the City that maximize resources and minimize the need to import water from other regions.

Water Waste Prevention Ordinance

The City has enforced water waste prevention as part of the City's Municipal Code since 1989 (Palo Alto Municipal Code Chapter 12.32). Enforcement includes written warning notices to violators and may result in fines and installation of a flow restrictor on the service connection of the customer or purchaser of water whose service connection was used in the violations observed or established, and billing the costs of such installation to said customer or purchaser.

In 2015, Palo Alto City Council approved an updated Green Building Ordinance (Palo Alto Municipal Code Chapter 16.14) that incorporates the state's 2013 Green Building Standards Code (CALGreen), which sets permit requirements for water efficiency design, including irrigation systems, in new development. In addition to the CALGreen standards, the City requires the installation of a "laundry to landscape ready" irrigation system for all residential new construction projects. Also, the City's Green Building Ordinance has a lower square footage trigger for irrigation efficiency than the state's Model Water Efficient Landscape Ordinance (MWELO). For non-residential projects, MWELO requires compliance for landscapes of any size associated with new construction and landscapes of 1,000 square feet for renovation projects. Under the City's current Green Building Ordinance, compliance with MWELO is required for landscapes of any size on all non-residential construction projects, as well as for landscaped areas of 1,000 square feet or more for residential projects. Palo Alto adopted the State Water Efficient Landscape Ordinance per Governor Brown's Drought Executive Order EO-29-15. The new ordinance went into effect February 1, 2016.

Metering

The City has approximately 20,000 water service connections in its service territory. In 2015, irrigation meters accounted for 2% of the total installed meters, whereas water consumption from irrigation meters accounted for 10% of the City's total metered water consumption. Non-revenue water (NRW) usage currently accounts for less than 7% of the City's water consumption (by comparison, the 2015 national average of NRW was 16%.)

The City is currently implementing an Advanced Metering Infrastructure (AMI) pilot installing advanced electric, gas and water meters at around 300 single-family homes. Customers with these advanced meters can monitor their hourly electric, gas and water usage from a secured website. Customers are alerted via email or text message when a potential water leak is detected and can act immediately to investigate and remedy the problem. So far, the AMI pilot has been very well-received by participating customers, and more than 200 leaks have been fixed by customers alerted to the leak by the program. The City currently plans to deploy advanced water meters to all customers by 2022.

Since 2012, the City has begun replacing aging water meters with digital water meters that register water usage down to increments of 0.01 CCF (or hundred cubic feet). Traditional water

meters can only register water usage in increments of 1 CCF. The smaller incremental water usage readings help to facilitate water leak detection.

Conservation Pricing

Since 1976, the City has implemented conservation-based pricing for water usage, within an overall cost-based rate structure. For residential customers, water usage is billed as a two-tiered volumetric charge that increases as monthly water consumption exceeds a threshold level. For non-residential customers, water usage is billed on a uniform volumetric charge. All customers are also billed a monthly service charge that varies depending on the meter size.

The City conducted a water cost of service and rate study in 2012 with the assistance of an independent consultant, to ensure continued compliance with the California Constitution's cost of service requirements for water rates. The 2012 study and water rate structure were evaluated and updated in 2015, in light of new judicial guidance on constitutionally compliant water rates. On an annual basis, City staff reviews and updates the City's water rates for both residential and nonresidential water customers.

Public Education and Outreach

Since 2006, the City has partnered with BAWSCA to offer free workshops on water efficient landscaping, irrigation and water conservation. Workshop topics include Creating a Water-Efficient Sustainable Garden, Laundry to Landscape Graywater Systems, Irrigation Basics for Homeowners, Water Conservation 101, Rainwater Harvesting, etc. In addition to public workshops, City of Palo Alto Utilities (CPAU) staff attends community, corporate and school events to promote water conservation programs and practices, in addition to energy efficiency, waste reduction and other sustainability practices.

The City carries out various seasonal and general water conservation campaigns via the use of television, online, social media and print advertisements. Palo Alto also regularly updates the City's website on water conservation programs and public workshops. The City utilizes utility bill inserts, brochures and email newsletters to customers as part of its outreach efforts.

In the fall of 2014, due to the drought, the City implemented a web and mobile application known as PaloAlto311 to allow residents and businesses to report incidents of leaks or other water waste issues.

In response to prolonged drought conditions, on January 31, 2014 the SFPUC asked its retail and wholesale customers to voluntarily reduce system-wide water consumption by 10 percent. That summer, BAWSCA, in partnership with the SFPUC, launched a regional drought education campaign to heighten awareness and encourage water conservation. The regional campaign drew upon the SFPUC's "Water Conservation is Smart and Sexy" citywide campaign. The

regional campaign appeared in the form of billboards, BART station ads, movie theater ads, and online video advertisements.

Following Governor Brown's Drought Executive Order on April 1, 2015 and conservation regulations mandating a statewide 25 percent reduction in potable urban water use, the SFPUC continued its call for a system-wide 10 percent reduction in water use. The SFPUC and BAWSCA partnered again to launch a new drought campaign for the summer of 2015 to remind customers to keep up their water conservation efforts, focusing in particular on outdoor water savings. Regional messaging was included in the form of billboards, BART station ads, television ads, newspaper ads, and a video campaign.

Programs to Assess and Manage Distribution Systems Real Loss

For over two decades, the City has pursued an aggressive Water Main Replacement Capital Improvement Program. This program identifies structurally deficient water mains and appurtenances that are undersized, corroded, and/or subject to breaks and leaks, and replaces them with jointless high-density polyethylene (HDPE) NSF 61 piping material using trenchless construction methods. Through this program, approximately 15,000 linear feet of water mains are replaced each year, which has significantly reduced water leaks throughout the system. The City maintains a 24-hour response program to fix water leaks.

In addition, the City also maintains a Water Meter Replacement Program that replaces 500 to 1,000 meters per year in accordance with American Water Works Association (AWWA) standards. In 2012 through 2014, a "Large Water Meter Testing, Calibration, Repair & Replacement" Program was undertaken that involved a total of 257 large water meters. Of these meters, 136 meters have been tested, repaired, removed, or replaced, thereby improving the accuracy and reliability of these meters.

Coupled with the aforementioned current AMI pilot, these capital improvement programs further enhance the City's ability to track volume of water entering and leaving the distribution system, reducing NRW and aligning the Utility's ten-year meter testing and replacement cycle in accordance with industry-standard best management practices.

Water Conservation Program Coordination and Staffing Support

Water Conservation Program Partnership with SCVWD

Since 2002, the City has partnered with SCVWD to promote and cost-share a wide range of water conservation programs to encourage residents and businesses to improve water use efficiency. These programs include free indoor and outdoor water audits, as well as rebates for upgrading a wide range of water-using fixtures to high efficiency models, including toilets, urinals, clothes washers, laundry to landscape graywater systems, high water-using landscapes, irrigation hardware, commercial food service and other process equipment.

Through SCVWD, the City has been offering the "Water Wise House Call" program that provides free site surveys to customers in both single-family and multi-family dwellings. The survey includes a review of customer water use history, water meter check for leak detection assistance, and thorough evaluation of indoor and outdoor water use. A technician provides each customer with free low-flow showerheads, faucet aerators, toilet dye tablets, and/or toilet flappers when needed. The landscape survey includes an evaluation of the entire irrigation system, catch-can test for irrigation distribution uniformity, and site-specific recommendations including changes to the irrigation schedule.

The Landscape Rebate Program (LRP) provides rebates for various irrigation hardware upgrades, including rain sensors, high efficiency nozzles, dedicated landscape meters, and weather-based irrigation controllers, as well as for converting high water-using landscapes (turf grass, pools) to a low water-using landscape. In response to the severe drought conditions, in 2014 the City and SCVWD doubled the rebate amounts customers could receive for a limited time period. This resulted in a significant increase in the number of LRP applications during FY 2015. The total square feet of turf grass removed through the LRP program in FY 2015 was more than ten times the area of grass replaced during the previous year.

Home Water Report Program

Beginning late 2013, the City began delivering quarterly Home Water Reports to single family households in Palo Alto. Approximately 13,000 residential customers received the reports. The Home Water Report compares a household's water usage to neighbors with similar lot sizes, landscape area, and family demographics. The reports rank a household for how water efficient it is compared to homes with similar demographics, in an attempt to encourage more water efficient behaviors and participation in conservation programs. Annual water savings from this program are estimated at approximately 1.9% for households receiving the reports. The Home Water Report program ended in 2015. However, Palo Alto plans to re-launch a similar program in 2016.

Water Conservation Coordinator

The City has maintained a full-time Water Conservation Coordinator position for more than 20 years and expects to maintain the position indefinitely. Duties of the Water Conservation Coordinator includes water conservation program planning, implementation and management, reporting on California Urban Water Conservation Council's Best Management Practices (BMP) implementation, and representing Palo Alto at various water conservation committees and meetings.

Water Waste Coordinator

In response to the drought in late 2014, the City created a part-time Water Waste Coordinator position. The Water Waste Coordinator performs a wide range of functions associated with the City's drought response program, including investigating incidents of water waste, enforcing the City's water use restrictions, and responding to customer inquiries about drought regulations and water conservation programs.

Other Demand Management Measures

Landscape Survey and Water Budget Program
Through SCVWD, the City offers a program that provides landscape irrigation surveys, water budgets and customized water usage reports for customers with large landscape sites. The water budget for each landscape site is calculated based on the area of irrigated landscape, type of plants, irrigation system and real-time weather monitoring. Monthly reports documenting a site's irrigation performance are distributed to site managers, landscapers, homeowners association board members and other relevant parties, as approved by utility account holders. Through a web portal, customers can access site-specific recommendations, view trends in water use, verify water budget assumptions and request a free landscape field survey from an irrigation expert. This program has been in place since 2012 and to date, there are 132 large landscape sites covered under this program.

Real-time Water Use Monitoring Pilot for Commercial Customers
In 2012, the City implemented a real-time water use monitoring pilot with selected large commercial customers to actively engage them in reducing water usage and water losses. The pilot deploys a simple, relatively low cost technology that enables standard water meters to track real-time consumption, similar to an advanced water meter. A wireless device attached to the water meter transmits real-time data to a cloud-based software platform. Customers securely log into a web portal to view water usage on a minute by minute interval, identify water leaks or other anomalies in water use, and address these issues before they become maintenance or billing problems. Over a two-year period, the total water use among pilot participants was reduced by approximately 8%.

Through grant funding from SCVWD, the City will launch a larger real-time water use monitoring pilot covering 100 city facility meters and 24 business customer sites. Pilot customers will be able to access real-time water consumption data through wireless sensors installed on the water meters. The pilot is expected to launch in early 2016 and will run for two years.

Business Water Reports Pilot Program
Through grant funding from SCVWD, the City will launch a Business Water Reports pilot to engage small to medium sized businesses in the hospitality and food service industries to actively manage their water use. The format and content of the report may vary slightly for customers in the hospitality versus food service sectors. The key objectives of the Business Water Reports are to communicate water use and potential ways to reduce water consumption, and to motivate behavior change for improved water use efficiency. The pilot is expected to launch in early 2016 and will run for two years.

Section 6 – Water Supply Reliability

Law

10631 (c)
(1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable.

Provide data for each of the following:

(A) An average water year, (B) A single dry water year, (C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.
10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(2) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

10631 (g) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

Water Supply Reliability

The weather-related reliability of the City's water supply is very dependent upon the reliability of SFPUC's regional water supply system. The SFPUC defines reliability by the amount and frequency of water delivery reductions (deficiencies) required to balance customer demands with available supplies in droughts. The SFPUC plans its water deliveries anticipating that a drought worse than the worst drought yet experienced may occur. This section discusses these potential system-wide deficiencies.

The SFPUC's Hetch Hetchy supply is vulnerable to periodic, short-term outages. Due to the fact that Hetch Hetchy water is not filtered, it is subject to strict water quality standards set by the State Water Board. As a result of weather events, turbidity levels can exceed standards requiring the Hetch Hetchy supply to be shut off until levels drop to within standards. Hetch Hetchy supply outages can last a week or longer. During these periods, the entire SFPUC supply comes from the Sunol Valley Water Treatment Plant and the Harry Tracy Water Treatment Plant, both of which are supplied by local reservoirs.

The City, working in cooperation with SFPUC and BAWSCA, completed several studies and reports analyzing weather- and climate-related reliability of the water supply. Several of these are described in previous sections of this UWMP, including the following:

- **Water Wells, Regional Storage and Distribution System Study (1999)** – This study examined the ability of the City's water system to supply water during an 8-hour disruption of SFPUC supply. The study concluded the City should invest in certain capital projects. These projects became part of the City's Emergency Water Supply and Storage Project, which is currently under construction.

- **The Water Supply Master Plan (2000)** – The WSMP was a joint study by BAWSCA and the SFPUC to address the future water supply needs of the 30 agencies and 2.3 million people who are served via the SFPUC water system. The City was actively involved in the development of this plan, participating on the WSMP Steering Committee. This plan is further described below.

- **Alternative Emergency Water Supply Options Study (2001)** – This study examined the ability of the City's distribution system to supply water during various lengths of supply disruption (e.g., 1 day, 3-days, 30 days) and included an analysis of the vulnerability of the City's water distribution system. The study concluded that the capital projects in the Emergency Water Supply and Storage Project, specifically related to groundwater wells, would result in the ability to supply sufficient water in disruptions of SFPUC supply.

- **City of Palo Alto Emergency Water Supply and Storage Project Final Environmental Impact Report (2007**) – The City completed construction of a 2.5 million gallon underground water reservoir and pump station in Palo Alto to meet emergency water supply and storage needs. In addition three new emergency supply wells were competed and five existing wells and the existing Mayfield Pump Station were upgraded.

Frequency and Magnitude of Supply Deficiencies

The City experienced severe droughts during 1976-77 and 1987-93. In response to these droughts the City adopted a number of water conservation strategies. In 2015, although the SFPUC system supply conditions only warranted a 10% voluntary reduction request by the SFPUC, the state-mandated 24% reduction in potable water use spurred an aggressive water conservation public outreach campaign. Full descriptions of the City's water conservation programs are included in Section 5, "Demand Management Measures".

The magnitude of future supply deficiencies is difficult to estimate. The total amount of water the SFPUC has available to deliver during a defined period of time is dependent on several factors which generally include a comparison of: 1) the amount of water that is available to the SFPUC system from natural runoff and reservoir storage; and 2) the amount of that water that

must be released from the SFPUC's system for commitments to purposes other than customer deliveries (e.g., releases below Hetch Hetchy reservoirs to meet Raker Act and fishery purposes).

The 1987-93 drought profoundly highlighted the deficit between SFPUC's water supplies and the demands on the SFPUC system. Based on the 1987-93 drought experience, the SFPUC assumes its "firm" capability to be the amount the system can be expected to deliver during historically experienced drought periods. In estimating this firm capability, the SFPUC assumes the potential recurrence of a drought such as occurred during 1987-93, plus an additional 18 months of limited water availability. The SFPUC used this "design drought" to develop the level of service goals for the Water System Improvement Program (WSIP) of meeting at least 80% of customer demands during periods of water shortage.

Reliability of the Regional Water System

The SFPUC's WSIP provides goals and objectives to improve the delivery reliability of the RWS, including water supply reliability. The goals and objectives of the WSIP related to water supply are:

Program Goal	System Performance Objective
Water Supply – *meet customer water needs in non-drought and drought periods*	Meet average annual water demand of 265 MGD from the SFPUC watersheds for retail and wholesale customers during non-drought years for system demands through 2018. Meet dry-year delivery needs through 2018 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts. Diversify water supply options during non-drought and drought periods. Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.

The adopted WSIP had several water supply elements to address the WSIP water supply goals and objectives. The following provides the water supply elements for all year types and the dry-year projects of the adopted WSIP to augment all year type water supplies during drought.

<u>Water Supply – All Year Types</u>

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.

Water Supply – Dry-Year Types

The adopted WSIP includes the following water supply projects to meet dry-year demands with no greater than 20% system-wide rationing in any one year:

- **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 is constructing a new dam of equal height downstream of the existing dam. The project EIR was certified by the San Francisco City Planning Commission in 2011, and construction is now ongoing. Construction of the new dam is slated for completion in 2018; the entire project should be completed in 2019.
- **Alameda Creek Recapture Project**: The Alameda Creek Recapture Project will recapture the water system yield lost due to 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. The project's Draft EIR will be released in the spring of 2016, and construction will occur from spring 2017 to fall 2018.
- **Lower Crystal Springs Dam Improvements**: The Lower Crystal Springs Dam Improvements were substantially completed in November 2011. While the project has been completed, permitting issues for reservoir operation have become significant. While the reservoir elevation was lowered due to Division of Safety of Dams 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 the original reservoir elevation can be restored.
- **Regional Groundwater Storage and Recovery Project**: The Groundwater Storage and Recovery 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. The project seeks to balance the management of groundwater and surface water resources in a way that safeguards 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, allowing them to reduce the amount of groundwater that they pump from the South Westside Groundwater Basin. Over time, the reduced pumping would allow the aquifer to recharge and result in increased groundwater storage of up to 20 billion gallons. The project's Final EIR was certified in August 2014, and the project also received Commission approval that month. The well station construction contract Notice to

Proceed was issued in April 2015, and construction is expected to be completed in spring 2018.

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 is having ongoing discussions with the Oakdale Irrigation District for a one-year transfer agreement with the SFPUC for 2 MGD (2,240 acre-feet).

In order to achieve its target of meeting at least 80% of its customer demand during droughts at 265 MGD, 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 Lower Crystal Springs Dam Improvements include a combined commitment of 12.8 MGD for instream flows on average. When this is reduced for an assumed Alameda Creek Recapture Project recovery of 9.3 MGD, the net loss of water supply is 3.5 MGD. The SFPUC's participation in regional water supply reliability efforts, such as the Bay Area Regional Desalination Project, additional water transfers, and other projects may help to make up for this shortfall.

Projected SFPUC Regional Water System Supply Reliability

The SFPUC has provided the data in the table in Appendix I presenting the projected RWS supply reliability. This table assumes that the wholesale customers purchase 184 MGD from the RWS through 2040 and the implementation of the dry-year water supply projects included in the WSIP. The numbers represent the wholesale share of available supply during historical year types per the Tier One Water Shortage Allocation Plan. This table does not reflect any potential impact to RWS yield from the additional fishery flows required as part of Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements Project.

Impact of Recent SFPUC Actions on Dry-Year Reliability

As noted earlier, in adopting the Calaveras Dam Replacement Project and the Lower Crystal Springs Dam Improvements Project, the SFPUC committed to providing fishery flows below Calaveras Dam and Lower Crystal Springs Dam, as well as bypass flows below Alameda Creek Diversion Dam. The fishery flow schedules for Alameda Creek and San Mateo Creek represent a potential decrease in available water supply of an average annual 9.3 MGD and 3.5 MGD, respectively with a total of 12.8 MGD average annually. The Alameda Creek Recapture Project, described above, will replace the 9.3 MGD of supply lost to Alameda Creek fishery flows. Therefore, the remaining 3.5 MGD of fishery flows for San Mateo Creek will potentially create a shortfall in meeting the SFPUC demands of 265 MGD and slightly increase the SFPUC's dry-year water supply needs.

The adopted WSIP water supply objectives include (1) meeting a target delivery of 265 MGD through 2018 and (2) rationing at no greater than 20% system-wide in any one year of a

drought. As a result of the fishery flows, the SFPUC may not be able to meet these objectives between 2015 and 2018. Participation in the Bay Area Regional Desalination Project and additional water transfers, as described earlier, may help manage the water supply loss associated with the fishery flows.

As a result of the Individual Supply Guarantees described above, the SFPUC has a responsibility to provide 184 MGD to its wholesale customers in perpetuity, regardless of demand. Therefore, the current projections for purchase requests through 2018 remain at 265 MGD, which includes wholesale and retail demand. However, in the last decade including the current drought, SFPUC deliveries have been below this level, as illustrated in the Table 20 below.

Table 20: Water Deliveries in San Francisco Regional Water System Service Area[38]

Fiscal Year	Total Deliveries (MGD)
2005-06	247.5
2006-07	257.0
2007-08	254.1
2008-09	243.4
2009-10	225.2
2010-11	219.9
2011-12	220.5
2012-13	223.9
2013-14	222.3
2014-15	196.0

Under the current drought and as of January 31, 2016, the SFPUC has called for, but has not mandated, a 10% system-wide reduction since January 2014. The SFPUC has not yet been compelled to declare a water shortage emergency and impose mandatory system-wide rationing because its customers have exceeded the 10% voluntary system-wide reduction in conjunction with the state-wide mandatory reductions assigned by the State Water Resources Control Board. If current drought conditions worsen between 2015 and 2018, and the SFPUC determines that system-wide rationing would need to be imposed, then the SFPUC would issue a declaration of a water shortage emergency in accordance with Water Code Section 350 and implement rationing in accordance with the WSA and WSAP as described above.

Climate Change

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 purposes, 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

[38] Reference: SFPUC FY 9-10 and FY 2014-15 J-Tables Line 9 "Total System Usage" plus 0.7 MGD for Lawrence Livermore National Laboratory use and 0.4 MGD for Groveland. No groundwater use is included in this number. Non-revenue water is included.

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, intensity and variability of precipitation, and an increased amount of precipitation falling as rain instead of as snow;
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality 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 2013 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 Regional Water System (RWS). These works are summarized below.

Bay Area Integrated Regional Water Management Plan

Climate change adaptation was established as an overarching theme for the 2013 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 Department of Water Resources' (DWR's) *Climate Change Handbook for Regional Water Planning* and using the most current science available for the Region. The vulnerability assessment, summarized in Table 21 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 21: Summary of BAIRWMP Climate Change Vulnerability Assessment

Vulnerability Areas	General Overview of Vulnerabilities
Water Demand	Urban and Agricultural Water Demand – Changes to hydrology in the Region as a result 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 percent 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. 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. 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.

Vulnerability Areas	General Overview of Vulnerabilities
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 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. 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. 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. 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. Changes to precipitation regimes may increase flooding. 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 Vulnerabilities
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. 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 cold water aquatic species. 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. 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 as a result of climate change. Some hydropower is also produced within the region and could also be affected by changes in the timing and amount of runoff.

Source: 2013 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 percent from present-day conditions by 2040 and by 2.6-10.2 percent 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 percent from present-day conditions by 2040 and by 24.7-29.4 percent 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 percent 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 planning to conduct a comprehensive assessment of the potential effects of climate change on water supply. The assessment will incorporate an investigation of new research on the current drought and is anticipated to be completed in late 2016 or early 2017.

Plans to Assure a Reliable Water Supply

The City has completed several studies and projects regarding water supply reliability. Of note, the City completed the Emergency Water Supply and Storage Project and certified the Project EIR for Phase 3 of the recycled water project. In addition, the City is continuing to evaluate other water supply alternatives as part of its ongoing Water Integrated Resource Plan (WIRP). This analysis will include the impact of long-term water supply shortage on the total water supply.

Section 7 – Water Shortage Contingency Plan

Law

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

Background

Except for recycled water, the City does not currently produce any of its own water supplies, but is dependent upon its suppliers. The City's primary supplier is the SFPUC. The SFPUC is the only supplier in normal years. The City's five older wells have been refurbished and the City completed construction of three new wells to remain in standby for use during emergencies and potentially to supplement the SFPUC supply during a severe drought. The SCVWD manages the county's groundwater and levies a groundwater extraction fee for all water produced by the wells within its jurisdictions. The City has also approved and signed a mutual aid agreement for emergency water supplies with California's Water Agency Response Network (Coastal group) that has over 75 signatories.

To meet the requirements of the Urban Water Management Planning Act and for the purposes of this document, a distinction will be made between a catastrophic interruption of water supplies and a water shortage due to drought. A catastrophic interruption of water supplies may occur due to natural disaster such as an earthquake or due to a sudden problem with water quality, or because of sabotage or terrorism. A water shortage due to drought is the more likely occurrence. The City has experienced three drought water shortages in the past 35 years, in l976-77, from l987 to l993, and the current ongoing drought.

Catastrophic Interruption of Supply

Regional System Reliability

The City, through BAWSCA, was actively involved in the review of the SFPUC System Vulnerability Report. This study examined the vulnerability of the SFPUC system to catastrophic events (e.g., earthquakes). The study, released in January 2000, indicated that some areas in the regional system could be without water for up to 60 days. To address these deficiencies, the SFPUC developed the WSIP to repair and upgrade the regional system. The program, nearly

completed now, included projects to repair, replace and seismically upgrade the regional water system's pipelines and tunnels, reservoirs and dams.

Planning, Training and Exercise

Following San Francisco's experience with the 1989 Loma Prieta Earthquake, the SFPUC created a departmental *SFPUC Emergency Operations Plan (EOP).* The *SFPUC EOP*, originally released in 1992, has been updated on average every two years. The latest EOP revision was in 2012. The *EOP* addresses a broad range of potential emergency situations that may affect the SFPUC, and it supplements the City and County of San Francisco's EOP, which was prepared by the Department of Emergency Management and last updated in 2007. Specifically, the purpose of the *SFPUC EOP* is to describe the SFPUC's emergency management organization, roles and responsibilities and establish emergency policies and procedures.

In addition, SFPUC divisions and bureaus have their own EOPs that are in alignment with the SFPUC EOP and describe their respective emergency management organization, roles and responsibilities and emergency policies and procedures. The SFPUC tests its emergency plans on a regular basis by conducting emergency exercises. Through these exercises the SFPUC learns how well the plans will or will not work in response to an emergency. Plan improvements are based on exercise and sometime real world event response and evaluation. Also, the SFPUC 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 individual emergency response roles.

Emergency Drinking Water Planning

With respect to drinking water quality, several SFPUC plans are relevant including the:

- Cryptosporidium Detection action Plan Revised in 2008
- Water Quality Notifications and Communications Plan revised in 2010
- Water Contamination and Response and Consequence Management Plan revised in 2012
- Regional Water System Emergency Disinfection and Recovery Plan revised in 2012
- Water Supply and Treatment Division Emergency Operations Plan revised in 2013

Power Outage Preparedness and Response

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 regional system 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 backup power in place in the form of generators or diesel

powered pumps. Additionally, both the Sunol Treatment Plant and the San Antonio Pump Station would not be impacted by a failure of the regional power grid because it runs off of the SFPUC hydro-power generated by the regional system

- Both the Harry Tracy Water Treatment Plant and the Baden Pump Station have backup generators in place.
- Additionally, the WSIP has expanded the SFPUC's ability to remain in operation during power outages and other emergency situations.

Capital Projects for Seismic Reliability and Overall System Reliability

As described in Section 6, the SFPUC has undertaken the WSIP to enhance the ability of the SFPUC water supply system to meet identified service goals for water quality, seismic reliability, delivery reliability, and water supply. The WSIP also included projects related to standby power facilities at various locations. These projects provide for standby electrical power at six critical facilities to allow these facilities to remain in operation during power outages and other emergency situations.

Local Distribution System Reliability

The City has improved its emergency supply preparedness by rehabilitating five existing wells, drilling three new wells, and building an additional water storage reservoir. The well system can now support a minimum of eight hours of normal water use at the maximum day demand level and four hours of fire suppression at the design fire duration level.

The City also maintains several critical interconnections with neighboring water utilities as shown in Table 22. These interties can be activated during critical events to ensure water supplies are not impacted and also to provide mutual aid to neighboring communities.

Table 22: Interties with other Agencies

Name	Number	Diameter (inches)
East Palo Alto	1	6
Mountain	2	6
Stanford	2	8
Purissima Hills WD	2	8,12

Emergency Response Plan

Response to a catastrophic interruption of supply is handled through a series of interconnected plans. All Disaster or Act of War Plans, from the state to local levels, use the Federal Civil Defense and Emergency Planning systems as role models with additions that take into consideration any unique conditions or situations that may exist within their jurisdictions.

At the national level, the Federal Emergency Management Agency (FEMA) controls all functions of Civil Defense or Emergency Planning for the Federal Government. FEMA will not assume control of an emergency until the President declares a State of Emergency or an Act of War

occurs. At that point FEMA will assume control through the State of California Office of Emergency Services (State OES) and make available all of its resources.

At the state level, the State OES will control any disaster within the state and make its resources available after a State of Disaster has been declared by the governor. The State OES further controls the Master Mutual Aid Agreement that can also be used in a local disaster (the City is a member of California's Water Agency Response Network, Region 2, a mutual aid system for water utilities, in accordance with State requirements).

At the county level, the Santa Clara County OES will control the unincorporated areas of the County. It will coordinate mutual aid within the County and act as an intermediary between local governments or utilities and the State mutual aid office.

On the city level, the City will control all emergencies according to its Emergency Response Plan. The Mayor, City Council or City Manager may declare an emergency at which time representatives of all City departments will report to the Emergency Operations Center.

The City's Emergency Response Plan incorporates the CPAU Water, Gas and Wastewater Operations Emergency Response Plan (the UER Plan), which covers any emergency curtailment of water supplies. The UER Plan is a detailed outline of actions to be taken and procedures to be followed by utility personnel in event of a water emergency. This plan is maintained in the office of Water, Gas and Wastewater Operations and must be updated every 12 months.

The UER Plan is designed as both an outline and a procedures manual. It covers the following primary functions:

1) Notification Procedures
2) Water Mutual Aid Agreement
3) Radio/Telephone /Communications
4) Water Receiving Station and Reservoir Check List
5) Boil Water Notifications
6) Highest Water Use Customer Load Reduction List
7) Water Interconnect Locations
8) Disinfecting of Water Mains

All CPAU personnel whose duties include work on the system through maintenance or construction operations, or as Utilities Dispatchers, are highly trained and experienced in performing their normal or "common emergency" duties. If a disaster or Act of War were to occur, the City's construction standards may have to be lowered to make temporary repairs to expedite the restoration of the system, but the procedures and safety rules by which the work would be accomplished will not change. These temporary repairs would be upgraded and made permanent or replaced, as necessary, at a later date. The City's primary concern is the safety of the general public and all City personnel.

To that end, CPAU continues to maintain three diesel emergency generators in order to enhance the water system response reliability during a catastrophic seismic event causing severance from the City's primary supply source, and is investigating additional purchases or leases. Lease acquisition of these emergency generators will fulfill this reliability goal for the medium- and the long-term. At the same time, given the uncertainty of the future, acquisition through lease agreements for these emergency gen sets will reduce the City's risk of generator inoperability. Generators would enable continued operation of water facilities during a transmission grid failure.

Water Shortage Contingency Analysis

Law

> 10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:
>
> (4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
>
> (5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.
>
> (6) Penalties or charges for excessive use, where applicable.
>
> 10632. (b) Commencing with the urban water management plan update due July 1, 2016, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

Palo Alto's Experience with Drought Management

The City has had considerable experience implementing action plans during a period of water shortage, such as a drought. The City has always been able to comply with any rationing requirement imposed by SFPUC. During the 1976/77 drought period, the City achieved reductions in citywide consumption of 16% in FY 1977 and 37% in FY 1978 compared to consumption in FY 1976. In the 1987-1993 drought period, the City's consumption was lower than consumption in 1987, the year just before SFPUC instituted mandatory rationing, by from 19% (in FY 1989) to over 35% (in FY 1992). In response to the voluntary 10% call for rationing in 2008-2009, the City responded with reductions of approximately 18% relative to 2004 consumption.

In 2015, the City responded to state-mandated potable water use reductions by implementing the water restrictions in Stage II of its WSCP. As of the end of January 2016, the City is on track to meet the 24% cumulative reduction target for the June 1, 2015 through October 31, 2016 compliance period compared to calendar year 2013. For the period June 1, 2015 through December 31, 2015, the City's usage was 33% below usage during the same period in 2013.

During these periods of water shortage and state-mandated reductions, the community has responded exceedingly well to requests to use water in the most efficient way possible. As a result of experiencing these drought-time water supply shortages, many residents and businesses have implemented permanent improvements in water use efficiency.

During a water shortage period, the Director of Utilities is responsible for executing the Water Shortage Contingency Plan. Representatives from appropriate City Departments and Utilities Divisions would need to be involved to oversee outreach and monitoring efforts. Additional resources will need to be dedicated to this effort both for internal and external execution of the plan.

A key element to developing water shortage contingency plans for the City is close coordination and cooperation with SFPUC, BAWSCA, and the SCVWD. It is critical to develop a coherent and coordinated regional response to water shortages in order to provide a consistent message to customers.

Regional Interim Water Shortage Allocation Plan

Tier One Drought Allocations

In July 2009, as part of the WSA, the wholesale customers and San Francisco adopted a Water Shortage Allocation Plan (WSAP) to allocate water from the regional water system to retail and wholesale customers during system-wide shortages of 20% or less (the "Tier One Plan")[39]. The Tier One Plan allows for voluntary transfers of shortage allocations between the SFPUC and any wholesale customer and between wholesale customers themselves. In addition, water "banked" by a wholesale customer, through reductions in usage greater than required, may also be transferred.

The Tier One Plan, which allocates water between San Francisco and the wholesale customers collectively, distributes water based on the level of shortage as shown in Table 23:

Table 23: SFPUC and Wholesale Customer Share of Available Water

Level of System Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customer 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 will expire at the end of the term of the WSA on June 30, 2034, unless extended by San Francisco and the wholesale customers.

[39] The previous water shortage allocation plan expired in 2009 with the termination of the previous Water Supply Agreement with the SFPUC. Details of the previous allocation plan are provided in the 2005 UWMP.

Tier Two Drought Allocations

In 2010, the wholesale customers negotiated and adopted the Tier Two Drought Implementation Plan (Tier Two Plan), which allocates the collective wholesale customer share among each of the 26 wholesale customers. This Tier Two Plan allocation is based on a formula that takes into account multiple factors for each wholesale customer including:

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

The water supplies made available from the SFPUC will be allocated to the individual wholesale customers 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 fixed wholesale customer's Individual Supply Guarantee as stated in the WSA. The second component is the Base/Seasonal Component, which is variable and is calculated using each wholesale customers total monthly water use from all available water supplies during the three consecutive years prior to the onset of the drought. The second component is accorded twice the weight of the first 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 minimum level of supply to meet health and safety needs for certain wholesale customers.

Each wholesale customer's Allocation Factor, which represents its percentage allocation of the total available water supplies, is calculated from its proportionate share of the total of all wholesale customers' Allocation Bases. 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.

For long-term planning purposes, each wholesale customer has been provided with the Tier Two Allocation Factors calculated by BAWSCA based upon the most recent normal year to determine its share of available RWS supplies. However, actual allocations to each wholesale customer during a future shortage event will be calculated in accordance with the Tier Two plan at the onset of the shortage. For long-term planning purposes, the City is using the value identified in the Tier Two Plan adopted by the City Council, as calculated for FY 2013. Table 24 below illustrates how much water would be available to Palo Alto from the regional system under different reduction scenario's using actual water demand from FY 2013. The Tier Two Plan will expire in 2018 unless extended by the wholesale customers.

Table 24: Palo Alto Share of Available SFPUC Water (AF/Y)

	Demand (FY 2013)	One Critical Dry Year Allocation	Allocations During Multiple Dry Years		
			Year 1	Year 2	Year 3
System-wide Shortage	0%	10%	10%	22%	22%
BAWSCA	163,429	170,934	170,934	144,722	144,722
City of Palo Alto	12,692	12,692	12,692	11,425	11,425
Availability of Water for Palo Alto	100%	100%	100%	90%	90%

Palo Alto's Water Shortage Contingency Planning

The City's primary response to a water supply shortage will be to reduce consumption. The City's Water Shortage Contingency Plan describes the response at four water supply shortage stages. (Water use restrictions discussed in these stages can be found in Appendix H).

- Stage I (5% to 10% supply reductions) calls for a low level of informational outreach and enforcement of the permanent water use ordinances.
- In Stage II (10% to 20%) there will be a stepped up outreach effort and the adoption of some additional water use restrictions. Drought rate schedules will be implemented.
- Stage III (20% to 35%) calls for increased outreach activities and additional emergency water use restrictions. Drought rates in each block would increase from those in Stage II. Fines and penalties would be applied to users in violation of water usage restrictions. In some cases, water flow restriction devices would be installed on customers' meters.
- Stage IV (35% to 50%) requires very close management of the available water supplies. Allocations of water for each customer will be introduced. Informational outreach activities would be operating at a very high level. Severe water use restrictions and a restrictive penalty schedule would be implemented.

Water Shortage Mitigation Options

Water shortage mitigation options can be classified under two categories: Supply Side Options and Demand Side Options. This section provides descriptions of many different actions and activities that are possible in reaction to a water supply shortage situation. The City's response to drought-time shortages depends upon the severity of the shortage. Following this section, specific actions are outlined for the various stages of a potential shortage.

Supply Side Options

The City's options to increase its short-term water supply are limited. The City's long-term supply options are discussed in Section 3, "System Supplies." The section below discusses short-term alternatives to increase supply in the event of a water supply shortage.

City Wells

The status of the City's emergency wells is discussed in the Groundwater area of Section 3, "System Supplies." During a drought period, it would be possible to use some water from the wells to supplement the supply from the SFPUC.

Recycled Water

During a drought or a short-term water emergency, recycled water would be available to the City, however, a wide distribution of recycled water would require substantial infrastructure that would be difficult to construct in a short period of time. The City or private companies with tanker trucks can obtain permits to utilize recycled water from the RWQCP. These companies can pick up recycled water and deliver it to customers who will pay for this service. During the summer of 2015, the City increased the use of water trucks to irrigate City trees on City-owned medians and several private companies utilized recycled water to deliver water to private citizens. Public awareness is enhanced by greater publicity of the availability of this alternative to customers.

This recycled water is available except in a catastrophic disaster (severe earthquake) that severs all sources of water (SFPUC, wells and storage) to the system thereby eliminating the source of water to the RWQCP. However, in the event of a severe earthquake the delivery of recycled water will be a low priority.

Water Purchases from Other Suppliers

The City could conceivably purchase water from a new supplier in an extreme water supply shortage situation. However, any such purchase would have to be consistent with the requirements specified in the WSA[40] and be coordinated with all other jurisdictions between the source and the City to ensure the supply meets deliverability requirements. The SFPUC has made such purchases of water from various suppliers in times of water shortages. The City and all other BAWSCA member agencies have received this water through the SFPUC delivery systems. It is unlikely that the City could negotiate a better deal than the SFPUC or BAWSCA in these extremely complicated arrangements, and therefore it is unlikely that the City would seek to purchase water on its own. The City is a participant in several regional efforts to evaluate and develop new supply sources, including purchasing water from other sources. The SFPUC system has several interties with adjacent water agencies, including EBMUD and the SCVWD.

These interties could be used to "wheel" water that is purchased from other sources or agencies.

Demand Side Options

In droughts, the City expects to achieve significant amounts of demand reduction through its use of DMMs, as that term is used in the California Water Code. (See, for example, §§ 371, 10631.) These options include a combination of information outreach programs, drought rate schedules, demand side programs and water use restrictions.

[40] WSA, Section 3.12

Defining Water Features

The City owns and operates several un-metered water features including two recirculating fountains and one recreational water feature that was turned off in 2015. In addition, Baronda Lake, which uses about 250 AF over the 5 month period from mid-May through mid-October, is used for recreation and education and is habitat for several species of fish, other aquatic life and birds. The lake is also a water source for many different types of mammals. A small number of commercial customers have recirculating fountains. In the proposed and attached Water Use Restrictions ordinance, non-recirculating fountains are prohibited. The City is not aware of any non-recirculating, privately-owned water features.

Demand Side Management Programs:

Demand side management programs can be offered using many different program design options and delivery mechanisms. Some examples are listed below.

Home Water Use Reports

Home Water Reports will be used to encourage customers to save water. The Home Water Report compares a household's water usage to neighbors with similar lot sizes, landscape area, and family demographics. The reports rank a household for how water efficient it is compared to homes with similar demographics, in an attempt to encourage more water efficient behaviors and participation in conservation programs.

Information Outreach Programs

Customers will be provided with information on ways to achieve needed water use reductions. The City will communicate to the customers how best to prioritize their water use needs and how to implement alternative ways to receive the same level of service while using less water.

Information and public outreach programs include utility bill inserts, information on CPAU's website, local print media campaigns, commercial targeted mailings, workshops and demonstrations, fact sheets on conservation technologies and practices, and coordination with product manufacturers and suppliers.

Incentive-based Demand Side Management Programs

In a persistent water shortage or required water use reduction, most customers will take the quick and easy actions first. More complex and expensive incentive programs to provide demand side management may be needed to achieve additional results. Although incentive programs require time to develop and promote, significant water savings can be achieved. Depending upon market saturation, some programs such as delivery of relatively inexpensive hardware (e.g. low-flow faucet aerators and showerheads) and services such as leak detection and irrigation system audits can offer quick drought-time savings. Other programs may include a toilet rebate program or incentives to replace high water use landscapes with water efficient landscape designs and installation of efficient irrigation hardware.

Customer Water Use Audit Programs

Water audits are provided as an informational service to customers and typically include an individualized, one-on-one analysis and site-specific recommendations for both indoor and outdoor water efficiency improvements. Audits can be enhanced by the delivery of relevant, action-oriented information the customer can use to change behavioral practices or participate in additional audit or rebate programs. In a water emergency or shortage, additional staff may be needed to provide water audits, rebate program administration, and outreach assistance to residential and commercial customers.

Drought Rate Schedules

Pricing is one of the most powerful tools that a utility can use to promote its conservation goals. The overarching criteria for constitutionally compliant water rate structures—for use in droughts or not—is that all rates must be based on the cost to serve customers. Both tiered water rates and volumetric-based rates can provide an incentive to conserve. CPAU has had tiered water rates for some time, and the bulk of water revenues are from volumetric rates and not the fixed monthly meter charge. This rate design encourages efficient use of water whether in a drought or not. However, when water use declines in droughts, revenue recovery may become a problem. In September 2015, drought surcharges were developed so that, upon Council action, additional charges could be applied to ensure the financial health of the Water Fund. The drought surcharges were imposed effective September 1, 2015 to recover (via a tiered volumetric charge) the cost of operating the distribution system.

Other Potential Rate Schedules and Structures

Customer Class Targets

In many water shortage situations, no rationing of water is required – ample communication of the water shortage coupled with drought surcharges, if needed, have been sufficient to meet the City's water reduction targets in the prior and current drought. If rationing of water is required to meet a water reduction requirement in a drought, customer class targets should mirror the required indoor/outdoor water reduction goals that may be established during a drought. Whether there will be different rate schedules (consistent with the cost of service requirement) for each customer class will be determined by: (a) the severity of the water shortage, and (b) the capabilities and limitations of the utility billing system. Experience has shown that separating the single- family residential customers—which are more homogeneous than any other customer group—from all other customer groups is generally the only distinction needed.

Allocation Methods

Any allocation plan would take into consideration the criteria listed in Appendix G. These criteria will be a guide to selecting the most efficient and effective water use reduction method under the particular circumstances of a specific drought situation.

1. *Allocations Based on Percentage of Past Use*

Plans that base a customer's allocation on a percentage of past use are sometimes perceived as fair and easy to administer. However, these plans have three significant shortcomings. First,

selection of a base year is problematic. There have been two water shortage periods in the City since l976. It would be difficult to pick a base year unaffected by shortage year programs on the one hand, or gradually increasing water use after a drought (the "rebound effect") on the other. The second problem is that each year the turnover of new accounts is approximately 20 to 30% (mostly multi-family residents). In addition, many businesses have changed their practices to some extent over the years. Therefore to use this plan in 2015 and beyond would mean that a large percentage of water customers would have an allocation based on a previous occupant's usage, a previous operation, or some alternative situation. Handling the large volume of such cases can create administrative difficulties and perceptions of inequities as revised or new allocations are assigned to these customers. The third major flaw in the "percent of past use" concept is that, regardless of base year selected, historically conservation-minded customers may feel penalized for their past efforts while profligate users may have too large an allocation.

2. *Equal Allocation for Each Home (for single-family residential)*

This plan would set an identical allocation for each home designed to meet the target reduction for the class. The first tier in the rate structure[41] would be set at this target amount. The second tier would be a "buffer" tier designed to accommodate seasonal water needs. The third and last tier would be a penalty rate block price considerably higher than the first two tiers.

All homes would be treated the same under this plan. In addition, it would be inexpensive to administer and easy to understand and implement. However, it could be perceived as unfair by relatively large families or customers with large lots.

Under this plan, hardship exemptions would be limited to those who require more water for health or safety reasons. No additional allowances would be provided for the number of persons living in the household or the landscaping requirements of the particular size lot. Enforcement of this plan would involve installing a flow restrictor on those customers who continue to exceed the allotment beyond a two-month period.

3. *Complete Per Capita Allocation Plan (for single-family residential)*

Under this plan each person would be allocated a certain amount of water per month. In addition, each household would be allotted a certain amount of water per month for other essential needs, including a base minimum amount for outdoor watering of shrubs and trees. Per capita information would be based on information supplied by the customers through a special mailing. The strength of this plan is that it would probably be more acceptable to the community than the equal allotment per household plan because it takes into account the relationship between water usage and the number of persons living in a household. Its weaknesses are the inability of the current Utilities billing system to record or manage "per capita" data and verification of per capita information.

[41] Any rate design must be consistent with "cost of service" principles embedded within the California constitution.

4. Default Per Capita Allocation Plan (for single-family residential)

Under this plan each household would receive an allocation sufficient for families of a default size. For households over that size, an additional amount would be allocated per month for the number of people over the default size. This plan is easier to administer than a complete per capita plan since the number of data entries is significantly reduced. The plan's weakness is its lack of detail or fine-tuning for households under the default size, which may be perceived as unfair by larger households.

Mandatory Water Rationing Plans Applicable to Multi-Family Accounts, Business, and City Departments

Due to the differences between customer classes, it is difficult to construct rationing plans that meet all the criteria listed in Appendix G. During the 1987-1993 drought period, the City introduced Baseline Consumption Allowances (BCAs) for all customer classes except single-family residential accounts. This includes multi-family residential, commercial, industrial, institutional, and city facilities accounts. The BCA was intended to represent the indoor consumption of each customer.

It is important for any allocation plan to take into account the specific needs of these customer classes because of their diversity and unique requirements. The BCA does this. Rate structures using the BCAs can be constructed as appropriate to meet the reduction targets required and to provide the economic incentive necessary to prompt customer action. And, the targets and the associated rate block prices could be changed as the reduction requirement changes. Weaknesses of this method are that it may not accurately represent indoor water use. For example, exemptions would have to be considered for customers with cooling towers, since lack of water for cooling towers would effectively end the customers' ability to cool their building interiors, resulting in possible health and safety impacts of employees. Another alternative in extreme cases (Stage 3 or higher) could be an allocation per fixture plus a cooling tower credit, which is similar to the per capita method for residences.

Excessive Use Penalties for All Allocation Methods

Penalties for excessive use are expected to vary according to the customer class. For single-family residential customers exceeding percent-of-past-use, equal-allocation-per-home, or per capita water use, the penalty could be installation of a flow restrictor when usage continued to exceed the allocation beyond a 2-month period. Enforcement of this penalty would only occur after customers were notified and any reasonable appeals had been processed.

For customers under a BCA (all classes except single family residential), the primary penalty is in the rate structure itself.

Water Use Prohibitions, Mandatory Restrictions

Adopting water use restrictions is another way to manage how customers use a limited resource. Restrictions can be classified as those preventing water waste, those "setting a tone", and those that prohibit low priority use in times of severe shortages.

In the case of a system-wide water shortage, close coordination with SFPUC is necessary. One of the considerations for selecting which water use restriction ordinances to adopt is what the City's suppliers recommend for the region. Both the SFPUC and SCVWD provide recommendations, and the City will attempt to follow those recommendations so that regional consistency is achieved.

The City's ability to enforce restrictions is also a critical variable in the selection of water use regulations. For restrictions to be credible and obeyed they must be enforceable and enforced. Therefore certain restrictions, such as limits on indoor uses such as showering, are not practical.

Water use restrictions are achieved by using the methods, prohibitions and penalties described in the sections below. Appendix H lists permanent water use restrictions that the City currently has in place and is proposing to put in place, and those that may be adopted on an emergency basis in times of state-mandated reductions or water shortage[42].

Stages of Action

Actions to be taken in response to a water shortage or state-mandated reduction depend on the severity of the shortage or the magnitude of the required reduction. The staged responses (Stage I to Stage IV) depend to some extent upon the local conditions and the length of time that customers have had to focus their attention on the water shortage. For each stage noted below, activity levels in several key areas are described. Appendix H, the Water Shortage Contingency Plan, details the planned water use restrictions for each reduction level. Reduction targets will be based on the most recent non-drought year. If a different base year were to be selected, the programs might require modification. In all stages, action will be taken to ensure City facility water use is reduced by the appropriate amount.

Some factors which influence the effectiveness of any water management plan include: (1) the customer's behavior and perception of the need to conserve; (2) weather; (3) the duration of the shortage or mandate; (4) the customer's economic situation; (5) the extent to which the City achieves its utility revenue targets; (6) the percentage of exemptions or variances granted; (7) the role of the media; and (8) the customer's acceptance of the need for water use reduction.

Because each water shortage situation is unique in duration, in breadth and in involvement by the state, there is a need for some flexibility in selecting the exact response strategy. Even with the same reduction target, the strategy in the first year of a drought may be different than that

[42] Section 12.32.015 of the Palo Alto Municipal Code, pertaining to emergency water use regulations, previously codified and containing portions of Ordinance Nos. 3960, 3984 and 4038, was suspended, but specifically not repealed, by Ordinance No. 4150, § 2. In pertinent part, Section 2 of Ordinance No. 4150 states that Section 12.32.015 is "suspended until such time as water shortage emergency conditions shall be subsequently found, determined, and declared by the Council to exist."

recommended for an additional year of a long running drought. It is very important early in a drought period to develop outreach messages and policy directions using a longer-term perspective. In this way, communications with customers throughout the drought period will be consistent and appropriate.

STAGE I: Minimum Water Shortage – 5% to 10% target water savings
The SFPUC requested voluntary reductions in this range in 1987, 2009, and 2014 which the City was able to achieve. In those years, SFPUC did not impose rationing.

Information Outreach and Audit Programs
The City provides ongoing informational outreach and audit programs. At this water shortage stage, the focus of these programs would be on water saving information. A low level media information campaign would begin with the emphasis on reducing waste. As water consumption is monitored, the level of emphasis would be adjusted in order to meet the reduction goal.

The City has permanent ordinances in place that prohibit the waste of water and additional permanent water use restrictions are proposed to Council via ordinance on a timeline parallel with the UWMP. These ordinances are sufficient for this stage of water shortage. Enforcement would be on an "as reported" basis and mostly via reminder notices.

Incentive-based Demand Side Management Programs
Programs designed to assist customers in demand side management would be continued and augmented, to the extent necessary to provide the savings required. These programs may include a toilet rebate program or incentives to remove lawn turf for less water-thirsty landscaping or to install advanced irrigation controllers. The City would continue to monitor programs being developed by other utilities in order to take advantage of regional momentum and shorten internal development time.

Drought Rate Structures
No special drought rate structure is needed at this water shortage stage. The City's standard single-family rate structure already encourages conservation by having a relatively small fixed charge and tiered rates.

STAGE II: Moderate Water Shortage – 10% to 20% target water savings
The City was able to achieve this level of water reduction (19.1%) when rationing was imposed by the SFPUC in FY 1989. The program used at that time is basically the one outlined below.

Information Outreach and Audit Programs
The frequency of advertising and events comprising the information campaign would be increased. Water kits with low-cost conservation devices will be available to customers.

Incentive-based Demand Side Management Programs

Programs designed to assist customers in demand side management would be continued and augmented to the extent necessary to provide the savings required. These programs may include incentives for replacing high water using fixtures such as toilets, clothes washers, and irrigation devices, as well as incentives to retrofit landscapes for a low water use, drought tolerant design. The City would continue to monitor programs being developed by other utilities in order to take advantage of regional momentum and shorten internal development time.

Drought Rate Structures

In response to water shortage conditions in the 1987-1992 drought, the City established separate drought rate schedules for single-family residential and all other customers and increased the price difference between lower and higher consumption tiers. For all customers except single- family residential customers, the consumption tiers were based on a Baseline Consumption Allowance (BCA) concept. This concept is described in the section, Water Shortage Mitigation Options, as applicable to multi-family, commercial, industrial, public facilities and City facilities accounts.

Water Use Restrictions

The City would be more vigilant in enforcing the water use restrictions. A system of warnings leading to possible fines and installation of a flow restrictor would be followed. During the summer of 2015, the City developed a mobile application (311) for members of the community to report wasted water. This technology allowed for much wider enforcement by City staff. A small number of emergency water use restrictions would be added.

STAGE III: Severe Water Shortage – 20% to 35% target water savings

The City achieved usage reductions of 31.5%, 35.4%, and 32.7% in FY 1991, FY 1992, and FY 1993, respectively, in response to SFPUC water rationing. The City is on track to exceed the 24% reduction target for the 2015/2016 state-mandated compliance period. The water conservation program implemented included the following major components:

Information Outreach and Audit Programs

All activities from Stage II would continue at escalated levels. In addition, emphasis would be put on targeted outreach to high water users and special categories of water users (e.g., car washes, restaurants, etc.).

Incentive-based Demand Side Management Programs

Existing demand side management programs would be continued. Staff would continue to closely monitor overall water savings in order to determine if additional levels of rebate amounts would provide additional savings, or whether other programs would be necessary.

Drought Rate Structures

To achieve these reduction goals in past droughts, rationing was not implemented. Instead, along with an extensive information outreach effort, drought surcharges may be imposed.

If reduction goals were not being met, reduction targets may need to be developed for each customer class. Potential strategies for allocation plans are discussed above.
The exact rates and rate structures would be established upon receipt of information regarding both the reduction requirement and applicable penalties and based on the utility's overall revenue requirements.

Water Use Restrictions
Additional "emergency" water use restrictions would be added to the existing permanent restrictions. The amount of staff time dedicated to enforcement would be increased.

STAGE IV: Critical Water Shortage – 35% to 50% target water savings
A program to meet this level of water use reduction has not yet been implemented in the City. However, in the spring of 1991, the SFPUC adopted a program calling for reductions in this range. Although ultimately replaced with a less restrictive program, the City discussed what actions would be taken to meet the critical reduction targets. The program below outlines the major components of the plan to meet such a target.

Information Outreach and Audit Programs
All activities from Stage III would continue at further escalated levels. A greater focus will be placed on survival strategies and prioritization assistance for all customer classes.

Incentive-based Demand Side Management Programs
Depending on what programs have been implemented prior to this stage, or current market saturations for certain devices, a selected number of indoor conservation incentives will be offered. These may include rebates for and/or free distribution of showerheads and faucet aerators, toilet modifications or retrofits, process water use modifications and use of recycled water.

Drought Rate Structures
At this level of reduction, an allotment method would be considered for each customer. The allocations would be sufficient for the most critical, high priority uses of water and the availability of water for outside use would be dramatically reduced. Various allotment methods are discussed in the previous section, Allocation/Allotment Methods.

Water Use Restrictions
Severe "emergency" water use restrictions, many of which will supersede less stringent restrictions imposed in a less critical phase, will be added. Enforcement will be more rigorous in terms of hours of enforcement, number of staff involved, and the speed with which penalties are applied.

Alternative Water Supplies During a Water Shortage

Recycled Water Use

Recycled water offers an alternative source of water to those customers with valuable landscaping. The availability of contractors who can haul recycled water will be advertised. In addition, the City will rent tanker trucks to irrigate valuable City landscaping and street trees that will undoubtedly be stressed by a long-term drought, the likely precursor to this stage of a water shortage.

Groundwater

In the event of a water shortage emergency, the City will evaluate the use of groundwater to meet any potable water supply deficiency. The City is limited in the amount of water that can be withdrawn from the local aquifer, so any decision to rely on groundwater will include consideration for operational limitations.

Revenue and Expenditure Impacts and Measures to Overcome Impacts

Law

10632. (a) The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

…(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

(2) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(6) Penalties or charges for excessive use, where applicable.

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed

measures to overcome those impacts, such as the development of reserves and rate adjustments.

Impact on Expenditures

Water utility expenditures can be generally categorized as fixed or variable expenses. The variable costs are almost entirely related to the costs of purchasing water supplies. Although the SFPUC supply costs are expressed as a variable commodity rate, the SFPUC system, like many water delivery systems, is almost exclusively a fixed cost conveyance and treatment system. As a retail provider, the City's fixed costs primarily relate to the cost of operating and maintaining the City's distribution system.

Supply Reductions and Service Interruptions

From a utility perspective, there is a downside to water conservation: the erosion of sales revenue. As consumers reduce their usage in response to the drought, the utility will experience a decline in sales. This decline in sales revenue will necessarily be greater than the associated decline in fixed expenses due to the volumetric retail rate structure. The impact of decreased revenues on operations can be mitigated to some extent by drawing upon cash reserve balances or enacting a rate increase.

An approach for short-term revenue shortfalls is to draw upon the utility's cash reserves, if they are sufficient, to cover the financial obligations of the utility. Other options include short term borrowing, financing long-term capital projects through revenue bonds rather than through current rates, or the implementation of drought surcharges to address the loss in sales revenue. Each of these approaches has its advantages and disadvantages. The appropriate response depends upon the specific circumstances facing the utility at that moment and other factors.

Usage Reductions and Bans

Implementation cost for the informational outreach programs, monitoring, and reporting during a water shortage increases during periods of voluntary and mandatory water use reductions. The 2015 state-mandated potable water use reductions cost the City an estimated $400,000. Estimates for those costs are $30,000 to $50,000 for voluntary programs. For mandatory programs, estimated costs are $400,000 to $600,000. The net effect is an increase in the expenses per unit of water sold.

Penalties

Excessive use penalties may be associated with certain drought rate structures described above. While additional staff resources would be needed to monitor customer use and install flow restrictors on excessive water users, it is difficult to quantify the cost of such a program.

Reduction Measuring Mechanism

Law

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

…(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

Under normal water supply conditions, the amount of water coming into the City from the SFPUC regional supply line is metered at the Arastradero, California, Page Mill, Sand Hill and Lytton turnouts. The daily meter readings are maintained at the Utility Control Center. Totals are reported monthly to CPAU for comparison to the billing amounts from the SFPUC.

In water shortage periods, the mechanism for determining actual reductions in water use remains largely the same. The Director of Utilities would form an ad hoc Water Committee with representatives of all divisions to oversee outreach and monitoring efforts. During curtailment stages in a water shortage, supply figures are reported a daily basis. The Water Committee would provide timely reports to the City Council on the shortage and success of measures taken.

If curtailment reaches Stage III or Stage IV, daily supply figures are reported to the Director of Utilities and the Water Committee. The Water Committee would report monthly to City Council or as frequently as information is requested by the City Council.

Water Shortage Contingency Ordinance/Resolution

Law

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

…(8) A draft water shortage contingency resolution or ordinance.

The City has experienced three instances of water shortage due to drought in the last 35 years. A shorter duration drought occurred in l976-77, and a longer water supply deficit occurred between l987 and l993. The current drought is ongoing. Appendix F provides a draft model ordinance that could be implemented during a water shortage emergency.

Section 8 – Supply and Demand Comparison Provisions

Law

10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from the state, regional, or local agency population projections within the service area of the urban water supplier.

Supply and Demand Comparison

Since the City's primary water supply is from the SFPUC, it is useful to examine the supply-demand comparison for the entire SFPUC system. Table 25 illustrates total system deliveries for both the retail and wholesale SFPUC customers. It indicates that during normal precipitation years, the SFPUC has adequate supplies to meet its contractual obligation to the wholesale customers of 184 MGD.

Table 25: SFPUC System Supply (MGD)[43]

	2015	2020	2025	2030	2035
Wholesale Supply Total	184	184	184	184	184
SFPUC Retail Supply	81	81	81	81	81
System Supply Totals	265	265	265	265	265

In adopting the WSIP, the SFPUC approved a water supply plan that provides for an Interim Supply Allocation with an automatic sunset in 2018. For the period up to the sunset of the ISL in 2018, Palo Alto's Interim Supply Allocation is 14.70 MGD[44]. The SFPUC has deferred consideration of several supply issues until 2018 pending additional studies and analysis of the SFPUC system. For purposes of the 2015 UWMP, the SFPUC has provided a supply commitment of 184 MGD for the wholesale agencies through 2030. The City has an ISG of 17.07 MGD (or 19,118 AFY) and projects demands will remain below the City's ISG through the 2010 UWMP planning horizon. Table 26 represents the City's Supply and Demand balance for the 2015 planning horizon based on the City's contractual entitlement with the SFPUC.

[43] Letter from Paula Kehoe, SFPUC Director of Water Resources, to Nicole Sandkulla, BAWSCA, dated February 22, 2010.

[44] As stated in earlier sections, the SFPUC unilaterally imposed the ISL on the BAWSCA agencies without prior agreement or discussion. The legality of the ISL is a potential future issue if deliveries from the regional system exceed the 265 MGD threshold for the ISL. Palo Alto's ISG is a perpetual entitlement that can only be reduced pursuant to the terms outlined in the WSA. For planning purposes the City relies solely on the ISG.

Table 26: City of Palo Alto Supply/Demand Balance (AF)

	2015	2020	2025	2030	2035
Palo Alto Demand for SFPUC Water	10,724	11,883	11,411	11,132	10,879
Individual Supply Guarantee	19,118	19,118	19,118	19,118	19,118
Difference	*8,394*	*7,235*	*7,707*	*7,986*	*8,239*

As previously discussed, projects as described in the WSIP will be required to meet demands during multiple dry years. The new water sources assumed to be available, with implementation dates, are summarized in Table 27.

Table 27: SFPUC Water Supply Assumptions (AF/Y)[45] [46]

	2015	2020	2025	2030	2035	2035
Water Supply Source						
Westside Basin Groundwater (AF/Y)		8,100	8,100	8,100	8,100	8,100
Districts Transfer (AF/Y)		2,240	2,240	2,240	2,240	2,240
Crystal Springs Reservoir Capacity (20.3 BG)			x	x	x	x
Calaveras Reservoir at Full Capacity		x	x	x	x	x
Alameda Creek Recapture (9.3 MGD)		x	x	x	x	x
Reservoir Operation Affecting Supply						
Crystal Springs Reservoir Release for In-Stream Flow to San Mateo Creek (3.5 MGD)	x	x	x	x	x	x
Calaveras Reservoir Release and Alameda Creek Diversion Dam Bypass for In-Stream Flow to Alameda Creek		x	x	x	x	x

Given the additional supplies assumed to be available, Appendix I Illustrates the level of single and multi-year water delivery shortages that can be expected in the future based on historical hydrologic periods and assuming the Wholesale customer normal year demand remains at 184 MGD.

[45] Schedule for restoration of Crystal Springs Reservoir storage is tied to permitting requirements for endangered plants.

[46] Release from Crystal Springs Reservoir to meet minimum in-stream flow requirement in San Mateo Creek began in January 2015.

The impact on the City will depend on how the shortage is applied to the City. For water shortages up to 20%, the Tier One water shortage plan will be applied. The formula included in the Tier One plan indicates that the cutback for the City will be similar to the system-wide cutback, but less than the average BAWSCA cutback. For system-wide shortages greater than 20%, the SFPUC will follow the Tier One plan up to the 20% reduction, and meet and discuss incremental reductions above the Tier One plan with the wholesale customers. The SFPUC has the authority to make final allocation decision for the portion above 20%, though the wholesale customers have the contractual right to challenge the proposed approach.[47]

During a severe drought the City could utilize groundwater to supplement SFPUC supplies, but the City anticipates that even in dire circumstances only a small amount of groundwater would be served (e.g. < 10% of overall demand). In response to a severe drought the City would work with residents and businesses to significantly reduce water use, and groundwater from City wells would be considered a supplemental resource. Additional information on the City's drought response is included in Section 7, "Water Shortage Contingency Plan."

[47] WSA, Section 3.11 (c)(3)

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APPENDIX A - Resolution Adopting UWMP

Resolution No. 9589
Resolution of the Council of the City of Palo Alto Adopting the 2015 Urban Water Management Plan to be Submitted to the California Department of Resources

RECITALS

A. The California Legislature has enacted the Urban Water Management Planning Act, California Water Code Sections 10610 - 10656, 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.

B. The City of Palo Alto ("City"), a municipal utility and chartered city, is an urban water supplier providing water to a population over 60,000.

C. 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.

D. The preparation of the updated Plan has been coordinated with other public agencies to the extent practicable, and staff has encouraged the active involvement of diverse social, cultural and economic sectors of the population within the City's retail water service area during preparation of the Plan.

E. The Plan must be adopted by July 1, 2016, 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.

F. After reviewing a draft Plan at their April 12, 2016 meeting, the Utilities Advisory Commission recommended that the Council adopt the Plan as presented; and

G. A noticed public hearing on the revised draft Plan was held by the City Council on May 16, 2016, at which time public comments were heard and considered.

NOW, THEREFORE, the Council of the City of Palo Alto RESOLVES as follows:

SECTION 1. The Council hereby adopts the 2015 Urban Water Management Plan of the City of Palo Alto, which shall be filed with the City Clerk. The City Manager is hereby authorized and directed to file the 2015 Urban Water Management Plan of the City of Palo Alto with the California Department of Water Resources and the State Library.

160229 jb 6053692

SECTION 2. The Council finds and determines that, under the California Water Code Section 10652, the adoption of the Plan and this resolution does not constitute a project under the California Environmental Quality Act, and no environmental assessment is required.

INTRODUCED AND PASSED: May 16, 2016

AYES: BERMAN, BURT, DUBOIS, FILSETH, HOLMAN, KNISS, SCHARFF, SCHMID, WOLBACH

NOES:

ABSENT:

ABSTENTIONS:

ATTEST:

DocuSigned by:
Beth Mizuno

City Clerk

DocuSigned by:

Mayor

APPROVED AS TO FORM:

DocuSigned by:
Amy Bartell

Senior Deputy City Attorney

APPROVED:

DocuSigned by:

City Manager

DocuSigned by:

Director of Utilities

DocuSigned by:

Director of Administrative Services

Certificate Of Completion

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Palo Alto , CA 94301
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James Keene james.keene@cityofpaloalto.org City Manager City of Palo Alto Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Accepted: 4/14/2015 5:40:07 PM ID: 44fe333a-6a81-4cb7-b7d4-925473ac82e3	DocuSigned by: Using IP Address: 50.174.200.162	Sent: 5/27/2016 7:37:07 AM Viewed: 6/7/2016 9:20:46 PM Signed: 6/7/2016 9:22:16 PM

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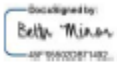
Patrick Burt patrick.burt@cityofpaloalto.org Mayor City of Palo Alto Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign ID:	 Using IP Address: 50.174.201.68 Signed using mobile	Sent: 6/7/2016 9:22:17 PM Viewed: 6/8/2016 8:38:18 AM Signed: 6/8/2016 8:38:44 AM
Beth Minor Beth.Minor@CityofPaloAlto.org City Clerk City of Palo Alto Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign ID:	 Using IP Address: 199.33.32.254	Sent: 6/8/2016 8:38:46 AM Viewed: 6/8/2016 8:56:44 AM Signed: 6/8/2016 8:57:15 AM
In Person Signer Events	**Signature**	**Timestamp**
Editor Delivery Events	**Status**	**Timestamp**
Agent Delivery Events	**Status**	**Timestamp**
Intermediary Delivery Events	**Status**	**Timestamp**
Janet Billups Janet.Billups@CityofPaloAlto.org Claims Investigators City of Palo Alto Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Accepted: 7/16/2015 9:40:23 AM ID: dfe1018f-934f-4300-bbf3-382374c81668	VIEWED Using IP Address:	Sent: 5/24/2016 8:12:45 AM Completed: 6/8/2016 8:57:15 AM
JULIA POLLARD Julia.Pollard@CityofPaloAlto.org Administrative Assistant City of Palo Alto Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign ID:	VIEWED Using IP Address:	Sent: 5/24/2016 8:20:50 AM Completed: 6/8/2016 8:57:15 AM
Judy Ng Judy.Ng@CityofPaloAlto.org Security Level: Email, Account Authentication (None) Electronic Record and Signature Disclosure: Not Offered via DocuSign ID:	VIEWED Using IP Address: 199.33.32.254	Sent: 5/24/2016 9:06:42 AM Viewed: 6/2/2016 7:50:21 AM Completed: 6/8/2016 8:57:15 AM

APPENDIX B - Public Participation Notices

CITY OF PALO ALTO

NOTICE OF PUBLIC HEARING ON URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the Palo Alto City Council will hold a Public Hearing at the regularly scheduled meeting on Monday, May 16, 2016 at 6:00 p.m. or as near thereafter as possible, in the Council Chambers, 250 Hamilton Avenue, Palo Alto, to consider the City of Palo Alto (City) adoption of the draft 2015 Urban Water Management Plan (Draft 2015 Plan) in compliance with the California Urban Water Management Planning Act; and

The California Urban Water Management Planning Act requires the City to review and update its Urban Water Management Plan every five years. The Draft 2015 Plan is available for public review and comment through the end of the public hearing described above. The Draft 2015 Plan is available online for public review at www.cityofpaloalto.org/uwmp, in print at the City libraries, and in the Council Chambers of City Hall.

BETH MINOR
City Clerk

Publish on Friday**, April 29**, 2016 and Friday, **May 6**, 2016

APPENDIX C - Water Loss Report

AWWA WLCC Free Water Audit Software: Reporting Worksheet

WAS v4.2

Back to Instructions

? Click to access definition

Water Audit Report for: City of Palo Alto
Reporting Year: 2014 (7/2013 - 6/2014)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	n/a	0.000	acre-ft/yr	
Master meter error adjustment (enter positive value):	n/a	0.000		acre-ft/yr
Water imported:	9	12,642.684	acre-ft/yr	
Water exported:	n/a	0.000	acre-ft/yr	
WATER SUPPLIED:		12,642.684	acre-ft/yr	

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

			Pcnt:	Value:
Billed metered:	7	11,584.745	acre-ft/yr	
Billed unmetered:	n/a	0.000	acre-ft/yr	
Unbilled metered:	n/a	0.000	acre-ft/yr	
Unbilled unmetered:		158.034	acre-ft/yr	1.25%

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION:		11,742.779	acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption)

899.905 acre-ft/yr

Apparent Losses

			Pcnt:	Value:
Unauthorized consumption:		31.607 acre-ft/yr	0.25%	

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	5	277.615	acre-ft/yr	277.615
Systematic data handling errors:	10	28.962	acre-ft/yr	
Apparent Losses:		338.183		

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	561.722	acre-ft/yr
WATER LOSSES:	899.905	acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER:	1,057.938	acre-ft/yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	236.0	miles
Number of active AND inactive service connections:	6	27,701	
Connection density:		117	conn./mile main
Average length of customer service line:	5	0.0	ft (pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	10	72.2	psi

COST DATA

Total annual cost of operating water system:	10	$39,097,916	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$7.62	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	10	$1,067.22	$/acre-ft

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	8.4%
Non-revenue water as percent by cost of operating system:	4.8%
Annual cost of Apparent Losses:	$1,122,379
Annual cost of Real Losses:	$599,480

Operational Efficiency Indicators

Apparent Losses per service connection per day:	10.90	gallons/connection/day
Real Losses per service connection per day*:	18.10	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.25	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	439.30	acre-feet/year
From Above, Real Losses = Current Annual Real Losses (CARL):	561.72	acre-feet/year
? Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.28	

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 82 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Customer metering inaccuracies
2: Billed metered
3: Water imported

For more information, click here to see the Grading Matrix worksheet

APPENDIX D – DWR Standardized Tables

Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
4310009	City of Palo Alto	19,863	10,177
	TOTAL	19863	10,177
NOTES:			

Table 2-2: Plan Identification (Select One)		
☑	Individual UWMP	
☐	Regional UWMP (RUWMP) *(checking this triggers the next line to appear)*	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
NOTES:		

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
☐	Agency is a wholesaler
☑	Agency 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 Day that the Fiscal Year Begins (dd/mm)	
1/7	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

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 CWC 10631.
Wholesale Water Supplier Name *(Add additional rows as needed)*
San Francisco Public Utilities Commission
NOTES:

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	67,400	70,500	73,700	77,100	80,800	84,600
NOTES: Table 3 in UWMP						

Table 4-1 Retail: Demands for Potable and Raw Water - Actual

Use Type	2015 Actual		
	Additional Description (as needed)	Level of Treatment When Delivered	Volume (AF)
Single Family		Drinking Water	4,554
Multi-Family		Drinking Water	1,530
Commercial		Drinking Water	1,911
Industrial		Drinking Water	397
Institutional/Governmental		Drinking Water	623
Landscape		Drinking Water	1,163
Losses		Drinking Water	546
TOTAL			10,724
NOTES	Table 11 in UWMP		

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)* ***Use 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*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
		2020	2025	2030	2035	2040-opt
Single Family		4,972	4,829	4,712	4,605	4,523
Multi-Family		1,670	1,622	1,583	1,547	1,519
Commercial		2,086	2,026	1,977	1,932	1,898
Industrial		434	421	411	402	394
Institutional/Governmental		680	661	645	630	619
Landscape		1,269	1,233	1,203	1,176	1,155
TOTAL		11110.84	10792.76	10529.91	10291.67	10107.97
NOTES: Table 11 in UWMP						

Table 4-3 Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040 *(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	10,177	11,111	10,793	10,530	10,292	10,108
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	10,177	11,111	10,793	10,530	10,292	10,108
NOTES:						

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
07/2013	562
NOTES:	

Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc... utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes
NOTES:	

Table 5-1 Baselines and Targets Summary *Retail Agency or Regional Alliance Only*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1995*	*2004*	*225*	*212*	*180*
5 Year	*2003*	*2007*	*208*		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES:					

Table 5-2: 2015 Compliance *Retail Agency or Regional Alliance Only**								
Actual 2015 GPCD	2015 Interim Target GPCD	**Optional Adjustments to 2015 GPCD** Enter "0" for adjustments not used *From Methodology 8*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
153	198	0	0	0	0	153	153	Yes
All values are in Gallons per Capita per Day (GPCD)								
NOTES:								

Table 6-1 Retail: Groundwater Volume Pumped

☑	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type *Drop Down List May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
Add additional rows as needed						
	TOTAL	0	0	0	0	0
NOTES:						

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015

☐	There is no wastewater collection system. The supplier will not complete the table below.					
	Percentage of 2015 service area covered by wastewater collection system *(optional)*					
	Percentage of 2015 service area population 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 in 2015	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*
Add additional rows as needed						
City of Palo Alto	Metered	21,616	City of Palo Alto	Regional Water Quality Control Plant	Yes	No
Total Wastewater Collected from Service Area in 2015:		21,616				
NOTES:						

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015

☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.						2015 volumes			
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
Regional Water Quality Control Plant	San Francisco Bay			Bay or estuary outfall	Yes	Tertiary	20,987	19,759	818	410
Regional Water Quality Control Plant	Bay via Emily Renzel Marsh			Wetlands	Yes	Tertiary	629	629	0	0
						Total	21,616	20,388	818	410
NOTES:										

Table 6-4 Retail: Current and Projected 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 Agency Producing (Treating) the Recycled Water:								
Name of Agency Operating the Recycled Water Distribution System:								
Supplemental Water Added in 2015								
Source of 2015 Supplemental Water								
Beneficial Use Type *These are the only Use Types that will be recognized by the DWR online submittal tool*	General Description of 2015 Uses	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation								
Landscape irrigation (excludes golf courses)	Parks	Tertiary	175	172	172	172	172	
Golf course irrigation	Palo Alto Municipal	Tertiary	166	196	196	196	196	
Commercial use								
Industrial use	RWQCP	Tertiary	448	448	448	448	448	
Geothermal and other energy production								
Seawater intrusion barrier								
Recreational impoundment								
Wetlands or wildlife habitat	Palo Alto Duck Pond	Tertiary	29	34	34	34	34	
Groundwater recharge (IPR)								
Surface water augmentation (IPR)								
Direct potable reuse								
Other	Type of Use							
		Total:	818	850	850	850	850	0
IPR - Indirect Potable Reuse								
NOTES:								

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
Use Type *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)		172	175
Golf course irrigation		196	166
Commercial use			
Industrial use		448	448
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat		34	29
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other	Required for this use		
	Total	850	818

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.		
32-34	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Add additional rows as needed			
		Total	0
NOTES:			

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.					
21-25	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List User may select more than one.*	Expected Increase in Water Supply to Agency *This may be a range*
	Drop Down List (y/n)	*If Yes, Agency Name*				
Add additional rows as needed						
NOTES:						

Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
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 Regional Water Supply System	10,724	Drinking Water	
Recycled Water	Recycled water from the Regional Water Quality Control Plant	858	Recycled Water	
Total		11,582		0
NOTES: Table 5 in UWMP				

Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
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*		**2020**		**2025**		**2030**		**2035**		**2040** *(opt)*	
		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)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Purchased or Imported Water	SFPUC Regional Water System	12,692		12,692		12,692		12,692		12,692	
Recycled Water	Recycled water from Regional Water Quality Control Plant	850		850		850		850		850	
Total		13,542	0	13,542	0	13,542	0	13,542	0	13,542	0
NOTES: Table 9 and Table 24 in UWMP											

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	2013	12,692	100%
Single-Dry Year	2013	12,692	100%
Multiple-Dry Years 1st Year	2013	12,692	100%
Multiple-Dry Years 2nd Year	2013	11,425	90%
Multiple-Dry Years 3rd Year	2013	11,425	90%
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency 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 an agency 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.			
NOTES: Table 24 in UWMP			

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	13,542	13,542	13,542	13,542	13,542
Demand totals *(autofill from Table 4-3)*	11,961	11,643	11,380	11,142	10,958
Difference	1,581	1,899	2,162	2,400	2,584
NOTES:					

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	13,542	13,542	13,542	13,542	13,542
Demand totals	11,961	11,643	11,380	11,142	10,958
Difference	1,581	1,899	2,162	2,400	2,584
NOTES: SFPUC supply plus recycled water					

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	13,542	13,542	13,542	13,542	
	Demand totals	11,961	11,643	11,380	11,142	
	Difference	1,581	1,899	2,162	2,400	0
Second year	Supply totals	12,275	12,275	12,275	12,275	
	Demand totals	11,961	11,643	11,380	11,142	
	Difference	314	632	895	1,133	0
Third year	Supply totals	12,275	12,275	12,275	12,275	
	Demand totals	11,961	11,643	11,380	11,142	
	Difference	314	632	895	1,133	0
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES:						

Table 8-1 Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description*)
Add additional rows as needed		
I	5-10%	Minimum Water Shortage
II	10-20%	Moderate Water Shortage
III	20-35%	Severe Water Shortage
IV	35-50%	Critical Water Shortage
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES:		

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
I	Other	Permanent restrictions in place with increased outreach	Yes
II	Landscape - Other landscape restriction or prohibition	No irrigation with potable water within 48 hours after measurable rainfall	Yes
II	Landscape - Limit landscape irrigation to specific days	3 days per week April-October and 1 day per week November -March	Yes
II	Other - Prohibit use of potable water for washing hard surfaces	Health and safety excepted	Yes
II	CII - Restaurants may only serve water upon request		Yes
II	CII - Lodging establishment must offer opt out of linen service		Yes
III	Landscape - Limit landscape irrigation to specific days	2 days per week April-october	Yes
III	Other water feature or swimming pool restriction	Filling of newly constructed pools, spas and hot tubs prohibited	Yes
III	Other	Water allocations may be imposed	Yes
III	CII - Other CII restriction or prohibition	Irrigation with potable water on golf courses limited to putting greens and tees	Yes
IV	Other	No new service connections unless customer pays for offsetting ocnservation	Yes
IV	Landscape - Other landscape restriction or prohibition	Drought-tolerant landscaping that minimizes irrigation and runoff required at construction sites	Yes
IV	Landscape - Prohibit certain types of landscape irrigation	Ornamental and turf irrigation	Yes
IV	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water		Yes
IV	Landscape - Prohibit certain types of landscape irrigation	Sprinkler irrigation prohibited	Yes
NOTES:			

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*
Add additional rows as needed		
I	Expand Public Information Campaign	
I	Offer Water Use Surveys	
I	Provide Rebates on Plumbing Fixtures and Devices	
I	Provide Rebates for Landscape Irrigation Efficiency	
I	Provide Rebates for Turf Replacement	
II	Other	Offer free low-cost water saving devises
II	Increase Water Waste Patrols	
II	Implement or Modify Drought Rate Structure or Surcharge	
III	Other	Possible allocations
IV	Other	All of the above at increased levels
NOTES: Pages 80-84 in UWMP		

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	12,692	11,425	11,425
NOTES: Table 24 in UWMP			

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Fremont	☑	☑
San Mateo	☑	☑
Brisbane	X	X
Burlingame	X	X
Daly City	X	X
Hayward	X	X
Millbrae	X	X
Milpitas	X	X
Mountain view	X	X
Redwood City	X	X
San Bruno	X	X
Santa Clara	X	X
Sunnyvale	X	X
Half Moon Bay	X	X
East Palo Alto	X	X
Foster City	X	X
Menlo Park	X	X
Belmont	X	X
Pacifica	X	X
Los Altos Hills	X	X
San Jose	X	X
Stanford	X	X
Hillsborough	X	X
South San Francisco	X	X
San Jose	☑	☑
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Santa Clara County	☑	☑
	☐	☐
	☐	☐
NOTES:		

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges

Baseline	Parameter	Value	Units
10- to 15-year baseline period	2008 total water deliveries	15,215.00	Acre Feet
	2008 total volume of delivered recycled water	968	Acre Feet
	2008 recycled water as a percent of total deliveries	6.37%	Percent
	Number of years in baseline period[1]	10	Years
	Year beginning baseline period range	1995	
	Year ending baseline period range[2]	2004	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	
	Year ending baseline period range[3]	2007	

[1] If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.

[2] The ending year must be between December 31, 2004 and December 31, 2010.

[3] The ending year must be between December 31, 2007 and December 31, 2010.

NOTES:

SB X7-7 Table 2: Method for Population Estimates

Method Used to Determine Population (may check more than one)	
☑	**1. Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population		
Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	56,647
Year 2	1996	56,885
Year 3	1997	57,420
Year 4	1998	57,868
Year 5	1999	58,136
Year 6	2000	58,467
Year 7	2001	59,334
Year 8	2002	60,028
Year 9	2003	59,930
Year 10	2004	59,894
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2003	59,930
Year 2	2004	59,894
Year 3	2005	60,319
Year 4	2006	60,992
Year 5	2007	61,323
2015 Compliance Year Population		
2015		67,400
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *								
			Deductions					
	Baseline Year *Fm SB X7-7 Table 3*	**Volume Into Distribution System** *Fm SB X7-7 Table(s) 4-A*	Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *Fm SB X7-7 Table 4-B*	Water Delivered for Agricultural Use	Process Water *Fm SB X7-7 Table(s) 4-D*	**Annual Gross Water Use**
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	13217.4816	0	0	0	0	0	13,217
Year 2	1996	15947.4105	0	0	0	0	0	15,947
Year 3	1997	15277.197	0	0	0	0	0	15,277
Year 4	1998	13676.2121	0	0	0	0	0	13,676
Year 5	1999	14610.8976	0	0	0	0	0	14,611
Year 6	2000	15426.6322	0	0	0	0	0	15,427
Year 7	2001	15449.9908	0	0	0	0	0	15,450
Year 8	2002	14775.4729	0	0	0	0	0	14,775
Year 9	2003	14174.3044	0	0	0	0	0	14,174
Year 10	2004	14978.5445	0	0	0	0	0	14,979
Year 11	0	0			0		0	0
Year 12	0	0			0		0	0
Year 13	0	0			0		0	0
Year 14	0	0			0		0	0
Year 15	0	0			0		0	0
10 - 15 year baseline average gross water use								**9,836**
5 Year Baseline - Gross Water Use								
Year 1	2003	14,174	0	0	0	0	0	14,174
Year 2	2004	14,979	0	0	0	0	0	14,979
Year 3	2005	13,538	0	0	0	0	0	13,538
Year 4	2006	13,322	0	0	0	0	0	13,322
Year 5	2007	14,603	0	0	0	0	0	14,603
5 year baseline average gross water use								**14,123**
2015 Compliance Year - Gross Water Use								
2015		10,724	0	0	0	0	0	10,724
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES:								

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source	SFPUC
This water source is:	
☐	The supplier's own water source
☑	A purchased or imported source

Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	13217.4816	0	13,217
Year 2	1996	15947.4105	0	15,947
Year 3	1997	15277.197	0	15,277
Year 4	1998	13676.2121	0	13,676
Year 5	1999	14610.8976	0	14,611
Year 6	2000	15426.6322	0	15,427
Year 7	2001	15449.9908	0	15,450
Year 8	2002	14775.4729	0	14,775
Year 9	2003	14174.3044	0	14,174
Year 10	2004	14978.5445	0	14,979
Year 11	0			0
Year 12	0			0
Year 13	0			0
Year 14	0			0
Year 15	0			0
5 Year Baseline - Water into Distribution System				
Year 1	2003	14174.3044	0	14,174
Year 2	2004	14978.5445	0	14,979
Year 3	2005	13537.5689	0	13,538
Year 4	2006	13321.6506	0	13,322
Year 5	2007	14603.0762	0	14,603
2015 Compliance Year - Water into Distribution System				
2015		10724.1345	0	10,724

** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 4-C.1: Process Water Deduction Eligibility					
Criteria 1 Industrial water use is equal to or greater than 12% of gross water use					
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction	Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	1995	13,217		0%	NO
Year 2	1996	15,947		0%	NO
Year 3	1997	15,277		0%	NO
Year 4	1998	13,676		0%	NO
Year 5	1999	14,611		0%	NO
Year 6	2000	15,427		0%	NO
Year 7	2001	15,450		0%	NO
Year 8	2002	14,775		0%	NO
Year 9	2003	14,174		0%	NO
Year 10	2004	14,979		0%	NO
Year 11	0	0			NO
Year 12	0	0			NO
Year 13	0	0			NO
Year 14	0	0			NO
Year 15	0	0			NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2003	14,174		0%	NO
Year 2	2004	14,979		0%	NO
Year 3	2005	13,538		0%	NO
Year 4	2006	13,322		0%	NO
Year 5	2007	14,603		0%	NO
2015 Compliance Year - Process Water Deduction Eligiblity					
2015		10,724		0%	NO
NOTES:					

SB X7-7 Table 4-C.2: Process Water Deduction Eligibility					
Criteria 2 Industrial water use is equal to or greater than 15 GPCD					
Baseline Year *Fm SB X7-7 Table 3*		Industrial Water Use	Population	Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	1995		56,647	0	NO
Year 2	1996		56,885	0	NO
Year 3	1997		57,420	0	NO
Year 4	1998		57,868	0	NO
Year 5	1999		58,136	0	NO
Year 6	2000		58,467	0	NO
Year 7	2001		59,334	0	NO
Year 8	2002		60,028	0	NO
Year 9	2003		59,930	0	NO
Year 10	2004		59,894	0	NO
Year 11	0		0		NO
Year 12	0		0		NO
Year 13	0		0		NO
Year 14	0		0		NO
Year 15	0		0		NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2003		59,930	0	NO
Year 2	2004		59,894	0	NO
Year 3	2005		60,319	0	NO
Year 4	2006		60,992	0	NO
Year 5	2007		61,323	0	NO
2015 Compliance Year - Process Water Deduction Eligibility					
2015			67,400	0	NO
NOTES:					

SB X7-7 Table 4-C.3: Process Water Deduction Eligibility							
Criteria 3 Non-industrial use is equal to or less than 120 GPCD							
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	Industrial Water Use	Non-industrial Water Use	Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility							
Year 1	1995	13,217		13,217	56,647	208	NO
Year 2	1996	15,947		15,947	56,885	250	NO
Year 3	1997	15,277		15,277	57,420	238	NO
Year 4	1998	13,676		13,676	57,868	211	NO
Year 5	1999	14,611		14,611	58,136	224	NO
Year 6	2000	15,427		15,427	58,467	236	NO
Year 7	2001	15,450		15,450	59,334	232	NO
Year 8	2002	14,775		14,775	60,028	220	NO
Year 9	2003	14,174		14,174	59,930	211	NO
Year 10	2004	14,979		14,979	59,894	223	NO
Year 11	0	0		0	0		NO
Year 12	0	0		0	0		NO
Year 13	0	0		0	0		NO
Year 14	0	0		0	0		NO
Year 15	0	0		0	0		NO
5 Year Baseline - Process Water Deduction Eligibility							
Year 1	2003	14,174		14,174	59,930	211	NO
Year 2	2004	14,979		14,979	59,894	223	NO
Year 3	2005	13,538		13,538	60,319	200	NO
Year 4	2006	13,322		13,322	60,992	195	NO
Year 5	2007	14,603		14,603	61,323	213	NO
2015 Compliance Year - Process Water Deduction Eligiblity							
2015		10,724		10,724	67,400	142	NO
NOTES:							

SB X7-7 Table 4-C.4: Process Water Deduction Eligibility				
Criteria 4 Disadvantaged Community *Use IRWM DAC Mapping tool* http://www.water.ca.gov/irwm/grants/resources_dac.cfm				
California Median Household Income		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
2015 Compliance Year - Process Water Deduction Eligibility				
2010	$53,046		0%	YES
A "Disadvantaged Community" is a community with a median household income less than 80 percent of the statewide average.				
NOTES:				

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1995	56,647	13,217	208
Year 2	1996	56,885	15,947	250
Year 3	1997	57,420	15,277	238
Year 4	1998	57,868	13,676	211
Year 5	1999	58,136	14,611	224
Year 6	2000	58,467	15,427	236
Year 7	2001	59,334	15,450	232
Year 8	2002	60,028	14,775	220
Year 9	2003	59,930	14,174	211
Year 10	2004	59,894	14,979	223
Year 11	0	0	0	
Year 12	0	0	0	
Year 13	0	0	0	
Year 14	0	0	0	
Year 15	0	0	0	
10-15 Year Average Baseline GPCD				**225**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2003	59,930	14,174	211
Year 2	2004	59,894	14,979	223
Year 3	2005	60,319	13,538	200
Year 4	2006	60,992	13,322	195
Year 5	2007	61,323	14,603	213
5 Year Average Baseline GPCD				**208**
2015 Compliance Year GPCD				
2015		67,400	10,724	142
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	225
5 Year Baseline GPCD	208
2015 Compliance Year GPCD	142
NOTES:	

SB X7-7 Table 7: 2020 Target Method
Select Only One

Target Method		Supporting Documentation
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator

NOTES:

SB X7-7 Table 7-A: Target Method 1
20% Reduction

10-15 Year Baseline GPCD	2020 Target GPCD
225	180

NOTES:

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target

5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target*	Calculated 2020 Target *Fm Appropriate Target Table*	Confirmed 2020 Target
208	198	180	180

** Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*

NOTES:

SB X7-7 Table 8: 2015 Interim Target GPCD

Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	2015 Interim Target GPCD
180	225	203

NOTES:

SB X7-7 Table 9: 2015 Compliance

Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*				Adjusted 2015 GPCD	2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015?
		Extraordinary Events	Weather Normalization	Economic Adjustment	TOTAL Adjustments			
142	203	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	0	142.0458502	142.0458502	YES

NOTES:

APPENDIX E – City of Palo Alto Resolution Approving Water Shortage Allocation Plan (w/attachments)

Resolution No. 9141

Resolution of the Council of the City of Palo Alto Approving a New Water Shortage Allocation Plan Pursuant to Section 3.11(C) of the 2009 Water Supply Agreement with San Francisco

WHEREAS, the City of Palo Alto is one of 26 agencies in San Mateo, Santa Clara and Alameda Counties which purchase water from the City and County of San Francisco (San Francisco) pursuant to a Water Supply Agreement entered into in 2009 (Agreement). Collectively these 26 agencies are referred to in the Agreement as Wholesale Customers.

WHEREAS, Section 3.11 of the Agreement addresses times when insufficient water is available in the San Francisco Regional Water System to meet the full demands of all users. Section 3.11(C) provides that during periods of water shortage caused by drought, the San Francisco Public Utilities Commission (SFPUC) will allocate available water between its retail customers and the Wholesale Customers collectively, in accordance with a schedule contained in the Water Shortage Allocation Plan set forth in Attachment H to the Agreement (Tier 1 Plan).

WHEREAS, Section 3.11(C) authorizes the Wholesale Customers to adopt an additional Water Shortage Allocation Plan, including a methodology for allocating the water which is collectively available to the 26 Wholesale Customers among each individual Wholesale Customer (Tier 2 Plan). It also commits the SFPUC to honor allocations of water unanimously agreed to by all Wholesale Customers or, if unanimous agreement cannot be achieved, water allocations that have been adopted by the Board of Directors of the Bay Area Water Supply and Conservation Agency (BAWSCA). The Agreement also provides that the SFPUC can allocate water supplies as necessary during a water shortage emergency if no agreed upon plan for water allocation has been adopted by the 26 Wholesale Customers or the BAWSCA Board of Directors.

WHEREAS, commencing in October 2009, representatives appointed by the managers of each of the Wholesale Customers have been meeting to develop a set of principles to serve as guidelines for an equitable allocation methodology, as well as formulas and procedures, to implement those principles. These discussions, and supporting technical analyses, have been conducted with the assistance of BAWSCA staff.

WHEREAS, the Tier 2 Plan, attached to this resolution as Exhibit A, has been endorsed by all of the Wholesale Customer representatives who participated in the formulation process and they have committed to recommend that it be formally adopted by the governing body of their respective agencies.

WHEREAS, the Tier 2 Plan allocates the collective Wholesale Customer share among each of the 26 wholesale customers through December 31, 2018 to coincide with San Francisco's deferral of decisions about additional water supply until at least 2018.

NOW, THEREFORE, the Council of the City of Palo Alto does hereby RESOLVE as follows:

EXHIBIT A

TIER 2 DROUGHT IMPLEMENTATION PLAN
AMONG WHOLESALE CUSTOMERS

This Tier 2 Drought Implementation (Plan) describes the method for allocating the water made available by the San Francisco Public Utilities Commission (SFPUC) among the Wholesale Customers during shortages caused by drought. This Plan is adopted pursuant to Section 3.11.C of the July 2009 Water Supply Agreement between the City and County of San Francisco and the Wholesale Customers (Agreement).

SECTION 1. APPLICABILITY AND INTEGRATION

Section 1.1 **Applicability**. This Plan applies when, and only when, the SFPUC determines that a system-wide water shortage of 20 percent or less exists, as set forth in a declaration of water shortage emergency adopted by the SFPUC pursuant to California Water Code Sections 350 *et seq.* This Plan applies only to water acquired and distributed by the SFPUC to the Wholesale Customers and has no effect on water obtained by a Wholesale Customer from any source other than the SFPUC.

Section 1.2 **Integration with Tier 1 Water Shortage Allocation Plan**. The Agreement contains, in Attachment H, a Water Shortage Allocation Plan which, among other things, (a) provides for the allocation by the SFPUC of water between Direct City Water Users (e.g., retail water customers within the City and County of San Francisco) and the Wholesale Customers collectively during system-wide water shortages of 20 percent or less, (b) contemplates the adoption by the Wholesale Customers of this Plan for allocation of the water made available to Wholesale Customers collectively among the 26 individual Wholesale Customers, (c) commits the SFPUC to implement this Plan, and (d) provides for the transfer of both banked water and shortage allocations between and among the Wholesale Customers and commits the SFPUC to implement such transfers. That plan is referred to as the Tier 1 Plan.

The Tier 1 Plan also provides the methodology for determining the Overall Average Wholesale Customer Reduction, expressed as a percentage cutback from prior year's normal SFPUC purchases, and Overall Wholesale Customer Allocation, in million gallons per day, both of which are used in determining the Final Allocation Factor for each Wholesale Customer. The Overall Average Wholesale Customer Reduction is determined by dividing the volume of water available to the Wholesale Customers (the Overall Wholesale Customer Allocation), shown as a share of available water in Section 2 of the Tier 1 Plan, by the prior year's normal total Wholesale Customers SFPUC purchases and subtracting that value from one.

This Plan is referred to in the Agreement as the Tier 2 Plan. It is intended to be integrated with the Tier 1 Plan described in the preceding paragraph. Terms used in this Plan are intended to have the same meaning as such terms have in the Tier 1 Plan.

TABLE 1- FIXED COMPONENT FOR USE IN TIER TWO ALLOCATION CALCULATION

Wholesale Customer	Fixed Component
ACWD	13.76
Brisbane/GVMID	0.98
Burlingame	5.23
Coastside	2.18
CWS Total	35.68
Daly City	4.29
East Palo Alto	1.96
Estero	5.90
Hayward	25.11
Hillsborough	4.09
Menlo Park	4.46
Mid Pen WD	3.89
Millbrae	3.15
Milpitas	9.23
Mountain View	13.46
North Coast	3.84
Palo Alto	17.07
Purissima Hills	1.62
Redwood City	10.93
San Bruno	3.25
San Jose	4.50
Santa Clara	4.50
Stanford	3.03
Sunnyvale	12.58
Westborough	1.32

TABLE 2 - BASE/SEASONAL CUTBACK CALCULATION FOR TIER TWO DROUGHT IMPLEMENTATION PLAN (DRIP) (Steps 1b-1f of DRIP Calculation)

APPENDIX F - Water Shortage Contingency Plan Draft Ordinance

DRAFT
WATER SHORTAGE CONTINGENCY ORDINANCE

Ordinance No._____
Ordinance of the Council of the City of Palo Alto Declaring a Water Shortage Emergency [And Reinstating Sections 12.32.015 And 12.32.030 of the Palo Alto Municipal Code Establishing Emergency Water Use Regulations And Maximum Monthly Water Use]

The Council of the City of Palo Alto finds and determines as follows:

A. The City of Palo Alto is the distributor of a public water supply within its boundaries.

B. The City faces a water supply shortage.

C. The Palo Alto Municipal Code and Urban Water Management Plan (adopted by the Council via Resolution ____ on _____, 2016), include a Water Shortage Contingency Plan and other tools to responsibly manage the City's water resources.

D. Under Water Code Section 350, the Council may declare a water shortage emergency condition to prevail within the City's service territory, whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.

E. The City Council has held a public hearing on the proposed adoption of this ordinance, the City Clerk having first duly given notice of the hearing as required by Government Code Section 6061.

NOW, THEREFORE, the Council of the City of Palo Alto does ORDAIN as follows:

SECTION 1. The City Council of the City of Palo Alto finds and determines that:

1. Due to _____, there is a significant shortage of water reserves.

2. The wholesale supplier for the City of Palo Alto has cut the annual deliveries of water for the period from _____to _____ by _____percent.

3. Normal demands and requirements of water consumers cannot be satisfied without depleting the water supply of the City to the extent that there would be insufficient water for human consumption, sanitation and fire protection.

APPENDIX G - Water Shortage Contingency Plan Evaluation Criteria

CRITERIA TO EVALUATE WATER SHORTAGE RESPONSE PLAN

This appendix lists criteria expected to guide the selection of allocation/allotment strategies whenever water use reductions are needed. Not all of them may be applicable to every strategy but customer perception of equity is important in achieving the necessary reductions.

1. Reduce overall City consumption by reduction target required – this is the effective goal of any plan. To accomplish this goal the percentage reduction for the various customer classes will necessarily vary because their ratios of indoor/outdoor use varies.

2. Sufficient water available for personal use – the most important use of water is for basic drinking, health, and sanitary uses, and therefore, this is given the highest priority of use. This prioritization will drive both rate schedules and water use restrictions. However, within allowed limits (i.e., water use restriction ordinances), customers will be able to choose how they use their allotment between indoor and outdoor uses.

3. Acceptance by the community – many people tend to evaluate or accept a particular water- rationing plan in terms of how it would directly affect them. It is this aspect which makes it difficult to gain a popular consensus on any one plan. However, any plan must be generally accepted by the community to be successful. One important aspect of acceptance is the public's understanding of the program; thus, it is viewed as important to make the plan as uncomplicated as possible.

4. Minimize unemployment or business loss – water is extensively used in both commercial and industrial functions. If water is severely limited to these consumers, increased unemployment and business losses could result. Staff intends that, wherever possible, this should be avoided. Still, outside water use must be sacrificed greatly if only minimal indoor reductions are required. Cooling tower use for air conditioning must also be considered.

5. Landscaping investment losses – in cases of critical or severe shortage of water, it is expected that significant landscaping losses may arise. The use of recycled water should be encouraged for certain applications. In some cases, using the City's well system to augment the SFPUC supply will be an option to provide a minimum amount of water for landscaping. In this case, the goal should be to keep valuable and mature trees and plantings alive. Shrubs and lawns will be considered a lower priority.

6. Workable plan – the plan must be workable in order to accomplish its goal. It must take the following factors into account:

    a. Cost - the cost of any water plan to the public should be minimized.
    b. Enforcement - enforcement is viewed as a key component of any plan. Those plans requiring fewer resources for enforcement would be preferable. However, the success

of a plan is contingent upon effective enforcement and the utility must be provided the resources to meet the enforcement objective. The current staff can only absorb a certain level of additional responsibilities without unreasonably impacting service to the customer.

c. The plan must be practical and feasible from a data processing viewpoint and not subject to erroneous results due to incomplete or inaccurate databases. A realistic timeframe must be allowed to perform any necessary data entry or customer programming functions.

9. Flexibility – the water shortage is a dynamic situation and may get better or worse. Thus, it is necessary that any plan be adaptable to changes in targets or adjustable if original expectations are not being met.

10. Allowance for new services – some provision must be made in any plan to serve new establishments or those under construction.

12. Recover penalties applied by suppliers – revenue should be collected to the extent necessary to recover any penalties that may be charged by suppliers.

APPENDIX H - Water Shortage Contingency Plan Use Restrictions

WATER USE RESTRICTIONS

Water use restrictions will depend on local conditions and on the length of the water shortage or drought. The City's Water Shortage Contingency Plan identifies measures appropriate for various stages of action, based on reduction targets for each stage. Section A of this Appendix describes the City's existing water use regulations. Section A-1 of this Appendix describes additional proposed permanent water use regulations to be adopted by City Council Ordinance. The restrictions in Section B are additional restrictions that could be applied in various stages or a drought or other water supply shortage. These staged restrictions are intended to serve as tools within the broader framework of the Urban Water Shortage Contingency Plan, to help the City reduce potable water consumption.

Implementation of individual restrictions within each stage shall be carried out at the direction of the City Council, in response to its assessment of local water supply conditions, feasibility, and consumption trends. The Council may, in its discretion, opt to revise, delete or include different elements than those described below, so long as the restrictions implemented serve the overall purpose of reducing local consumption.

A. Permanent Water Use Regulations (*See* Palo Alto Municipal Code Section 12.32.010)

1. Flooding or runoff of potable water into gutters, driveways, sidewalks, streets or other unlandscaped areas is prohibited.
2. An operating shut-off valve is required for hoses used to wash cars, boats, trailers, buses or other vehicles, or to wash sidewalks, building structures, other hard-surfaced areas or parts thereof. Use of a hose for such purposes should be avoided whenever possible.
3. Potable water for consolidation of backfill and other nondomestic uses in construction shall not be used if other water sources, such as reclaimed water, are available, as determined by the Director of Utilities or his or her designee. Applicants for hydrant permits from the city of Palo Alto shall be deemed to have consented to restrictions on water use which may be imposed by the Director of Utilities or his or her designee.
4. Any broken or defective plumbing, sprinklers, watering or irrigation systems which permit the escape or leakage of water shall be repaired or replaced as soon as possible, but no later than the date established by the Director of Utilities, or his or her designee, as reasonable after observation of the broken or defective system.

A-1. Proposed Additional Water Use Restrictions, to be added to Palo Alto Municipal Code Section 12.32.010.

5. Ornamental landscape[1] or turf irrigation with potable water shall not be allowed between 10:00 a.m. and 6:00 p.m., except via hand watering with a bucket or a hose with an operating shut-off valve.

6. The use of potable water in a fountain or other decorative water feature is prohibited, except where the water is part of a recirculating system.
7. The use of potable water for street sweepers/washers is prohibited if non-potable water is available, as determined by the Director of Utilities, or his or her designee.
8. Commercial car washes must use recycled water systems, if economically feasible.

B. Additional Restrictions Available for Council's Consideration in Droughts or Other Water Supply Shortages

Stage I:
No additional restrictions

Stage II:
1. Irrigation with potable water during and within 48 hours after a measurable rainfall, as determined by the Director of Utilities, or his or her designee, and posted on the Palo Alto website, is prohibited.
2. The irrigation of ornamental landscapes[1] or turf with potable water more than three days per week is prohibited during the months of April through October.[2]
2. The irrigation of ornamental landscapes or turf with potable water more than one day per week is prohibited during the months of November through March. [2]
3. The application of potable water to driveways and sidewalks is prohibited, except where necessary to address an immediate health and safety need or to comply with a term or condition in a permit issued by a state or federal agency.
4. Restaurants and other food service operations shall serve water to customers only upon request.
5. 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.

Stage III:
All water use restrictions for Stage II, and the following:
1. The irrigation of ornamental landscapes[1] or turf with potable water more than two days per week is prohibited during the months of April through October.[2]
2. The filling of newly constructed pools, spas and hot tubs is prohibited.
3. Water allocations may be imposed.
4. Irrigation with potable water on golf courses is limited to putting greens and tees.

Stage IV:
All water use restrictions for Stages II and III, and the following:
1. No new water service connections are permitted unless the customer pays for sufficient conservation measures to be applied elsewhere in the City, to offset anticipated water use at the site to be served by the new water service, as determined by the City of Palo Alto.

2. Drought tolerant landscaping that minimizes irrigation and runoff is required at new construction sites, and non-drought tolerant landscaping is prohibited.
3. Ornamental landscape and turf irrigation with potable water is prohibited.
6. The washing of all vehicles is prohibited except for at commercial washing facility that recirculates its water or uses recycled water.
7. Sprinkler irrigation is prohibited.

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[1] "Ornamental landscapes" serve purely decorative purposes, and are distinguished from trees, edible gardens or landscapes that provide more than a purely aesthetic function.

[2] Customers with a public or private non-residential facility containing ornamental landscapes or turf which supports a demonstrable business necessity or public benefit may apply for City approval of an alternative irrigation schedule.

APPENDIX I – Single and Multi Year Delivery Shortages

This table shows the SFPUC supplies that would be able to be delivered to the wholesale agencies in different hydrological conditions represented by each year from 1920 through 2011. This assumes that the wholesale customer demand is 184 MGD. The deliveries highlighted in yellow show hydrological years when a system-wide supply shortage of 10% would be experienced and the deliveries to the wholesale customers would be reduced by more than 15%. The deliveries shown highlighted in orange and bold are in years when a system-wide supply shortage of 20% would result in supplies to wholesale customers being reduced by more than 25%.

	Wholesale Demand=184 MGD				
Delivery For Fiscal Year	**2010**	**2015**	**2020**	**2025**	**2030**
1920	184	184	184	184	184
1921	184	184	184	184	184
1922	184	184	184	184	184
1923	184	184	184	184	184
1924	184	184	184	184	184
1925	154.6	184	184	184	184
1926	184	184	184	184	184
1927	184	184	184	184	184
1928	184	184	184	184	184
1929	184	184	184	184	184
1930	184	184	184	184	184
1931	184	184	184	184	184
1932	**132.5**	152.6	152.6	152.6	152.6
1933	184	184	184	184	184
1934	184	184	184	184	184
1935	154.6	184	184	184	184
1936	184	184	184	184	184
1937	184	184	184	184	184
1938	184	184	184	184	184
1939	184	184	184	184	184
1940	184	184	184	184	184
1941	184	184	184	184	184
1942	184	184	184	184	184
1943	184	184	184	184	184
1944	184	184	184	184	184
1945	184	184	184	184	184
1946	184	184	184	184	184
1947	184	184	184	184	184
1948	184	184	184	184	184
1949	184	184	184	184	184
1950	184	184	184	184	184
1951	184	184	184	184	184
1952	184	184	184	184	184

	Wholesale Demand=184 MGD				
Delivery For Fiscal Year	**2010**	**2015**	**2020**	**2025**	**2030**
1953	184	184	184	184	184
1954	184	184	184	184	184
1955	184	184	184	184	184
1956	184	184	184	184	184
1957	184	184	184	184	184
1958	184	184	184	184	184
1959	184	184	184	184	184
1960	184	184	184	184	184
1961	152.6	184	184	184	184
1962	**132.5**	152.6	152.6	152.6	152.6
1963	184	184	184	184	184
1964	184	184	184	184	184
1965	184	184	184	184	184
1966	184	184	184	184	184
1967	184	184	184	184	184
1968	184	184	184	184	184
1969	184	184	184	184	184
1970	184	184	184	184	184
1971	184	184	184	184	184
1972	184	184	184	184	184
1973	184	184	184	184	184
1974	184	184	184	184	184
1975	184	184	184	184	184
1976	184	184	184	184	184
1977	152.6	184	184	184	184
1978	**136.2**	152.6	152.6	152.6	152.6
1979	184	184	184	184	184
1980	184	184	184	184	184
1981	184	184	184	184	184
1982	184	184	184	184	184
1983	184	184	184	184	184
1984	184	184	184	184	184
1985	184	184	184	184	184
1986	184	184	184	184	184
1987	184	184	184	184	184
1988	152.6	184	184	184	184
1989	**132.5**	152.6	152.6	152.6	152.6
1990	**132.5**	152.6	152.6	152.6	152.6
1991	**132.5**	**132.5**	**132.5**	**132.5**	**132.5**
1992	**132.5**	152.6	152.6	152.6	152.6
1993	**136.2**	**132.5**	**132.5**	**132.5**	**132.5**
1994	184	184	184	184	184

	Wholesale Demand=184 MGD				
Delivery For Fiscal Year	**2010**	**2015**	**2020**	**2025**	**2030**
1995	154.6	184	184	184	184
1996	184	184	184	184	184
1997	184	184	184	184	184
1998	184	184	184	184	184
1999	184	184	184	184	184
2000	184	184	184	184	184
2001	184	184	184	184	184
2002	184	184	184	184	184
2003	184	184	184	184	184
2004	184	184	184	184	184
2005	184	184	184	184	184
2006	184	184	184	184	184
2007	184	184	184	184	184
2008	184	184	184	184	184
2009	184	184	184	184	184
2010	184	184	184	184	184
2011	184	184	184	184	184