City of Petaluma

2015 Urban Water Management Plan

FINAL
JUNE 2016

CITY OF PETALUMA

2015 URBAN WATER MANAGEMENT PLAN

June 2016

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1 Introduction and Overview

The Urban Water Management Act (Act) became part of the California Water Code with the passage of Assembly Bill 797 during the 1983-1984 regular session of the California Legislature. The California Water Code requires every urban water supplier providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to adopt and submit an Urban Water Management Plan (UWMP) every five years (2010, 2015, 2020, etc.) to the California Department of Water Resources (DWR). The specific planning requirements are in the California Water Code Division 6, Part 2.6 Urban Water Management Planning.

1.1 Introduction

This UWMP presents the City of Petaluma's (City) water supply and planning programs per the UWMP requirements. The core requirements for the UWMP include:

- A description of the water service area.
- A description of the existing and planned supply sources.
- Estimates of past, present, and projected water use.
- Confirmation that the City is on track for achieving water use goals established in the 2010 UWMP.
- A description of water conservation Demand Management Measures (DMMs) planned and already in place, and other conservation measures.
- A description of the Water Shortage Contingency Plan.
- Recycled water opportunities.

In 2009, a significant amendment to the Urban Water Management Act was made in response to the state's water shortages, droughts, and other factors. This was the Water Conservation Act of 2009, also known as SBX7-7 or 20x2020. This act required urban water suppliers to report in their UWMPs their Base Daily per Capita Water Use (Baseline GPCD), the 2015 Interim Urban Water use target, 2020 Urban Water Use Target, and Compliance Daily per Capita water use. In summary, the UWMPs are required to establish water use targets for 2015 and 2020, with the ultimate goal of achieving a statewide reduction of water usage by 20% by the year 2020.

1.2 Overview

The City of Petaluma 2015 UWMP presents each required element per the Department of Water Resources (DWR) 2015 Urban Water Management Plans Guidebook for Urban Water Suppliers. In addition to the original requirements of the UWMPs, the guidebook includes several changes to the California Water Code since the 2010 UWMPs. These changes include:

- Requirement to provide narratives describing water demand measures, addressing nature and extent of each water demand measure implemented over the past 5 years.
- Requirement to electronically submit the 2015 UWMP to the DWR by July 1, 2016.
- Requirement to include standardized forms, tables, or displays specified by the DWR.
- Requirement to quantify and report distribution system water loss.
- Provide for water use projections to account for water savings estimated to result from adopted codes, standards, ordinances, or land use plans.

In summary, the 2015 UWMP must include: the baseline demand analysis from SBX7-7, compliance with the interim 2015 Urban Water Use target, Urban Water Use target analysis for 2020, projected Urban Water Use through the year 2040, and description of programs to achieve the target demand reductions in the UWMP.

2 Plan Preparation

2.1 Basis for Preparing UWMP

According to the California Water Code (CWC), an Urban Water Supplier that provides water for municipal services to more than 3,000 customers or more than 3,000 acre-feet is required to prepare a UWMP and update it every five years. The City falls into this category with more than 19,000 water service connections and more than 7,000 acre-feet of water supplied. The City is also considered a Public Water System (PWS) that is regulated by the State Water Resources Control Board, Division of Drinking Water.

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
4910006	City of Petaluma	19,739	7,678
	TOTAL	19,739	7,678

NOTES: Numbers based on billing data and

2.2 Regional Planning

A water supplier has the opportunity to either prepare their UWMP as an individual water supplier or as part of a Regional group. Regional planning provides many benefits including increasing regional self-reliance, reducing the need for imported water, and proper management of regional water assets. The City is using the individual UWMP, and is reporting solely on its own service area. The City will notify and coordinate with the appropriate regional agency and constituents, which in this case is Sonoma County, and the Sonoma County Water Agency (Water Agency).

Table 2-2: Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance**
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☑	Water Supplier is also a member of a Regional Alliance	North Marin-Sonoma Alliance
☐	**Regional Urban Water Management Plan (RUWMP)**		

The City is one of the retailers that purchase water from the Water Agency. The City routinely coordinates water resource planning efforts with the other retailers and the Water Agency. These retailers include the City of Santa Rosa, the City of Rohnert Park, the City of Sonoma, the City of Cotati, the Town of Windsor, the Marin Municipal Water District (MMWD), the North Marin Water District (NMWD), and the Valley of the Moon Water District (VMWD) allows for an agency to identify an individual target goal and a regional target goal. The City includes both goals in this UWMP. The City coordinated with the other Water Agency retailers to develop the regional alliance and set goals for the SB X7-7 requirements for 20 percent demand reduction by 2020. These goals and demand projections are discussed in Chapters 4 and 5, and included in the Appendices.

2.3 Fiscal or Calendar Year and Units of Measure

The 2015 UWMP prepared by the City will report using Calendar years (January 1st through December 31st), and use Acre-Feet as its unit of measure. Although the city often uses reports which use Million Gallons (MG), and billing records which use Hundred Cubic Feet (HCF), these quantities have been converted to Acre-Feet for consistency with other reporting agencies.

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
Units of Measure Used in UWMP	
Unit	AF

2.4 Coordination and Outreach

The City as a water supplier that relies upon a wholesale agency (Water Agency) for water supply is required to coordinate with the wholesale agency regarding projected water demands from that source, in five year increments for 20 years. This water supplier information exchange is an important requirement for an accurate and cohesive planning effort.

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
Sonoma County Water Agency (Water Agency)

The City also coordinated with the Regional Alliance to develop projected water demands and water conservation efforts to ensure the requirements of SBX-7 will be met. This coordination effort produced the 2015 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update which can be found in Appendix D.

2.5 Outreach

The City must send a notice to all county and city governments within its service area of its intent to develop and adopt the 2015 UWMP. This process is discussed in Chapter 10 of this UWMP.

The City has also coordinated with the Water Agency and other agencies in preparation with this 2015 UWMP. Table 2-5 indicates each entity the City has coordinated with and the extent of this coordination.

Table 2-5 Retail: Water Supplier Information Exchange

Agency	Participated in Developing Plan	Commented on Draft	Attended Public Hearing	Contacted for Assistance	Sent Copy of Draft	Sent Notice of Intention to Adopt	Not Involved/ No Info.
Water Agency				X	X	X	
Sonoma County						X	
City of Santa Rosa	X						
North Marin Water District	X						
Rohnert Park	X						
Sonoma	X						
Cotati	X						
Windsor	X						
Marin Municipal Water District	X						
Others to be added pending hearing process							

3 System Description

The City of Petaluma's Department of Public Works and Utilities (PW&U) serves water to customers both within the city's boundary and outside that boundary. This chapter describes the City of Petaluma's service area, population, climate, and other elements.

3.1 General Description

The City serves the majority of water to customers within the city boundary. Water is also served to customers outside the boundary for a variety of reasons. Some outside boundary customers were obtained when the previous private water company was replaced with a municipal water utility service, some customer's wells failed, and some customers were obtained from the Water Agency, as well as other specific reasons. The City's largest customer outside of the boundary is the United States Coast Guard training station located 8 miles west of town. The City's water service area is shown in Figure 3-1. The City also provides recycled water for to landscape irrigation customers within the City boundary, as well as agricultural irrigation customers outside the city boundary. These landscape irrigation customers are located along the eastern border of the city, while the agricultural customers are all located to the southeast, near the City's water reclamation facility.

3.2 Service Area Climate

The service area climate reflects its close proximity to the Pacific Ocean. The area is subject to marine layer-type conditions throughout the year. The average summer time temperature is 60 degrees F, and the average winter temperature is 45 degrees F. The climate exhibits two distinct annual seasons, wet and dry. Most rainfall occurs in the winter months, with almost no rain in the summer months. The total average annual rainfall is over 26 inches. The annual average evapotranspiration rate (ETo) is approximately 40 inches.

3.3 Service Area Population and Demographics

PW&U's service population is divided into two elements: customers within the City limits, and those outside of the City limit. The City serves smaller single family units outside the City boundary. The exception to this is that the City also serves the Coast Guard training facility. Historic population data within the City limit is tracked by the California Department of Finance (DOF). Annual population and average persons per household values are provided by the DOF. The DOF also provides a person per dwelling unit value. The persons per dwelling unit values are used to estimate the population of residential connections outside the City's boundary. The Coast Guard station provided a current population of 1,444.

Future population within the City boundary is projected in the City's 2025 General Plan. Population projections for customers outside the City boundary are developed with two methods. The residential customer accounts use the persons per dwelling unit value from the DOF. The Coast Guard population is assumed to stay constant through 2040. The population projections were based on interpolating historical population to build-out population reported in the City's 2008 General Plan (Maddaus, 2015). Table 3-1 lists the service area population projected out to 2040.

Table 3-1 Retail: Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040
	61,798	63,631	66,061	68,490	70,920	73,350

NOTES: 2015 Number based on DOF Tables and population at coast guard base. 2020-2040 Numbers based on the Maddaus report located in Appendix D.

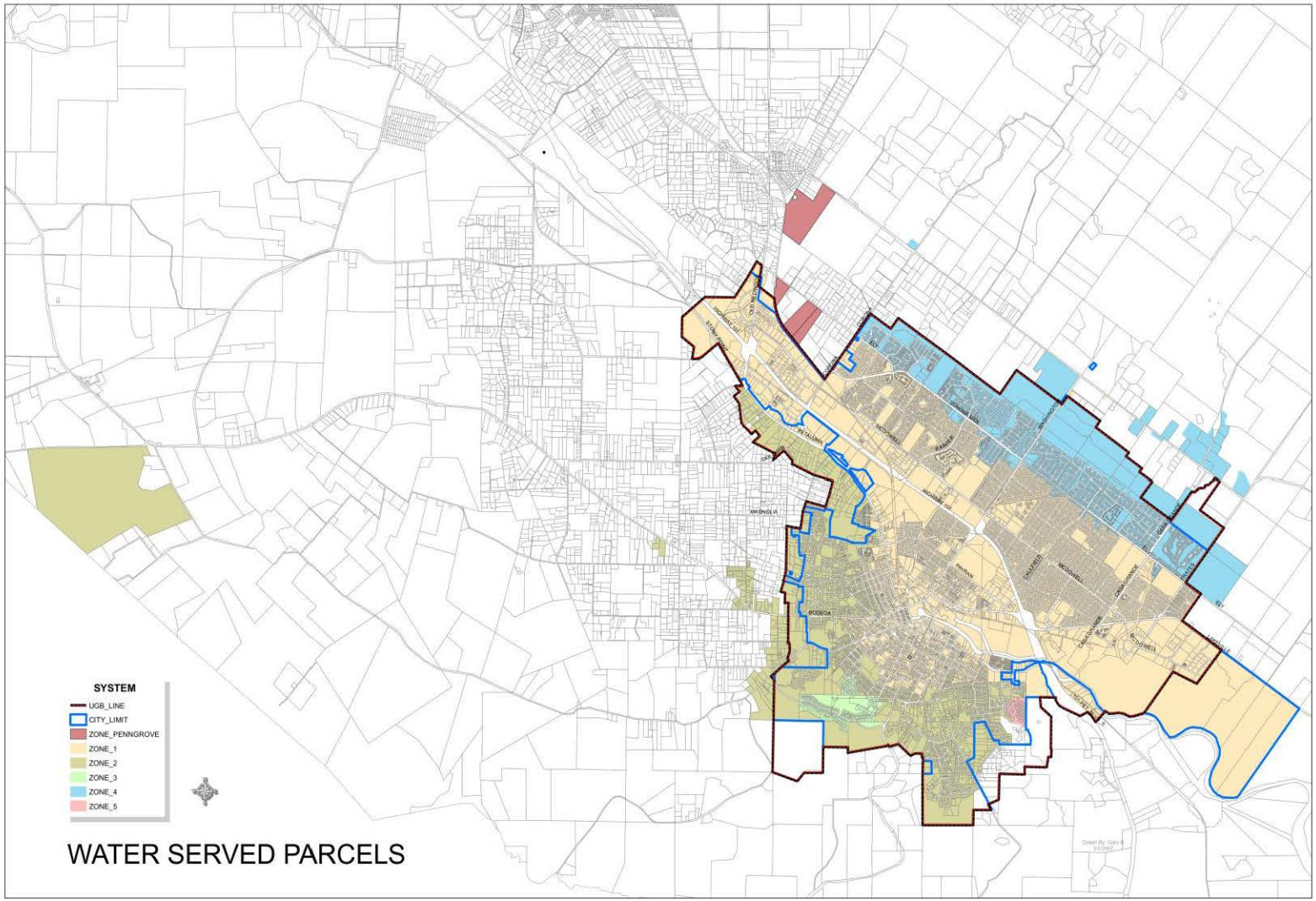


Figure 3-1. Service Area

4 System Water Use

This chapter describes and quantifies the Utility's current water use and water use projections through the year 2040. The chapter covers only the use of potable water to for the Utility's customers. Recycled water use will be covered in Chapter 6.

4.1 Water Use by Sector

The water demand provided by the Utility is broken down in account types or sectors which include:

- Single Family
- Multi-Family
- Commercial
- Industrial
- Institutional/Governmental
- Landscape (Irrigation accounts)

Each water system connection has an account type (listed above) associated with it. Monthly billing records for each account type were totaled using the Utility's billing software, and combined for an annual water demand. The 2015 water demand is shown in Table 4-1.

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

	2015 Actual		
Use Type	Additional Description	Level of Treatment When Delivered	Volume
Single Family		Drinking Water	3,425
Multi-Family		Drinking Water	761
Commercial		Drinking Water	930
Industrial		Drinking Water	662
Institutional/Governmental		Drinking Water	300
Landscape	All IRR accounts combined	Drinking Water	666
		TOTAL	6,744
NOTES: Volume based on 2015 Billing Records for metered accounts.			

It is noted that 2015 was a unique year for water demands as the state was experiencing a three year drought. The State of California mandated the City of Petaluma to reduce its water consumption by 16%, a figure in which the City was able to accomplish by increasing water conservation efforts and applying water use restriction methods.

The projected water demands through the year 2040 were developed in a joint effort with the Regional Alliance. These projected water demands include water savings from conservation programs and plumbing code changes. A summary of the methods used for these projected water demands is shown in Appendix D. The projected water demands are shown in Table 4-2. It is important to note that these projected water demands do not include water losses from distribution system or any expected potable offset from the recycled water system. Water Loss is discussed in Chapter 4.2. The recycled water demand is discussed in Chapter 6.

Table 4-2 Retail: Demands for Potable and Raw Water - Projected

Use Type	Additional Description	2020	2025	2030	2035	2040-opt
Single Family		4,294	4,380	4,416	4,493	4,583
Multi-Family		1,263	1,281	1,300	1,321	1,346
Commercial		939	961	983	1,014	1,048
Industrial		456	601	746	889	1,033
Institutional/Governmental		411	418	428	441	455
Landscape	All Irrigation Accounts	1,035	1,052	1,083	1,119	1,158
TOTAL		8,398	8,693	8,956	9,277	9,623

NOTES: Demands based off Maddaus Report located in Appendix D. Projected demands include passive savings (Plumbing Code, etc.), and Conservation Program A. Numbers do not include NRW (Losses) which are estimated at 9-10%.

The recycled water demand from Chapter 6 is included in the following table. The 2015 UWMP guidelines include a total water demand, which is the sum of the potable water demand and the recycled water demand, as shown in Table 4-3.

Table 4-3 Retail: Total Water Demands

	2015	2020	2025	2030	2035	2040-opt
Potable Water Demand *From Table 4-2 and 4-1*	6,744	8,398	8,693	8,956	9,277	9,623
Recycled Water Demand *From Table 6-4*	846	1,138	1,301	1,339	1,339	1,424
TOTAL	7,590	9,536	9,994	10,295	10,616	11,047

4.2 Distribution System Water Losses

The water demands shown in Chapter 4.1 are considered actual water consumption by the end users, but it does not equal the amount of water entering into the distribution system. This difference is considered "System Losses". This system loss includes uses for fire protection, flushing, sewer cleaning, and/or other non-billed uses. It also includes loss from leaks and meter inaccuracies. A detailed Water Audit quantifying these system losses is shown in Appendix E. The system loss for 2015 is shown in Table 4-4.

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date	Volume of Water Loss*
01/2015	591
NOTES: Water audit located in Appendix E	

4.3 Estimating Future Water Savings

When estimating the projected water demands, water savings from codes, standards, and ordinances were included. These water savings are considered "Passive Savings". These passive savings resulted from two categories: the savings from the natural replacement of existing plumbing fixtures with water –efficient models required under current plumbing code standards, and the savings from the installation of water-efficient fixtures and equipment in new buildings and retrofits as required under CALGreen Building Code Standards.

Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections?	Yes
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.	Chapter 4.3
Are Lower Income Residential Demands Included In Projections?	Yes
NOTES: Demand Projections for Lower Income Residential demands found to be similar to non- lower income demands.	

4.4 Water Use for Lower Income Households

The demand for lower income households was considered in the projected demands for the City. The demand factor for lower income households was found to be similar to the demand factor for non-lower income households and the demand projections were calculated accordingly.

4.5 Climate Change

A preliminary Climate Change Vulnerability Assessment was created and can be found in Appendix H. The climate change assessment takes into consideration water demand, water supply, water quality, sea level rise, flooding, ecosystem and habitat vulnerability, and hydropower. The results of the water demand portion of the assessment are the following:

- Industries that require cooling/process water may be subject to increased demand due to average temperature increase. The City does not have any major industries that require cooling water.
- An increase in average temperature is expected to increase outdoor water use. If maximum and minimum monthly water uses vary by more than 25%, then the area may be subject in an increase in water demand due to an increase in temperature. The City's difference between maximum and minimum month for water demand was found to be 50%, which is greater than the threshold of 25%. The City's water conservation efforts such as encouraging removing turf for mulch and expansion of the City's recycled water system should reduce the water demand for irrigation water during the summer months.
- Agriculture will be sensitive to climate change and may require more water as the climate warms. The agriculture in the area is outside of the system boundary. Many of the agricultural areas are serviced with recycled water, with future expansion planned.
- Areas with more demand may be vulnerable to droughts and may become more dependent on groundwater. The City uses groundwater wells for emergency uses only. The groundwater basin is shown to have recently reduced groundwater levels due to the drought from 2013-2015.

5 SB X7-7 Baselines and Targets

This chapter presents the 20x2020 baseline calculation methodology, results, and selected targets. The guidelines allow an agency can meet individual demand reduction goals and/or regional reduction goals. For the 2010 UWMP, the City of Petaluma calculated an individual goal, as well as a goal in conjunction with a regional alliance. The regional alliance was formed by the other Water Agency Contractors, of which the City is a participating member. For the 2015 UWMP, the City will focus on the individual goal for 20x20x20 compliance. The City participated with the regional alliance for a uniform projected demand, as discussed in Chapter 3. The UWMP Guidelines provide for an agency to be in compliance if it meets its individual goal, but the regional group does not meet the regional goal.

5.1 Updating Calculations from 2010 UWMP

For the 2010 UWMP, the City calculated a 2020 urban water use target using available population estimates. After examining sample data from the Department of Finance, the DWR has determined that discrepancies in the Department of Finance's projected 2010 population and actual population based on the 2010 Census warrants a recalculation of the 2020 urban water use target. Using 2010 Census data, the city has recalculated the 2020 Urban water use target. The DWR has established standardized tables for SBX7-7 verification. These tables can be found throughout this chapter, and also in Appendix G.

5.2 Baseline Periods

The gallon per capita per day (gpcd) urban water use target must be calculated and reported for two baseline periods The 10- or 15-year baseline and the 5-year baseline. In order to determine whether the 10-year or 15-year baseline is to be used is dependent on the percentage of recycled water delivered in the year 2008. If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. In 2008, the percentage of recycled water delivered by the City was 5.89 %, which means a 10-year baseline is required. The 5-year baseline period water use (gpcd) must also be calculated and used to confirm the selected 2020 target meets the minimum water use reduction requirements. The baseline period ranges are shown in SBX7-7 Table 1.

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	10,413	Acre Feet
	2008 total volume of delivered recycled water	613	Acre Feet
	2008 recycled water as a percent of total deliveries	5.89%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	1995	
	Year ending baseline period range[3]	2004	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	
	Year ending baseline period range[4]	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 Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.*			
[3]The ending year must be between December 31, 2004 and December 31, 2010.			
[4]The ending year must be between December 31, 2007 and December 31, 2010.			

5.3 Service Area Population

To calculate the annual GPCD, the population must be determined for each baseline year in both baseline periods and in the 2015 compliance year. The method for determining population was by using 2010 Census Data and DOF population tables.

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population	
☑	**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

The population for the service area was determined using the DOF population tables, as well as including the population of the US Coast Guard base in which the City supplies water. The population for the base was estimated at 1,350 persons. The population for each of the baseline years is shown below.

SB X7-7 Table 3: Service Area Population		
Year		**Population**
10 to 15 Year Baseline Population		
Year 1	1995	50,716
Year 2	1996	52,210
Year 3	1997	53,400
Year 4	1998	54,735
Year 5	1999	56,188
Year 6	2000	57,630
Year 7	2001	57,847
Year 8	2002	57,877
Year 9	2003	58,075
Year 10	2004	58,263
5 Year Baseline Population		
Year 1	2003	58,075
Year 2	2004	58,263
Year 3	2005	58,283
Year 4	2006	58,522
Year 5	2007	59,084
2015 Compliance Year Population		
2015		61,798

5.4 Gross Water Use

The gross water use is the sum of groundwater and surface water put into the potable water distribution system. Groundwater is provided by the City's wells. Each well contains a meter that records flow entering the system. Surface water is purchased from the Water Agency and is metered at six aqueduct connection points; Corona, Dynamic, Payran, Washington, McNear, and Petaluma Boulevard South. There are exclusions which are not included in the gross water use which include:

- Recycled water delivered within the service area
- Indirect recycled water
- Water placed into long term storage
- Water conveyed to another urban supplier
- Water delivered for agricultural use
- Process water

The annual gross water use for each baseline year is shown in the table below.

SB X7-7 Table 4: Annual Gross Water Use *								
Baseline Year		**Volume Into Distribution System.**	**Deductions**					**Annual Gross Water Use**
			Exported Water	**Change in Dist. System Storage (+/-)**	**Indirect Recycled Water**	**Water Delivered for Agricultural Use**	**Process Water**	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	9,499			-		-	9,499
Year 2	1996	9,817			-		-	9,817
Year 3	1997	10,586			-		-	10,586
Year 4	1998	10,763			-		-	10,763
Year 5	1999	12,080			-		-	12,080
Year 6	2000	11,977			-		-	11,977
Year 7	2001	12,286			-		-	12,286
Year 8	2002	11,502			-		-	11,502
Year 9	2003	10,801			-		-	10,801
Year 10	2004	11,000			-		-	11,000
10 - 15 year baseline average gross water use								**11,031**
5 Year Baseline - Gross Water Use								
Year 1	2003	10,801			-		-	10,801
Year 2	2004	11,000			-		-	11,000
Year 3	2005	10,027			-		-	10,027
Year 4	2006	9,712			-		-	9,712
Year 5	2007	9,903			-		-	9,903
5 year baseline average gross water use								**10,289**
2015 Compliance Year - Gross Water Use								
2015		7,678	-		-		-	**7,678**
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								

The final step in the baseline calculations is to determine the daily per capita water use for each of the baseline years. The baseline daily per capita water use is shown in the following table.

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year		Service Area Population	Annual Gross Water Use	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1995	50,716	9,499	167
Year 2	1996	52,210	9,817	168
Year 3	1997	53,400	10,586	177
Year 4	1998	54,735	10,763	176
Year 5	1999	56,188	12,080	192
Year 6	2000	57,630	11,977	186
Year 7	2001	57,847	12,286	190
Year 8	2002	57,877	11,502	177
Year 9	2003	58,075	10,801	166
Year 10	2004	58,263	11,000	169
10-15 Year Average Baseline GPCD				**177**
5 Year Baseline GPCD				
Baseline Year		Service Area Population	Gross Water Use	Daily Per Capita Water Use
Year 1	2003	58,075	10,801	166
Year 2	2004	58,263	11,000	169
Year 3	2005	58,283	10,027	154
Year 4	2006	58,522	9,712	148
Year 5	2007	59,084	9,903	150
5 Year Average Baseline GPCD				**157**
2015 Compliance Year GPCD				
2015		61,798	7,678	**111**

A summary table showing the 10-15 Year Baseline gpcd, 5-year gpcd, and the 2015 compliance year gpcd is shown below.

SB X7-7 Table 6: Gallons per Capita per Day	
10-15 Year Baseline GPCD	177
5 Year Baseline GPCD	157
2015 Compliance Year GPCD	111

5.5 2015 and 2020 Targets

There are four target methodologies defined by the DWR in the 2015 UWMP Guidelines:

1. 20 percent reduction of baseline demand.
2. Performance Standards
3. 95 percent of Hydrologic Regional Plan from the 20 x 2020 Water Convention Plan, State of California Agency Team.
4. Calculated Savings by Water Sector

The City has chosen Target Method 1 to determine the water use target.

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
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator

A 20% reduction of the 10-15 year baseline gpcd is shown in the table below.

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	**2020 Target GPCD**
177	**141**

Based on the California Water Code, the method adopted by the City must have a 2020 urban water use target not less than 5 percent from the 5-year baseline. The confirmation is shown in the table below.

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[1]	Calculated 2020 Target[2]	**Confirmed 2020 Target**
157	149	141	**141**
[1]*Maximum 2020 Target is 95% of the 5 Year Baseline GPCD* [2]*2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.*			

5.6 2015 Compliance Daily Per Capita Water Use

In order to determine whether the City is on track in complying with the 2020 Urban Water Target, an interim 2015 Target gpcd is calculated and compared against the actual 2015 water use based on consumption data and estimated population. The interim 2015 target gpcd is shown below.

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target	10-15 year Baseline GPCD	**2015 Interim Target GPCD**
141	177	**159**

Based on the actual 2015 gpcd water use, the City is in compliance with the 2020 Urban Water Use target.

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)* Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD	2015 GPCD	**Did Supplier Achieve Targeted Reduction for 2015?**
		Extraordinary Events	Weather Normalization	Economic Adjustment				
111	159	*0*	*0*	*0*	-	111	111	**YES**

5.7 Regional Alliance

The DWR UWMP Guidelines allow for 20x2020 compliance to be met by a group of water agencies, known as a regional alliance. If the regional alliance meets its 2015 and 2020 target, all members are considered in compliance. However, if the regional goals are not met, an agency can still be in compliance by meeting their own individual goals. The City, along with the other Water Agency retailers, formed a regional alliance as listed in Table 10. The group has selected Target Option 1, 20 percent of baseline by 2020. The baseline calculation is a weighted average of each member's own 2015 and 2020 goals as shown in Table 11. The development of each member's individual goals is presented in each respective individual UWMP.

Table 10: Regional Group 2020 Alliance Members	
City of Petaluma	Sonoma
North Marin Municipal Water District	Cotati
City of Santa Rosa	Windsor
Rohnert Park	Marin Municipal Water District
Valley of the Moon Water District	

Table 11: Regional Compliance Target Development

SCWA Water Agency Contractor	2015			2020		
	Current Population	Individual GPCD Target	Product of Individual Population Size and GPCD Target [(1) * (2)]	Current Population	Individual GPCD Target	Product of Individual Population Size and GPCD Target [(1) * (2)]
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Cotati	7,288	134	976,592	7,288	130	947,440
MMWD	189,000	137	25,855,200	189,000	124	23,436,000
North Marin	61,381	156	9,575,436	61,381	139	8,531,959
Petaluma	61,798	159	9,825,882	61,798	141	8,713,518
Rohnert Park	41,675	140	5,834,500	41,675	119	4,959,325
Santa Rosa	173,071	136	23,537,656	173,071	126	21,806,946
Sonoma	11,147	202	2,251,694	11,147	180	2,006,460
VOMWD	23,478	133	3,122,574	23,478	124	2,911,272
Windsor	27,486	143	3,930,498	27,486	130	3,573,180
Total	596,324		84,910,032	596,324		76,886,100

	2015	**2020**
Regional GPCD Target [Total of (3) / Total of (1)]	143	129

NOTES: Population and targets from each respective member's UWMP. Table may be modified pending adoption of each respective member's UWMP

6 Water Supplies

The City has historically used surface water, groundwater, and recycled water to supply its various customer demands. The near-term future supply strategy relies on surface water from the Sonoma County Water Agency (Water Agency) and recycled water from its own water recycling facility. This chapter presents the description of existing and projected future supplies.

6.1 Purchased or Imported Water

The City of Petaluma purchases water from the Water Agency which is supplied by the federal Russian River Project, which it operates along with the Water Agency's appurtenant water transmission system. The key elements to the Russian River system are the Coyote Valley Dam, which creates Lake Mendocino on the East Fork Russian River, and Warm Springs Dam, which creates Lake Sonoma on Dry Creek (a tributary to the Russian River). The Agency manages releases at both reservoirs for water supply and to maintain required minimum flows in the Russian River and Dry Creek pursuant to State Water Resources Control Board (SWRCB) Decision 1610 (D1610). Flood control releases from these reservoirs are controlled by the United States Army Corps of Engineers (USACE). Flows in the Russian River are augmented by the Pacific Gas & Electric Company's (PG&E) Potter Valley Project, which diverts a portion of the Eel River flows to the East Fork of the Russian River upstream of Lake Mendocino.

Future Potter Valley Project Diversions from the Eel River into the Russian River via Pacific Gas & Electric's Project are regulated by a number of agencies including the Federal Energy Regulatory Commission (FERC), and NOAA-NMFS. In 2004, FERC issued a final decision that reduced the amount of diversion from the Eel River into the Russian River by approximately 15 percent to protect Eel River fisheries.

Water from the Russian River is diverted by the Agency near Forestville and conveyed via its transmission system to its wholesale customers, which includes the City. The City receives the Water Agency supply through the Petaluma Aqueduct. The Petaluma Aqueduct has a diameter of 33 inches. This provides a physical limitation of 38 million gallons per day (MGD) at 10 feet per second.

The City of Petaluma, along with the other Water Agency contractors, signed the Restructured Agreement for Water Supply (Restructured Agreement) in 2006. The Restructured Agreement provides for the financing, construction, and operation of diversion facilities, transmission lines, storage tanks, booster pumps, conventional wells, and appurtenant facilities. The agreement does not provide for a fixed supply or daily rate. Instead, the agreement states that the Water Agency is not obligated to provide the City of Petaluma more than 13,400 acre-feet per year or more than 21.8 million gallons per day as an average daily rate during any one month.

The City of Petaluma does not hold any water rights for the Water Agency supply. The Water Agency holds four State Water Resources Control Board (SWRCB) permits (12947A, 12949, 12950, and 16596). The permits authorize the Water Agency to store water in Lake Mendocino (122,500 ac-ft) and Lake Sonoma (245,000 ac-ft), and to divert and re-divert 180 cubic feet per second (cfs) (116.3 MGD) of water from the Russian River and Dry Creek, up to 75,000 ac-ft/yr.

The permits also establish minimum instream flow requirements for fish and wildlife protection and Russian River recreational considerations. These minimum instream flow requirements vary according to the hydrologic cycle (i.e., dry water years versus normal water years) as defined by the SWRCB's Decision 1610. Recent studies discussed below suggest the minimum flows required by D1610 may negatively impact the fishery habitat. In addition, other issues impact the management of the Russian River system. The Water Agency is working to improve its supply reliability through multiple efforts. The following describes each issue and current status.

6.1.1 Water Supply Projects

The Water Agency developed the Water Supply and Transmission System Project (WSTSP) in 1998 to increase diversions from the Russian River and increase the transmission system capacity. The WSTSP was expected to increase Water Agency Russian River diversions to 101,000 ac-ft/yr and increase the Agency's water transmission system average-day peak month delivery capacity from 92 to 149 MGD.

The Agency's Board of Directors certified the WSTSP EIR in 1998. In 1999, a lawsuit was filed challenging the WSTSP EIR. In 2000, the trial court found the EIR to be adequate. However, on May 16, 2003, the Court of Appeals reversed the trial court's decision, concluding that the EIR was inadequate because it did not contain adequate cumulative impacts and alternatives analyses and its description of the project's environmental setting was deficient. The WSTSP was put on hold by the Water Agency Board of Directors. A project entitled the Fish Habitat Flows and Water Rights Project was developed to address the environmental impacts through re-operation of the Russian River project components. This project is described below.

6.1.2 Russian River Biological Opinion

On September 24, 2008, the National Marine Fisheries Service (NMFS) issued a 15-year biological opinion for water supply, flood control operations, and channel maintenance conducted by the U.S. Army Corps of Engineers (USACE), Sonoma County Water Agency, and Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed. The biological opinion authorizes incidental take of threatened and endangered species, pending an implementation of an alternative to existing management of reservoir releases, river flow, habitat condition and facilities in portions of the mainstream Russian River, Dry Creek, and Russian River estuary. In summary, the biological opinion concluded that the elevated river flows required by Decision 1610 were adversely affecting the fish habitat.

The biological opinion lists alternatives to reduce the affects to fish habitat from the various agency operations. The alternatives addressing the Water Agency operations and water supply impacts include:

- Reducing summertime flows in the Russian River and Dry Creek
- Enhancing six miles of habitat in Dry Creek
- Creating a freshwater lagoon in the estuary during summer months
- Monitoring both habitat and fish in Dry Creek, the estuary, and Russian River
- Eliminating impediments to fish spawning or improving habitat in several streams.

The biological opinion requires that summertime flows be permanently reduced to replicate river conditions in dry years. Since the biological opinion was released, the Water Agency has submitted a petition to the State Water Resources Control Board (State Board) requesting permanent changes to Decision 1610 minimum flow requirements in line with the biological opinion and is preparing an EIR required by the CEQA. Since 2010, the Water Agency has requested temporary changes to the Decision 1610 minimum flows annually per the biological opinion recommendations. The Water Agency received its first temporary flow reductions in 2010, and each subsequent year, the latest in 2015.

The Water Agency is continually planning and implementing the biological opinion requirements. A project update to the biological opinion was released in January 2016. The project update provides a synopsis of current work being done to fulfill the requirements of the biological opinion. The work currently being done includes:

- Dry Creek Habitat Enhancement Project
- Fish Monitoring
- Mirabel Screen and Fish Ladder Project
- Russian River Estuary Project
- Fish Flow Project
- Interim Flow Changes
- Public Outreach, Reporting & Legislation.

6.1.3 Seasonal hydrologic constraints on the Russian River diversion facilities

The ability of the Water Agency to divert water from the Russian River can be limited by the rate of recharge to the aquifer through the streambed. To augment this recharge capacity, the Agency has constructed several infiltration ponds that surround the Water Agency collector wells. Diversions and infiltration operations are also assisted by an inflatable dam. The Water Agency's water production capacity is complex and will vary from year to year based on a number of factors. In any given year, Agency production needs depend on demands, which are a function of temperature, precipitation, growth, and hydrologic conditions. The hydrologic conditions are in turn a function of groundwater levels and the permeability of the riverbed, which in turn impacts whether or not supply is groundwater or considered underflow from the river. An Water Agency analysis of water trends from 1997 to 1999 concluded that stressed hydrologic conditions occurred in the fall/early winter, followed by non-stressed conditions in the winter, and stressed conditions again in the spring, prior to the rubber dam being raised. Stressed hydrologic conditions are determined by monitoring groundwater levels and noting the decline in water levels as the Water Agency pumps water to meet demands. Agency staff

is continuing to analyze the seasonal constraint and its potential impact on the ability to provide water to its customers. As non-peak demands continue to rise, the Agency will increasingly rely on using the inflatable dam more continuously throughout the year if conditions allow use.

6.1.4 Water Agency Water Supply Strategy Action Plan

The Water Agency has developed multiple Water Supply Strategy Action Plans with the latest in 2013. The action plan addresses strategies and goals to improve supply reliability, implement the BO requirements, and other issues. The City of Petaluma is collaboratively working with the Water Agency and the other contractors to address the regional water supply and demand issues.

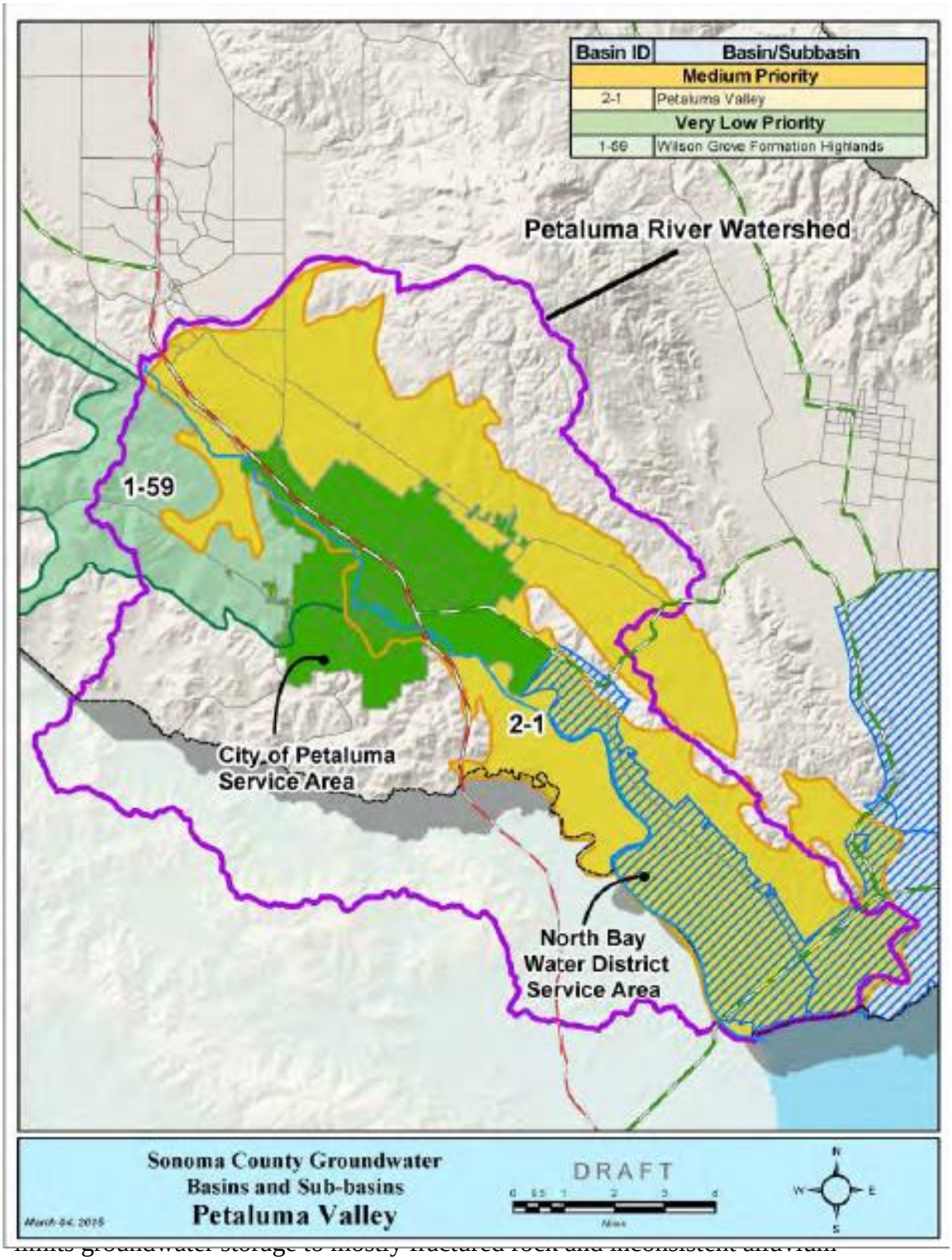
6.1.5 Water Agency Water Supply Reliability

An update to the water supply reliability analysis will be included in the Water Agency's 2015 UWMP. In the City's past UWMPs, the reliability analysis showed that no impact to the City's water supplies would occur during drought years. At the time of this writing, the Water Agency informed the City, that their model analysis showed impacts to the City's water supply during a single-year drought scenario, which would require mandatory 30% reduction in water releases to the Russian River. The impacts to reduction will be discussed in Chapter 7 of this UWMP.

With the Water Agency's diversions currently limited to 75,000 AFY, the Water Agency has overcommitted the available supply through the 2006 Restructured Agreement. The Restructured Agreement lists a total of 77,445 AFY to the Water Contractors under Chapter 3.1 Delivery Entitlements of Water Contractors. The Restructured Agreement states the Water Agency is not obligated to provide the City of Petaluma more than 13,400 acre-feet per year and 21.8 mgd average daily rate during any month. Until modified through an updated contract or other means, the City assumes its reliable supply has not changed from the Restructured Agreement.

6.2 Groundwater

The City of Petaluma maintains wells that pump from the Petaluma Valley Basin. The California Department of Water Resources Bulletin 118, 2003 Update identifies the Petaluma Valley Basin as Basin Number 2.1. The total basin acreage is listed at 46,100 acres. The groundwater basin is defined by Bulletin 118 and is generally the Petaluma River Valley starting at Penngrove on the north and following the valley south to San Pablo Bay, as shown in Figure 4-1.



limits groundwater storage to mostly fractured rock and inconsistent alluvium opportunities. According to past studies, including the DWR Bulletin 118-4 study of the Petaluma Valley Basin in 1982, there are no known geological units that would typically provide favorable, high-yield groundwater opportunities. The water quality is impacted by arsenic, iron, manganese, nitrate, and coliform. Customers have also noted taste and

odor issues when the groundwater wells are used to supplement surface water. Private shallow wells located near the tidal influence portion of the Petaluma River have shown salt water intrusion, but there were no instances of salt water intrusion in the City of Petaluma's wells identified in the studies.

The City of Petaluma does not rely on groundwater as a significant portion of supply due to specific yield and water quality limitations. Since 2000, groundwater is only used for peak water demand needs or to minimize short-term supply cost impacts to customer rates. Only 6 of the existing 12 active wells are used for production. Many of the wells are inactive due to low yields, poor water quality, or deteriorating well conditions. The active wells range in production from approximately 100 gpm to 600 gpm. According to Bulletin 118, there is insufficient information to develop total basin yield or the groundwater budget.

A groundwater management plan for the basin has not been developed yet. However, the City has begun efforts to improve monitoring and knowledge of the basin for further use. The City has registered with the DWR California Statewide Groundwater Elevation Monitoring (CASGEM) system. The City is the reporting agency for Basin 2-1 and will monitor groundwater elevations and quality in the basin to improve the basin knowledge and help build a better understanding of sustainable yield. The City is also working with the USGS in a Groundwater Study to be completed in the Fall of 2017. The study is compiling and evaluating the existing data, collecting new data, and developing a groundwater flow model.

In September 2014 the Sustainable Groundwater Management Act give local agencies (cities, Counties, and Water Districts) the powers needed to sustainably manage groundwater over a long-term period, and requires Groundwater Sustainability Plans (GSPs) be developed. Petaluma is not designated as a high priority but is one of three basins in Sonoma County required to develop a Groundwater Sustainability Agency (GSA). The groundwater agency must develop a plan by 2022 per the legislation. The Department of Water Resources will issue the requirements for the plan in 2016 and review for completeness by 2024. The City of Petaluma is working with the County and the Water Agency on the framework to create a GSA. Outreach has been performed and finalization of the GSA structure is planned by the Fall of 2016. Public hearings are scheduled in March 2017 to meet the deadline of the GSA formation by June 30, 2017.

The City has consistent groundwater use for the past five years, with an increase in usage in 2015. In 2015, the city supplied approximately 5% of its annual demand using groundwater. This increase was the product of rehabilitated well sites and studies to determine actual production capabilities in the event of emergency use. The high groundwater usage in 2011 is due to the impacts of wholesale water rates increase from the Water Agency. The wholesale water rates were increased, and the City opted to supply more groundwater in an effort to reduce the costs burden on its ratepayers. The City of Petaluma intends to only use groundwater in the future as emergency backup supply, peaking needs, or other short-term scenarios. The City continues to maintain and sample the wells per State requirements and to keep the wells in working condition should they be required in an emergency.

Table 6-1 Retail: Groundwater Volume Pumped						
Groundwater Type	**Location or Basin Name**	**2011**	**2012**	**2013**	**2014**	**2015**
Alluvial Basin	Petaluma Valley	784	194	164	131	375
	TOTAL	784	194	164	131	375
NOTES: High volume in 2011 due to increase in wholesale costs.						

Groundwater use from 2011-2015 is summarized in Table 6-1.

6.3 Surface Water

The City does not have its own sources of surface water.

6.4 Stormwater

The City does not use stormwater for potable water supply such as infiltration basins or treatment.

6.5 Wastewater and Recycled Water

The City owns and operates its own wastewater collection and treatment system. The Water Utility operates the Ellis Creek Water Recycling Facility (ECWRF) that can treat wastewater to Title 22 recycled water standards. The ECWRF is located south of town, near the existing oxidation ponds on Lakeville Highway. The ECWRF is regulated in the National Pollution Discharge Elimination System (NPDES) permit, promulgated by the San Francisco Bay Region of the California Regional Water Quality Control Board (RWQCB). The NPDES permit allows for discharge of secondary effluent into the Petaluma River adjacent to the ECWRF from October 21 through April 30 of each year.

6.5.1 System Description

The ECWRF produces both secondary and tertiary effluent to meet the Water Recycling Criteria contained in the California Code of Regulation, Title 22. The purpose of the recycled water program is two-fold, it provides potable water offset and it allows for effluent discharge during the non-river discharge restriction period.

The 6.7 mgd ADWF ECWRF is able to produce two levels of recycled water: Title 22 disinfected secondary-23 effluent for restricted reuse, and Title 22 disinfected tertiary effluent for unrestricted reuse. ECWRF preliminary treatment includes screening and grit removal, secondary treatment through oxidation ditches, and secondary clarification. After clarification, the flow is split between the secondary and tertiary recycled water treatment facilities. Disinfected secondary-23 facilities consist of oxidation ponds, treatment and polishing wetland cells, sodium hypochlorite disinfection, and recycled

water pumping. During the non-river discharge season (May 1st to October 20th), a combination of secondary effluent and pond effluent will be disinfected to Title 22 disinfected Secondary-23 standards using the existing disinfection facilities. Tertiary treatment facilities include chemical addition and flocculation, filtration, and UV disinfection. The current capacity of the tertiary system is 5.2 mgd. A future expansion to the tertiary system will increase the capacity to 7.8 mgd.

The tertiary system is fully operations and it serves agricultural and industrial customers mostly located near the ECWRF, as well as urban recycled water customers, such as parks, golf courses, schools, and business parks within the service area.

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

Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Petaluma	Metered	5,207	City of Petaluma	ECWRF	Yes	No
Total Wastewater Collected from Service Area in 2015:		5,207				

NOTES:ECWRF = Ellis Creek Water Recycling Facility

6.5.2 Current Wastewater and Recycled Water Use

Currently, the ECWRF has two operations schedules for its treated wastewater. During the period between October 21 to April 30, the recycled facility treats 0.35 MGD (470 AFY) to tertiary standards for plant process water, while the remaining wastewater is treated to secondary standards and discharged to the Petaluma River. During the period between May 1 and October 20, the ECWRF is restricted from discharging to the Petaluma, and therefore 100% of the wastewater it receives is treated to tertiary standards and distributed to its customers, excluding the 470 AFY it uses for plant process water. The majority of recycled water produced by the ECWRF is delivered to agricultural customers outside of the service area. These agricultural customers were previously using captured runoff or pumped groundwater as a source of water. The recycled water use by these agricultural customers is not considered potable offset from the water within the City's service area. The second largest use of recycled water is irrigation for golf courses within the City limits, for Rooster Run GC and Adobe Creek GC. These golf courses have historically used pumped groundwater as their source for irrigation. Because these golf courses did not use the City's potable water system for their irrigation, the recycled water use for these golf courses is also not considered potable offset. The remaining recycled water is delivered to customers consisting of parks and schools. This

recycled water use is considered urban potable offset as these customers were once connected to the service area distribution system of potable water. A summary of the amount of wastewater treated and recycled water use is shown in Table 6-3.

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

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Treatment Level	2015 volumes			
					Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
ECWRF	E001	Petaluma River	River or creek outfall	Tertiary	5,207	2,987	1,313	863
				TOTAL	5,207	2,987	1,313	863

6.5.3 Projected Recycled Water Use Direct Beneficial Use

The DWR defines beneficial use in several categories which include:

- Agricultural Irrigation
- Landscape Irrigation
- Golf Course Irrigation
- Commercial Use
- Industrial Use
- Geothermal
- Seawater Intrusion Barrier
- Recreational Impoundment
- Wetlands or Wildlife Habitat
- Groundwater Recharge
- Surface Water Augmentation
- Direct Potable Reuse.

Currently the City only uses recycled water for Agricultural, Golf Course, and Landscape Irrigation. The direct beneficial uses do not include recycled water for use within the recycled water facility. The City is planning an expansion of the urban recycled water system to deliver recycled water to more parks and schools throughout the service area. The City is also planning an expansion to deliver recycled water to more agricultural customers outside of the City's service area. The projected recycled water directs beneficial uses within the service are is shown in the following table.

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area							
Name of Agency Producing (Treating) the Recycled Water:		City of Petaluma					
Name of Agency Operating the Recycled Water Distribution System:		City of Petaluma					
Beneficial Use Type	**Level of Treatment**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Agricultural irrigation	Tertiary						
Landscape irrigation (excludes golf courses)	Tertiary	121	371	534	572	572	577
Golf course irrigation	Tertiary	723	765	765	765	765	845
Commercial use	Tertiary	2	2	2	2	2	2
Industrial use	--	--	--	--	--	--	--
Geothermal and other energy production	--	--	--	--	--	--	--
Seawater intrusion barrier	--	--	--	--	--	--	--
Recreational impoundment	--	--	--	--	--	--	--
Wetlands or wildlife habitat	--	--	--	--	--	--	--
Groundwater recharge (IPR)*	--	--	--	--	--	--	--
Surface water augmentation (IPR)*	--	--	--	--	--	--	--
Direct potable reuse	--	--	--	--	--	--	--
	TOTAL:	846	1,138	1,301	1,339	1,339	1,424
**IPR - Indirect Potable Reuse*							
NOTES: The ECWRF uses up 470 AFY of Recycled Water. Currently over 860 AFY of recycled water is used for agriculture outside of the service area. Up to 3,500 AFY of recycled water for agricultural use is planned through to 2040.							

The agricultural irrigation was not included due to it being outside of the City's service area. The Golf Course irrigation is included, although it should be noted that this recycled use is not considered potable offset. The Golf Course irrigation has historically been supplied by groundwater pumping and was not serviced by the City's potable water distribution system. The golf course irrigation increase shown in 2040 is considered potable water offset, as the irrigation is currently supplied by potable water.

A projection for 2015 recycled water use was included in the 2010 UWMP. A comparison showing the projected 2015 use and actual use is shown in the following table.

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
Use Type	**2010 Projection for 2015**	**2015 Actual Use**
Agricultural irrigation	1,982	861
Landscape irrigation (excludes golf courses)	0	121
Golf course irrigation	1,216	723
Commercial use	0	2
Industrial use	121	469
Geothermal and other energy production	0	0
Seawater intrusion barrier	0	0
Recreational impoundment	0	0
Wetlands or wildlife habitat	0	0
Groundwater recharge (IPR)	0	0
Surface water augmentation (IPR)	0	0
Direct potable reuse	0	0
TOTAL	3,319	2,176
NOTES: In order to match with the 2010 UWMP Projections, Agricultural use outside of the service area, and recycled water used by the ECWRF was included in the 2015 Actual recycled water use.		

The 2010 UWMP projected 2015 use includes a large agricultural use outside of the City's service area, as well as planned landscape irrigation. The projected 2015 recycled water use did not differentiate between golf course irrigation and landscape irrigation. The 2015 Actual Use for recycled water use listed in the table includes agricultural recycled water use to for comparison purposes.

6.5.4 Methods to Expand Future Recycled Water Use

The City is currently in the process of applying the State's Water Recycling Funding Program (WRFP) in order to obtain funding for expansion of the recycled water distribution system. The City is also involved with the North Bay Water Reuse Program (NBWRP) which is a regional water recycling and management initiative which covers areas north of the San Francisco Bay.

The planned expansion of the recycled water system is separated into four parts. There are projects that are currently under design and installation to connect parks, schools, and commercial areas which are relatively near the existing recycled water system. In addition these projects that are currently underway, there are 3 planned phases of expansion for the recycled water system:

- Phase 1 – This phase will expand the system along the north-eastern boundary of the city and bring the recycled water distribution system to multiple schools, parks, and commercial areas,
- Phase 2 – This phase to continue the phase 1 expansion and created a looped system and deliver water to multiple parks, schools and commercial areas. This phase will also expand the recycled water system westerly toward the center of the City for a possible connection point to the planned phase 3 expansion.
- Phase 3 – This phase will expand the recycled water system westerly across the freeway and Petaluma River to deliver recycled water to the western portion of the City.

Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Prop 1 /Underway	Expand recycled system along City's eastern boundary and to commercial areas with large irrigation use	2016-2020	257 AFY
Phase 1	Expand recycled system into north-east area of city and created a looped system	2020+	163 AFY
Phase 2	Expand recycled system into central/southern part of City to connect Schools, Parks, commercial irrigation and LAD accounts.	2025+	38 AFY
Phase 3	Expand recycled system across river to western portion of City	2040+	85 AFY
		TOTAL	657 AFY

Figure 6-1 shows the planned expansion of the City's recycled water system.

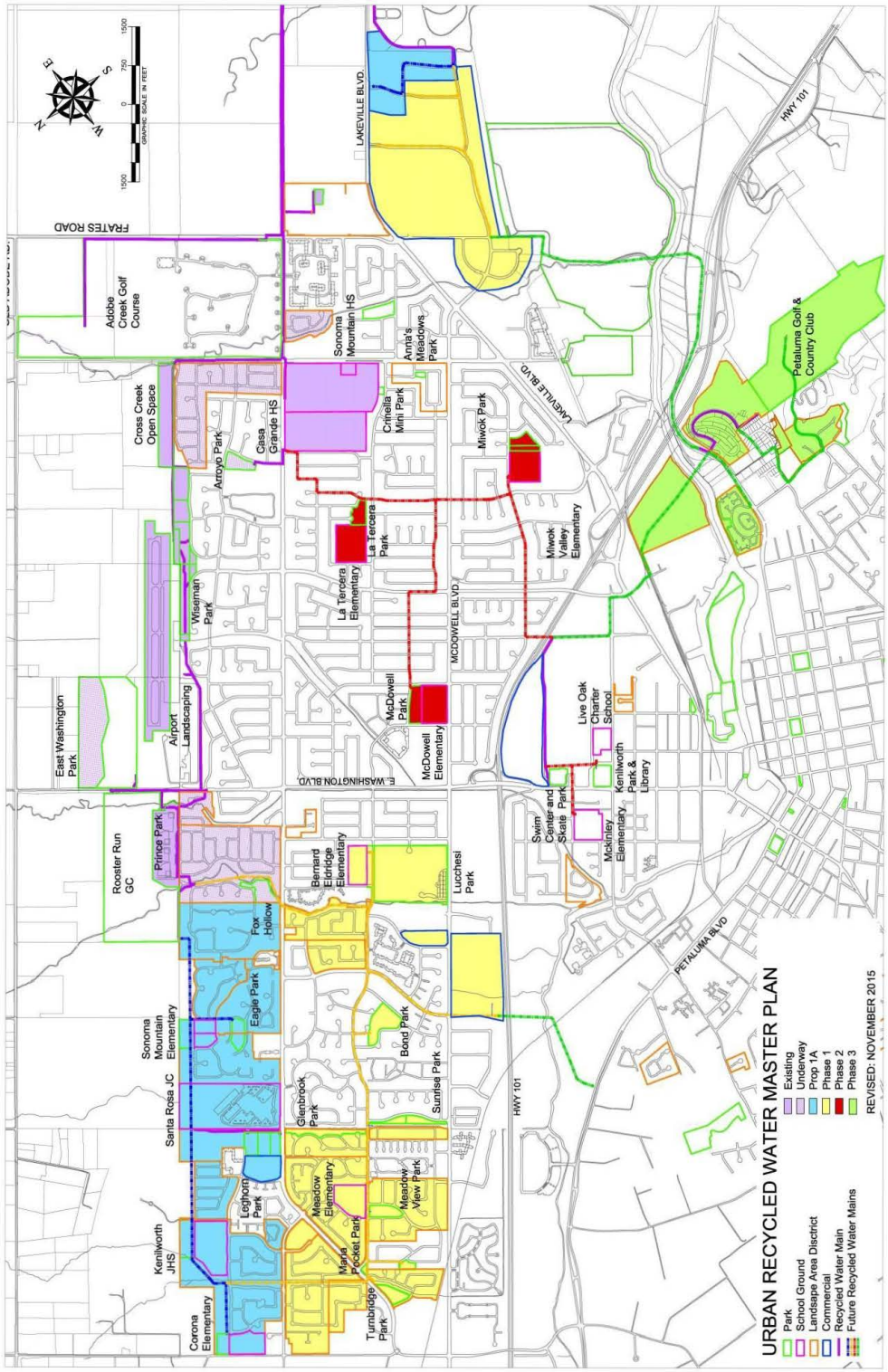


Figure 6-1. Urban Recycled Water System Expansion

6.6 Desalinated Water Opportunities

The City of Petaluma has not identified current desalination opportunities. However, the City is the reporting agency for the California Statewide Groundwater Elevation Monitoring program for the groundwater basin. The reporting area covers wells near the San Pablo Bay and surface water bodies that are likely under tidal influence. This Water Utility will monitor groundwater quality for these areas and will gain a better understanding of desalination opportunities in the future.

6.7 Future Water Projects

The City is currently in the process of expanding the groundwater well system. These wells are intended to be used for emergency purposes, peaking usage, and other short term scenarios. For the purposes of this UWMP, they are not intended for a reliable annual supply. Conjunctive use of the wells in 2015 accounted for 375 acre feet of supply. There are no other expected future water supplies.

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.

6.8 Summary of Existing and Planned Sources

The supply for the City consists of three components: Purchased water from the Water Agency, pumped groundwater from the City owned wells, and recycled water produced by the ECWRF. The City and the Water Agency have an agreement in that the Water Agency will not supply the City with more than 13,400 Acre Feet per year. This 13,400 AFY is greater than the projected demand discussed in Chapter 4. The actual 2015 water supply and total right/safe yield are shown in the table below.

Table 6-8 Retail: Water Supplies — Actual

Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield
Purchased or Imported Water	WATER AGENCY	7,303	Drinking Water	13,400
Groundwater	Municipal Wells	375	Drinking Water	
Recycled Water	ECWRF	846	Recycled Water	
	TOTAL	8,524		13,400

NOTES: The recycled water numbers include Golf Course Irrigation which is not considered potable water offset.

The projected water supplies are shown in Table 6-6. As described in the groundwater chapter, the City projects zero groundwater use in the future, for the purposes of this UWMP, until a better understanding of long-term yield, water quality, and treatment requirements are understood. In addition the table only lists the potable offset portion of the recycled water supply projections, and only assumes the projected demand as supply for the recycled water use within the service area.

Table 6-9 Retail: Water Supplies — Projected

		Projected Water Supply				
		2020	**2025**	**2030**	**2035**	**2040**
Water Supply	Additional Detail on Water Supply	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	WATER AGENCY	13,400	13,400	13,400	13,400	13,400
Groundwater	Municipal Wells	0	0	0	0	0
Recycled Water	ECWRF	1,138	1,301	1,339	1,339	1,424
TOTAL		14,538	14,701	14,739	14,739	14,824

NOTES: Volume for Recycled water matches projected demand use. More recycled water is available, but will be used for out of service area agricultural use.

6.9 Climate Change Impacts to Supply

The impacts to supply due to climate change for the City's water supplies are as follows:

- Purchased Water: The City purchases water from the Water Agency. The Water Agency has not provided an impact study due to climate change. At this time climate change impacts to this supply are not known to the City.
- Groundwater: Climate change can greatly affect the availability and yield from groundwater aquifers. The City does not use its groundwater supplies for a reliable annual supply, but rather a supply for emergency purposes and conjunctive use to keep the wells in State conformance and to exercise the system.
- Recycled Water: Climate change can impact the supply for recycled water in that a reduced amount of wastewater produced will reduce the amount of recycled water produced. The existing and proposed recycled water demand from urban offset users within the service area is much less than the capacity of the ECWRF. It is expected that the impacts due to climate change on the recycled water supply will be minimal.

7 Water Supply Reliability Assessment

The City has historically used surface water groundwater, and recycled water to supply its various customer demands. The near-term future supply strategy relies on surface water imported from the Sonoma County Water Agency (Water Agency) and recycled water from its own water recycling facility. This chapter presents the long term reliability of the City's water supplies.

7.1 Constraints on Water Sources

There are several potential factors that could result in reduction or inconsistent reliability of the City's water supplies. These factors include legal, environmental, water quality, and climatic impacts. Potential factors the Water Agency surface water supply are discussed in Chapter 6.1 of this UWMP.

Groundwater sources may be impacted by water quality issues or reduced yield due to drought. The City has experienced some water quality issues in the past discussed with its groundwater. However, as the City is not projecting using groundwater supply as a normal supply, there are no impacts to the supply quantity.

There are no projected impacts to the City's recycled water supply, though future regulations or other issues may impact reliability.

7.2 Reliability by Type of Year

An analysis on the reliability of the City's main supply (Water Agency imported surface water), was performed. The analysis includes the historic reliability of the water supply, and any vulnerability to seasonal or climactic shortage. The historic climatic shortage was analyzed based on average year, single dry-year which represents the lowest water supply to the City, and multiple dry years which is a period that represents the lowest average water supply availability for a consecutive multiple dry year periods (three years or more). The years selected for analysis for the average year, single-dry year, and multiple dry years are 1962, 1997, and 1988-1991, respectively.

The Water Agency's supply is subject to reductions in Decision 1610 based on Lake Sonoma volume. Lake Sonoma has a total volume of 381,000 AF and a supply pool of up to 212,000 AF. When the total volume is less than 100,000 AF, the Water Agency diversion is subject to a 30 percent reduction. Using the water type years as listed above and in Table 7-1, the Water Agency supply is expected to have an impact only in the single-dry year scenario. With up to three years of supply stored in Lake Sonoma, the system is relatively resistant to impacts from the average year to four years of dry hydrology.
This analysis showed that during a single-dry year scenario, the levels in Lake Sonoma drop below 100,000 AF before July 15. Based on terms in the Water Agency's water rights, the Water Agency is required to reduce their diversions from the Russian River by

30%. This reduction in diversions directly impacts the City's supply of water. The 30% reduction is based on the Water Agency's average monthly deliveries during the same month of the previous three years. In order to satisfy the City's demand with the reduced supply, the City will need to increase the production of local water supplies, and increase water conservation efforts. And enactment of the City's water contingency plan will most likely be required depending on the amount of reduction in consumption required and the amount water that can be supplied by the City's groundwater sources.

Table 7-1 Retail: Basis of Water Year Data			
		Available Supplies if Year Type Repeats	
Year Type	**Base Year**	**Volume Available**	**% of Average Supply**
Average Year	1962	13,400	100%
Single-Dry Year	1977		70%
Multiple-Dry Years 1st Year	1988	13,400	
Multiple-Dry Years 2nd Year	1989	13,400	
Multiple-Dry Years 3rd Year	1990	13,400	
Multiple-Dry Years 4th Year *Optional*	1991	13,400	
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
NOTES: Base years are from 2010 UWMP. During single dry year drought scenario. The Water Agency must reduce diversions by 30%.			

7.3 Supply and Demand Assessment

As discussed in 7.2, the Water Agency supply is not expected to be reduced during normal and four dry-year scenarios, and the City projects the full MOU supply volume of 13,400 AF will be available. During a Single-dry year scenario, the City expected is supply volume from the Water Agency to be reduced significantly. The City may decide to temporarily reduce its demands and supply delivery during certain future conditions to assist in addressing regional water supply and demand issues.

The normal year supply and demand comparison is shown in Table 7-2.

Table 7-2 Retail: Normal Year Supply and Demand Comparison

	2020	2025	2030	2035	2040
Supply totals	14,538	14,701	14,739	14,739	14,824
Demand totals	9,536	9,994	10,295	10,616	11,047
Difference	5,002	4,707	4,444	4,123	3,777

NOTES: Supply Totals include 13,000 AF and Recycled water supply to meet projected recycled water demand. Demand totals include potable water demand, and recycled water demand.

The single-dry year supply and demand scenario is presented in Table 7-3.

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison

	2020	2025	2030	2035	2040
Supply totals	7,254	7,530	7,735	7,974	8,254
Demand totals	9,536	9,994	10,295	10,616	11,047
Difference	(2,282)	(2,464)	(2,560)	(2,642)	(2,793)

NOTES: Supply Totals are based on a 30% reduction in the water demand reported to the water agency. This assumes that the Water Agency will only be able to supply 70% of the City's demand. The Supply totals also include Recycled water supply to meet projected recycled water demand. Demand totals include potable water demand, and recycled water demand.

The multiple-dry year supply and demand scenario is presented in Table 7-4.

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	**2025**	**2030**	**2035**	**2040**
First year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Second year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Third year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Fourth year *(optional)*	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
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: Supply Totals include 13,400 AF and recycled water supply to meet projected recycled water demand.						

8 Water Shortage Contingency Planning

8.1 Stages of Action

The City applies a four-stage rationing plan during declared water shortages. The rationing plan also applies to catastrophic loss of water. The rationing plan determines a consumption reduction of up to and over 50 percent of the normal consumption depending on causes, severity, and anticipated duration of the water supply shortage. Table 8-1 summarizes the rationing plan stages of action. Requirements and actions are identified in each stage to achieve the necessary demand reduction. Actions for each stage and water shortage demand reduction measures are detailed in the Water Shortage Contingency Plan (WSCP) in Appendix C.

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		
1	15%	Minimal
2	25%	Moderate
3	35%	Severe
4	50%	Critical

[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*

8.2 Prohibitions on End Users

Specific water use prohibitions and restrictions are implemented at each stage of the WSCP in order to achieve the necessary demand reduction targets. Table 8-2 lists the prohibitions and restrictions on end users at each stage.

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses

Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
1	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
1	CII - Restaurants may only serve water upon request		Yes
1	Other - Require automatic shut of hoses		Yes
1	Other - Prohibit use of potable water for washing hard surfaces		Yes
1	Landscape - Other landscape restriction or prohibition	Application of potable water to outdoor landscapes during and within 48 hours after measureable rainfall is prohibited	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner		Yes
2	CII - Lodging establishment must offer opt out of linen service		Yes
2	Landscape - Limit landscape irrigation to specific times		Yes
2	Landscape - Limit landscape irrigation to specific days		Yes
2	Other - Prohibit use of potable water for construction and dust control	Amount of potable water used for dust control limited	Yes

2	Landscape - Prohibit certain types of landscape irrigation	Irrigation with potable water of ornamental turf on public street medians prohibited	Yes
2	Water Features - Restrict water use for decorative water features, such as fountains		Yes
2	Other	Vehicle washing only at commercial facilities	Yes
3	Landscape - Other landscape restriction or prohibition	All landscape irrigation prohibited except for food gardens and mature trees	Yes
3	Landscape - Other landscape restriction or prohibition	Moratorium on landscape installations that require water	Yes
3	Other water feature or swimming pool restriction	Filling or topping off all swimming pools prohibited except for public facilities	Yes
4	Landscape - Prohibit all landscape irrigation	No private landscape irrigation allowed	Yes
4	Landscape - Other landscape restriction or prohibition	Public irrigation use only allowed for playing fields and mature trees or shrubs	Yes

8.3 Penalties, Charges, Other Enforcement of Prohibitions

Water shortage enforcements and fines can be applied to customers who are in violation of the WSCP stage mandates, the limitations and prohibitions listed in Table 8-2, the City's Water Conservation Regulations, or to customers who are not meeting their assigned Customer Demand Reduction Plans. The City will issue a warning followed by increasing levels of fines for repeat offenses.

8.4 Consumption Reduction Methods by Agencies

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference
Add additional rows as needed		
1	Expand Public Information Campaign	
1	Provide Rebates on Plumbing Fixtures and Devices	
1	Provide Rebates for Landscape Irrigation Efficiency	
1	Provide Rebates for Turf Replacement	
1	Offer Water Use Surveys	
1	Increase Water Waste Patrols	
2	Implement or Modify Drought Rate Structure or Surcharge	
2	Other	Analyze billing records to conduct outreach to highest water users and identify certain customer account for inclusion in a Customer Demand Reduction Plan.
2	Other	All consumption reduction methods from previous stage
3	Other	All consumption reduction methods from previous stage
4	Other	All consumption reduction methods from previous stage

8.5 Determining Water Shortage Reductions

The City will measure and determine actual water savings made from implementing the stages of the WSCP by relying on water meters that record water consumption.

8.6 Revenue and Expenditure Impacts

The City is undergoing a rate study and setting process. The next proposed rate plan will include analysis and development of alternatives to meet short-term and long-term water shortage revenue reductions, and a water shortage rate structure will be established.

8.7 Resolution or Ordinance

A draft water shortage contingency resolution is included in the WSCP (Appendix C).

8.8 Catastrophic Supply Interruption

Water supplies may be interrupted due to water supply contamination, major transmission pipeline break, regional power outage, or a natural disaster such as an earthquake. In the event of an emergency, the City will respond according to the Drought/Emergency Planning Actions as described in the Chapter 3 of the WSCP (Appendix C).

8.9 Minimum Supply Next Three Years

Table 8-4 Retail: Minimum Supply Next Three Years

	2016	2017	2018
Available Water Supply	13,400	13,400	13,400

9 Demand Management Measures

The City maintains an active conservation program. The City is a member of the California Urban Water Conservation Council (CUWCC) and reports progress through the CUWCC's annual reporting process. However, the City's efforts go well beyond the standard CUWCC MOU. Extensive analysis of the City's conservation program and demand management measures (DMM) were conducted in 2015. The 2015 analysis was done in conjunction with the partners of SMSWP, and resulted in the modification of several programs in the City's 2008 Water Conservation Plan. These efforts led to the current conservation and demand management program as presented in this section.

9.1 Demand Management Measures for Wholesale Agencies

The City is not a wholesale water provider and the DMM in this section are not applicable. The WATER AGENCY is required to provide assistance to its retailers under these DMMs as presented in the WATER AGENCY UWMP. Through the SMSWP, the WATER AGENCY provides the following programs to the City:

- School Education Program
- Regional Marketing
- CII Indoor and Outdoor Surveys

9.2 Demand Management Measures for Retail Agencies

The 2015 UWMP Guidebook provides a list of required DMM. This section lists each required DMM for retail agencies per the Guidebook, as well as the additional programs implemented by the City. Table 9-1 compares the 7 DMM program measures to the City's programs to identify which program provides the services in the counterpart DMM.

Table 9-2 DMM versus Petaluma Comparison

UWMP DMM	City of Petaluma DMM
9.2.1 Water Waste Prevention Ordinances	Implemented in City Ordinance
9.2.2 Metering	AMR
9.2.3 Conservation Pricing	Implemented through Finance
9.2.4 Public Education and Outreach	Public Information & School Education SMWSP – Regional Program City Program
9.2.5 Programs to Assess and Manage Distribution System Real Loss	AWWA Methodology
9.2.6 Water Conservation Program Coordination and Staffing Support	Approved Water Conservation Program
9.2.7 Other Demand Management Measures	Indoor and Outdoor Surveys - CII Replace CII Inefficient Equipment Efficient Toilet Replacement Program - CII HE Faucet Aerator/Showerhead Giveaway – CII HE Faucet Aerator/Showerhead Giveaway – SF, MF Indoor and Outdoor Surveys – SF, MF Efficient Toilet Replacement Program – SF HE Clothes Washer Rebate – SF, MF Outdoor Large Landscape Audits & Water Budgeting/Monitoring Landscape Rebates and Incentives for Equipment Upgrade Turf Removal – MF, CII Turf Removal – SF Water Conserving Landscape and Irrigation Codes Require Smart Irrigation Controllers and Rain Sensors in New Development

9.2.1 Water Waste Prevention Ordinance

The City adopted Water Conservation Regulations Ordinance No. 2316 in February, 2009 as part of the City's Municipal Code (PMC). The ordinance prohibits such practices as non-recirculating fountains, deliberate waste of water, single-pass evaporative cooling towers, or other non-essential uses of water as defined in the PMC Chapter 15.17. The ordinance gives the City the authority to disconnect service if water waste is not corrected. The City's water waste prohibition can be found in Section 15.17.70 of the Water Conservation Regulations (Appendix I).

9.2.2 Metering

All customers are metered and charged using volumetric rates. The City is working on an AMR program which will help to address customer meter inaccuracy. All meters will be on AMR in 2016.

9.2.3 Conservation Pricing

The City has always been metered and charged on volumetric rates. Expense and revenue requirements are evaluated regularly and rates are adjusted to match requirements for cost recovery. The City's current water rate structure contains a

monthly service charge and a tiered volumetric charge. There are four tiers for the residential customers and one tier for all other customers. The wastewater rate also has two components, a service charge and a volumetric charge based on the customer's average winter water usage.

9.2.4 Public Education and Outreach

The City's Public Information & School Education programs cover this DMM. The City has maintained a public outreach program since 2002 and currently provides an annual budget of approximately $75,000 to develop the conservation program and demand management messages for each program. The City uses all media to reach its customers, including print, radio, television, web site, PSA's, bill inserts, informational booths, demonstration gardens, movie theater ads, and others. Informational booths are set up at the annual Sonoma-Marin Fair and at seasonal farmers markets. The City maintains several water conservation demonstration gardens throughout the City, located at the City Hall, Ellis Creek Water Recycling Facility, Tahola Lane, and the Cavanaugh Recreation Center. Customer bills contain comparison of water usage to the previous year usage to provide the help the customer understand their water usage.

The City is in an agreement with the non-profit organization Daily Acts to provide public outreach and school education for the water conservation program. In 2015, Daily Acts conducted 29 conservation workshops, tabling events, and seminars providing outreach and education to 1121 Petaluma residents. The total number of students who received classroom instruction with Daily Acts in 2015 was 344.

The City is also a partner of a regional Public Information & School Education program through Sonoma-Marin Saving Water Partnership (SMSWP). The annual public information budget for SMSWP is $160,000 for all water contractors including the City. These program funds go to regional programs such as QWEL, Water Wise Gardening Online, Garden Sense, and the Eco-Friendly Garden Tour. The SMSWP school education budget is $300,000 annually for all water contractors and provides water education to grades K-12. The school education program provides curriculum materials, classroom instruction, water education field trips and study programs, assemblies and workshops, ESL water-focused lessons, and water education teacher trainings.

The City tracks outreach efforts and estimates the number of customers reached through each outreach effort. The Water Utility compares its individual program participation to its annual goals to estimate the effectiveness of its public information program. The program is modified through new messaging or using different media to reach the program implementation goals.

9.2.5 Programs to Assess and Manage Distribution System Real Loss

The Public Works and Utilities department conduct the efforts for this DMM. All accounts will be on AMR in 2016 and all meters area assigned by customer class. Staff monitors production and sales records on a monthly basis to identify unaccounted for water. Annual reports are produced to include water production, sales by customer class, and quantity of non-revenue water in order to identify unaccounted for water compared to

past years and to identify any potential issues. The City conducts a water audit annually based on AWWA Methodology, see Appendix E for the City's 2015 water audit.

9.2.6 Water Conservation Program Coordination and Staffing Support The City has maintained a fulltime conservation coordinator since 2006 when the position was created. The City also budgets for one full-time equivalent (FTE) to help implement the conservation program. The coordinator's duties include management and implementation of the programs, budgeting and cost tracking, conducting site visits or other audits, representing the program at public information events, customer demand tracking, and others. Additional staff is utilized to assist in site visits and audits, budgeting and planning, water demand analysis, public information events and campaigns, or other program implementation needs.

9.2.7 Other Demand Management Measures

Indoor and Outdoor Surveys – CII
Top water customers from each CII category are offered a free professional water survey through SMSWP that would evaluate ways for the business to save water. After the survey, recommendations are made and financial incentives may be offered to qualifying businesses.

Replace CII Inefficient Equipment
After undergoing a free water use survey, a CII customer may be qualified for a financial incentive. The program may provide rebates for a standard list of water efficient equipment including x-ray machines, icemakers, air-cooled ice machines, steamers, washers, spray valves, efficient dishwashers, replacing once through cooling, and adding conductivity controller on cooling towers. Incentives are granted at the discretion of SMSWP.

Efficient Toilet Replacement Program – CII
The CII Efficient Toilet Replacement Program provides a rebate or voucher of up to $260 for the installation of a high efficiency flushometer toilet (1.28 gpf or less).

HE Faucet Aerator/Showerhead Giveaway – CII
This program distributes low-flow showerheads and faucet aerators during CII water surveys and at community events. Supplies are made available at City Hall, the Public Works and Utilities building, and at Ellis Creek Water Recycling Facility.

HE Faucet Aerator/Showerhead Giveaway – SF, MF
This program distributes low-flow showerheads, faucet aerators and hose-end shut-off nozzles during residential water surveys and at community events. Supplies are made available at City Hall, the PW&U building, and at ECWRF.

Indoor and Outdoor Surveys – SF, MF
The City offers indoor and outdoor water surveys for existing residential customers. The survey currently includes the following:

- Check for water leaks in toilets, showers, and faucets
- Meter reading instructions and use for leak checking
- Measure showerhead and faucet flow rates
- Check irrigation system and timers
- Review or develop customer irrigation schedules
- Site survey report listing findings and recommendations
- Information on other conservation programs including rebate programs
- Give-away of efficient shower heads, faucet aerators, and hose-end shut-off nozzles

Efficient Toilet Replacement Program – SF
The City currently offers ultra-high efficient toilet (UHET) rebates to all City residents and sewer customers to replace older toilets that are designed to flush more than 1.6 gpf. The City will rebate any UHET that has flushes 1.28 gpf or less with dual flush technology for up to $150 per replacement toilet.

HE Clothes Washer Rebate – SF, MF
The City currently offers a rebate of up to $125 for efficient washing machines to residential customers.

Outdoor Large Landscape Audits & Water Budgeting/Monitoring
The City offers outdoor water audits for all existing large landscapes customers. All large multi-family residential, CII and public irrigators of large landscapes would be eligible for free landscape water audits upon request.

Landscape Rebates and Incentives for Equipment Upgrade
The City offers all multi-family residential, CII and irrigation customers with landscape the Smart Landscape Rebate Program. Rebates are for landscape retrofits or installation of water efficient upgrades. Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades including Rain Sensors, Weather Based Irrigation Controllers and more.

Turf Removal – SF, MF, CII
The City offers a turf removal program called Mulch Madness that provides free mulch, plants, and irrigation supplies to any qualifying customer willing to mulch over existing turf areas. In 2015 347 program participants converted 476,700 square feet of turf into low water use gardens that has removed lawn or irrigated areas from irrigation. The program is designed to offer a low-cost landscape alternative for those customers that do want to remove their lawns without the higher cost of re-landscaping.

Water Conserving Landscape and Irrigation Codes
The City adopted Water Conservation Regulations Ordinance No. 2562 in 2016 as part of the City's Municipal Code. This Ordinance replaced the City's landscape water use efficiency standards with updated standards to comply with State Model Water Efficient Landscape Ordinance. The City's updated Ordinance increases water efficiency standards for new and renovated landscapes through more efficient irrigation systems and limiting high water use plants including turf. The City's landscape water use efficiency standards can be found in Section 15.17.050 of the Water Conservation Regulations (Appendix I).

Require Smart Irrigation Controllers and Rain Sensors in New Development
The City currently requires all new development to install weather adjusting Smart Irrigation Controllers. This requirement applies to developers of all properties of greater than four residential units and all commercial development.

9.3 Implementation over the Past Five Years

This section provides a brief description and quantification of the DMM listed in Section 9.2 that the City implemented over the past five years.

Water Waste Prevention Ordinance
The City adopted Water Conservation Regulations Ordinance No. 2316 in February, 2009 as part of the City's Municipal Code (PMC). The ordinance prohibits such practices as non-recirculating fountains, deliberate waste of water, single-pass evaporative cooling towers, or other non-essential uses of water as defined in the City's Water Conservation Regulations (Appendix I).

Metering
All customers have been metered over the past five years. The City is currently working on an AMR program which will help to address customer meter inaccuracy. All meters will be on AMR in 2016.

Conservation Pricing
The City has always been metered and charged on volumetric rates. Expense and revenue requirements are evaluated regularly and rates are adjusted to match requirements for cost recovery. The City's current water rate structure contains a monthly service charge and a tiered volumetric charge. There are four tiers for the residential customers and one tier for all other customers.

Public Education and Outreach
The City has maintained a public outreach program since 2002 and currently provides an annual budget of approximately $75,000 to develop the conservation program and demand management messages for each program. The City uses all media to reach its customers, including print, radio, television, web site, PSA's, bill inserts, informational booths, demonstration gardens, movie theater ads, and others. Informational booths are set up at the annual Sonoma-Marin Fair and at seasonal farmers markets. The City maintains several water conservation demonstration gardens throughout the City, located

at the City Hall, Ellis Creek Water Recycling Facility, Tahola Lane, and the Cavanaugh Recreation Center.

The City is in an agreement with the non-profit organization Daily Acts to provide public outreach and school education for the water conservation program. In 2015, Daily Acts conducted 29 conservation workshops, tabling events, and seminars providing outreach and education to 1121 Petaluma residents. The total number of students who received classroom instruction with Daily Acts in 2015 was 344.

Regional Public Education and Outreach
The City has been a partner of a regional Public Information & School Education program through Sonoma-Marin Saving Water Partnership (SMSWP) since 2009. The annual public information budget for SMSWP is $160,000 for all water contractors including the City. These program funds go to regional programs such as QWEL, Water Wise Gardening Online, Garden Sense, and the Eco-Friendly Garden Tour. The SMSWP school education budget is $300,000 annually for all water contractors and provides water education to grades K-12. The school education program provides curriculum materials, classroom instruction, water education field trips and study programs, assemblies and workshops, ESL water-focused lessons, and water education teacher trainings. The total number of students in Sonoma and Marin reached each year via the SMSWP Education Program varies. In 2015, 2,564 students participated in field study programs, 32,636 students received curriculum materials including all Petaluma City Schools, and 4,256 students received classroom instruction.

Programs to Assess and Manage Distribution System Real Loss
The City has been monitoring unaccounted for water loss for the past 20 years. Staff monitors production and sales records on a monthly basis to identify unaccounted for water. Annual reports are produced to include water production, sales by customer class, and quantity of non-revenue water in order to identify unaccounted for water compared to past years and to identify any potential issues. The apparent loss in 2015 was approximately 4.6% of the total water supplied.

Water Conservation Program Coordination and Staffing Support
The City has maintained a fulltime conservation coordinator since 2006 when the position was created. The City also budgets for one full-time equivalent (FTE) to help implement the conservation program. Additional staff is utilized to assist in site visits and audits, budgeting and planning, water demand analysis, public information events and campaigns, or other program implementation needs.

Indoor and Outdoor Surveys – CII
Since 2009, the City has offered water customers from each CII category a free professional water survey through SMSWP that would evaluate ways for the business to save water. After the survey, recommendations are made by SMSWP and financial incentives may be offered to qualifying businesses.

Replace CII Inefficient Equipment
After undergoing a free water use survey, a CII customer may be qualified for a financial incentive. The program may provide rebates for a standard list of water efficient equipment including x-ray machines, icemakers, air-cooled ice machines, steamers, washers, spray valves, efficient dishwashers, replacing once through cooling, and adding conductivity controller on cooling towers. Incentives are granted at the discretion of SMSWP. This program has been offered since 2009 through SMSWP.

Efficient Toilet Replacement Program – CII
The CII Efficient Toilet Replacement Program began in 2007 and provides a rebate or voucher of up to $260 for the installation of a high efficiency flushometer toilet (1.28 gpf or less). Since 2010, the City has rebated CII customers for the installation of 67 high efficiency toilets.

HE Faucet Aerator/Showerhead Giveaway – CII
This program has been offered since 2002 and distributes low-flow showerheads and faucet aerators during CII water surveys and at community events. Supplies are made available at City Hall, the Public Works and Utilities building, and at Ellis Creek Water Recycling Facility.

HE Faucet Aerator/Showerhead Giveaway – SF, MF
This program has been offered since 2002 distributes low-flow showerheads, faucet aerators and hose-end shut-off nozzles during residential water surveys and at community events. Supplies are made available at City Hall, the PW&U building, and at ECWRF.

Indoor and Outdoor Surveys – SF, MF
The City has offered indoor and outdoor water surveys for existing residential customers over the last five years. This program is marketed through the City's public outreach program.

Efficient Toilet Replacement Program – SF
The City has offered toilet rebates to residents since 2007. The City currently offers ultra-high efficient toilet (UHET) rebates to all City residents and sewer customers to replace older toilets that are designed to flush more than 1.6 gpf. The City will rebate any UHET that flushes 1.28 gpf or less with dual flush technology for up to $150 per replacement toilet. Between 2010 and 2015, the City rebated 1,680 residential toilet replacements. The program is marketed through the City's public outreach program.

HE Clothes Washer Rebate – SF, MF
The HE clothes washer rebate has been offered since 2002. City currently offers a rebate of up to $125 for efficient washing machines to qualifying customers. Since 2010, the City has distributed 2,385 HE clothes washer rebates. The program is marketed through the City's public outreach program.

Outdoor Large Landscape Audits & Water Budgeting/Monitoring
Over the last five years, the City has offered outdoor water audits for all existing large landscapes customers. The program is marketed through the City's public outreach program and targeted messaging through bill inserts.

Landscape Rebates and Incentives for Equipment Upgrade
The City offers all multi-family residential, CII and irrigation customers with landscape the Smart Landscape Rebate Program. Rebates are for landscape retrofits or installation of water efficient upgrades. Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades including Rain Sensors, Weather Based Irrigation Controllers and more. This program has been implemented since 2010.

Turf Removal – SF, MF, CII
Since 2010, the City has offered a turf removal program called Mulch Madness that provides free mulch, plants, and irrigation supplies to qualifying customers willing to mulch over existing turf areas. Since 2010, 1226 program participants have converted 1,454,739 square feet of turf into low water use gardens. The program is marketed through the City's public outreach program.

Water Conserving Landscape and Irrigation Codes
The City adopted Water Conservation Regulations Ordinance No. 2562 in 2016 as part of the City's Municipal Code. This Ordinance repealed the City's 2008 landscape water use efficiency standards and replaced them with updated landscape and irrigation standards to comply with State Water Efficient Landscape requirements.

Require Smart Irrigation Controllers and Rain Sensors in New Development
Since 2010, the City has required all new development to install weather adjusting Smart Irrigation Controllers. This requirement applies to developers of all properties of greater than four residential units and all commercial development.

9.4 Planned Implementation to Achieve Water Use Targets

The list below describes the DMM that the City plans to implement in order to achieve its water use targets. DMM effectiveness will be measured by customer data kept in the billing database that is used to evaluate the impacts of DMM on demand over time. A description of each DMM can be found in Section 9.2 Demand Management Measures for Retail Agencies.

1. Water Waste Prevention Ordinances
2. Metering
3. Conservation Pricing
4. Public Education and Outreach
    - SMWSP – Regional Program
    - City Program
5. Programs to Assess and Manage Distribution System Real Loss
6. Water Conservation Program Coordination and Staffing Support

7. Indoor and Outdoor Surveys – CII
8. Replace CII Inefficient Equipment
9. Efficient Toilet Replacement Program – CII
10. HE Faucet Aerator/Showerhead Giveaway – CII
11. HE Faucet Aerator/Showerhead Giveaway – SF, MF
12. Indoor and Outdoor Surveys – SF, MF
13. Efficient Toilet Replacement Program – SF
14. HE Clothes Washer Rebate – SF, MF
15. Outdoor Large Landscape Audits & Water Budgeting/Monitoring
16. Landscape Rebates and Incentives for Equipment Upgrade
17. Turf Removal – MF, CII
18. Turf Removal – SF
19. Water Conserving Landscape and Irrigation Codes
20. Require Smart Irrigation Controllers and Rain Sensors in New Development

9.5 Members of the California Urban Water Conservation Council

The City is a member of the CUWCC and submits annual Best Management Practice reports to show compliance with the CUWCC's MOU.

10 Plan Adoption, Submittal and Implementation

The 2015 UWMP process includes CWC requirements for a public hearing, the UWMP adoption process, submitting the UWMP, and plan implementation.

10.1 Notice of Public Hearing

Water suppliers must hold a public hearing prior to adopting the plan. The public hearing provides an opportunity for the public to provide input to the plan before it's adopted. There are two audiences to be notified for the public hearing; cities and counties, and the public.

There are two required notices to cities and counties. A 60-day notification must be sent to cities and counties that states the supplier is reviewing the UWMP and considering amendments to the Plan. A notice of public hearing must also be sent which states the time and place of the public hearing, and include the location of where the 2015 UWMP can be viewed, the UWMP revision schedule, and contact information of the UWMP preparer. The public hearing must also be noticed in a local newspaper, per Government Code 6066. The 60-day Notification, Notice of Public Hearing sent to cities and counties, and Notice placed in a local newspaper can be found in Appendix A.

Table 10-1 Retail: Notification to Cities and Counties

City Name	60 Day Notice	Notice of Public Hearing
City of Petaluma	☑	☑
County Name	**60 Day Notice**	**Notice of Public Hearing**
Sonoma County	☑	☑

10.2 Public Hearing and Adoption

The City held a public review of the UWMP to discuss the plan and receive comments from the public. A Public hearing was conducted at the May 16, 2016 Council Meeting. The UWMP was approved at the May 16, 2016 Council Meeting following the Public hearing. The adoption resolution is provided in Appendix B. Within 60 days of submittal to the DWR, the City will submit a copy of the UWMP to Sonoma County. Within 30 days of submittal to the DWR, the City will also submit a copy of the UWMP to the California State Library, and make a copy of the UWMP available for public viewing at the City's Public Works and Utilities department during normal business hours located at 202 North McDowell Boulevard, Petaluma, CA 94954.

Appendix A
2015 UWMP 60-day Notification and Public Hearing Notification

CERTIFICATION OF PUBLICATION IN
Petaluma Argus-Courier
(Published Thursdays)
IN THE
SUPERIOR COURT
OF THE
STATE OF CALIFORNIA
In and for the County of Sonoma

This space for County clerk's Filing Stamp

RECEIVED
MAY 18 2016
CITY CLERK

Proof of Publication of

DECLARATION

Notice

I am a citizen of the United States, over the age of eighteen years and a resident of said county and was at all said times the principal clerk of the printer and publisher of The Petaluma Argus-Courier, a newspaper of general circulation, published weekly in the City of Petaluma, in said County of Sonoma, State of California; that The Petaluma Argus-Courier is and was at all times herein mentioned, a newspaper of general circulation as that term is defined by Section 6000 of the Government Code; its status as such newspaper of general circulation having been established by Court Decree No. 35518 of theSuperiorCourt of the State ofCalifornia, in and for theCountyofSonoma, Department No. I thereof; and as provided by said Section 6000, is published for the dissemination of local and telegraphic news and intelligence of a general character, having a bona fide subscription list of paying subscribers, and is not devoted to the interests, or published for the entertainment or instruction of a particular class, profession, trade, calling, race or denomination, or for the entertainment and instruction of such classes, professions, trades, callings, races or denominations, that at all said times said newspaper has been established, published in the said City of Petaluma, in said County and State at regular intervals for more than one year preceding the first publication of this notice herein mentioned; that said notice was set in type not smaller than nonpareil and was preceded with words printed in black face type not smaller than nonpareil, describing and expressing in general terms, the purport and character of the notice intended to be given; that the notice, of which the annexed is printed copy, was published and printed in said newspaper on

4/21, 4/28, 5/5, 5/12 - 5/12/16

I DECLARE UNDER PENALTY OF PERJURY that the foregoing is true and correct.

DATED 5/16/16

at Petaluma, California.

Dawn M Castro

CITY OF PETALUMA
NOTICE OF PUBLIC HEARING
ADOPTION OF THE CITY OF PETALUMA'S 2015 URBAN WATER MANAGEMENT PLAN

Notice is hereby given that a public hearing will be conducted by the City Council on Monday, May 16, 2016, at or after 7:00 p.m., in the City Council Chambers, City Hall, 11 English Street, Petaluma, CA. The purpose of the public hearing will be to receive public comment prior to formal adoption of the City of Petaluma's "2015 Urban Water Management Plan."

Copies of the "2015 Urban Water Management Plan" are available for public review at:

Office of the City Clerk, City of Petaluma, 11 English Street, Department of Public Works & Utilities, City of Petaluma, 202 North McDowell Boulevard and at the Ellis Creek Water Recycling Facility, City of Petaluma, 3890 Cypress Drive, during normal business hours. The document is also available for review at the City of Petaluma's website: cityofpetaluma.net.

If you cannot attend, you are encouraged to submit written comments and recommendations prior to the public hearing. Written comments may be mailed to: City Clerk, City of Petaluma, 11 English Street, Petaluma, CA 94952, or emailed to: cityclerk@ci.petaluma.ca.us, or delivered to the City Clerk, City Hall, 11 English Street, Petaluma.

Claire Cooper
City Clerk

April 21, 2016
April 28, 2016
May 5, 2016
May 12, 2016

2737676 – Pub. Apr. 21, 28; May 5, 12, 2016 4tl

CITY OF PETALUMA

POST OFFICE BOX 61
PETALUMA, CA 94953-0061

February 23, 2016

To: Interested Agencies

Re: Notice of Review and Preparation of the 2015 Urban Water Management Plan Update

The City of Petaluma is currently reviewing and updating the City's Urban Water Management Plan (UWMP), as required by State law. The 2015 UWMP is due to the California Department of Water Resources by July 1, 2016.

A draft of the 2015 UWMP will be made available for public review later this year and a public hearing will be scheduled and noticed at least 14-days prior to the hearing. The UWMP will provide an analysis of the projected water demand and supply over the next 25 years, as well as an updated water conservation plan.

If you are interested in providing input during the preparation of the UWMP, please contact me at (707) 778-4580 or kcarothers@ci.petaluma.ca.us.

Sincerely,

Kent Carothers
Operations Manager

Distribution List:

Sonoma County Water Agency, Attention: Grant Davis
Sonoma Valley County Sanitation District, Attention: Grant Davis
Valley of the Moon Water District, Attention: Dan Muelrath
City of Santa Rosa, Attention: David Guhin
City of Sonoma, Attention: Dan Takasugi
City of Sonoma Planning Commission, Attention: David Goodison
City of Sonoma Community Services Environmental Commission
City of Rohnert Park, Attention: Mary Grace Pawson
City of Cotati, Attention: Craig Scott
Town of Windsor, Attention: Toni Bertolero
North Marin Water District, Attention: Chris DeGabriele
Marin Municipal Water District, Attention: Krishna Kumar
County of Sonoma PRMD, Attention: Tennis Wick
Sonoma Valley Basin Advisory Panel, Attention: Marcus Trotta
Sonoma Ecology Center, Attention: Richard Dale

Public Works & Utilities

City Engineers
11 English Street
Petaluma, CA 94952
Phone (707) 778-4303
Fax (707) 776-3602
E-Mail:
publicworks@
ci.petaluma.ca.us

Parks & Building Maintenance
840 Hopper St. Ext.
Petaluma, CA 94952
Phone (707) 778-4303
Fax (707) 778-4437

Transportation Services
555 N. McDowell Blvd.
Petaluma, CA 94954
Phone (707) 778-4421
Fax (707) 776-3799

Utilities & Field Operations
202 N. McDowell Blvd.
Petaluma, CA 94954
Phone (707) 778-4546
Fax (707) 778-4508

E-Mail: publicworks@
ci.petaluma.ca.us

Appendix B
2015 UWMP Adoption Resolution

Resolution No. 2016-074 N.C.S.
of the City of Petaluma, California

ADOPTING THE CITY OF PETALUMA 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the Urban Water Management Planning Act, Water Code Section 10610 et seq., (the Act) requires that every urban water supplier which provides 3,000 acre feet or more of water annually, or which directly or indirectly supplies water for municipal purposes to more than 3,000 customers, shall prepare an Urban Water Management Plan, the primary objective of which is to plan for the conservation and efficient use of water; and

WHEREAS, the Act also requires all urban water purveyors serving over 3,000 customers or over 3,000 acre-feet of water annually to develop a Water Shortage Contingency Plan; and

WHEREAS, the Water Conservation Act of 2009, Senate Bill SBx7X7, requires a 20% reduction in per capita water use by 2020; and

WHEREAS, requirements of the Water Conservation Act of 2009 applicable to urban water suppliers may be incorporated into the Urban Water Management Plan; and

WHEREAS, the Urban Water Management Plan must be adopted after public review and a public hearing by the City, and after adoption by the City Council must be filed with the California Department of Water Resources and sent to the State Library; and

WHEREAS, the City of Petaluma has prepared the City of Petaluma 2015 Urban Water Management Plan, including SBx7-7 20% by 2020 water use reduction goals and the City of Petaluma Urban Water Shortage Contingency Plan 2015 per the requirements of the Urban Water Management Planning Act; and

WHEREAS, the Petaluma City Council conducted a public hearing on the City of Petaluma 2015 Urban Water Management Plan, including the SBx7X7 20% by 2020 water use reduction goals, and the City of Petaluma Urban Water Shortage Contingency Plan 2015 on May 16, 2016; and

WHEREAS, the City of Petaluma published a notice on the public hearing on April 21, 28, and May 12, 2016 in the *Petaluma Argus-Courier;* and

WHEREAS, adoption of the UWMP pursuant to this resolution is exempt from the requirements of the California Environmental Quality Act (CEQA) pursuant to Sections 15307 and 15308 of the CEQA Guidelines as action by a regulatory agency for protection of natural resources and the environment that includes procedures for protection of the environment.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Petaluma as follows:

1. The above recitals are incorporated herein by reference.

2. The City of Petaluma 2015 Urban Water Management Plan, including the Water Conservation Act SBx7X7 20% by 2020 water-use reduction goals, Method 1, and the City of Petaluma Water Shortage Contingency Plan 2015 are hereby adopted.

3. The Department of Public Works and Utilities Department is hereby directed to submit the City of Petaluma 2015 Urban Water Management Plan to the California Department of Water Resources and the California State Library within 30 days of adoption of the Plan.

Under the power and authority conferred upon this Council by the Charter of said City.

REFERENCE:	I hereby certify the foregoing Resolution was introduced and adopted by the Council of the City of Petaluma at a Regular meeting on the 16th day of May, 2016, by the following vote:
AYES:	Albertson, Barrett, Mayor Glass, Healy, Kearney, Vice Mayor King, Miller
NOES:	None
ABSENT:	None
ABSTAIN:	None

Approved as to form:

City Attorney

ATTEST:

City Clerk

Mayor

Appendix C
City of Petaluma Water Shortage Contingency Plan – 2015

City of Petaluma
Water Shortage Contingency Plan
2015

1. Introduction

This City of Petaluma Water Shortage Contingency Plan is a component of the City's Urban Water Management Plan and describes actions at each stage of a water shortage. The Plan is updated periodically to address the most current requirements of urban water shortage contingency planning and to give the City flexibility in addressing supply shortages that may result from droughts, natural disasters, reduced deliveries from the Sonoma County Water Agency (SCWA), and other water shortage conditions. These regulations will be enforced in the event of a water shortage and are in addition to the City's Water Conservation Regulations located in Chapter 15, Section 17 of the Petaluma Municipal Code (PMC).

Petaluma's Urban Water Shortage Contingency Plan addresses demand reduction strategies for the Petaluma distribution system. The City's wholesaler, SCWA, determines trigger points on the Russian River system, which may in turn trigger Petaluma's program.

2. Water Supply

The City's primary source of water supply is SCWA, which delivers water imported from the Russian River and from groundwater wells in the Santa Rosa Plain to the City of Petaluma. Under the Restructured Agreement for Water Supply between SCWA and its contractors, including the City of Petaluma, the City is entitled to delivery of water at a rate of 21.8 million gallons per day with an annual volume limit of 13,400 acre feet. The City also has 10 wells capable of producing up to 3.5-4 million gallons a day for 3 months for emergency purposes only.

3. Drought/Emergency Planning Actions

In addition to responding to drought conditions, the City's Water Shortage Contingency Plan can be used to respond to emergency conditions that interrupt water supplies to the City. Water supplies may be interrupted due to water supply contamination, major transmission pipeline break, regional power outage, or a natural disaster such as an earthquake. In the event of an emergency, the City will respond as outlined below.

3.1 SCWA Supply Interruption

In the event that the SCWA's Russian River supply becomes contaminated (i.e. due to a chemical spill or other environmental incident) or is unavailable due to natural disaster, it may be possible that no water would be available from SCWA for a period of time. In such a case, the City would need to rely on water from system storage facilities and emergency wells. The City will first determine existing storage supply, secure the Kastania Storage Tanks, evaluate the potential length of supply shut down, and then determine which water storage stage to declare. Once a water shortage stage is selected, the City will implement the appropriate measures as defined in the stage description.

3.2 Power Failure

If an area-wide electrical power failure were to occur within the City's water service area, many of the City's pumping facilities could potentially be impacted. Uninterruptible power supplies are used at the Public Works and Utilities Building and at each of the field sites to power the SCADA system. The batteries can provide approximately eight hours of power, which should be sufficient time to return power or connect to a standby generator. Three portable generators are available and have been used in the past to support power outage response. SCWA's facilities may also be vulnerable to power outages; most of the SCWA facilities which serve the City have backup power provisions.

3.3 Earthquake

Water system infrastructure, including pump stations, storage tanks, and pipelines, can be damaged during a strong earthquake. The City's facilities have been constructed in accordance with the applicable building codes to minimize potential damage during an earthquake. Major reconstruction of existing facilities must also be designed to meet the provisions of the Uniform Building Code for Seismic Zone four. However, it is expected that some facilities may be damaged as the result of a strong earthquake. The City has multiple storage facilities and looped distribution pipelines, to allow potentially damaged portions of the City's system to be quickly isolated and repaired.

4. Water Waste Restrictions

The following use restrictions are located in the City's Water Conservation Regulations in Chapter 15, Section 17 of the PMC, and are in addition to the customer mandates of each water shortage stage. Refer to PMC Chapter 15, Section 17 for a complete list of regulations. As these requirements are subject to change, the most current regulations apply.

- Hose-end shut-off nozzles required on all garden and utility hoses to include washing cars, boats, and trailers.
- No runoff or overspray caused by outdoor irrigation.
- No water used for non-recycling water features such as fountains.
- Irrigation accounts cannot exceed allocated water budgets by more than twenty percent.
- The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited. (Regulation proposed)
- Pools and spas must be covered while not in use. (Regulation proposed)

5. Water Shortage Stages

Demand reduction strategies will be employed at all stages of a water shortage emergency. This section describes each stage and anticipated demand reductions. A water shortage stage may be triggered by supply conditions or by required reductions. The City may prioritize certain uses during a shortage stage such as health and safety uses, commercial or industrial needs, permanent or heritage landscape irrigation, or others.

Stage	Supply Conditions	Reduction Requirement	Demand Reduction Target	Program Type
Stage 1- Minimal	Up to 15% Reduction in SCWA Water Supply	Up to 15%	Up to 15%	Voluntary
Stage 2- Moderate	Up to 16-25% Reduction in SCWA Water Supply	16% - 25%	Up to 25%	Mandatory
Stage 3- Severe	Up to 26-35% Reduction in SCWA Water Supply	26% - 35%	Up to 35%	Mandatory
Stage 4- Critical	Up to 36-50%+ Reduction in SCWA Water Supply	36% - 50%	Up to 50%+	Mandatory

5.1 Stage 1- Minimal

Stage One is designed to achieve demand reductions up to 15 percent as determined by the Director of Public Works and Utilities (Director). This stage relies mainly on voluntary actions by the customer to reduce demand. A public information campaign will be developed and implemented to message customers.

Customer Mandates

- Water served in restaurants on request only.
- No application of potable water for washing down pavement, except for health and safety, including sanitation.

City Actions

1. Adopt resolution requesting voluntary water conservation of up to 15 percent as determined by the Director. Resolution to prohibit water waste and to reduce all non-essential water use per the City's Water Waste Ordinance located in Chapter 15, Section 17 of the City's Municipal Code.
2. Initiate public information campaign, which may include:
    a. Prepare and disseminate educational brochures, bill inserts, and customer mailers.
    b. Disseminate technical information to specific customer types.
    c. Set up public information booths at community events urging water conservation and showing ways that public can save water.
    d. Coordinate media outreach program; issue news releases to the media.
    e. Explain other stages and forecast future reduction needs.
    f. Encourage early morning and late night irrigation.

5.2 Stage 2- Moderate

Stage Two is designed to achieve demand reductions of between 16 and 25 percent as determined by the Director. Demand reductions are mandatory, but other than the Stage Mandates, the customer is expected to reduce demands through methods that best fit their situation. The City will track customer demands and implement mandatory measures for customers that do not reduce demands.

Customer Mandates

- All Stage Mandates established in previous stage, plus:
- Irrigation of landscape with potable water shall be prohibited except during specific hours and days to be determined by the Director.
- Irrigation with potable water of ornamental turf on public street medians is prohibited.
- Operating ornamental fountains prohibited.
- Recycled water must be used for dust control where feasible. The number of truck loads of potable water for dust control may be limited as determined by the Director.
- Vehicle washing only at commercial facilities.

- Operators of hotels and motels to 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.

City Actions

1. Adopt resolution for Stage Two requirements.
2. Update public information campaign for Stage Two requirements and implement all public outreach methods in Stage One.
3. Intensify outreach efforts as necessary to communicate mandatory requirements and increased demand reduction targets.
4. Expand Water-Wise HouseCall Program to include explanation of water shortage requirements and potential fines.
5. City will analyze billing records to identify highest water users.
6. City will conduct targeted outreach to the highest users.
7. Customer Demand Reduction Plan.
8. Implement water shortage rate structure as adopted by the City's Water Rate Resolution. The most current rates apply.

The City will identify certain customer accounts for inclusion in a Customer Demand Reduction Plan. Customers identified for inclusion in a Customer Demand Reduction Plan are allowed to meet demand reduction requirements in two ways:

a. Achieve percent reduction from reference year's usage of same billing period. Percent reduction and reference year to be determined at implementation of water shortage stage.
b. Meet Customer Demand Reduction Plan as assigned by the City.

Customers who do not meet percent reduction goals from last year's usage of same billing period or an assigned Customer Demand Reduction Plan will be issued warning notices and fines as described in Water Shortage Warnings and Fees below.

5.3 Stage 3- Severe

Stage Three is designed to achieve demand reductions between 26 and 35 percent as determined by the Director. Demand reductions are mandatory, but other than the Stage Mandates, the customer is expected to reduce demands through methods that best fir their situation. The City will track customer demands and implement mandatory measures for customers that do not reduce demands.

Customer Mandates

- All Stage Mandates established in previous stage, plus:
- A moratorium on landscape installations that require water.
- Filling or topping off all swimming pools prohibited, except for public facilities.
- No landscape irrigation except for food gardens and mature trees.

City Actions

1. Adopt resolution for Stage Three requirements.
2. Update public information campaign for Stage Three requirements and implement all public outreach methods in Stage One. Intensify outreach efforts as necessary to communicate mandatory requirements and increased demand reduction targets.
3. Refer to Stage Two Actions 3 – 8.

5.4 Stage 4- Critical

Stage Four is designed to achieve demand reductions between 36 and 50 percent as determined by the Director. In addition to reduction between 36 and 50 percent, Stage Four will be used to meet demands greater than 50 percent. Demand reductions are mandatory. The City will track customer demands and implement mandatory measures for customers that do not reduce demands.

Customer Mandates

- All Stage Mandates established in previous stage, plus:
- No landscape irrigation allowed. Public irrigation use only allowed for playing fields and mature trees or shrubs. City may modify this to eliminate all irrigation depending on shortage condition.

City Actions

1. Adopt resolution for Stage Four requirements.
2. Update public information campaign for Stage Four requirements and implement all public outreach methods in Stage One. Intensify outreach efforts as necessary to communicate mandatory requirements and increased demand reduction targets.
3. Refer to Stage Two Actions 3 – 8.

6. Water Shortage Warnings and Fees

Water shortage emergency warnings and fees can be applied to customers who are in violation of the Water Shortage Contingency Plan stage mandates, the City's Water Conservation Regulations, or to customers who are not meeting their assigned Customer Demand Reduction Plans. The City will issue warnings and fines as necessary according to the following process:

a. Personal contact with the customer at the address of the water service. Education and technical support provided.
b. If personal contact is unsuccessful, written notice of the violation, including date that violation must be corrected, may be left on the premises, with a copy of the notice sent by certified mail to the customer. Customer is given 72 hours or less as appropriate to mitigate violation.
c. As adopted by the City Council pursuant to PMC Section 1.16.030, current fines, as stated in Resolution No. 2008-212 N.C.S., are as follows:
    i. First Violation: Fine of $100
    ii. Second Violation: Fine of $500
    iii. Third violation: Fine of $1,000

    The most current fines apply as adopted by City Council.
d. Pursuant to PMC Section 15.17.100, in addition to issuing a notice of violation, if appropriate, City may install a pressure reducing device in service connection or disconnect service until verification of correction is made.
e. Customer will be charged $250 for installation of pressure reducing service, and $250 for removal of device. Device will not be removed until customer has paid all fines and outstanding account balances, and customer has been assigned a water budget.
f. Customer will be charged $60 for service disconnection and $60 for re-connection. Service will not be re-connected until customer has paid all fines and outstanding account balances, and customer has been assigned a water budget.

7. Impacts to Revenues

The City is undergoing a rate study and setting process. The next proposed rate plan will include analysis and development of alternatives to meet short-term and long-term water shortage revenue reductions, and a water shortage rate structure will be established.

DRAFT Water Shortage Emergency Resolution

RESOLUTION AUTHORIZING THE CITY MANAGER TO IMPLEMENT THE CITY'S WATER SHORTAGE CONTINGENCY PLAN, STAGE ____.

WHEREAS, the City of Petaluma is a City empowered to provide water service within certain boundaries; and

WHEREAS, the Sonoma County Water Agency is a wholesaler of water to the City of Petaluma; and

WHEREAS, due to (Current condition- drought, contamination, etc.), water supply conditions indicates that a ____ percent reduction demand is required to ensure adequate supply in 20___(insert date); and

WHEREAS, the Sonoma County Water Agency has reduced delivery to the City and all prime contractors by ____ percent; and]

WHEREAS, on ____ (date), Governor ____ (name) declared a drought state of emergency and directed state and local officials to take all actions necessary to conserve water; and]

WHEREAS, on _____ (date), Governor ____ (name)/State Water Resources Control Board issued/adopted _____; and]

WHEREAS, the City of Petaluma has adopted a resolution, 2008-xxx-N.C.S., updating the schedule of penalties for violations of the PMC including violations of the water conservation ordinance;

WHEREAS, the City of Petaluma has the authority and responsibility to adopt water demand reductions measures within its area of service; and

WHEREAS, the Public Works and Utilities staff is recommending the implementation of Stage ___ of the City's Water Shortage Contingency Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City Council declares that under the current water shortage conditions a Water Shortage Emergency exists, within the area served by the City Water System.

BE IT FURTHER RESOLVED BY THE CITY COUNCIL OF THE CITY OF PETALUMA AS FOLLOWS:

1. The above recitals are true and correct and hereby declared to be finding of the City Council of the City of Petaluma.
2. The City Council directs the City Manager to implement a program of demand management as defined in the Petaluma Water Shortage Contingency Plan to realize City-wide water use reduction of ____ percent.
3. This resolution shall become effective immediately.
4. Under the water shortage conditions existing in Stage ___, Stage ___ of the City's Water Shortage Contingency Plan shall be implemented with the following modifications:
    a. Irrigation with potable water using automatic sprinkler systems shall be prohibited except on _____, _____, and _____ (insert days of the week) between the hours of ___ pm and ___ am.
    b. Recycled water must be used for dust control where feasible. The number of truck loads of potable water for dust control are limited to ___ (insert number of trucks) tucks per ___ (insert day or week) as determined by Director of Public Works and Utilities.
    c. Achieve ___ (insert percent) percent reduction from ____ (insert reference year) year's usage of same billing period.

Appendix D

2015 Urban Water Management Plan – Water Demand Analysis and Water Conservation Measure Update – Maddaus Water Management Inc.

City of Petaluma

2015 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update

FINAL

July 1, 2015

CITY REVISIONS

October 29, 2015

PETALUMA 1858

SONOMA - MARIN SAVING WATER PARTNERSHIP

QWEL Qualified Water Efficient Landscaper

MADDAUS WATER MANAGEMENT INC.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACS	American Community Survey
AF	acre-foot/acre-feet
AFY	acre-foot/acre-feet per year
AMI	Automated Meter Infrastructure
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
BMP	Best Management Practice
CCR	California Code of Regulations
CII	Commercial, Industrial, and Institutional
CPI	Consumer Price Index
CUWCC	California Urban Water Conservation Council
DWR	Department of Water Resources
DSS	Decision Support System
FY	Fiscal Year
GPCD	Gallons per capita per day
gpf	Gallons per flush
HE	High Efficiency
HEU	High Efficiency Urinal
ILI	Infrastructure Leakage Index
IRR	Irrigation
MF	Multi-family
MG	Million gallons
MMDD	Master measure design database
MMWD	Marin Municipal Water District
MWM	Maddaus Water Management, Inc.
ND	New Development
NMWD	North Marin Water District
NRW	Non-revenue water
PV	Present value
PWSS	Public Water System Statistics
SB	Senate Bill
SCWA	Sonoma County Water Agency
SF	Single Family
SMSWP	Sonoma-Marin Saving Water Partnership
UHET	Ultra High Efficiency Toilet
ULFT	Ultra Low Flow Toilet
UWMP	Urban Water Management Plan
WF	Water factor
WSA	Water Supply Assessment

EXECUTIVE SUMMARY

Introduction

To prepare for the submission of the 2015 Urban Water Management Plan, a demand and conservation technical analysis was conducted by Maddaus Water Management, Inc. (MWM) for the City of Petaluma. The report was subsequently modified by the City of Petaluma. The primary purpose of this analysis was to:

1. Calculate a demand forecast for the years 2015 to 2040.
2. Calculate the range of conservation costs and savings for the years 2015 to 2040. This effort included:
    - Evaluating twenty-five existing and new conservation programs that can possibly reduce future water demand.
    - Estimating the costs and water savings of these measures.
    - Combining the measures into increasingly more aggressive programs and evaluating the costs and water savings of these programs.

Long-Term Demand and Conservation Program Analysis Results

The MWM project included analysis for all the Sonoma and Marin County Water Contractors receiving Russian River Water Supply from Sonoma County Water Agency and consisted of two main parts: (1) create a demand and conservation analysis for 2015 to 2040, and (2) evaluate conservation savings potential for the years 2015 to 2040 with a variety of different measures and conservation programs.

The first step in the analysis was to review and analyze historical water use production and billing data. Building on MWM's previous year 2010 demand and conservation technical analysis effort, for most Water Contractors, billing data was provided for the years 2010 to 2014. The data was graphically analyzed and discussed with the individual Water Contractors.

The historical water use, the selected population and employment projections, the plumbing code information, and discussions with the Water Contractors were used to create a demand forecast for the years 2015 to 2040, as further described in Section 3.

Once the demands were completed, the conservation measures were analyzed for a total of 25 measures shown in Table ES-1. The conservation analysis included all the measures selected by the Sonoma-Marin Water Contractors via electronic survey. The following important assumptions about the conservation measures were included in this analysis:

1. The measures reviewed for each Water Contractor is listed in the following table and described in Section 4.
2. New development ordinances were updated to reflect new local ordinances, the Model Water Efficient Landscape Ordinance, and the CALGreen building code (as of May 1, 2015). This can be found in Appendix A.

The following tables and figures present the water demands and conservation savings for this analysis. The Plumbing Code includes the new California State Law (Assembly Bill 715), which requires High Efficiency Toilets and High Efficiency Urinals as of 2014. The Plumbing Code also includes SB 407, which applies to all new construction and replacements as of 2017 for single family and 2019 for multi-family and commercial properties. The increase of projected growth in population and/or jobs will cause water demand to increase. For each Water Contractor the three conservation Program scenarios are organized as follows:

- **Program A**: "Existing Program" option includes the measures that the Water Contractor currently offers. These measures are not necessarily designed the way they are currently implemented, having, in some cases, more aggressive annual account targets planned for the future.

- **Program B**: "Optimized Program" represents the measures that the Water Contractor currently offers. These measures are not necessarily designed the way they are currently implemented, having, in some cases, more aggressive annual account targets. Program B is designed the same as Program A.
- **Program C**: "All Measures Analyzed" presents a scenario where all 25 measures are implemented.

Table ES-1 presents the conservation measures modeled in this analysis sorted by utility, CII, landscape, and residential category.

Table ES-1 Conservation Measures Evaluated

Utility Measures	CII Measures	Landscape Measures	Residential Measures
Water Loss	Indoor and Outdoor Surveys - CII	Outdoor Large Landscape Audits & Water Budgeting/Monitoring	HE Faucet Aerator / Showerhead Giveaway - SF, MF
AMI	Replace CII Inefficient Equipment	Landscape Rebates and Incentives for Equipment Upgrade	Indoor and Outdoor Surveys - SF, MF
Pricing	Efficient Toilet Replacement Program - CII	Turf Removal - MF, CII	Efficient Toilet Replacement Program – SF
Public Info & School Education - SMSWP	Urinal Rebates – CII	Turf Removal - SF	Direct Install UHET, Showerheads, and Faucet Aerators - SF, MF
Public Info & School Education - Water Contractor	Plumber Initiated UHET & HEU Retrofit Program	Water Conserving Landscape and Irrigation Codes	HE Clothes Washer Rebate - SF, MF
Prohibit Water Waste	Require <0.25 gal/flush Urinals in New Development	Require Smart Irrigation Controllers and Rain Sensors in New Development	Submeters Incentive
	HE Faucet Aerator / Showerhead Giveaway – CII		

Sonoma Marin Saving Water Partnership (SMSWP) program includes all Sonoma and Marin County Water Contractors receiving water from Sonoma County Water Agency (SCWA). The conservation programs implemented in 2015 do vary among the individual Water Contractors.

Figure ES-1 presents the collective Water Contractors' conservation measure program scenarios, indicating which measures have been selected by the City of Petaluma for implementation within each program.

Figure ES-1. Conservation Measure Program Scenarios

Program Scenarios				
	Measures	**Program A**	**Program B**	**Program C**
Program Scenarios	Water Loss	☑	☑	☑
	AMI	☐	☐	☑
	Pricing	☑	☑	☑
	Public Info & School Education - SMWSP	☑	☑	☑
	Public Info & School Education - Water Contractor	☑	☑	☑
	Prohibit Water Waste	☑	☑	☑
	Indoor and Outdoor Surveys - CII	☑	☑	☑
	Replace CII Inefficient Equipment	☑	☑	☑
	Efficient Toilet Replacement Program - CII	☑	☑	☑
	Urinal Rebates – CII	☐	☐	☑
	Plumber Initiated UHET & HEU Retrofit Program	☐	☐	☑
	Require <0.25 gal/flush Urinals in New Development	☐	☐	☑
	HE Faucet Aerator / Showerhead Giveaway – CII	☑	☑	☑
	HE Faucet Aerator / Showerhead Giveaway - SF, MF	☑	☑	☑
	Indoor and Outdoor Surveys - SF, MF	☑	☑	☑
	Efficient Toilet Replacement Program – SF	☑	☑	☑
	Direct Install UHET, Showerheads, and Faucet Aerators - SF, MF	☐	☐	☑
	HE Clothes Washer Rebate - SF, MF	☑	☑	☑
	Submeters Incentive	☐	☐	☑
	Outdoor Large Landscape Audits & Water Budgeting/Monitoring	☑	☑	☑
	Landscape Rebates and Incentives for Equipment Upgrade	☑	☑	☑
	Turf Removal - MF, CII	☑	☑	☑
	Turf Removal - SF	☑	☑	☑
	Water Conserving Landscape and Irrigation Codes	☑	☑	☑
	Require Smart Irrigation Controllers and Rain Sensors in New Development	☑	☑	☑

The following table presents the City of Petaluma's potable water use projections without plumbing code savings, with only plumbing code savings and no active conservation activity, and with plumbing code savings and Program A, Program B, and Program C active conservation program implementation savings.

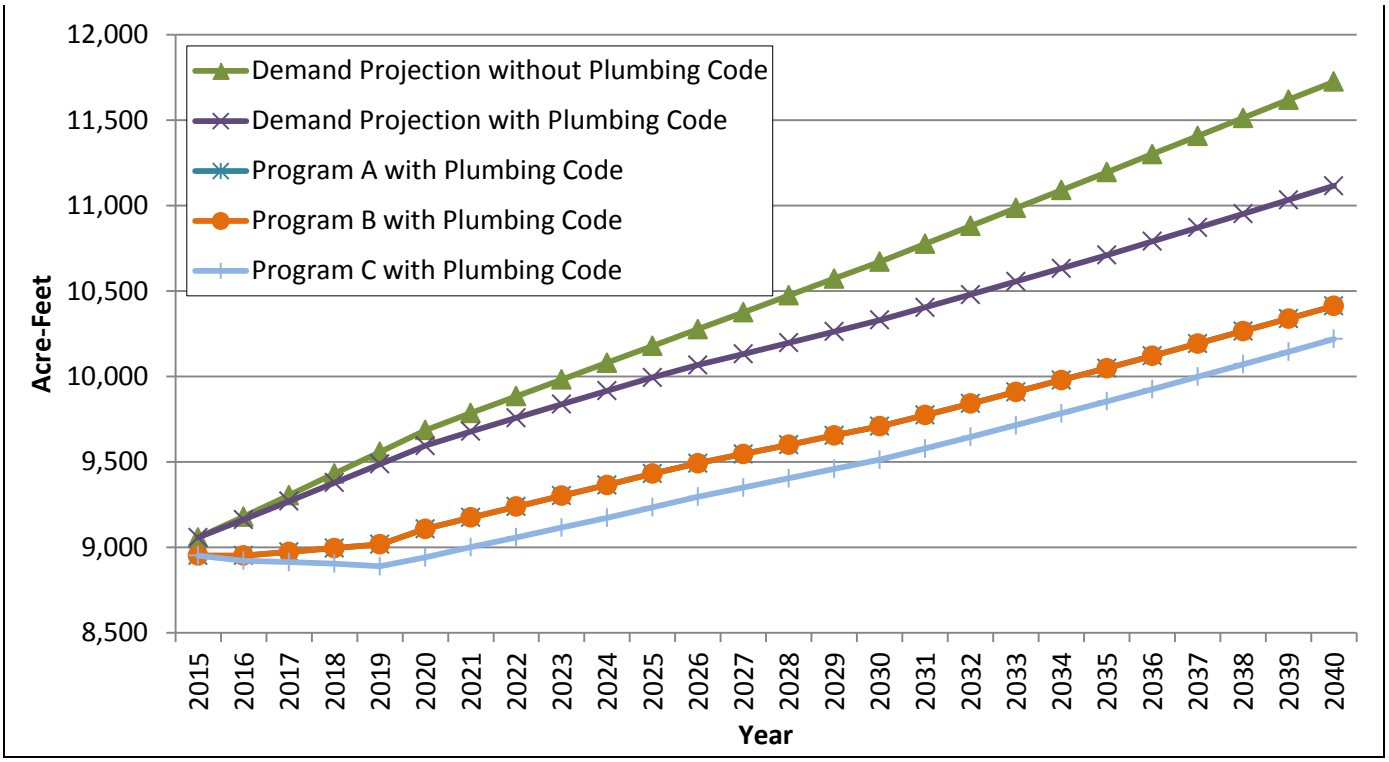
Table ES-2. Potable Water Use Projections (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Demand without Plumbing Code (AFY)	9,058	9,686	10,179	10,672	11,196	11,726
Demand with Plumbing Code (AFY)	9,058	9,596	9,995	10,331	10,711	11,116
Demand with Plumbing Code and Program A	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program B	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program C	8,953	8,942	9,235	9,513	9,855	10,220

*Data is not weather normalized. Total water use is potable only. Does not include recycled water use. Recycled water use and projection are in a separate section in the UWMP.

Figure ES-2 exhibits the City of Petaluma's long term demands without plumbing code savings, with only plumbing code savings and no active conservation activity, and with plumbing code savings and Program A, Program B, and Program C active conservation program implementation savings.

Figure ES-2. Long Term Demands with Conservation Programs*



Note: All line types shown in the legend are presented in the graph. The following demand scenarios, Program A and Program B, are identical in value and therefore may be indistinguishable in the figure.

The following table shows the annual water savings for plumbing codes only as well as plumbing codes with Program A, Program B, and Program C active conservation program implementation in five-year increments.

The benefit to cost ratio for each conservation program from the perspective of the Water Contractor (water utility) and the perspective of the Water Contractors and customers (community) is also presented.

Table ES-3. Water Demand Program Savings Projections

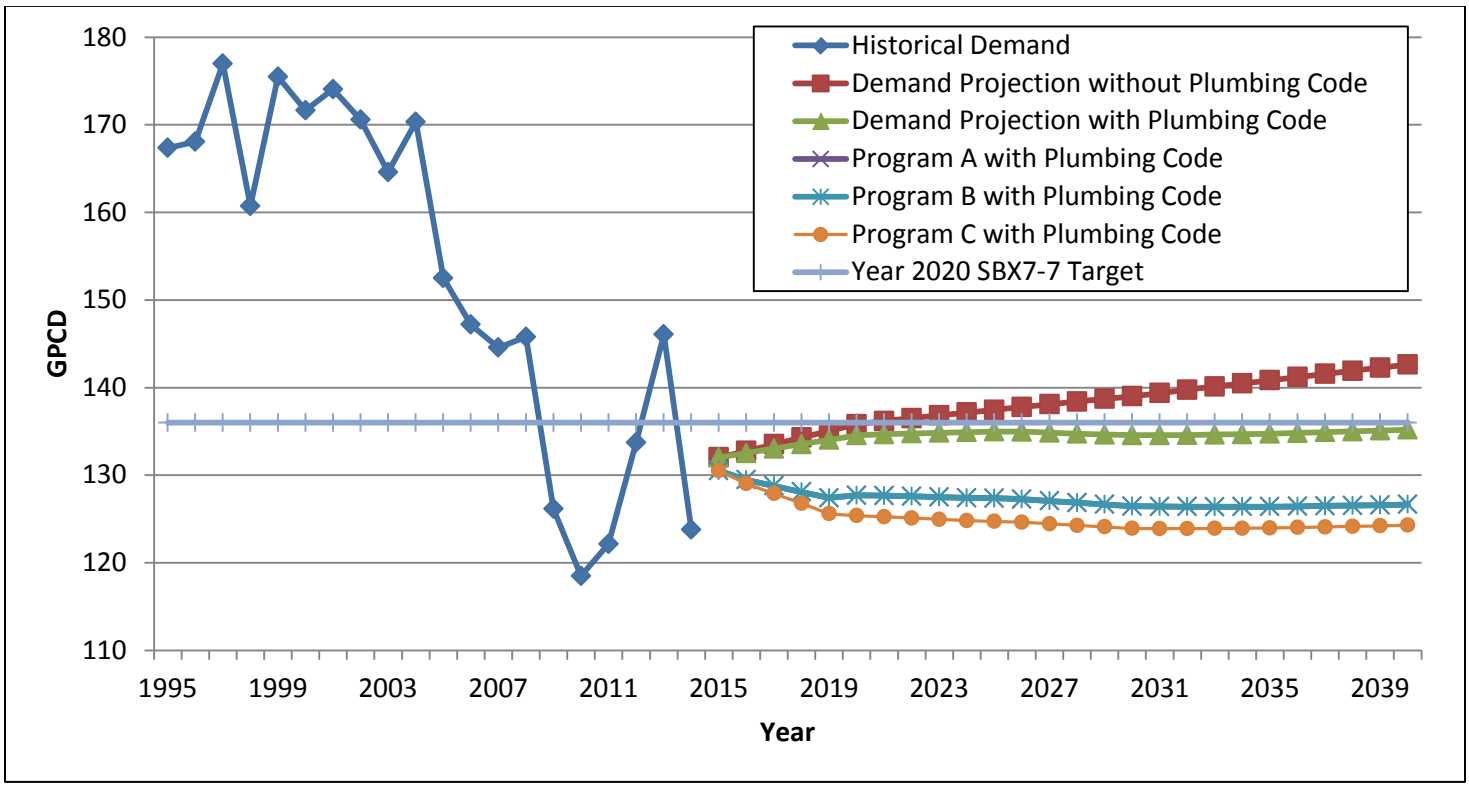
Conservation Program Water Savings (AFY)	2015	2020	2025	2030	2035	2040	Water Utility Benefit to Cost Ratio	Community Benefit to Cost Ratio
Plumbing Code	-	90	184	341	484	609	N/A	N/A
Program A with Plumbing Code	105	578	747	963	1,146	1,312	1.18	0.68
Program B with Plumbing Code	105	578	747	963	1,146	1,312	1.18	0.68
Program C with Plumbing Code	105	744	944	1,158	1,341	1,506	1.19	0.78

Table ES-4 and Figure ES-3 present the SB X7-7 target GPCD and year as well as projected GPCD demand estimates with plumbing codes alone, and with plumbing codes with Program A, Program B, and Program C for the City of Petaluma.

Table ES-4. Water Conservation Program Savings Projections - SB X7-7 Target GPCD

GPCD Target Source	SB X7-7
GPCD Goal	136
GPCD Goal Year	2020
GPCD with Plumbing Code in 2020	135
GPCD Program A with Plumbing Code in 2020	128
GPCD Program B with Plumbing Code in 2020	128
GPCD Program C with Plumbing Code in 2020	125

Figure ES-3. Water Conservation Program Savings Projections – SB X7-7 Target, GPCD



Notes:

1. All line types shown in the legend are presented in the graph. The following demand scenarios, Program A and Program B, are identical and therefore indistinguishable in the figure.
2. Note the decline in water use in the 2014 dry year and 2008-2011 economic recession.

The following table shows the year 2040 indoor and outdoor water savings for the three conservation programs modeled; the present value of water savings and the present value of costs to the utility and community are also displayed. The cost of utility savings per unit volume of water is shown in the far-right column.

Table ES-5. Economic Analysis of Alternative Programs

	2040 Indoor Water Savings (AFY)	2040 Outdoor Water Savings (AFY)	2040 Total Water Savings (AFY)	Present Value of Water Savings ($)	Present Value of Utility Costs ($)	Present Value of Community Costs ($)	Cost of Utility Savings per Unit Volume ($/AF)
Program A with Plumbing Code	736	576	1,312	$13,713,262	$11,636,482	$24,504,552	$815
Program B with Plumbing code	736	576	1,312	$13,713,262	$11,636,482	$24,504,552	$815
Program C with Plumbing Code	840	666	1,506	$18,115,038	$15,178,407	$28,568,925	$816

1. INTRODUCTION

The City of Petaluma has a current water conservation program. This report evaluates whether expanding existing conservation efforts is a cost-effective way to meet future water needs.

In this report demand management and water conservation are used interchangeably. The evaluation includes measures directed at existing accounts as well as new development measures that mandate that new residential and business customers become more water efficient. Three program scenarios were provided to help evaluate the net effect of running multiple measures together over time. Assumptions and results for each of the 25 individual measures and three programs will be described in detail in this report.

1.1 Goals and Objectives

The purpose of this report is to present an overview of the demand and conservation evaluation process which has been completed for the City of Petaluma (Petaluma or Water Contractor). The goal was to develop forecasts of demand and conservation savings for the 2015 Urban Water Management Plan. The local water utility retail Water Contractors of the Sonoma-Marin Saving Water Partnership (SMSWP) including City of Cotati, Marin Municipal Water District (MMWD), North Marin Water District, City of Petaluma, City of Rohnert Park, City of Santa Rosa, City of Sonoma, Valley of the Moon Water District, and Town of Windsor, collectively known as the Water Contractors, worked together to prepare a Water Demand Analysis and Water Conservation Measures Report (Project).

This Project included the development of transparent, defensible, and uniform demand and conservation projections for the nine Sonoma-Marin Saving Water Partnership (SMSWP) Water Contractors, using a common methodology that can be used to support regional planning efforts as well as individual contractor work. Pursuant to this goal, the specific objectives of the Project were as follows:

(1) Quantify the total average-year water demand for each SMSWP Water Contractor to the year 2040;
(2) Quantify the passive and active conservation water savings potential for each individual SMSWP Water Contractor through 2040;
(3) Identify conservation programs for further consideration for regional implementation by SMSWP; and
(4) Provide each SMSWP Water Contractor with a user-friendly model that can be used to support ongoing demand and conservation planning efforts.

1.2 Approach and Methodology

To accomplish the above goal and objectives, each Water Contractor's water demands and conservation savings was forecasted through 2040 using the Demand Side Management Least Cost Planning Decision Support System (DSS Model). The DSS Model prepares long-range, detailed water demand and conservation savings projections to enable a more accurate assessment of the impact of water efficiency programs on demand. The DSS Model can use either a statistical approach to forecast demands (e.g., an econometric model), or it can use forecasted increases in population and employment to evaluate future demands. Furthermore, the DSS Model evaluates conservation measures using benefit cost analysis with the present value of the cost of water saved and benefit-to-cost ratio as economic indicators. The analysis is performed from various perspectives including the utility and community. The DSS Model was also used to forecast demands for the Water Contractors in prior planning efforts in 2005 and 2009 (except the City of Petaluma in 2009).

1.3 Collaboration between SMSWP, Water Contractors and SCWA

This report was completed as a collaborative effort between the staff of the SMSWP Water Contractors and the consulting team from Maddaus Water Management, Inc. The Sonoma County Water Agency (SCWA) also provided input on technical items associated with the conservation analysis, given its role as the wholesale water agency to the nine Water Contractors. Over the course of this report's development, input was solicited from the aforementioned groups (Project Team) through multiple forums, including workshops, one-on-one meetings, and web-based meetings.

1.4 Content of Report

This report provides a general overview for the methodology, assumptions, and results for the demand forecast and conservation analysis. The following information is included in this report and is discussed in individual sections below:

- Section 2 - Data Collection and Verification Process
- Section 3 - Demand Projections
- Section 4 - Comparison of Individual Conservation Measures
- Section 5 - Results of Conservation Program Evaluation
- Section 6 - Conclusions
- Appendix A - Assumptions for the DSS Model
- Appendix B - Water Use Graphs for Production and Customer Categories
- Appendix C - Measure Screening Process and Results
- Appendix D - Assumptions for Water Conservation Measures Evaluated in the DSS Model
- Appendix E – List of Contacts
- Appendix F – References

2. DATA COLLECTION AND VERIFICATION PROCESS

This section presents an overview of the long term demand and conservation evaluation process including the initial data collection steps.

2.1 Data Collection Process

The initial phase of this effort included a data collection process using a Data Collection and Verification File (Data File). The quantitative Data File was developed in Microsoft Excel to collect, organize, and verify the necessary input data for the DSS Model. The data required for the demand and conservation projections was organized into the Data Files (one per Water Contractor). This task was streamlined by populating the Data File using a variety of existing data sources based on previous project collaborations and readily available information prior to distributing the files to the individual Water Contractors. Each Water Contractor was then asked to verify that the information in the Data File was accurate and update any missing information. A key source for existing data was the CUWCC database, the Sonoma-Marin Saving Water Partnership Conservation Reports and SCWA Rates for Water Deliveries annual reports, which capture much of the required data. Other significant data sources included 2010 UWMPs, Department of Water Resources Public Water System Statistics (DWR PWSS) Reports and the 2013 Association of Bay Area Governments (ABAG) Projections (population and employment forecasts).

The Data File was completed and verified by the member Water Contractors through the following steps:

(1) **Distribution of Files to Individual Water Contractors**: The files were distributed to the individual Water Contractors in January 2015 via the Project's ftp site.
(2) **Instructional Meetings**: A kick off meeting with the Water Contractors was held on January 21, 2015 to disseminate information related to the data collection process. During the meeting, the Project Team reviewed the Data File contents with the Water Contractors and provided instructions for completing the files.
(3) **Data File Completion by Water Contractors**: Each Water Contractor reviewed and completed its individual Data File, which required:
    - Verification of the data that was pre-populated in the file by the Project Team
    - Data entry of missing information into the Data File as needed
(4) **Data File Submission by Water Contractors**: Water Contractors submitted the files via the Project ftp site between the end of February and early March 2015 after completing Step 3.
(5) **Data File Review and Refinement**: The Project Team reviewed the individual data files in the order submitted. If further data and refinement were required, the Project Team contacted the individual Water Contractor to obtain the necessary information.
(6) **Data Signature Forms**: Once the data was submitted by each Water Contractor and deemed to be complete, the Water Contractor signed a data verification form to acknowledge the data was ready for the demand analysis portion of the project.

2.2 Types of Data Collected

The data needs of the DSS Model drove the data collection effort. The individual data elements within each category are documented in Table 2-1. Data including water rates and total employment (jobs) were collected to evaluate the historical growth and future growth in the service area. The service area data was used for both of the demand forecasting tools in the DSS Model and for the conservation analysis.

Service area demographic data such as the number of dwelling units were collected from the 2010 U.S. Census data and 2011-2013 American Community Survey (ACS) 3-Year Estimates. Population sources include the 2010 UWMPs, the 2013

ABAG Projections (population and employment forecasts), SMSWP conservation reports, prior DSS Models, and Water Contractor provided projections. The service area demographics were used for future demand forecasting.

Historical conservation data from the SMSWP and CUWCC conservation activity databases was incorporated into the Project for a review of future conservation program levels of saturation and as a benchmark of reasonable levels of implementation for future conservation programs.

Table 2-1. Data Collected for Water Contractors

Model Input Parameter	Time Period	Units	Source(s)
Service Area Data			
Agency Info	Current	NA	Water Contractor Provided
Contact Info	Current	Name, number, email	Water Contractor Provided
Planning Documents	Varies	NA	2010 UWMP Water Contractor Provided
Abnormal Years	Varies	Years	Water Contractor Provided
Customer Classes	Varies	NA	Water Contractor Provided
System Input Volume (Water Production)	1997-2014 or longer if provided	Volume	Previous DSS Models SMSWP & CUWCC Conservation Database 2010 UWMPs DWR PWSS Reports
Consumption and Accounts	1997-2014 or longer if provided	Volume	
Cost of Water	Varies	$ / Volume	Water Contractor provided
Maximum Day Demand	Varies	Date & Volume	Water Contractor provided
Water System Audits	2010 to 2014 if available	NA	Water Contractor Provided American Water Works Association (AWWA) Methodology
Service Area Demographics			
Historical Service Area Population	2000-2014	People	Water Contractor Provided
Projected Population	2015-2040	People	ABAG 2013 2010 UWMP Prior DSS Models Water Contractor Provided
DP-1 General Profile and Housing Characteristics	2010	Various units	2010 US Census 2013 ACS 3-yr
DP04 Selected Housing Characteristics	2010	Various units	2010 US Census 2013 ACS 3-yr
B25033 Population in Housing Units	2010	Dwelling units	2010 US Census 2013 ACS 3-yr
Economy			
Historical Service Area Employment	2000-2014	Jobs	ABAG 2013 2010 UWMP Prior DSS Models Water Contractor Provided
Projected Jobs	2015-2040	Jobs	ABAG 2013 DSS Models Water Contractor Provided
Conservation			
Historical Conservation	Program Inception to 2014	Various units	SMSWP and CUWCC Database Prior DSS Models Water Contractor Provided
Conservation Targets	2018, 2020 or other	GPCD	SMSWP and CUWCC Database Water Contractor Provided

3. DEMAND PROJECTIONS

The purpose of Section 3 is to document the demand projections developed for the Project. This section presents:

- Demand methodology overview,
- Population and employment projections,
- Water use data analysis inputs and key assumptions for the DSS Model,
- Water use targets
- Water demand projections with and without the plumbing code savings through 2040 (this is the demand before incorporating planned water savings from future active conservation efforts), and
- Water demand projections in the 2010 Urban Water Management Plan (UWMP) format in preparation for the 2015 UWMP

3.1 Demand Methodology Overview

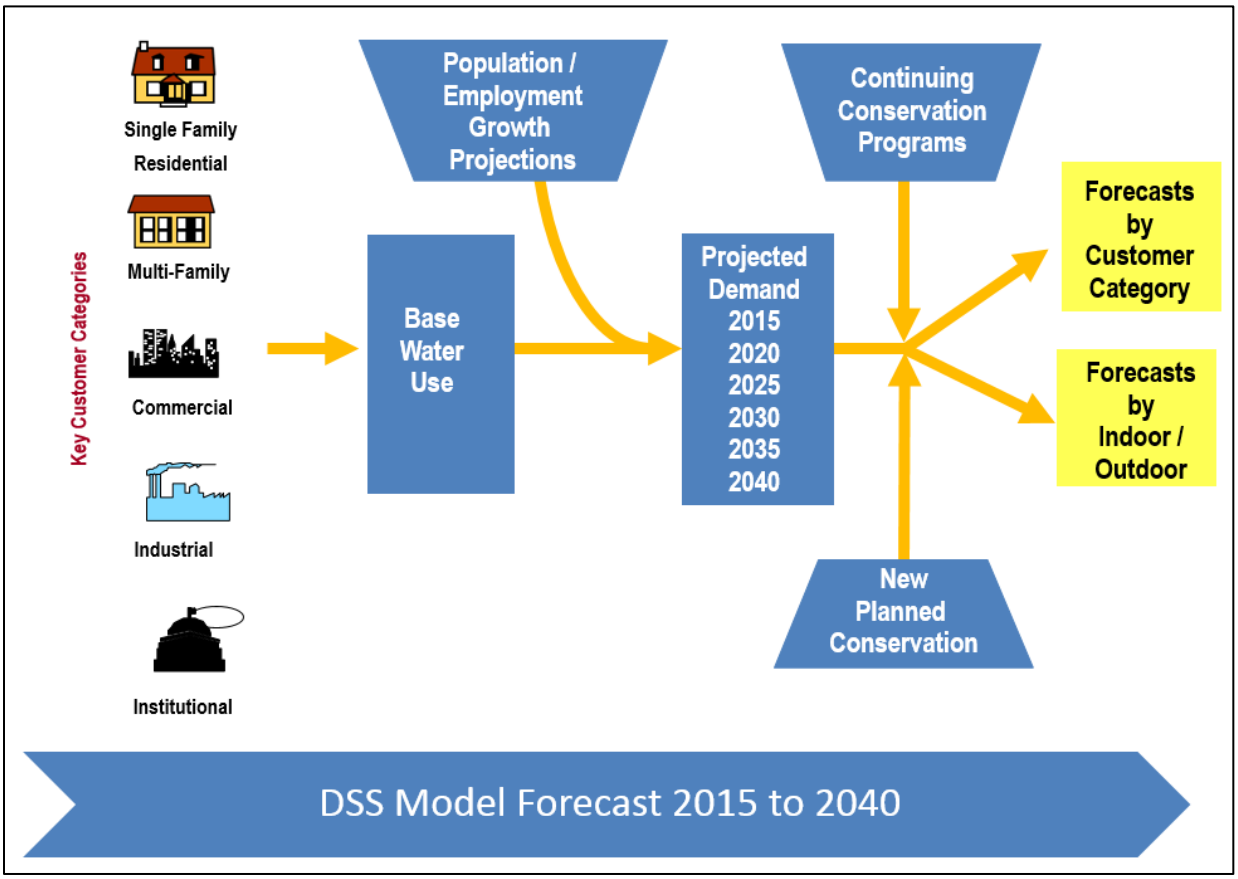
Each Water Contractor's water demand (i.e., average year demand before additional active conservation savings were incorporated) was forecasted through 2040 using the DSS Model. The demand analysis process included forecasting future water demand (2015-2040) by customer category based upon forecasted increases in population and employment. Average water use per customer category account was based on an analysis of historical data between 1990 and 2014 (or a shorter period if a Water Contractor's historical data was incomplete) historical range. To forecast water demands, the DSS Model relies on demographic and employment projections, combined with the effects of natural fixture replacement due to the implementation of plumbing codes to forecast future demands. Natural fixture replacement due to the implementation of plumbing codes is part of passive conservation savings. Passive conservation refers to water savings resulting from actions and activities that do not depend on direct financial assistance or educational programs from Water Contractors. These savings result primarily from (1) the natural replacement of existing plumbing fixtures with water-efficient models required under current plumbing code standards and (2) the installation of water-efficient fixtures and equipment in new buildings and retrofits as required under CALGreen Building Code Standards. The DSS Model evaluated water savings associated with these codes and standards to project passive conservation savings. Section 3 of this report presents the DSS Model's demand estimates taking into account savings only from passive conservation.

3.1.1 DSS Model Methodology

For the demand projections (2015 through 2040), the DSS Model was used to forecast water demand for each Water Contractor. The DSS Model also includes a conservation component that quantifies savings from passive conservation (e.g. plumbing codes) and active conservation programs. The DSS Model's conservation component covers the entire forecast period, 2015-2040. Quantification of water savings potential from active conservation programs is presented in Sections 4 and 5.

The DSS Model prepares long-range, water demand and conservation water savings projections. The DSS Model is an end-use model that breaks down total water production (i.e., water demand in the service area) into specific water end uses, such as toilets, faucets, irrigation, etc. This "bottom-up" approach allows for detailed criteria to be considered when estimating future demands, such as the effects of natural fixture replacement, plumbing codes, and conservation efforts. The purpose of using end use data is to enable a more accurate assessment of the impact of water efficiency programs on demand and to provide a rigorous and defensible modeling approach necessary for projects subject to regulatory or environmental review.

Figure 3-1. DSS Model Flow Diagram



As shown in Figure 3-1, the first step for forecasting water demands using the DSS Model was to gather customer category billing data from each Water Contractor. The next step was to check the model by comparing water use data with available demographic data to characterize water usage for each customer category (single family, multi-family, commercial, industrial, and institutional) in terms of number of users per account and per capita water use. During the model calibration process data were further analyzed to approximate the indoor/outdoor split by customer category. The indoor/outdoor water usage was also further divided into typical end uses for each customer category. Published data on average per-capita indoor water use and average per-capita end use were combined with the number of water users to verify that the volume of water allocated to specific end uses in each customer category is consistent with social norms from end use studies on water use behavior (e.g., for flushes per person per day).

3.1.2 Water Contractor Input and Review

As part of the Project's collaborative approach, an instructional webinar conference call was held in April 2015 to facilitate SMSWP Water Contractor understanding of and involvement in the development of the demand projections. The webinar was attended by the SMSWP Water Contractors. During the webinar, the Project Team reviewed the methodology using a real example with preliminary results from one of the SMSWP Water Contractors. The goal of the webinar was (1) to review the demand modeling approach and results, and (2) to answer Water Contractor questions.

The Water Contractors had the opportunity to review the demand modeling results and to provide questions and comments at the one-on-one calls and emails with the Project Team. In addition, individual in-person meetings were held between MWM modeling staff and Water Contractor representatives to review the draft demand projections in May 2015.

3.2 Future Population and Employment Projections

Each Water Contractor's future population and employment (jobs) projections were incorporated into each DSS Model to project future demand. Population and employment projections through 2040 were provided or confirmed by each Water Contractor through the data collection process described in Section 2. These growth projections were used to develop a projected demand through the year 2040. Population projections were obtained from one of the following sources:

- Local General Plan (population and employment) – Typically these plans, depending upon when they were published, have a population and jobs forecast for 2040 and build out.
- Association of Bay Area Governments (ABAG) (population and employment) – ABAG recently published a new projections report in 2013 that includes population and employment estimates for each city in the San Francisco Bay Area. The ABAG projections report provides population and employment estimates for 2000, 2005, 2010, 2015, 2020, 2025, 2030, 2035, and 2040. ABAG now publishes its projections report every four years consistent with the Sustainable Community Strategies time line. The previous DSS Model projections and ABAG Projections for 2013 were reviewed to determine the most appropriate data set to use in this DSS Model update.
- Water Supply Assessment (WSA) – No WSAs were provided by any of the Water Contractors for use in this Project but sometimes WSA's can have demographic projections.

At the Water Contractor's request, the population projections were based on interpolating historical population to build-out population reported in the City of Petaluma 2008 General Plan. Employment projections were based on 2013 ABAG Subregional Study Area (SSA) estimates. The City of Petaluma subsequently modified the growth projections for industrial jobs to an annual average increase of 10 percent per year from 2015 to 2040 (250% increase over 25 years). This reflects the recent growth Petaluma has experienced in the water demands and wastewater production by industrial customers. Population and employment estimates used in this effort were based on Water Contractor projections to be consistent with the Water Contractor's planning projections. Population and Employment projections are shown in Figure 3-2 and Table 3-1.

Figure 3-2. Historical and Projected Population and Employment

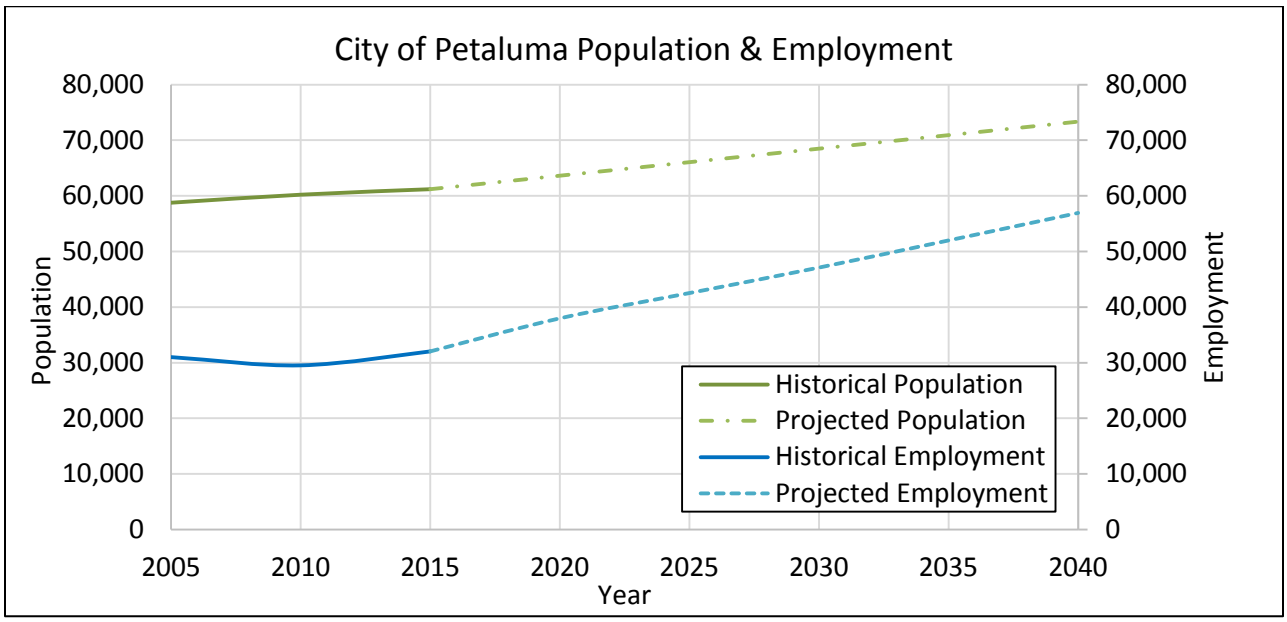


Table 3-1. Historical and Projected Population and Employment

Year	Population	Total Employment	Industrial Employment
2005	58,771	31,006	xx
2010	60,214	29,527	xx
2015	61,201	32,037	7,689
2020	63,631	37,983	11,534
2025	66,061	42,527	15,379
2030	68,490	47,108	19,224
2035	70,920	51,992	23,069
2040	73,350	56,933	26,914

Notes:

1. Population projections are based on interpolating historical population to build-out population reported in the City of Petaluma 2008 General Plan. As provided by the City of Petaluma, the 2040 population is the build-out of 72,000 people plus 1,350 Coast Guard population.
2. Employment projections are based on 2013 ABAG SSA estimates and City revisions for Industrial sector jobs.

3.3 Water Use Data Analysis and Key Inputs to the DSS Model

The demand analysis process includes using baseline average water use per customer to forecast water demands by customer category based upon forecasted increases in population and employment to predict customer category account growth. Average water use per customer category account was based on a water use data analysis investigating historical and current water use data and demographic data. This analysis includes the following elements:

- *Model Start Year* – This is the starting year for the analysis. For this project, the start year for the model is 2015. The DSS Model includes 25 years of data projecting information until the year 2040.
- *Base Year for Future Water Factors* – Based on an analysis of historical water billing data, each Water Contractor selected a year or average of multiple years that is representative of current water use and used as a base year demand factor for developing future water use projections. The year (or average of multiple years) was chosen by the Water Contractors for the following reasons:
    - The selected year, or average of years, shows less of an effect from the recession. For many of the Water Contractors, the years 2008 through 2011 show a dip in water demand in many areas due to reduction in economic activity.
    - The year(s) selected had relatively "normal" climate conditions (i.e., not a drought or excessively wet year), so no significant weather adjustments were necessary. For all Water Contractors, the year 2014 was affected by drought conditions. The water billing or production data shown in Appendix B was not weather normalized for this analysis.
    - Many Water Contractors elected to average a few years of data for the analysis. Some Water Contractors selected an individual year as they felt it was representative in terms of weather, vacancy, and customer water use for demand projection purposes.
    - Appendix B presents historical customer category water use graphs. Historical water use was provided by the City of Petaluma, taken from DWR's annual PWSS reports, or taken from previous modeling efforts conducted by MWM. The data was reviewed and confirmed by the City. Units shown are average gallons of water per account per day. These graphs were reviewed to better identify outlier data points and years so that a representative baseline water use value (of average account water use by category) could be determined. The effects of drought, economic recessions, service line failures, and meter inaccuracies are typically evident in these figures.

- *Start Year Accounts* - The start year accounts represents the average number of accounts for each customer category in 2014.
- *Average gal/day/acct* – This is the amount of water in gallons that is used per day, per account.
- *Indoor/outdoor Water Use* – This is the amount of water per account split into the percent that is used indoors and outdoors.
- *Non-Revenue Water (NRW)* – This is the sum of all water input to the system that is not billed (metered and unmetered) water consumption, including apparent (metering accuracy) and real losses. The values were calculated by taking the difference between the amount of water produced and the amount of water that was sold. Data provided by the Water Contractor was used, if provided, unless another more accurate value from the AWWA M36 Water Loss reports was provided.
- *Census Data* – The 2010 Census data or 2013 American Community Survey 3-year data was used as a general reference when determining population, housing units and household sizes for each individual city (and/or unincorporated area) serviced by the Water Contractors. Housing units and household sizes were used to estimate water use per person in the service area as well as individual residential customer categories.
- *Current Service Area Population* – The 2015 total population for the Water Contractors was taken directly from the selected population projection source shown in Table 3-1.
- *Procedure for service areas not contiguous with city boundaries* – When a Water Contractor serves an area outside a city boundary, estimates were generated either from census tract data (when available for the unincorporated areas), Department of Finance data, ABAG Projections, Department of Water Resources (DWR) reported data, General Plan data, or by the local Water Contractor if known. If none of these six sources were available, then the Project Team was provided data from the local Water Contractor to make reasonable estimates.
- *Employment data* – The employment figures were obtained from the selected source as discussed earlier in this report.

The following Table 3-2 shows the key inputs and assumptions used in the model. The assumptions having the most dramatic effect on future demands are the natural replacement rate of fixtures, how residential or commercial future use is projected, and finally the percent of estimated non-revenue water. More details on these assumptions, including screenshots of where they are incorporated into the DSS Model, can be found in Appendix A.

Table 3-2. Water Use Data Analysis and DSS Model Key Assumptions

Parameter	Model Input Value, Assumptions, and Key References
Model Start Year	2015
Water Demand Factor Year(s) [Base Year(s)]	2008-2013. 2014 was not used since it was a drought year.
Non-Revenue Water in Start Year	9.2% This value can be found in the green NRW section of each Water Contractor's DSS Model.
Population Projection Source	City of Petaluma 2008 General Plan (2040 value includes the build-out of 72,000 plus 1,350 coast guard population)
Employment Projection Source	2013 ABAG SSA with City revisions
Avoided Cost of Water	$1,368.87/AF ($4,201/MG). This value can be found in the "Avoided Costs" red section of each Water Contractor's DSS Model.
Base Year Water Use Profile (average of years 2008 through 2013)	

Parameter	Model Input Value, Assumptions, and Key References				
Customer Categories	**Start Year Accounts**	**Total Water Use Distribution**	**Demand Factors (gal/day/acct)**	**Indoor Use %**	**Residential Indoor Water Use (gpcd)**
Single Family	16,763	53%	232.34	66%	54
Multi-family	677	15%	1,679.30	49%	41
Business	1,072	11%	745.02	97%	N/A
Industrial	21	4%	13,181.50	71%	N/A
Public Authority	154	5%	2,282.90	45%	N/A
Irrigation	531	12%	1,657.64	0%	N/A
Total	19,218	100%	N/A	N/A	N/A
Residential End Uses	CA DWR Report "California Single Family Water Use Efficiency Study," 2011, AWWARF Report “Residential End Uses of Water” (DeOreo, 1999, 2015) (2015 AWWARF Report is pending). Water Contractor supplied data on costs and savings, professional judgment where no published data available. Each Water Contractor’s water end use breakdown can be found in the “End Uses” section of their DSS Model on the “Breakdown” worksheet.				
Non-Residential End Uses, %	AWWARF Report "Commercial and Institutional End Uses of Water” (Dziegielewski, 2000). Each Water Contractor’s water end use breakdown can be found in the “End Uses” section of their DSS Model on the “Breakdown” worksheet.				
Efficiency Residential Fixture Current Installation Rates	U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Reference "High Efficiency Plumbing Fixtures - Toilets and Urinals" (Koeller & Company, 2005). Reference Consortium for Efficient Energy (www.cee1.org) This information is included in the “Codes and Standards” green section of each Water Contractor’s DSS Model by customer category fixtures.				
Water Savings for Fixtures, gal/capita/day	AWWARF Report “Residential End Uses of Water” 1999, CA DWR Report "California Single Family Water Use Efficiency Study", 2011, Water Contractor supplied data on costs and savings, professional judgment where no published data available. This information is included in the “Codes and Standards” green section on the “Fixtures” worksheet of each Water Contractor’s DSS Model.				
Non-Residential Fixture Efficiency Current Installation Rates	U.S. Census, Housing age by type of dwelling plus natural replacement plus rebate program (if any). Assume commercial establishments built at same rate as housing, plus natural replacement. This information is included in the “Codes and Standards” green section of each Water Contractor’s DSS Model by customer category fixtures.				
Residential Frequency of Use Data, Toilets, Showers, Washers, Uses/user/day	Falls within ranges in AWWARF Report “Residential End Uses of Water” 1999. This information is included in the “Codes and Standards” green section on the “Fixtures” worksheet of each Water Contractor’s DSS Model, and confirmed in each “Service Area Calibration End Use” worksheet by customer category.				
Non-Residential Frequency of Use Data, Toilets and Urinals, Uses/user/day	Estimated based using AWWARF Report “Commercial and Institutional End Uses of Water” 2000. This information is included in the “Codes and Standards” green section on the “Fixtures” worksheet of each Water Contractor’s DSS Model, and confirmed in each “Service Area Calibration End Use” worksheet by customer category.				

Parameter	Model Input Value, Assumptions, and Key References
Natural Replacement Rate of Fixtures	Residential Toilets 2% (1.28 gpf and 1.6 gpf toilets), 2.5% (3.5 gpf and higher toilets)
	Commercial Toilets 2% (1.28 gpf and 1.6 gpf toilets), 2.5% (3.5 gpf and higher toilets)
	Residential Showers 4%
	Residential Clothes washers 10%
	A 4% replacement rate corresponds to 25 year life of a new fixture.
	A 10% replacement rate corresponds to 10 year washer life based on 2014 AWWARF Report "Residential End Uses of Water" and "Bern Clothes Washer Study," Final Report, Energy Division, Oak Ridge National Laboratory, for U.S. Department of Energy, March 1998. Online: www.energystar.gov
	This information is included in the "Codes and Standards" green section on the "Fixtures" worksheet of each Water Contractor's DSS Model.
Future Residential Water Use	Increases Based on Population Growth and Demographic Forecast
Future Non-Residential Water Use	Increases Based on Employment Growth and Demographic Forecast

3.4 Water Use Targets

SB X7-7 or "The Water Conservation Act of 2009" was enacted to ensure California continues to have reliable water supplies, requiring urban water agencies to collectively reduce statewide per capita water use by 20% before December 31, 2020. The law establishes that the base daily per capita use be based on total gross water use, divided by the service area population. Each Water Contractor has a different per capita consumption baseline value and year 2020 water use target.

In tracking per capita water use, which is measured in gallons per capita per day (GPCD), the primary project driver is the SB X7-7 20x2020 compliance requirements that require calculation using population in future UWMPs including tracking of: baseline GPCD (10 years between 1994 and 2010), a 2015 target, and a 2020 target. The year 2020 SB X7-7 GPCD target for the City of Petaluma is 136[1]. Petaluma has also elected to track their year 2018 CUWCC GPCD target of 130.74.

3.5 Water Demand Projections With and Without the Plumbing Code

Water demand projections were developed to the year 2040 using the DSS Model. Table 3-3 shows projected demands in 5-year increments with and without plumbing codes and appliance standards. Information and assumptions about plumbing code and appliance standards can be found in Appendix A.

The demand projections reflect average water use assuming average weather conditions and **do not** reflect drier and hotter drought conditions. Likewise, climate change (which might alter weather patterns), increased or decreased rainfall, and possibly increased irrigation demand in the spring and fall due to a warmer climate have **NOT** been addressed in this analysis.

[1] Source: City of Petaluma 2010 Urban Water Management Plan Table 3-5.

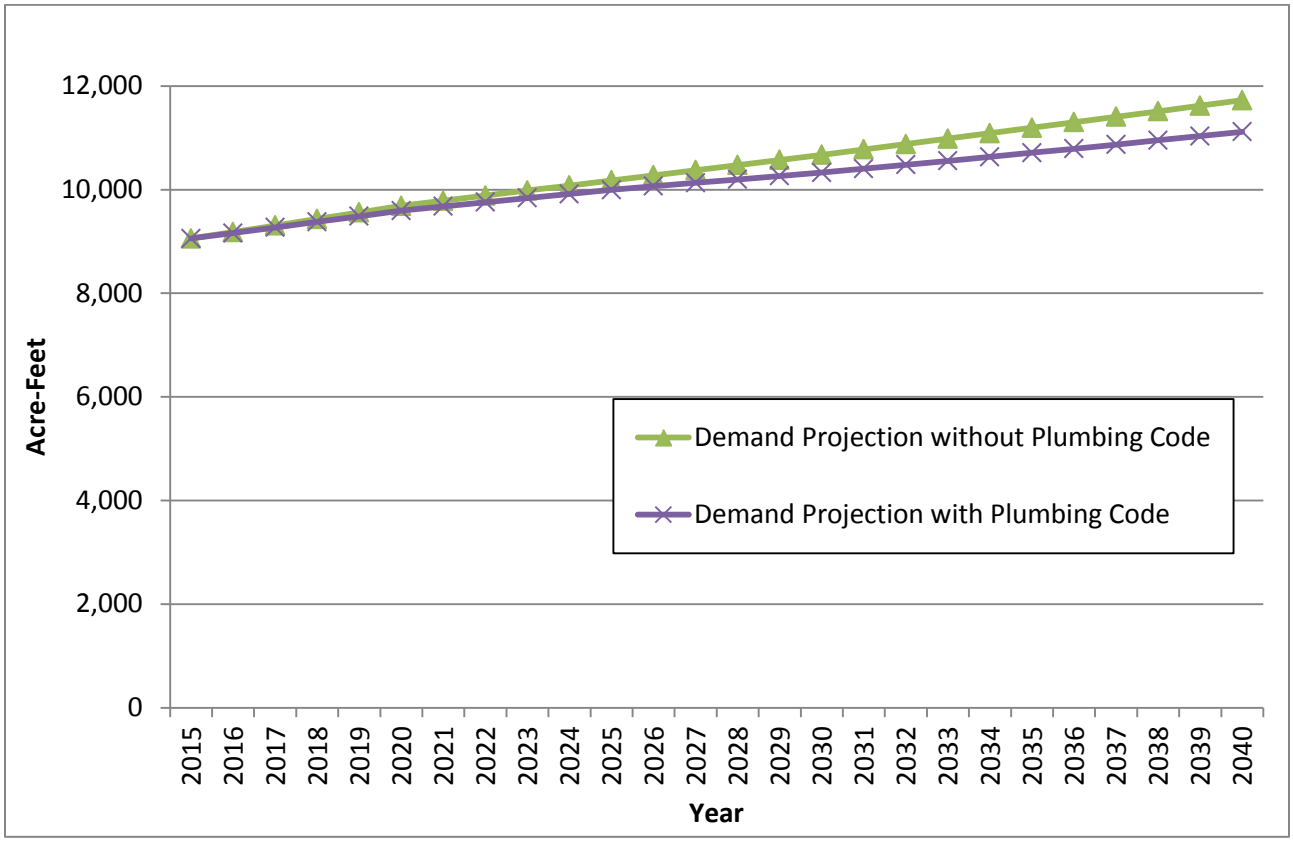
Table 3-3. Potable Water Use Projections (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Demand without Plumbing Code (AFY)	9,058	9,686	10,179	10,672	11,196	11,726
Demand with Plumbing Code (AFY)	9,058	9,596	9,995	10,331	10,711	11,116

*Data is not weather normalized. Total water use is potable only. Does not include recycled water use. Recycled water use and projection are in a separate section in the UWMP. Values include NRW.

Figure 3-3 shows the potable water demand projections with and without the plumbing code through 2040.

Figure 3-3. Potable Water Use Projections for City of Petaluma (AFY)



3.6 Water Demand Projections – 2015 Urban Water Management Plan (UWMP) Format

The draft 2015 Urban Water Management Plan Guidance Document from the California Department of Water Resources (CA DWR) was released in April 2015 and the final guidance document is not planned to be released until after July 1, 2015. Without the final guidance document, the exact formatting of the tables for the 2015 UWMP are not known. Therefore, it was elected to place the demand data into the draft 2015 UWMP format.

The 2015 draft Urban Water Management Plan Guidance Document from the California Department of Water Resources requests that future demand information be in a specific format. The following tables are the 2015 draft UWMP tables relating to population and demand that are requested. The demand projection shown is the "with Plumbing Code" demands and is otherwise the same as Table 3-3 and Figure 3-3.

Table 3-4 below provides population projections for the service area.

Table 3-4. (DWR Table 2-2) Population – Current and Projected*

	2015	2020	2025	2030	2035	2040
Population Served	61,201	63,631	66,061	68,490	70,920	73,350

*Includes US Coast Guard.

The current and projected number of connections and deliveries to the Water Contractor's water distribution system, by sector, are identified in the following Table 3-5 and Table 3-6. Deliveries include plumbing code savings but do not include non-revenue water (NRW).

Table 3-5. Demands and Accounts by Customer Category*

		Single Family	Multi-family	Business	Industrial	Public Authority	Irrigation	Total (no NRW)
2015	# of accounts	16,763	677	1,072	21	154	531	19,218
	Deliveries AFY	4,366	1,274	895	310	394	987	8,226
2020	# of accounts	17,429	704	1,165	32	167	577	20,073
	Deliveries AFY	4,488	1,312	964	456	426	1,072	8,718
2025	# of accounts	18,094	731	1,195	42	172	592	20,826
	Deliveries AFY	4,616	1,339	985	601	436	1,100	9,078
2030	# of accounts	18,760	758	1,228	53	176	608	21,582
	Deliveries AFY	4,691	1,361	1,006	746	447	1,130	9,382
2035	# of accounts	19,425	785	1,273	63	183	631	22,360
	Deliveries AFY	4,777	1,389	1,038	889	463	1,172	9,728
2040	# of accounts	20,091	811	1,322	74	190	655	23,142
	Deliveries AFY	4,876	1,420	1,072	1,033	479	1,216	10,096

*Based on Demand WITH Plumbing Code, excluding NRW.

Table 3-6. (DWR Table 3-1) Retail Uses of Potable and Raw Water - Actual and Projected (Acre-Feet/Year)

Use Type	2015	2020	2025	2030	2035	2040
Single Family	4,366	4,488	4,616	4,691	4,777	4,876
Multi-family	1,274	1,312	1,339	1,361	1,389	1,420
Business	895	964	985	1,006	1,038	1,072
Industrial	310	456	601	746	889	1,033
Public Authority	394	426	436	447	463	479
Irrigation	987	1,072	1,100	1,130	1,172	1,216
Total	**8,226**	**8,596**	**8,818**	**8,984**	**9,198**	**9,435**

For this project, losses or non-revenue water (NRW) is defined as the difference between total water produced and water sold to customers. Non-revenue water use normally includes unmetered water use, such as for fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, meter inaccuracy, and unauthorized connections. Non-revenue water can also result from meter inaccuracies. The total current and future water losses for the system are shown in Table 3-7.

Table 3-7. (DWR Table 3-4) Losses from Potable Water System (Acre-Feet)/Year

	2015	2020	2025	2030	2035	2040
Potable System Losses	832	878	917	949	983	1,020

The total current and future water use for the system is shown in the table below.

Table 3-8. (DWR Table 3-6) Total Potable Water Use (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Retail Uses	8,226	8,718	9,078	9,382	9,728	10,096
Losses	832	878	917	949	983	1,020
Total	9,058	9,596	9,995	10,331	10,711	11,116

*Total water use is potable only. Does not include recycled water use. Recycled water use and projection are in another section of the UWMP.

Passive savings due to plumbing codes and standards as well as documented historical conservation activity are presented in the following Table 3-9. These savings include savings from toilets, urinals, showerheads and clothes washers.

Table 3-9. (DWR Table 3-8) Passive Savings (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Total Passive Savings	-	90	184	341	484	609

*Passive savings **are** accounted for in the water use projections in DWR Table 3-1.

4. COMPARISON OF INDIVIDUAL CONSERVATION MEASURES

This section presents the conservation measure screening process, a description of the measures selected to be analyzed in the Water Contractor's DSS Model, measure design assumptions and modeling methodology, and a comparison of the individual conservation measure costs and savings.

4.1 Selecting Conservation Measures to be Evaluated (Conservation Measure Screening)

An important step in updating the water conservation program is the review and screening of new water conservation measures. New measures were designed with an implementation schedule reflecting dates sometime in the future when the Water Contractor might begin such programs. The first step in the conservation analysis was to review historical water conservation activity and savings. The purpose of this review was to look at historically successful programs, past penetration rates (activity levels) for individual measures, and the types of programs that were implemented (and for which customers – single family, multi-family, commercial, etc.) by each of the Water Contractors since the 2010 UWMP. The participation rates were incorporated into the design of each of the 25 conservation measure activity levels in the DSS Model analysis.

Following the review of the historical conservation efforts, a list of over 50 potential conservation measures was provided to each Water Contractor to be considered for further evaluation in the DSS Model. This list of measures was then screened by SMSWP and the Water Contractors to: (1) identify those measures with the highest level of interest and potential for implementation within the region and (2) identify which entity (SMSWP or individual Water Contractors) would be best suited to implement each measure. Through this process, a total of 25 measures were selected for analysis in the individual Water Contractor DSS models. The screening process and results are described in Appendix C. Once the 25 measures were selected for analysis, a master measure design database (MMDD) was created to streamline the individual measure design process by being a starting point for all the Water Contractor's measures so that measure design parameters such as target end uses, customer classes, unit costs and savings would initially align.

4.2 Conservation Measures Evaluated

Table 4-1 includes the 25 water use efficiency measures that were included in the DSS Model analysis. The table includes measures, devices and programs (e.g., direct install high efficiency toilets) that can be used to achieve water use efficiency, methods through which the device or program will be implemented and what distribution method, or mechanism, can be used to activate the device or program. The list of potential measures was drawn from MWM and Water Contractor general experience and review of local Water Contractor's water use efficiency programs. The measure descriptions apply generally to each Water Contractor; Water Contractor-specific measure descriptions can be found in Appendix D where screen shots of every conservation measure's inputs from each Water Contractor's DSS Model are presented.

Water use efficiency savings due to plumbing codes such as CALGreen (California Statewide New Development Building Code), SB 407 (Plumbing Fixture Retrofit on Resale or Remodel), and any new development ordinances specific to each individual Water Contractor are included in the DSS Model and presented in Appendix A.

Table 4-1. Water Use Efficiency Measure Descriptions

No.	Measure Name	Measure Description
1	Water Loss	WATER CONTRACTOR MEASURE: Maintain a thorough annual accounting of water production, sales by customer class and quantity of water produced and billed consumption (to define non-revenue water). In conjunction with system accounting, include water system audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining potential for reducing real (physical) water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and real water losses water every year by a pre-determined amount based on cost-effectiveness. These programs typically pay for themselves based on savings in operational costs (and saved rate revenue can be directed more to system repairs/replacement and other costs) and recovered revenue through addressing apparent losses. Specific goals and methods to be developed by Utility. May include accelerated main and service line replacement. Enhanced real loss reduction may include more ambitious main replacement and active leak detection. Capture water from water main flushing and hydrant flow testing for reuse.
2	AMI	WATER CONTRACTOR MEASURE: Retrofit system with AMI meters and associated network capable of providing continuous consumption data to Utility offices. Improved identification of system and customer leaks is a major conservation benefit. Some costs of these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and opening and closing accounts are accomplished without the need for a site visit. Also enables enhanced billing options and ability to monitor unauthorized usage, such as use/tampering with closed accounts or irrigation when time of day or days per week are regulated. Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to their usage, which has been shown to improve accountability and reduce water use. A five-year change-out would be a reasonable objective and may take longer if coupled with a full meter replacement program (on the order of 10 years). Require that new, larger or irrigation customers install such AMI meters as described above and possibly purchase means of viewing daily consumption inside their home, business, or by their landscape/property managers, either through the Internet (if available) or separate device. The AMI system would, on demand, indicate to the customer and Utility where and how their water is used, facilitating water use reduction and prompt leak identification. This would require Utility to install an AMI system.
3	Pricing	WATER CONTRACTOR MEASURE: Assumes average annual price increase of 5% for the next 25 years unless otherwise specified by the Water Contractors. Measure converts price increases to real price increases net of inflation; Annual increase must be above user set threshold (such as assuming a 2% inflation) to trigger a demand reduction.
4	Public Info & School Education - SMSWP	REGIONAL MEASURE: Continue with regional public information and school education campaign. School education includes: school assembly program, classroom presentations, and other options for school education.
5	Public Info & School Education - Water Contractor	WATER CONTRACTOR MEASURE: Public information dissemination and school education initiatives beyond those conducted by SMSWP.
6	Prohibit Water Waste	WATER CONTRACTOR OR REGIONAL MEASURE: Adopt or modify ordinance that prohibits the waste of water defined as gutter flooding, restrictions on watering days and failure to repair leaks in a timely manner.
7	Indoor and Outdoor Surveys	WATER CONTRACTOR OR REGIONAL MEASURE: Top water customers from each CII category would be offered a professional water survey that would evaluate ways for the

No.	Measure Name	Measure Description
	- CII	business to save water and money. The surveys would be for targeted to large users (accounts that use more than 5,000 gallons of water per day) such as hotels, restaurants, large stores and schools. Emphasis will be on supporting the top users in each customer category.
8	Replace CII Inefficient Equipment	WATER CONTRACTOR OR REGIONAL MEASURE: After undergoing a free water use survey, SMSWP will analyze the recommendations on the provided findings report and determine if the site qualifies for a financial incentive. Financial incentives will be provided after analyzing the cost benefit ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of SMSWP while funding lasts.
9	Efficient Toilet Replacement Program - CII	WATER CONTRACTOR MEASURE: Efficient Toilet Replacement Program - CII. Provide a rebate or voucher for the installation of a high efficiency flushometer toilet - toilets flushing 1.28 gpf or less. Rebate amounts reflect the incremental purchase cost.
10	Urinal Rebates – CII	WATER CONTRACTOR MEASURE: Provide a rebate or voucher for the installation of a high efficiency urinals. WaterSense standard is 0.5 gpf or less, though models flushing as low as 0.125 gpf (1 pint) are available and function well, so could be specified. Rebate amounts would reflect the incremental purchase cost.
11	Plumber Initiated UHET & HEU Retrofit Program	WATER CONTRACTOR MEASURE: Plumber Initiated Ultra High Efficiency Toilet (UHET) and/or Urinal Retrofit Program. The Water Contractor would subsidize the installation cost of a new UHET or High Efficiency Urinal (HEU) purchased by the Water Contractor. If elected to be run as a regional measure, then SMSWP would subsidize the installation cost of a new UHET or HEU purchased by SMSWP. Licensed plumbers, pre-qualified by SMSWP would solicit customers directly. Customers would get a new UHET and HEU installed at a discounted price.
12	Require <0.125 gal/flush Urinals in New Development	WATER CONTRACTOR MEASURE: Require that new buildings be fitted with .125 gpf (1 pint) or less urinals rather than the current standard of 0.5 gal/flush models.
13	HE Faucet Aerator / Showerhead Giveaway – CII	WATER CONTRACTOR MEASURE: High Efficiency Faucet Aerator / Showerhead Giveaway – CII. Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events.
14	HE Faucet Aerator / Showerhead Giveaway - SF, MF	WATER CONTRACTOR MEASURE: High Efficiency Faucet Aerator / Showerhead Giveaway - SF, MF. Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events. Need to coordinate this program with the School Education measure on retrofit kit giveaways to the same customer categories.
15	Indoor and Outdoor Surveys - SF, MF	REGIONAL OR WATER CONTRACTOR MEASURE: Indoor and outdoor water surveys for existing residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, and toilet devices. Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, with either part of the repair subsidized and/or the cost paid with revolving funds paid back with water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences. May include adjustments to irrigation schedules on automatic irrigation controllers. Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi.
16	Efficient Toilet	WATER CONTRACTOR MEASURE: Provide a rebate or voucher for the installation of an

No.	Measure Name	Measure Description
	Replacement Program – SF	ultra-high efficiency toilet (UHET). UHET toilets flush 1.28 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost. Replacement program can be either a direct install or rebate program. Includes replacement of 1.6 gpf that are not well functioning.
17	Direct Install UHET, Showerheads, and Faucet Aerators - SF, MF	WATER CONTRACTOR OR REGIONAL MEASURE: Direct Install High Efficiency Toilets, Showerheads, and Faucet Aerators in Residential Buildings. Utility would subsidize installation cost of a new UHET purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new UHET and showerheads and faucet aerators installed at a discounted price.
18	HE Clothes Washer Rebate - SF, MF	WATER CONTRACTOR MEASURE: Provide a rebate for efficient washing machines to residential customers. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology.
19	Submeters Incentive	WATER CONTRACTOR MEASURE: Require or provide a partial cost rebate to meter all remaining mobile home parks that are currently master metered but not separately metered. Provide a rebate (per unit) to assist MF building owners installing submeters on each existing individual apartment or condominium unit.
20	Outdoor Large Landscape Audits & Water Budgeting/Monitoring	WATER CONTRACTOR OR REGIONAL MEASURE: Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multi-family residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Website will provide feedback on irrigation water use (budget vs. actual). May include the cost for dedicated meter conversion.
21	Landscape Rebates and Incentives for Equipment Upgrade	WATER CONTRACTOR MEASURE: For SF, MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient upgrades; Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades including: Large Rainwater Catchment Systems, Rain Barrels, Rain Sensors, Rotating Sprinkler Nozzles, Drip Irrigation Equipment, Weather Based Irrigation Controllers and Gray Water Systems.
22	Turf Removal - MF, CII	WATER CONTRACTOR MEASURE: Provide a per square foot incentive to remove turf and replace with low water use plants or hardscape. This could be a rebate program or direct delivery of materials. Also, Petaluma does not cap or have an upper limit on the amount of area replaced for commercial or multi-family residential.
23	Turf Removal - SF	WATER CONTRACTOR MEASURE: Provide a per square foot incentive to remove turf and replace with low water use plants or permeable hardscape. Rebate based on dollars per square foot removed and capped at an upper limit for single family residences.
24	Water Conserving Landscape and Irrigation Codes	WATER CONTRACTOR MEASURE: Develop and enforce Water Efficient Landscape Design Standards. Standards specify that development projects subject to design review be landscaped according to climate appropriate principals, with appropriate turf ratios, plant selection, efficient irrigation systems and smart irrigation controllers. The ordinance could require certification of landscape professionals.
25	Require Smart Irrigation Controllers and Rain Sensors in New Development	WATER CONTRACTOR MEASURE: Require Weather Adjusting Smart Irrigation Controllers per CALGreen on New Development. It is optional to require Rain Sensors in CALGreen for New Development. Require developers for all properties (100%) of greater than four residential units and all commercial development to install the weather based irrigation controllers. May require landscaper training.

4.3 Water Reduction Methodology

Each conservation measure targets a particular water use such as indoor single family water use. Targeted water uses are categorized by water user group and by end use. Targeted water user groups include single family residential, multi-family residential, commercial, industrial, and institutional (CII), etc. Measures may apply to more than one water user group. Targeted end uses include indoor and outdoor use. The targeted water use is important to identify because the water savings are generated from reductions in water use for the targeted end use. For example, a residential retrofit conservation measure targets single family and multi-family residential indoor use, and in some cases specifically shower use. When considering the water savings potential generated by a residential retrofit one considers the water saved by installing low-flow showerheads in single family and multi-family homes.

The market penetration goal for a measure is the extent to which the product or service related to the conservation measure occupies the potential market. In essence, the market penetration goal identifies how many fixtures, rebates, surveys, etc. the wholesale customer would have to offer or conduct over a period of time to reach its water savings goal for that conservation measure. This is often expressed in terms of the number of fixtures, rebates, surveys, etc. offered or conducted per year.

The potential for errors in market penetration goal estimates for each measure can be significant because they are based on previous experience, chosen implementation methods, projected utility effort, and funds allocated to implement the measure. The potential error can be corrected through re-evaluation of the measure as the implementation of the measure progresses. For example, if the market penetration required to achieve specific water savings turns out to be more or less than predicted, adjustments to the implementation efforts can be made. Larger rebates or additional promotions are often used to increase the market penetration. The process is iterative to reflect actual conditions and helps to ensure that market penetration and needed savings are achieved regardless of future variances between estimates and actual conditions.

In contrast, market penetration for mandatory ordinances can be more predictable with the greatest potential for error occurring in implementing the ordinance change. For example, requiring dedicated irrigation meters for new accounts through an ordinance can assure an almost 100 percent market penetration for affected properties.

Water contractors are constantly looking at when a measure reaches saturation. Baseline surveys are the best approach to having the most accurate information on market saturation. This was taken into account when analyzing individual conservation measures where best estimates were made. MWM was not provided with any baseline surveys for this analysis, but discussions were held with the individual Water Contractors on what their best estimates were for saturation for their service area.

4.4 Perspectives on Benefits and Costs

The determination of the economic feasibility of water conservation programs involves comparing the costs of the programs to the benefits provided. This analysis was performed using the DSS Model developed by MWM. The DSS Model has received the endorsement of the California Urban Water Conservation Council, and calculates cost effectiveness of conservation measure savings at the end-use level; for example, the model determines the amount of water a toilet rebate program saves in daily toilet use for each single family account. Additional detail on the DSS Model and assumptions can be found in Appendix A.

4.5 Present Value Parameters

The time value of money is explicitly considered. The value of all future costs and benefits is discounted to 2015 (the model start year) at the real interest rate of 3.01%. The DSS Model calculates this real interest rate, adjusting the current nominal interest rate (assumed to be approximately 6.1%) by the assumed rate of inflation (3.0%). The formula to calculate the real interest rate is: (nominal interest rate – assumed rate of inflation)/ (1 + assumed rate of inflation). Cash flows discounted in this manner are subsequently referred to as “Present Value” sums. Additional information on Present Value referenced in Appendix A.

4.6 Measure Assumptions including Unit Costs and Water Savings

Appendix D presents the assumptions and inputs used in the Water Contractor's DSS Model to evaluate each water conservation measure. Assumptions regarding the following variables were made for each measure:

- Targeted Water User Group End Use – Water user group (e.g., single family residential) and end use (e.g., indoor or outdoor water use).
- Utility Unit Cost – Cost of rebates, incentives, and contractors hired (by Water Contractor or SMSWP) to implement measures. The assumed dollar values for the measure unit costs were closely reviewed by staff and are found to be adequate for each individual measure. The values in the majority of cases are in the range of what is currently offered by other water utilities in the region.
- Retail Customer Unit Cost – Cost for implementing measures that is paid by retail customers (i.e., the remainder of a measure's cost that is not covered by a utility rebate or incentive).
- Utility Administration and Marketing Cost – The cost to the utility for administering the measure, including consultant contract administration, marketing, and participant tracking. The mark-up is sufficient (in total) to cover conservation staff time and general expenses and overhead.

Costs are determined for each of the measures based on industry knowledge, past experience and data provided by the Water Contractor. Costs may include incentive costs, usually determined on a per-participant basis; fixed costs, such as marketing; variable costs, such as the costs to staff the measures and to obtain and maintain equipment; and a one-time set-up cost. The set-up cost is for measure design by staff or consultants, any required pilot testing, and preparation of materials that are used in marketing the measure. Measure costs are estimated each year between 2015 and 2040. Costs are spread over the time period depending on the length of the implementation period for the measure and estimated voluntary customer participation levels.

Lost revenue due to reduced water sales is not included as a cost because the conservation measures evaluated herein generally take effect over a span of time that is sufficient to enable timely rate adjustments as necessary to meet fixed cost obligations.

Data necessary to forecast water savings of measures include specific data on water use, demographics, market penetration, and unit water savings. Savings normally develop at a measured and predetermined pace, reaching full maturity after full market penetration is achieved. This may occur three to ten years after the start of implementation, depending upon the implementation schedule.

The unit costs vary according to the type of customer account and implementation method being addressed. For example, a measure might cost a different amount for a residential single family account, than a residential multi-family account, and for a rebate versus an ordinance requirement or a direct installation implementation method. Typically water utilities have found there are increased costs associated with achieving higher market saturation, such as more surveys per year. The DSS Model calculates the annual costs based on the number of participants each year. The general formula for calculating annual utility costs is:

- Annual Utility Cost = Annual market penetration rate x total accounts in category x unit cost per account x (1+administration and marketing markup percentage)
- Annual Customer Cost = Annual number of participants x unit customer cost
- Annual Community Cost = Annual utility cost + annual customer cost

4.7 Assumptions about Avoided Costs

The most expensive source of water for almost all of the Water Contractors, and in some cases the only source of water, is the SCWA Russian River Supply. The price of the water to the Water Contractors is set by SCWA every year and varies by Water Contractor location, depending upon which aqueduct they draw from. Since 1990, the annual price of water has increased significantly. The annual rate of increase from 1989/90 to 2013/14 has varied from 4.0 to 5.1% per year, depending upon the aqueduct.

Since 1990, the annual rate of inflation has been 2.64% per year in the San Francisco Bay Area, as measured by the Consumer Price Index (CPI). Based on this data the price of SCWA water has increased faster than the CPI.

Therefore, in evaluating the benefit-cost ratio of conservation measures and programs it is appropriate to consider the net increase in benefits (i.e., the net increase in the avoided cost of water). Other costs, such as the cost of conservation, will increase presumably at the CPI rate. Also, the cost of conservation programs will be paid for with inflated dollars.

For this evaluation, the avoided costs are escalated from the 2014 value to a projected 2030 value (16 years). The total avoided cost of water escalated is the 2014 current SCWA price of water plus the chemical/treatment and pumping and distribution costs. The chemical/treatment and pumping and distribution costs were provided by the Water Contractors in their data collection workbooks.

The net increase and the water production avoided costs used in this evaluation are provided in the following table. The 2014 SCWA cost of water is escalated to a 2030 projected value using a 4% per year rate increase. The cost of treatment distribution and pumping is escalated at 2% per year.

Table 4-2. Water Contractor Avoided Costs of Water

Water Contractor	Rate Basis	SCWA FY 2014-15 Water Rates (per AF)	Estimated SCWA 2030 Water Rates (per AF)	2014 Treatment, Distribution and Pumping Costs (per AF)	Estimated 2030 Treatment, Distribution and Pumping Costs (per AF)	Total Estimated 2030 Water Production Operational Costs (per AF)[1]
City of Santa Rosa	Santa Rosa Aqueduct	$ 730.68	$ 1,368.55	$0.00	$0.00	$1,368.55
City of Petaluma	Petaluma Aqueduct	$ 730.68	$ 1,368.55	$0.23	$0.32	$1,368.87
City of Rohnert Park		$ 730.68	$ 1,368.55	$0.00 [2]	$0.00	$1,368.55
City of Cotati		$ 730.68	$ 1,368.55	$0.00 [2]	$0.00	$1,368.55
Valley of the Moon Water District	Sonoma Aqueduct	$ 793.24	$ 1,485.72	$0.00 [2]	$0.00	$1,485.72
City of Sonoma		$ 793.24	$ 1,485.72	$0.00 [2]	$0.00	$1,485.72
Town of Windsor	Individual Rate	$ 876.81	$ 1,368.55[3]	$0.00 [2]	$0.00	$1,368.55
North Marin Water District	Individual Rate	$ 741.78	$ 1,389.34	$29.09	$39.93	$1,429.27
Marin Municipal Water District	Individual Rate for first 4,300 acre-feet from SCWA	$ 786.91	$ 1,473.87	$65.65	$90.12	$1,563.99

[1] This value is used in each Water Contractor's DSS Model.
[2] Water Contractors did not provide specific energy/cost quantities, therefore, the distribution cost is assumed to be zero which as an avoided cost will produce a more conservation estimate for the value of conserved water.
[3] Town of Windsor water rates in 2030 will change to Santa Rosa Aqueduct rates.

For those Water Contractors with wastewater operation costs including chemical, treatment, energy, and transport costs, a 2% per year escalation was used to a projected 2030 value. These values can be found in each Water Contractor's data collection workbook and DSS Model.

This avoided cost determination process has the effect of raising the benefit-cost ratios in our evaluation by the amount that is roughly the percentage difference in the future versus the current price of SCWA water. In our opinion, this escalation represents a more realistic comparison of benefits and costs of conservation.

4.8 Comparison of Individual Measures

Table 4-3 presents how much water the measures will save through 2040, how much they will cost, and what the cost of saved water will be per unit volume *if the measures are implemented on a stand-alone basis (i.e. without interaction or overlap from other measures that might address the same end use(s)).* Thus, savings from measures which address the same end use(s) are not additive. The model uses impact factors to avoid double counting in estimating the water savings from programs of measures. For example, if two measures are planned to address the same end use and both save 10% of the prior water use then the net effect is not the simple sum (20%). Rather it is the cumulative impact of the first measure reducing the use to 90% of what it was without the first measure in place and then reducing the use another 10% to result in the use being 81% of what it was originally. In this example the net savings is 19%, not 20%. Using impact factors, the model computes the reduction as follows, 0.9 x 0.9 = 0.81 or 19% water savings.

Since interaction between measures has **not** been accounted for in Table 4-3, it is **not** appropriate to include totals at the bottom of the table. However, the table is useful to give a close approximation of the cost effectiveness of each individual measure.

Cost categories are defined below:

- Utility Costs - those costs that the Water Contractor as a water utility will incur to operate the measure including administrative costs.
- Utility Benefits - the avoided cost of producing water.
- Customer Costs - those costs customers will incur to implement a measure in the Water Contractor's service area and maintain its effectiveness over the life of the measure.
- Customer Benefits - the savings other than from reduced water/sewer utility bills, such as energy savings resulting from reduced use of hot water. Conservation program participants will see lower water and sewer bills but overall there will be no net customer benefit.
- Community Costs and Benefits - Community Costs and Benefits include Utility Costs plus Customer Costs, and Utility Benefits plus Customer Benefits, respectively.

The column headings in Table 4-3 are defined as follows:

- Present Value (PV) of Utility and Community Costs and Benefits ($) = the present value of the 25-year time stream of annual costs or benefits, discounted to the base year.
- Utility Benefit-Cost ratio = PV of Utility Costs divided by PV of Utility Benefits over 25 years.
- Community Benefit-Cost ratio = (PV of Utility Benefits plus PV of customer energy savings) divided by (sum of PV of Utility Costs plus PV of Customer Costs), over 25 years.
- Five Years Total Cost to Utility ($) = the sum of the annual Utility Costs for years 2015 through 2019. Only those measures that are run between 2015 and 2020 will have a cost. The measures start in the years as specified for each measure shown in Appendix D.

- Water Savings in 2020 (AFY) = water saved in acre-feet per year. The year 2020 is provided as this information is helpful as relates to the statewide SB X7-7 legislation (the legislation is described earlier in this Plan).
- Utility Cost of Water Saved per Unit Volume ($/AF) = PV of Utility Costs over 25 years divided by the 25-Year Water Savings. This value is compared to the utility's avoided cost of water as one indicator of the cost effectiveness of conservation efforts. It should be noted that the value somewhat undervalues the cost of savings because program costs are discounted to present value and the water benefit is not.

Table 4-3. Conservation Measure Cost and Savings

Measure	Present Value of Water Utility Benefits	Present Value of Community Benefits	Present Value of Water Utility Costs	Present Value of Community Costs	Water Utility Benefit to Cost Ratio	Community Benefit to Cost Ratio	Five Years of Water Utility Costs 2015-2020[1]	Water Savings in 2020 (AFY)	Cost of Savings per Unit Volume ($/AF)
Water Loss	$3,384,627	$3,384,627	$1,155,528	$1,155,528	2.93	2.93	$500,000	143	$317
AMI	$3,868,049	$3,868,049	$2,419,639	$2,419,639	1.60	1.60	$2,104,985	168	$627
Pricing	$136,412	$136,412	$319,813	$319,813	0.43	0.43	$50,000	35	$180
Public Info & School Education - SMSWP	$663,871	$1,013,813	$577,710	$577,710	1.15	1.75	$146,877	23	$944
Public Info & School Education - Water Contractor	$663,871	$1,013,813	$895,451	$895,451	0.74	1.13	$227,659	23	$1,464
Prohibit Water Waste	$54,055	$54,055	$615,126	$826,737	0.09	0.07	$160,520	2.2	$10,951
Indoor and Outdoor Surveys - CII	$915,080	$1,677,404	$1,217,493	$2,029,155	0.75	0.83	$303,169	30	$1,423
Replace CII Inefficient Equipment	$75,628	$178,783	$55,735	$98,608	1.36	1.81	$57,415	2.6	$858
Efficient Toilet Replacement Program - CII	$189,627	$189,627	$411,957	$594,779	0.46	0.32	$437,210	7.2	$2,503
Urinal Rebates – CII	$24,047	$24,047	$169,382	$199,495	0.14	0.12	$146,829	1.1	$8,123
Plumber Initiated UHET & HEU Retrofit Program	$123,024	$123,024	$242,262	$299,602	0.51	0.41	$56,617	2.4	$2,130
Require <0.25 gal/flush Urinals in New Development	$129,148	$129,148	$75,545	$350,253	1.71	0.37	$57,569	5.4	$667
HE Faucet Aerator / Showerhead Giveaway – CII	$42,574	$97,665	$45,705	$121,881	0.93	0.80	$48,507	4.7	$1,592
HE Faucet Aerator / Showerhead Giveaway - SF, MF	$79,738	$158,433	$55,947	$149,192	1.43	1.06	$59,341	8.6	$1,042
Indoor and Outdoor Surveys - SF, MF	$2,795,223	$3,753,609	$3,996,019	$4,867,094	0.70	0.77	$1,015,947	109	$1,460
Efficient Toilet Replacement Program – SF	$158,794	$158,794	$165,570	$298,027	0.96	0.53	$175,614	6.1	$1,207

Measure	Present Value of Water Utility Benefits	Present Value of Community Benefits	Present Value of Water Utility Costs	Present Value of Community Costs	Water Utility Benefit to Cost Ratio	Community Benefit to Cost Ratio	Five Years of Water Utility Costs 2015-2020[1]	Water Savings in 2020 (AFY)	Cost of Savings per Unit Volume ($/AF)
Direct Install UHET, Showerheads, and Faucet Aerators - SF, MF	$853,190	$1,387,550	$442,281	$551,151	1.93	2.52	$75,938	12	$550
HE Clothes Washer Rebate - SF, MF	$434,675	$1,000,445	$130,498	$694,249	3.33	1.44	$138,414	17	$351
Submeters Incentive	$41,006	$55,501	$192,816	$244,234	0.21	0.23	-	0.2	$4,175
Outdoor Large Landscape Audits & Water Budgeting/Monitoring	$42,733	$42,733	$43,676	$50,146	0.98	0.85	$46,350	5.7	$1,244
Landscape Rebates and Incentives for Equipment Upgrade	$157,251	$157,251	$152,775	$254,626	1.03	0.62	$162,114	14	$1,101
Turf Removal - MF, CII	$920,337	$920,337	$381,121	$4,891,424	2.41	0.19	$211,706	28	$375
Turf Removal - SF	$411,556	$411,556	$989,283	$3,272,243	0.42	0.13	$553,449	13	$2,175
Water Conserving Landscape and Irrigation Codes	$1,143,566	$1,143,566	$58,335	$525,018	19.60	2.18	$23,625	30	$44
Require Smart Irrigation Controllers and Rain Sensors in New Development	$1,120,213	$1,120,213	$368,740	$2,882,872	3.04	0.39	$114,542	24	$281

[1]Some measures have no Water Utility Costs from 2015 to 2020, indicated by a dash (-) in the table. This means that there are no costs for these five years only, from 2015, inclusive, up to 2020, exclusive. It is not indicative of any activity before 2015 or during and/or after 2020. This column is meant to be helpful for budgeting purposes only.

5. RESULTS OF CONSERVATION PROGRAM EVALUATION

This section describes the process of selecting conservation measures for developing alternative conservation program scenarios and various cost, savings, and target results.

5.1 Selection of Measures for Programs

The 25 conservation measures were incorporated into each Water Contractor's DSS Model for cost-benefit analysis and selection of a conservation program to meet the Water Contractor's goals. Included in each Water Contractor's DSS Model was a list of measures in each of three alternative conservation programs (Programs A, B, and C), which were designed to illustrate a range of various measure combinations and resulting water savings. Four key items were taken into consideration during measure selection for Programs A, B, and C:

- Existing Water Contractor water use efficiency measures;
- Programs run by SMSWP;
- Measures focused on Programmatic BMP defined by the CUWCC's Memorandum of Understanding if the individual Water Contractor had reported on a measure; and
- New and innovative measures.

These programs are not intended to be rigid frameworks but rather to demonstrate the range in savings that could be generated if selected measures were run together. For each Water Contractor the three program scenarios are organized as follows:

- **Program A**: "Existing Program" option includes the measures that the Water Contractor currently offers. These measures are not necessarily designed the way they are currently implemented, having in some cases, more aggressive annual account targets. Again, though Program A represents the conservation measures each Water Contractor is currently implementing, it is important to note that these measures are designed in each Water Contractor's DSS Model to represent how the measure will be implemented in the future and not necessarily how it has historically been implemented.
- **Program B**: "Optimized Program" represents the measures that the Water Contractor currently offers. These measures are typically cost-effective and save significant amounts of water. Key benchmarks for the proposed strategies include: (1) cost-effectiveness, (2) compliance with CUWCC's BMPs, (3) ability to help achieve water use reduction targets by 2020 (SB X7-7) if applicable for the individual Water Contractor, (4) reflects reasonable predicted annual water contract budget allocations for water conservation activities. Program B includes the same measures as Program A.
- **Program C**: "All Measures Analyzed" presents a scenario where all 25 measures are implemented. Though it is unlikely that the Water Contractor would elect to implement all the measures, this program offers the opportunity to explore what the water savings (and costs) would potentially be should the Water Contractor implement such an extensive conservation program.

The Water Contractor's DSS Model presents estimated average per capita per day savings with the plumbing codes only, and each of the alternative programs (Program A, B, and C). Plumbing code includes current state and federal standards (including CALGreen, Senate Bill 407 and Assembly Bill 715) for items such as toilets, showerheads, faucets, pre-rinse spray valves. SB 407 and AB 715 require the replacement of non-water conserving plumbing fixtures with water-conserving fixtures.

The Water Contractor was provided a copy of the DSS Model to review the conservation program options, tailor the programs to meet its needs, and select the program that fit its individual water savings goals and budgets. The reasons that each member Water Contractor selected a particular suite of measures varied and included the following consideration:

- Measure cost-effectiveness to Water Contractor
- Applicability to service area
- Amount of water savings generated
- Cost to Water Contractor
- Ease of implementation for Water Contractor and staffing required
- Whether the measure was being run by SCWA or SMSWP
- Local preferences

The following figure displays which measures are in each program.

Figure 5-1. Conservation Measures Selected for Scenarios

Program Scenarios				
	Measures	**Program A**	**Program B**	**Program C**
Program Scenarios	Water Loss	☑	☑	☑
	AMI	☐	☐	☑
	Pricing	☑	☑	☑
	Public Info & School Education - SMWSP	☑	☑	☑
	Public Info & School Education - Water Contractor	☑	☑	☑
	Prohibit Water Waste	☑	☑	☑
	Indoor and Outdoor Surveys - CII	☑	☑	☑
	Replace CII Inefficient Equipment	☑	☑	☑
	Efficient Toilet Replacement Program - CII	☑	☑	☑
	Urinal Rebates – CII	☐	☐	☑
	Plumber Initiated UHET & HEU Retrofit Program	☐	☐	☑
	Require <0.25 gal/flush Urinals in New Development	☐	☐	☑
	HE Faucet Aerator / Showerhead Giveaway – CII	☑	☑	☑
	HE Faucet Aerator / Showerhead Giveaway - SF, MF	☑	☑	☑
	Indoor and Outdoor Surveys - SF, MF	☑	☑	☑
	Efficient Toilet Replacement Program – SF	☑	☑	☑
	Direct Install UHET, Showerheads, and Faucet Aerators - SF, MF	☐	☐	☑
	HE Clothes Washer Rebate - SF, MF	☑	☑	☑
	Submeters Incentive	☐	☐	☑
	Outdoor Large Landscape Audits & Water Budgeting/Monitoring	☑	☑	☑
	Landscape Rebates and Incentives for Equipment Upgrade	☑	☑	☑
	Turf Removal - MF, CII	☑	☑	☑
	Turf Removal - SF	☑	☑	☑
	Water Conserving Landscape and Irrigation Codes	☑	☑	☑
	Require Smart Irrigation Controllers and Rain Sensors in New Development	☑	☑	☑

5.2 Results of Program Evaluation

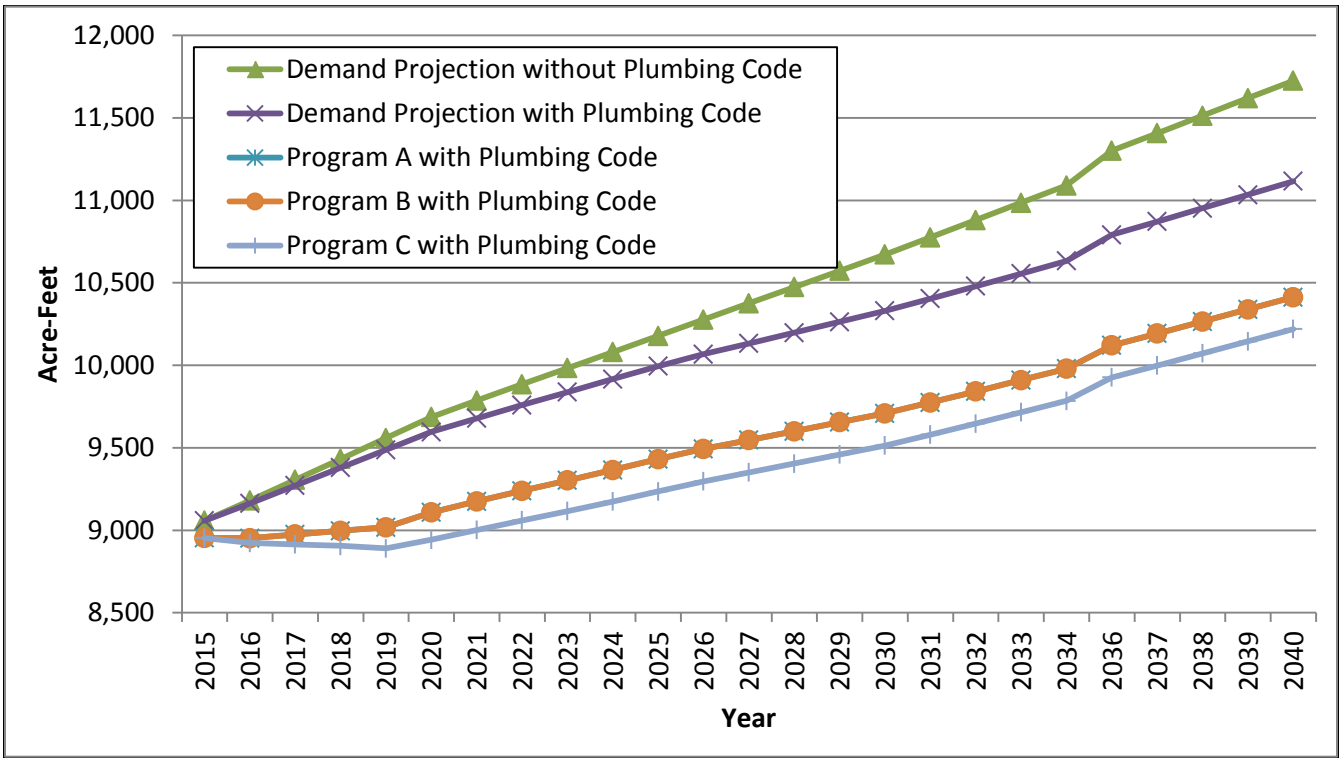
The following table and Figure 5-2 shows annual water demand with no conservation (plumbing code only) and the three conservation programs.

Table 5-1. Potable Water Use Projections (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Demand without Plumbing Code (AFY)	9,058	9,686	10,179	10,672	11,196	11,726
Demand with Plumbing Code (AFY)	9,058	9,596	9,995	10,331	10,711	11,116
Demand with Plumbing Code and Program A	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program B	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program C	8,953	8,942	9,235	9,513	9,855	10,220

*Data is not weather normalized. Total water use is potable only. Does not include recycled water use. Recycled water use and projection are in a separate section in the UWMP.

Figure 5-2. Long Term Demands with Conservation Programs



Note: All line types shown in the legend are presented in the graph. The following demand scenarios, Program A and Program B, are identical in value and therefore may be indistinguishable in the figure.

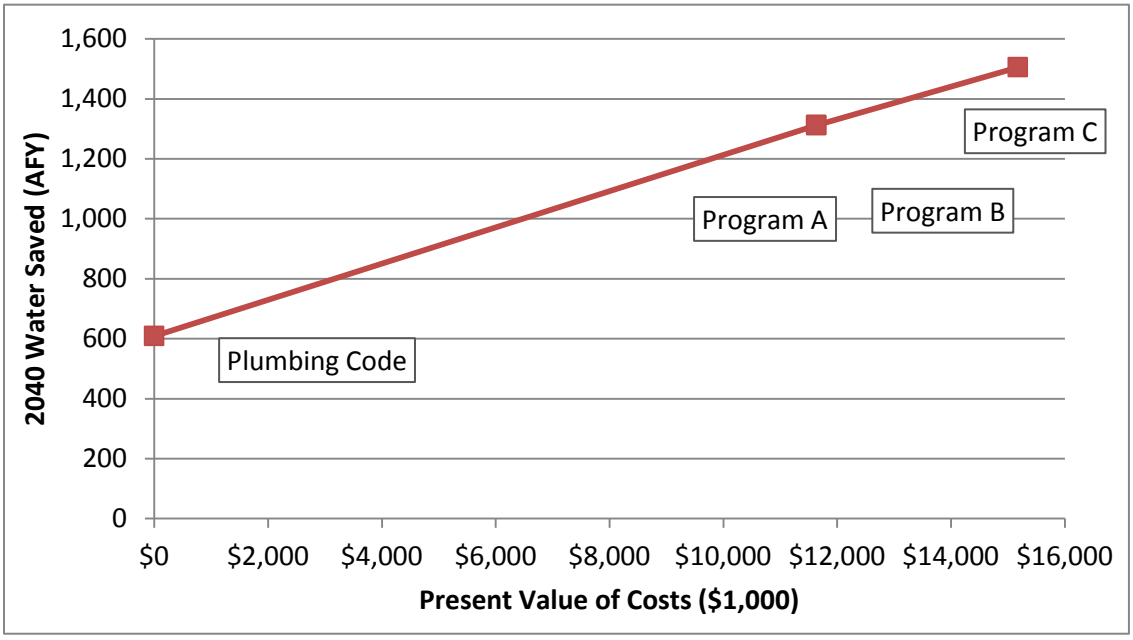
Table 5-2 shows the savings in 5-year increments for all three conservation programs; these are from the conservation programs alone and include the plumbing code savings. The separate starting points for the demand with and without the plumbing code versus the conservation programs is directly correlated to the variation in individual measures selected for each individual Program A, B, and C.

Table 5-2. Long Term Conservation Program Savings

Conservation Program Water Savings (AFY)	2015	2020	2025	2030	2035	2040	Water Utility Benefit to Cost Ratio	Community Benefit to Cost Ratio
Plumbing Code	-	90	184	341	484	609	N/A	N/A
Program A with Plumbing Code	105	578	747	963	1,146	1,312	1.18	0.68
Program B with Plumbing Code	105	578	747	963	1,146	1,312	1.18	0.68
Program C with Plumbing Code	105	744	944	1,158	1,341	1,506	1.19	0.78

Figure 5-3 shows how marginal returns change as more money is spent to achieve savings. Most recently it may be impacted by the goals set forth by SB X7-7, which calls for a reduction in per capita water use by 2020 (this is independent of the economic analysis).

Figure 5-3. Present Value of Utility Costs versus Cumulative Water Saved



Note: Program A and Program B have identical points on the graph and therefore are indistinguishable in the figure.

Table 5-3 presents key evaluation statistics compiled from the DSS Model. Assuming each program's measures are successfully implemented, projected indoor, outdoor and total water savings for 2040 in AFY are shown; these savings do include plumbing code savings. Savings and costs in the following table are a result of each program's conservation measures and any plumbing codes. Total present value costs and savings are estimated over the 25 year analysis period using an interest rate of 3%. The cost of water saved is presented for the utility. These cost parameters are derived from the annual time stream of utility, customer, and community costs.

Table 5-3. Comparison of Long-Term Conservation Programs – Utility Costs and Savings

	2040 Indoor Water Savings (AFY)	2040 Outdoor Water Savings (AFY)	2040 Total Water Savings (AFY)	Present Value of Water Savings ($)	Present Value of Utility Costs ($)	Present Value of Community Costs ($)	Cost of Utility Savings per Unit Volume ($/AF)
Program A with Plumbing Code	736	576	1,312	$13,713,262	$11,636,482	$24,504,552	$815
Program B with Plumbing code	736	576	1,312	$13,713,262	$11,636,482	$24,504,552	$815
Program C with Plumbing Code	840	666	1,506	$18,115,038	$15,178,407	$28,568,925	$816

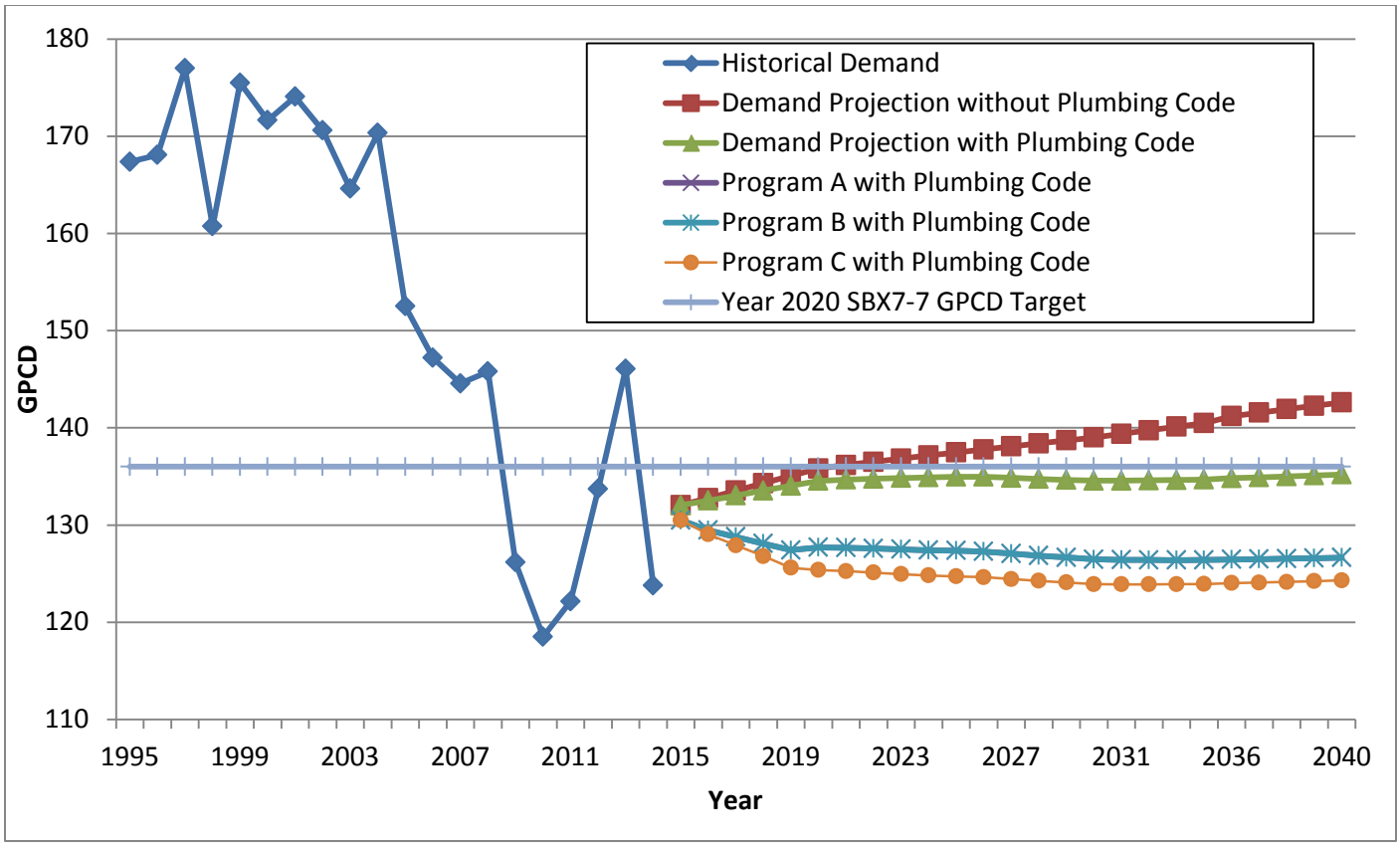
The following table presents the year 2020 GPCD target and Program A, B, and C GPCD estimates for the Water Contractor.

Table 5-4. Water Conservation Program Savings Projections - SB X7-7 Target GPCD

GPCD Target Source	SB X7-7
GPCD Goal	136
GPCD Goal Year	2020
GPCD with Plumbing Code in 2020	135
GPCD Program A with Plumbing Code in 2020	128
GPCD Program B with Plumbing Code in 2020	128
GPCD Program C with Plumbing Code in 2020	125

The following figure presents the year 2020 GPCD target and historical and projected GPCD estimates with plumbing codes and Program A, B, and C savings.

Figure 5-4. Water Conservation Program Savings Projections – SB X7-7 Target, GPCD



Notes:

1. All line types shown in the legend are presented in the graph. The following demand scenarios, Program A and Program B, are identical in value and therefore indistinguishable in the figure.
2. Note the decline in water use in the 2014 dry year and 2008-2011 economic recession.

6. CONCLUSIONS

This section presents a discussion of the relative savings and cost-effectiveness of the Water Contractor's alternative conservation programs.

The City of Petaluma's service area has a relatively high portion of residential water use and a significant amount of outdoor water use. Consequently, residential and irrigation conservation programs produce the most savings. The City's service area is not a heavy manufacturing sector, so the conservation potential in the commercial sector is relatively low. Overall conclusions are as follows:

- The change in water demands from years 2015 to 2040 are provided in Table 6-1. Five projected demand scenarios have been analyzed for the 25-year study period.
- Water savings from implementation of Program A, Program B, and Program C conservation programs would reduce water needs in 2040 by approximately 6.3%, 6.3% and 8.1% respectively when compared to 2040 potable water demand with the plumbing code.
- For Program A, B, and C measures, approximately 79% of the active conservation water savings potential in 2040 (or 44% of the water savings total if the plumbing code is included) is in reducing outdoor use; the rest is indoor use reduction potential.
- The average cost of water saved by Program A or B over 30 years ($815 per acre-foot) is higher than the current price of SCWA water ($730.68 per acre-foot), but substantially lower than the estimated SCWA 2030 rate ($1,368.55 per acre-foot) (refer to Table 4-2). Thus, measures that are cost-effective at today's water rates will be more so if SCWA rates rise in the future.
- Water savings contributed by Program A measures alone are 703 acre-feet in 2040 (active program savings).
- Likewise, water savings contributed by the Program B measures alone are 703 acre-feet in 2040 (active program savings).
- Water savings contributed by the Program C measures alone are 897 acre-feet in 2040 (active program savings).
- Benefit-cost ratios of Program A, Program B, and Program C conservation alternatives are 1.18, 1.18, and 1.19 respectively, indicating that all program combinations are cost-effective from the utility standpoint.

Table 6-1. Potable Water Use Projections (Acre-Feet/Year)*

	2015	2020	2025	2030	2035	2040
Demand without Plumbing Code (AFY)	9,058	9,686	10,179	10,672	11,196	11,726
Demand with Plumbing Code (AFY)	9,058	9,596	9,995	10,331	10,711	11,116
Demand with Plumbing Code and Program A	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program B	8,953	9,108	9,432	9,709	10,049	10,413
Demand with Plumbing Code and Program C	8,953	8,942	9,235	9,513	9,855	10,220

*Data is not weather normalized. Base year water demand is based on 2008-2013. 2014 was not used since it was a drought year. Total water use is potable only. Does not include recycled water use. Recycled water use and projection are in a separate section in the UWMP.

APPENDIX A - ASSUMPTIONS FOR THE DSS MODEL

The following section presents the key assumptions used in the DSS Model. The assumptions having the most dramatic effect on future demands are the natural replacement rate of fixtures, how residential or commercial future use is projected, and finally the percent of estimated real water losses. This section presents DSS Model assumptions regarding plumbing code water savings, present value parameters, and active conservation measure costs and savings.

A.1 Plumbing Codes and Legislation

The DSS Model incorporates the following three items as a "code" meaning that the savings are assumed to occur and are therefore "passive" savings.

1. National Plumbing Code
2. CALGreen
3. AB 715
4. AB 407

Each of the three items is described below. In the sections following the descriptions is information on how the DSS Model handles these items and what information is needed for input.

National Plumbing Code

The Federal Energy Policy Act of 1992, as amended in 2005 requires only fixtures meeting the following standards can be installed in new buildings:

- Toilet – 1.6 gal/flush maximum
- Urinals – 1.0 gal/flush maximum
- Showerhead - 2.5 gal/min at 80 psi
- Residential Faucets – 2.2 gal/min at 60 psi
- Public Restroom Faucets - 0.5 gal/min at 60 psi
- Dishwashing pre-rinse spray valves – 1.6 gal/min at 60 psi

Replacement of fixtures in existing buildings is also governed by the Federal Energy Policy Act that requires only devices with the specified level of efficiency (shown above) can be sold today (since 2006). The net result of the plumbing code is that new buildings will have more efficient fixtures and old inefficient fixtures will slowly be replaced with new more efficient models. The national plumbing code is an important piece of legislation and must be carefully taken into consideration when analyzing the overall water efficiency of a service area.

In addition to the plumbing code the US Department of Energy regulates appliances such as residential clothes washers. Regulations to make these appliances more energy efficient has driven manufactures to dramatically reduce the amount of water these efficient machines use. Generally, front loading washing machines use 30 to 50% less water than conventional models (which are still available). In a typical analysis the DSS Model forecasts a gradual transition to high efficiency clothes washers (using 12 gallons or less) so that by the year 2025 this will be the only type of machines purchased. In addition to the industry becoming more efficient, rebate programs for washers have been successful in encouraging customers to buy more water efficient models. Given that machines last about 10 years, eventually all machines will be of this type. In 2012, the United States Environmental Protection Agency estimated the Energy Star clothes washer market share in the US in 2011 to be over 60%. Energy Star washing machines have a water factor (WF) of 6.0 or less. A WF of 6.0 is the equivalent of using 3.1 cubic feet or 23.2 gallons of water per load.

State Building Code – CALGreen

The CALGreen requirements effect all new development in the State of California after January 1, 2011. The new development requirements under CALGreen are listed in the following figure. MWM added the CALGreen requirements that effect all new development in the State of California after January 1, 2011. MWM modeled water savings from the CALGreen building code by adding Multi-family and Commercial customer categories as appropriate to applicable conservation measures.

Table A-1. CALGreen Building Code Summary Table

CALGreen Building Code						
Building Class	**Component**	**Effective Date***	**Indoor Fixtures Included**	**Indoor Requirement**	**Landscaping & Irrigation Requirements**	**Are the Requirements Mandatory?**
Residential	Indoor	1/1/2011	Toilets, Showers, Lavatory & Kitchen Faucets, Urinals	Achieve 20% savings overall below baseline		Yes
	Outdoor	1/1/2011			Provide weather adjusting controllers	Yes
Non Residential	Indoor	1/1/2011	Submeter leased spaces	Only if building >50,000 sq. ft. & if leased space use >100 gpd		Yes
			Toilets, Showers, Lavatory & Kitchen Faucets, Wash Fountains, Metering Faucets, Urinals	Achieve 20% savings overall below baseline		Yes
	Outdoor	1/1/2011			Provide water budget	> 1,000 sq ft. landscaped area
					Separate meter	As per Local or DWR ordinance
					Prescriptive landscaping requirements	> 1,000 sq ft. landscaped area
					Weather adjusting irrigation controller	Yes

* Effective date is 7/1/2011 for toilets.

New Development Ordinances – Water Contractor-Specific

The new development ordinances for each Water Contractor are listed in the following Table A-2 below.

Table A-2. New Development Ordinances

New Development (ND) Measure	NMWD	City of Rohnert Park[1]	City of Cotati[2]	City of Santa Rosa	Town of Windsor	City of Sonoma	Valley of the Moon WD	Marin Municipal Water District	City of Petaluma	CALGreen Requirement
Applicability (Customer Classes)	All	All	All	All	All	All	All	All	All	All
ND1-Rain Sensor Retrofit	2005	No	No	2010	2010 (SF>4 lots) & >2,500 sq ft/lot	No	2010, SF>5,000 sq ft	2000	Yes	No
ND2-Smart Irrigation Controller	2005	Yes	2010	2010	2010 (SF>4 lots) & >2,500 sq ft/lot	No	2010, SF>5,000 sq ft	2011	Yes	Yes
ND3- High Efficiency Toilets	2005	Yes	2009	2011	2011	No	No	2011	Yes	Yes
ND4-Dishwasher New Efficient	2005	No	2009	No	No	No	No	2012	Yes	No
ND5-Clothes Washing Machine Requirement	2000	No	2009	No	No	No	No	2011	Yes	No
ND6-Hot Water on Demand	No	No	No	No	No	No	No	No	No	No
ND7-High Efficiency Faucets and Showerheads	2006	Yes	2009	2011	2011	No	No	2011	Yes	Yes
ND8-Landscape and Irrigation Requirements	2004	2010 (State ordinance)	2010	SF since 2007. All other since 1993	2010 for landscapes > 2,500 sq ft (applies	2010 (adopted ordinance planned to	2010 for All except SF<5,000 sq. ft. and	1994	Yes	Yes

New Development (ND) Measure	NMWD	City of Rohnert Park[1]	City of Cotati[2]	City of Santa Rosa	Town of Windsor	City of Sonoma	Valley of the Moon WD	Marin Municipal Water District	City of Petaluma	CALGreen Requirement
					to all but SF<5 lots)	be adopted September 1, 2010, budgets w/ 60% ET	turf<600 sq ft			
Urinals	2008	No	No	2011	2011	2009	No	2011	Yes	Yes
Source	NMWD Reg 15	Measure is mandatory under CALGreen. City adopted CALGreen effective January 2011.	Use Build it Green Checklist (Mandatory)	Adopting CALGreen 2010	Adopted WELO June 2010, CALGreen + Tier 1 January 2011	Use Build it Green Checklist (Mandatory)	County ordinance effective Jan 1, 2010	MMWD Title 13 Water Service Conditions	City ordinance 2009	State Reqmt; May take effect 2012

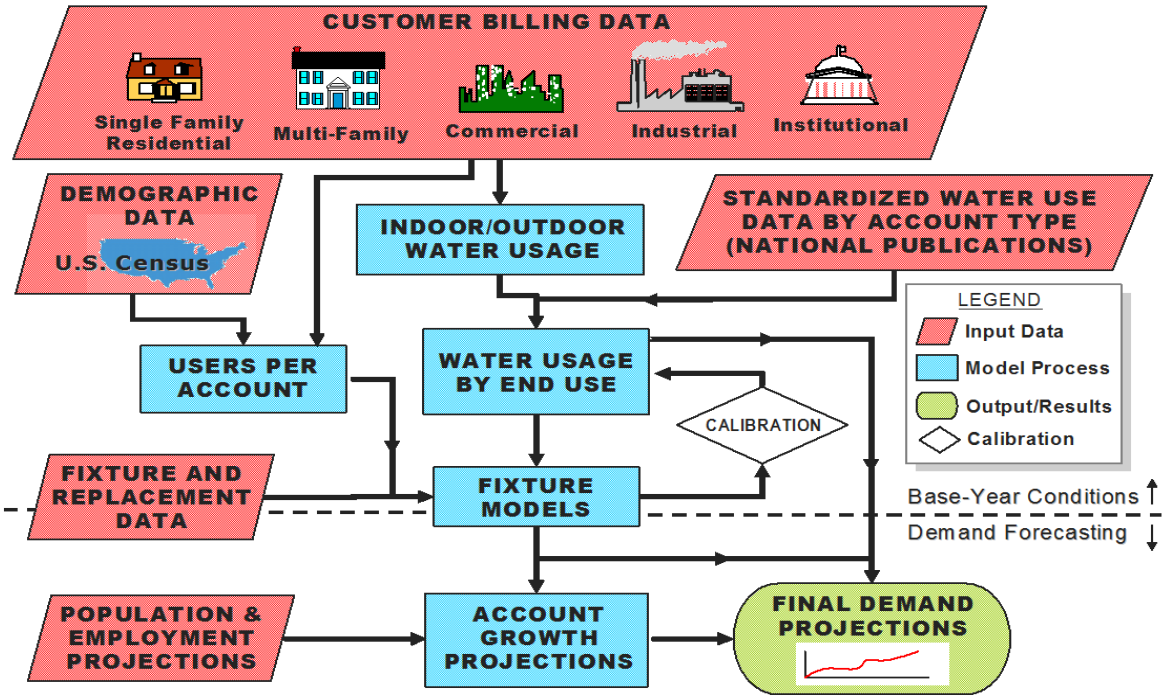
[1]City of Rohnert Park has extensive green building ordinance requiring developers to select from a set of green building measures including some of the listed measures.
[2]City of Cotati ND-3 confirmed to start in 2009 based on July 27, 2010 with City of Cotati at the request of Damien O'Bid. Build It Green Checklist mandatory, beginning in the year 2004. The year 2009 was selected as a start date for 100% deployment of measures, as the measures can be selectively deployed providing the overall point minimum is achieved.

State Plumbing Code – AB 715

The Plumbing Code includes the new CCR Title 20 California State Law (AB 715) requiring High Efficiency Toilets and High Efficiency Urinals be exclusively sold in the state by 2014.

The following figure conceptually describes how the National plumbing code, CALGreen and AB 715 are incorporated into the flow of information in the DSS Model.

Figure A-1. DSS Model Overview Used to Make Potable Water Demand Projections



California State Law – SB 407

SB 407 (Plumbing Fixture Retrofit on Resale or Remodel): The DSS Model carefully takes into account the overlap with SB 407, the plumbing code (natural replacement), CALGreen, AB 715 and rebate programs (such as toilet rebates). SB 407 begins from the year 2017 in residential and 2019 in commercial properties. SB 407 program length is variable and continues until all the older high flush toilets have been replaced the service area. The number of accounts with high flow fixtures is tracked to make sure that the situation of replacing more high flow fixtures than actually exist does not occur.

DSS Model Fixture Replacement

The DSS Model is capable of modeling multiple types of fixtures, including fixtures with slightly different design standards. For example currently toilets can be purchased that can flush at a rate of 0.8 gallons per flush, 1.0 gallon per flush or 1.28 gallons per flush. The 1.6 gpf and higher gallons per flush toilets still exist but no longer can be purchased in California and cannot therefore be used for a replacement or new installation. So the DSS Model utilizes a fixture replacement table to decide what type of fixture is installed when a fixture is replaced or a new fixture is installed. The replacement of the fixtures is listed as a percentage as shown in the following figure. For example, a value of 100% would represent that all the toilets sold would be of one particular flush volume. A value of 75% means that three out of every four toilets installed would be of that particular flush volume type. The DSS Model contains a pair of replacement tables for each fixture type and customer category combination. For example, the DSS Model will contain a

pair of replacement tables for Residential Single Family toilets, Residential Multi-family toilets, Commercial toilets, Residential clothes washing machines, Commercial washing machines, etc.

Figure A-2. Example Toilet Replacement Percentages by Type of Toilet

Replacement Appliance Market Shares				
Year	1.28 gpf HET	1.6 gpf ULFT	High Use Toilet	Total
2012	75%	25%	0%	100%
2014	100%	0%	0%	100%
2020	100%	0%	0%	100%
2030	100%	0%	0%	100%
2050	100%	0%	0%	100%
New Appliance Market Shares				
Year	1.28 gpf HET	1.6 gpf ULFT	High Use Toilet	Total
2012	100%	0%	0%	100%
2014	100%	0%	0%	100%
2020	100%	0%	0%	100%
2030	100%	0%	0%	100%
2050	100%	0%	0%	100%

In the previous example, the DSS Model combines the effects of the following for the toilet fixture type:

- Federal Policy Act
  - Determines the "saturation" of 1.6 gpf toilets as it was in effect from 1992-2014 for toilet replacements.
- CALGreen
  - Determines that all "new appliance market share" toilets in "new" development will be 1.28 gpf
  - The year 2012 was selected as the beginning of the toilet portion of the code did not go into effect until July 1, 2011 and it also takes a while to get a permit, build the facility or residence, and have the toilets functioning with the building occupied, such that the savings would not actually occur until the year 2012 rather than the year 2011.
- AB 715
  - Determines that the "replacement appliance market" and "new appliance market" toilets will all be 1.28 gpf toilets or lower.

DSS Model Initial Fixture Proportions

The DSS Model also needs a place to start when it comes to fixture replacement. It needs to know what the initial proportions (or percentages) of each type of fixture that are currently installed (also known as fixture saturation rate) in the modeled service area for each customer class.

Figure A-3 presents an example of the initial proportions determined for residential toilets in the year 2010. In the following **example** the model started in 2010, therefore it is assumed the initial proportions of the 1.28 gallon per flush type toilets is 0% as they were not readily available at that time. Then using the 2010 DP-04 census data, which shows the age of houses in the service area, it is calculated that 39.3% of the total current homes were built since 1992 when 1.6 gallon per flush toilets where required to be installed in new homes. Then an average natural replacement rate (rate of broken or remodeled toilet) of 2.5% per year for higher flush volume toilets is assumed. Then, in this example, a 3.96% replacement rate is calculated due to a rebate program that was raising the replacement rate of toilets. This gives the initial proportion of 1.6 gallon per flush (gpf) toilets to be 90.0%, and 1.28 gpf toilets 3.3%. In this case the initial proportion of high flush toilets is assumed to be the remainder of 6.7%. This figure shows an example of a toilet fixture model and how it incorporates the changes from each of these legislative items. There are similar fixture models for showers, clothes washers, and urinals. There is one fixture model for each of the following categories:

- Single family toilets
- Multi-family toilets

- Commercial toilets
- Commercial urinals
- Single family showers
- Multi-family showers
- Single Family clothes washers
- Multi-family clothes washers

Figure A-3. Example Residential Toilet Initial Proportions from Fixture Analysis used for DSS Fixture Model

Fixture Model:	**Residential**		***Toilets***					
Appliance Data						Comments	Replacement Data	
Fixture Type	Volume per Use (Gallons)[1]	Proportion of Homes by Age[2]	Net Change due to Natural Replacement	Net Change due to Rebate Program[3]	Initial Proportions[4]		Fixture Type	Percent Annual Replacement[5]
1.28 gal/flush High Efficiency Toilets (HET)	1.3	0.0%	0.0%	3.30%	3.3%	3.4% as these toilets were not very prelevant in the start year.	1.28 gal/flush High Efficiency Toilets (HET)	2.0%
1.6 gal/flush Ultra Low Flow Toilets (ULFT)	1.8	39.3%	50.0%	0.66%	90.0%	39.3% new homes since 1990 + 50% natural replacement +15% retrofit program	1.6 gal/flush Ultra Low Flow Toilets (ULFT)	2.0%
High Flush and 3.5 gal/flush	4.0	60.7%	-50.00%	-3.96%	6.7%	Remainder	High Flush and 3.5 gal/flush	2.5%

NOTES:

1a. Volumes-per-use are based on average flush volumes for age of toilet. New toilets when out of adjustment flush at an average of 1.8 gpf instead of 1.6 gpf.

1b. Initial proportions of fixtures installed in homes are based on the age of homes as provided in the 2010 Census.

2. Assume homes constructed after 1992 installed ULFTs.

3. Net change due to rebate program is based on historical active conservation activity.

4. The initial proportions are fundamentally calculated by taking the initial proportions of homes by age (corresponding to efficiency levels) and adding the net change due to natural replacement and adding change due to rebate program minus the "free rider effect." No fixture % can exceed 90%.

5a. Assume a 2.5% replacement rate for older toilets to the ULFTs over the 17 years since they where required.

5b. Assume a future annual replacement rate of 2.0% for high efficiency fixtures, 2.0% for medium efficiency fixtures and 2.5% for low efficiency fixtures. 2.0% corresponds to a 50 year fixture life. 2.5% corresponds with a 40 year fixture life.

These initial proportions determine in the fixture model and found in each Water Contractor's Water Use Data Analysis workbook, are then entered into the DSS Model for each fixture's "Codes and Standards" worksheet. A screenshot of the single family toilets codes and standards worksheet is shown in the following figure. Most DSS Models include fixture models for SF and MF toilets, showers, and clothes washers; and commercial toilets and urinals.

Figure A-4. Example Residential Toilet Fixture Screenshot from DSS Model

Single Family Toilets		
Single Family Toilets	**General**	
	Measure Category	Default Plumbing Code
	Start Year	2012
	Description	The DSS Model is capable of modeling multiple types of fixtures, including fixtures with slightly different design standards. For example currently toilets can be purchased that can flush at 1.28 gallons per flush or 1.6 gallons per flush. The higher flush toilets (3.5gpf) still exist but no longer can be purchased in California and cannot therefore be used for a replacement or new installation. The DSS Model utilizes a fixture replacement table to decide what type of toilet is installed when a fixture is replaced or a new fixture is installed. The replacement of the fixtures is listed as a percentage. For example, a value of 100% would represent that all the toilets sold would be of one particular flush volume. A value of 75% means that three out of every four toilets installed would be of that particular flush volume type. The DSS Model combines the effects of the following for the toilet fixture type: • Federal Policy Act: Determines the "saturation" of 1.6 gpf toilets as it was in effect from 1992-2014 for toilet replacements. • Cal Green: Determines that all "new appliance market share" toilets in "new" development will be 1.28 gpf. The year 2012 was selected for the model input as the toilet portion of the code did not go into effect until July 1, 2011 and it also takes a while to get a permit, build the facility or residence, and have the toilets functioning with the building occupied, such that the savings would not actually occur until the year 2012 rather than the year 2011. • AB 715: Determines that the "replacement appliance market" and "new appliance market" toilets will all be 1.28 gpf toilets. An additional input to the DSS Model is the natural replacement rate of fixtures due to breakage, remodeling or other reason for replacement over time. To do this the DSS Model uses a percentage value for each fixture type that becomes the assumed natural replacement rate for that fixture. For example, a natural replacement rate of 2.5% is used for older toilets. This value can be modified by the user as shown on the previous worksheet. Each year the number of remaining accounts with old toilets is calculated as 0.975 times the prior year's value.
Categories	Comments	1. Volumes-per-use are based on average flush volumes for age of toilet. New toilets when out of adjustment flush at an average of 1.8 gpf instead of 1.6 gpf. 2. Initial proportions of fixtures installed in homes are based on the age of homes as provided in the 2010 Census. 3. Assume homes constructed after 1992 installed ULFTs. 4. Net change due to rebate program is based on historical active conservation activity. 5. The initial proportions are fundamentally calculated by taking the initial proportions of homes by age (corresponding to efficiency levels) and adding the net change due to natural replacement and adding change due to rebate program minus the "free rider effect." No fixture % can exceed 90%. 6. Assume a 2.5% replacement rate for older toilets to the ULFTs over the 17 years since they where required. 7. Assume a future annual replacement rate of 2.0% for high efficiency fixtures, 2.0% for medium efficiency fixtures and 2.5% for low efficiency fixtures. 2.0% corresponds to a 50 year fixture life. 2.5% corresponds with a 40 year fixture life.
	Customer Category	Single Family
	End Use	Toilets
	Effected Fixtures	
	1.28 gpf HET	☑
	1.6 gpf ULFT	☑
	High Use Toilet	☑
	Initial Fixture Proportions	
	1.28 gpf HET	2.7%
	1.6 gpf ULFT	90.0%
	High Use Toilet	7.3%
	Total	100.0%

DSS Model Fixture Replacement Rates

An additional input to the DSS Model is the natural replacement rate of fixtures due to breakage, remodeling or other reason for replacement over time. To do this the DSS Model uses an percentage value for each fixture type that becomes the assumed natural replacement rate for that fixture. For example, high flush toilets have a replacement rate value of 2.5%. Each year the number of remaining accounts with old toilets is calculated as 0.975 times the prior year's value. This value can be modified by the user for any fixture as shown in Figure A-5 below.

Also included in the following figure are example fixture efficiencies, which can be adjusted to any desired level based on service area characteristics. MWM can update data on efficiency levels found in the field and the 2011 California Single Family Water Use Efficiency Study (Bill DeOreo) or other recent information related to fixture saturation rates.

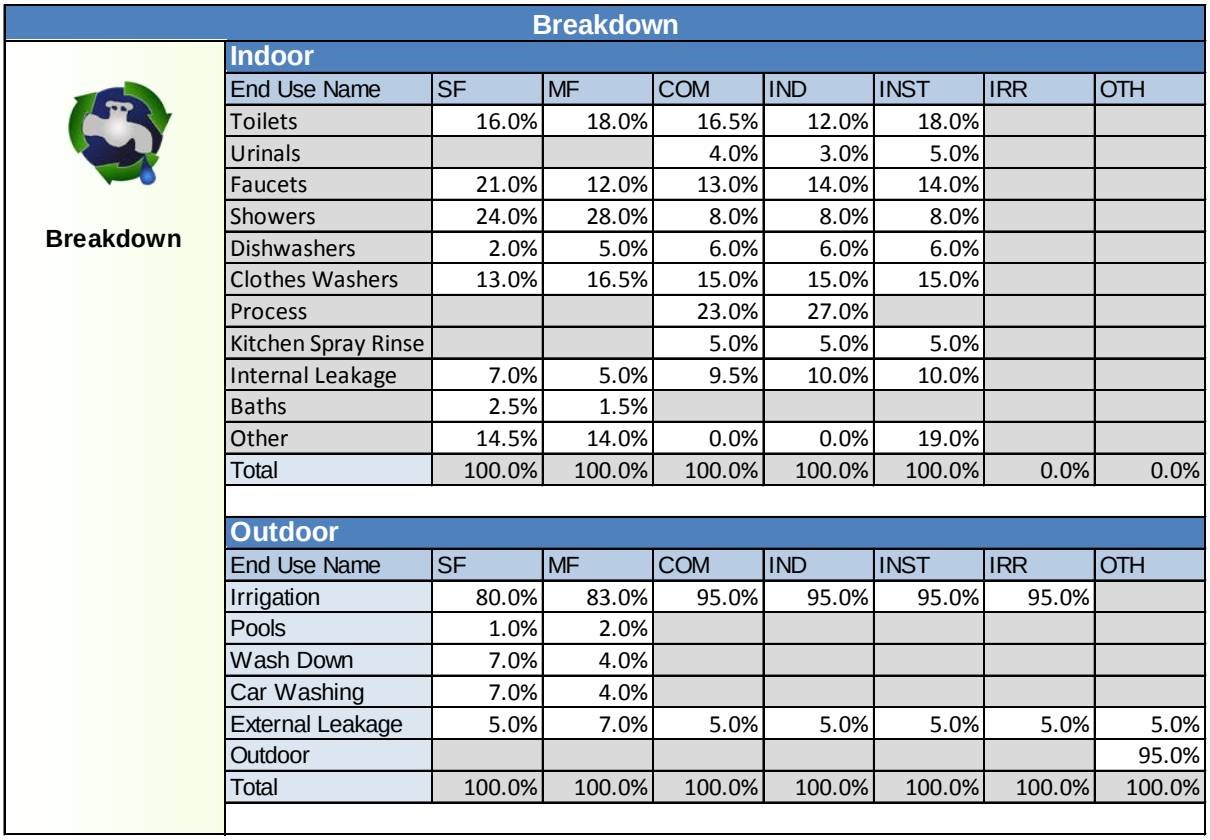
Figure A-5. Example Future Replacement Rates of Fixtures from DSS Model

Fixtures					
Fixture Name	End Use	Average Water Use	Units	Fixture Life (yrs)	Replacement Rate
1.28 gpf HET	Toilets	1.30	gpf	50	2.0%
1.6 gpf ULFT	Toilets	1.80	gpf	50	2.0%
High Use Toilet	Toilets	3.50	gpf	40	2.5%
1 gpf Urinal	Urinals	1.00	gpf	50	2.0%
0.5 gpf Urinal	Urinals	0.50	gpf	50	2.0%
Waterless Urinal	Urinals	0.00	gpf	50	2.0%
High Use Urinals	Urinals	3.00	gpf	40	2.5%
Quart Urinals	Urinals	0.25	gpf	50	2.0%
High Efficiency 2 gpm	Showers	13.92	gal per use	25	4.0%
Low Flow 2.5 gpm	Showers	18.27	gal per use	25	4.0%
High Flow > 3 gpm	Showers	23.49	gal per use	25	4.0%
Efficient	Clothes Washers	12.00	gal per use	10	10.0%
Medium Efficiency	Clothes Washers	19.20	gal per use	10	10.0%
Top Loader	Clothes Washers	34.20	gal per use	10	10.0%

DSS Model End Uses

Indoor and outdoor residential and non-residential end use breakdowns can be found in the “End Uses” section of each Water Contractor’s DSS Model on the “Breakdown” worksheet. As screenshot example of this worksheet is shown in Figure A-6. The source of these values is the California DWR Report "California Single Family Water Use Efficiency Study", 2011, AWWARF’s Report “Residential End Uses of Water” 2015 (pending), and Water Contractor supplied data on costs and savings. AWWARF’s 2000 "Commercial and Institutional End Uses of Water” is also used.

Figure A-6. End Use Breakdown Example Screenshot



Breakdown

Indoor

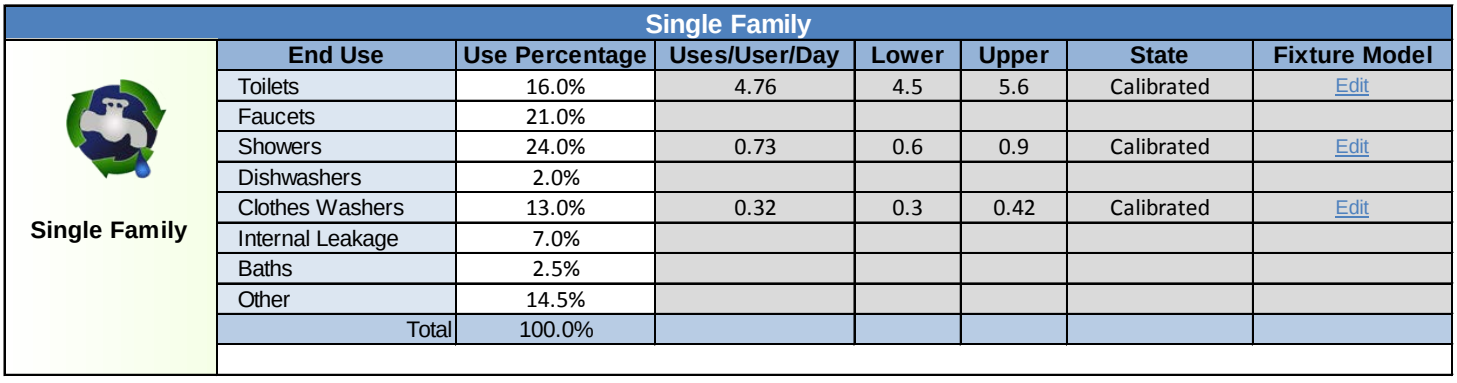
End Use Name	SF	MF	COM	IND	INST	IRR	OTH
Toilets	16.0%	18.0%	16.5%	12.0%	18.0%		
Urinals			4.0%	3.0%	5.0%		
Faucets	21.0%	12.0%	13.0%	14.0%	14.0%		
Showers	24.0%	28.0%	8.0%	8.0%	8.0%		
Dishwashers	2.0%	5.0%	6.0%	6.0%	6.0%		
Clothes Washers	13.0%	16.5%	15.0%	15.0%	15.0%		
Process			23.0%	27.0%			
Kitchen Spray Rinse			5.0%	5.0%	5.0%		
Internal Leakage	7.0%	5.0%	9.5%	10.0%	10.0%		
Baths	2.5%	1.5%					
Other	14.5%	14.0%	0.0%	0.0%	19.0%		
Total	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%

Outdoor

End Use Name	SF	MF	COM	IND	INST	IRR	OTH
Irrigation	80.0%	83.0%	95.0%	95.0%	95.0%	95.0%	
Pools	1.0%	2.0%					
Wash Down	7.0%	4.0%					
Car Washing	7.0%	4.0%					
External Leakage	5.0%	7.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Outdoor							95.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

End use breakdown values will differ slightly between Water Contractors due to differing demographics of their service area population. Residential frequency of use information for toilets, showers, and washers, and non-residential frequency of use of toilets and urinals is included in the "Codes and Standards" green section on the "Fixtures" worksheet of each Water Contractor's DSS Model, and then confirmed in each "Service Area Calibration End Use. Calculated frequencies of use in uses/user/day for customer end uses are presented in each customer category's "Service Area Calibration End Use" worksheet and compared to an industry-accepted use range based on AWWARF's residential, commercial and institutional end use reports mentioned previously. An example of this calibration sheet is shown in the screenshot in Figure A-7 below.

Figure A-7. Single Family End Use Breakdown and Fixture Use Frequency Example Screenshot



Single Family

End Use	Use Percentage	Uses/User/Day	Lower	Upper	State	Fixture Model
Toilets	16.0%	4.76	4.5	5.6	Calibrated	Edit
Faucets	21.0%					
Showers	24.0%	0.73	0.6	0.9	Calibrated	Edit
Dishwashers	2.0%					
Clothes Washers	13.0%	0.32	0.3	0.42	Calibrated	Edit
Internal Leakage	7.0%					
Baths	2.5%					
Other	14.5%					
Total	100.0%					

A.2 Present Value Parameters

Present value analysis using constant FY 2014 dollars and a real discount rate of 3% is used to discount costs and benefits to the base year. From this analysis, benefit-cost ratios of each measure are computed. When measures are put together in programs, the model is set up to avoid double counting savings from multiple measures that act on the same end use of water. For example, multiple measures in a program may target toilet replacements. The model includes assumptions to apportion water savings between the multiple measures.

Economic analysis can be performed from several different perspectives, based on which party is affected. For planning water use efficiency programs for utilities, the perspectives most commonly used for benefit-cost analyses are the "utility" perspective and the "community" perspective. The "utility" benefit-cost analysis is based on the benefits and costs to the water provider. The "community" benefit-cost analysis includes the utility benefit and costs together with account owner/customer benefits and costs. These include customer energy and other capital or operating cost benefits plus costs of implementing the measure, beyond what the utility pays.

The utility perspective offers two advantages. First, it considers only the program costs that will be directly borne by the utility. This enables the utility to fairly compare potential investments for saving versus supplying increased quantities of water. Second, revenue shifts are treated as transfer payments, which means program participants will have lower water bills and non-participants will have slightly higher water bills so that the utility's revenue needs continue to be met. Therefore, the analysis is not complicated with uncertainties associated with long-term rate projections and retail rate design assumptions. It should be noted that there is a significant difference between the utility's savings from the avoided cost of procurement and delivery of water and the reduction in retail revenue that results from reduced water sales due to water use efficiency. This budget impact occurs slowly, and can be accounted for in water rate planning. Because it is the water provider's role in developing a water use efficiency plan that is vital in this study, the utility perspective was primarily used to evaluate elements of this report.

The community perspective is defined to include the utility and the customer costs and benefits. Costs incurred by customers striving to save water while participating in water use efficiency programs are considered, as well as the benefits received in terms of reduced energy bills (from water heating costs) and wastewater savings, among others. Water bill savings are not a customer benefit in the aggregate for reasons described above. Other factors external to the utility, such as environmental effects, are often difficult to quantify or are not necessarily under the control of the utility. They are therefore frequently excluded from economic analyses, including this one.

The time value of money is explicitly considered. Typically the costs to save water occur early in the planning period whereas the benefits usually extend to the end of the planning period. A long planning period of 30-40 years is typically used because costs and benefits that occur beyond 2050 years have very little influence on the total present value of the costs and benefits. The value of all future costs and benefits is discounted to the first year in the DSS Model (the base year, which in this case is 2015), at the real interest rate of 3.01%. The DSS Model calculates this real interest rate, adjusting the current nominal interest rate (assumed to be approximately 6.1%) by the assumed rate of inflation (3.0%). The formula to calculate the real interest rate is: (nominal interest rate – assumed rate of inflation)/ (1 + assumed rate of inflation). Cash flows discounted in this manner are herein referred to as "Present Value" sums.

A.3 Assumptions about Measure Costs

Costs were determined for each of the measures based on industry knowledge, past experience and data provided by the individual Water Contractors. Costs may include incentive costs, usually determined on a per-participant basis; fixed costs, such as marketing; variable costs, such as the costs to staff the measures and to obtain and maintain equipment; and a one-time set-up cost. The set-up cost is for measure design by staff or consultants, any required pilot testing, and preparation of materials that will be used in marketing the measure. The model was run for 36 years (each year between FY 2014 and FY 2050). Costs were spread over the time period depending on the length of the implementation period for the measure and estimated voluntary customer participation levels.

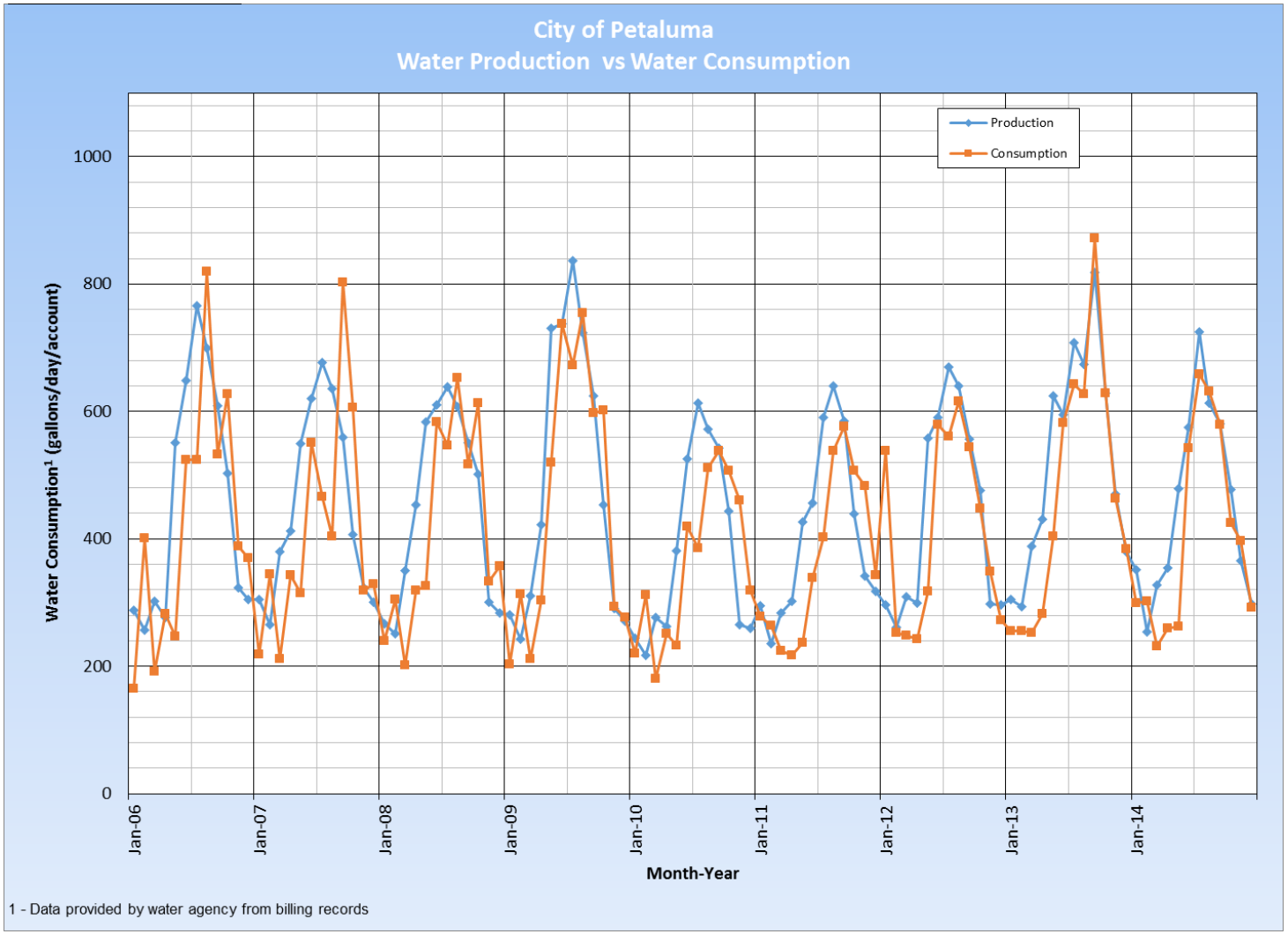
Lost revenue due to reduced water sales is not included as a cost because the water use efficiency measures evaluated herein generally take effect over a long span of time that is sufficient to enable timely rate adjustments, if necessary, to meet fixed cost obligations and savings on variable costs such as energy and chemicals.

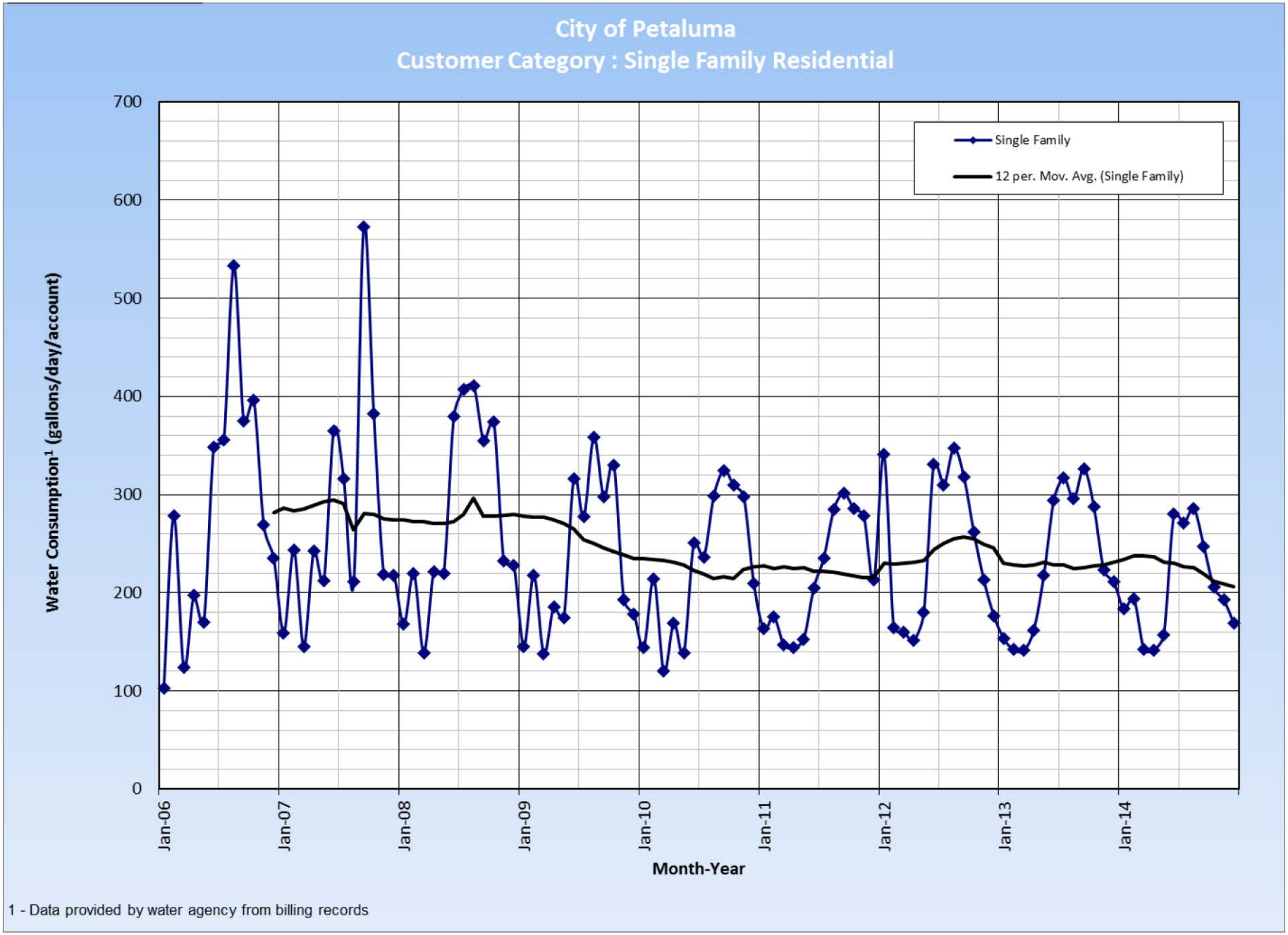
A.4 Assumptions about Measure Savings

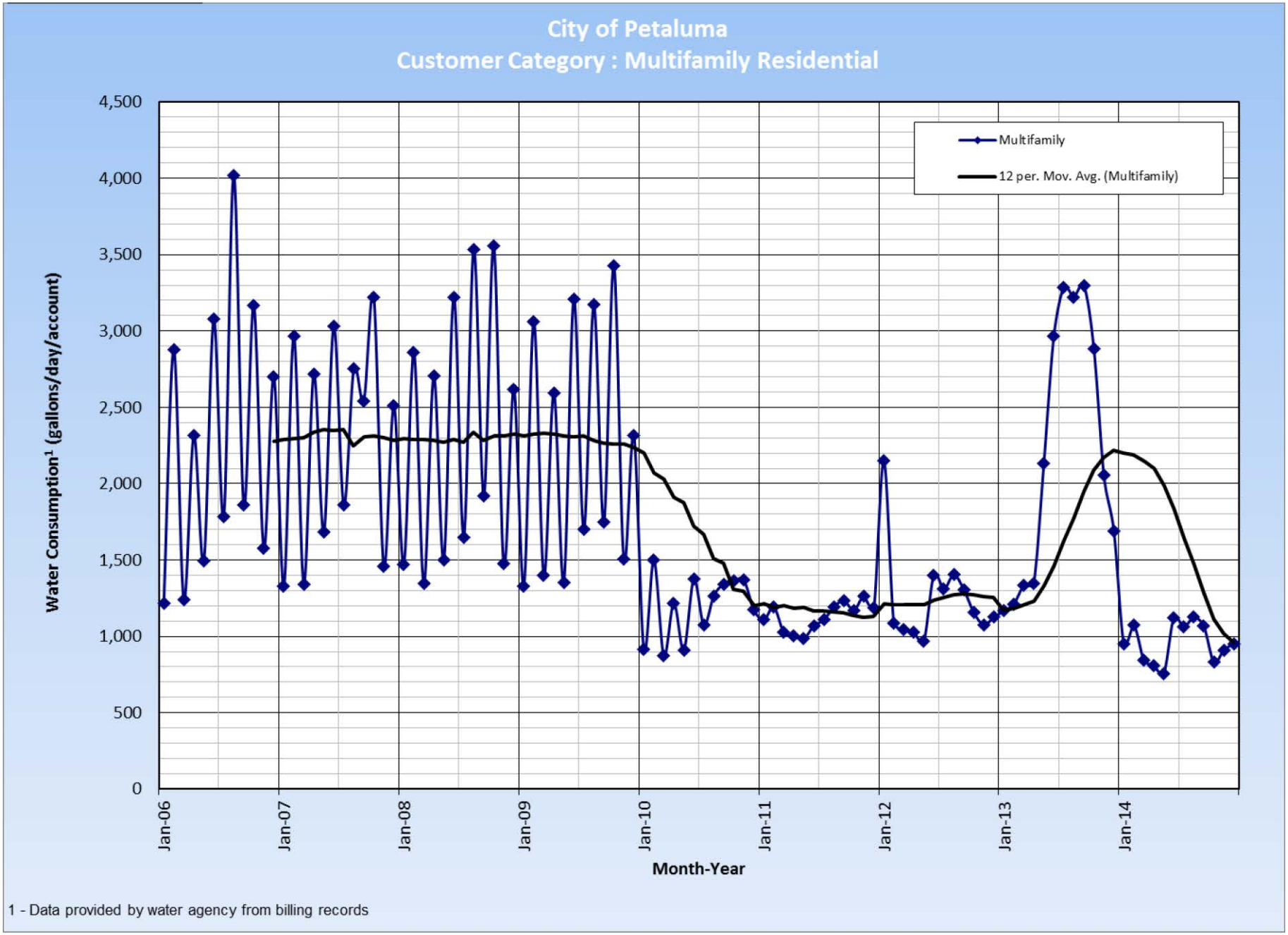
Data necessary to forecast water savings of measures include specific data on water use, demographics, market penetration, and unit water savings. Savings normally develop at a measured and predetermined pace, reaching full maturity after full market penetration is achieved. This may occur three to seven years after the start of implementation, depending upon the implementation schedule. For every water use efficiency activity or replacement with more efficient devices, there is a useful life. The useful life is called the "Measure Life" and is defined to be how long water use efficiency measures stay in place and continue to save water. It is assumed that measures implemented because of codes, standards or ordinances, like toilets for example, would be "permanent" and not revert to an old inefficient level of water use if the device needed to be replaced. However, some measures that are primarily behavioral based, such as residential surveys, are assumed to need to be repeated on an ongoing basis to retain the water savings (e.g., homeowners move away and new homeowners may have less efficient water using practices around the home). Surveys typically have a measure life on the order of five years.

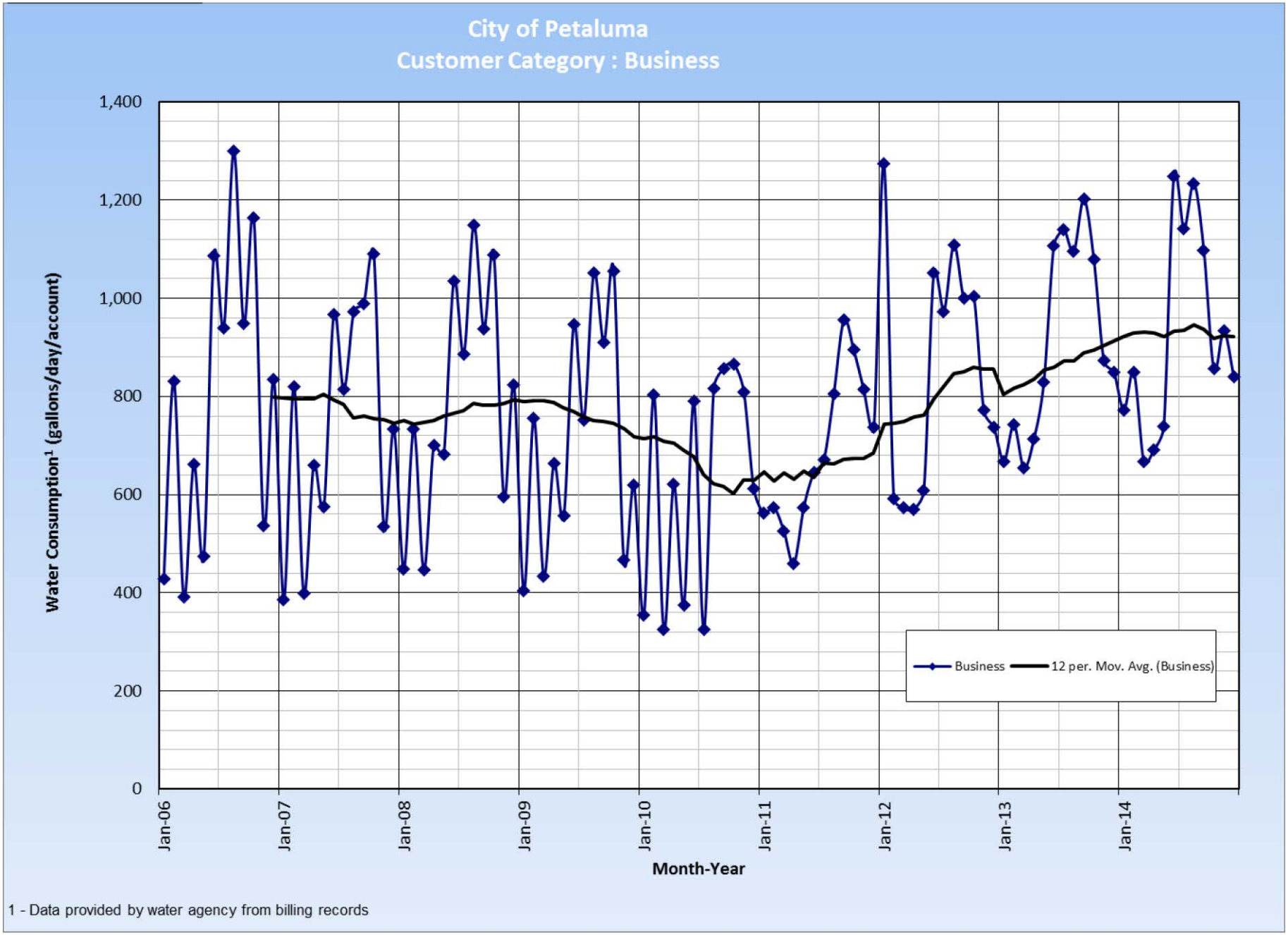
APPENDIX B - WATER USE GRAPHS FOR PRODUCTION AND CUSTOMER CATEGORIES

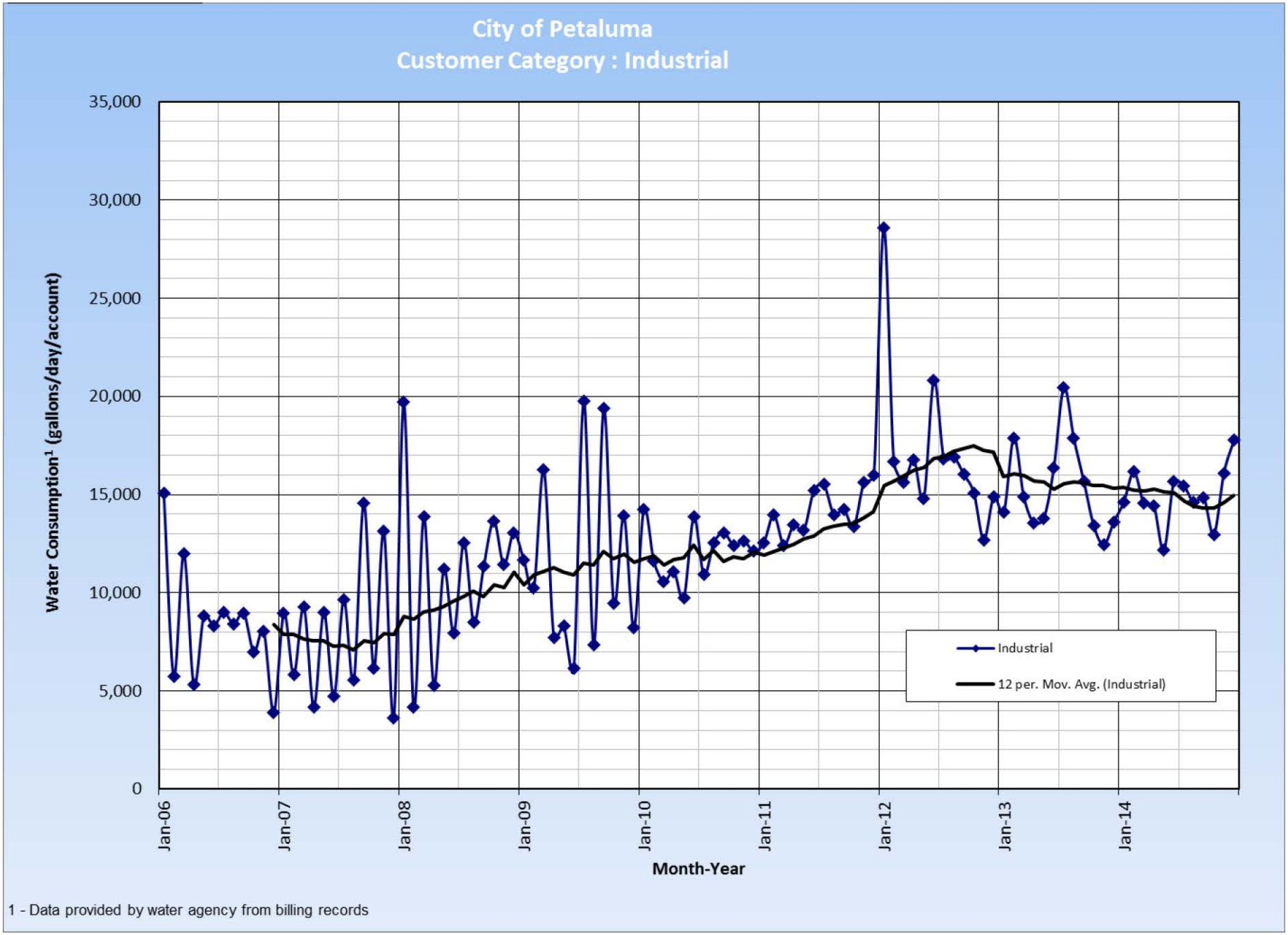
As initially presented in Section 3 of this report, this appendix presents historical customer category water use graphs. Units shown are average gallons of water per account per day. These graphs were reviewed to better identify outlier data points and years so that a representative baseline water use value (of average account water use by category) could be determined. The effects of drought, economic recessions, service line failures, and meter inaccuracies are typically evident in these figures.

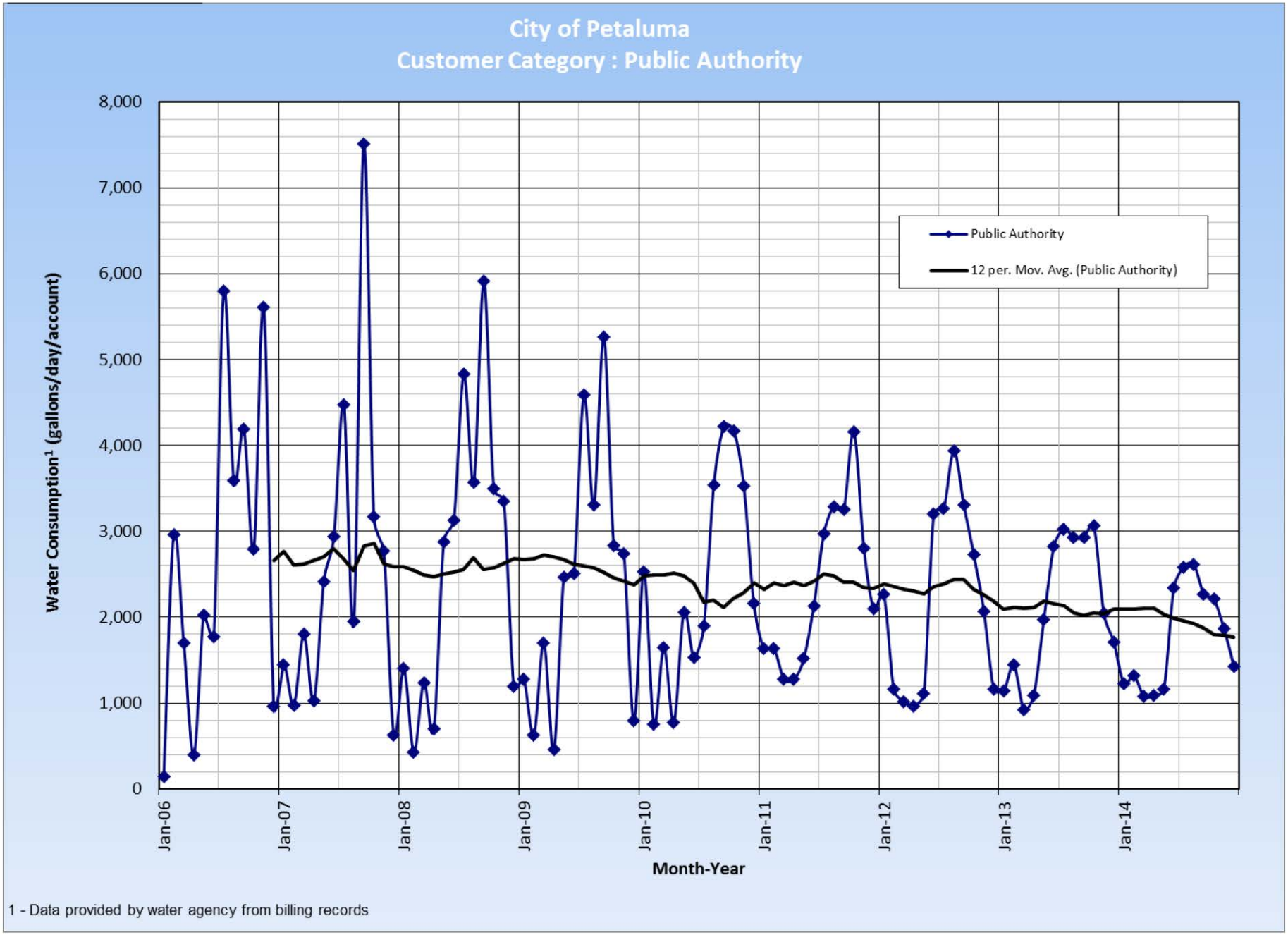


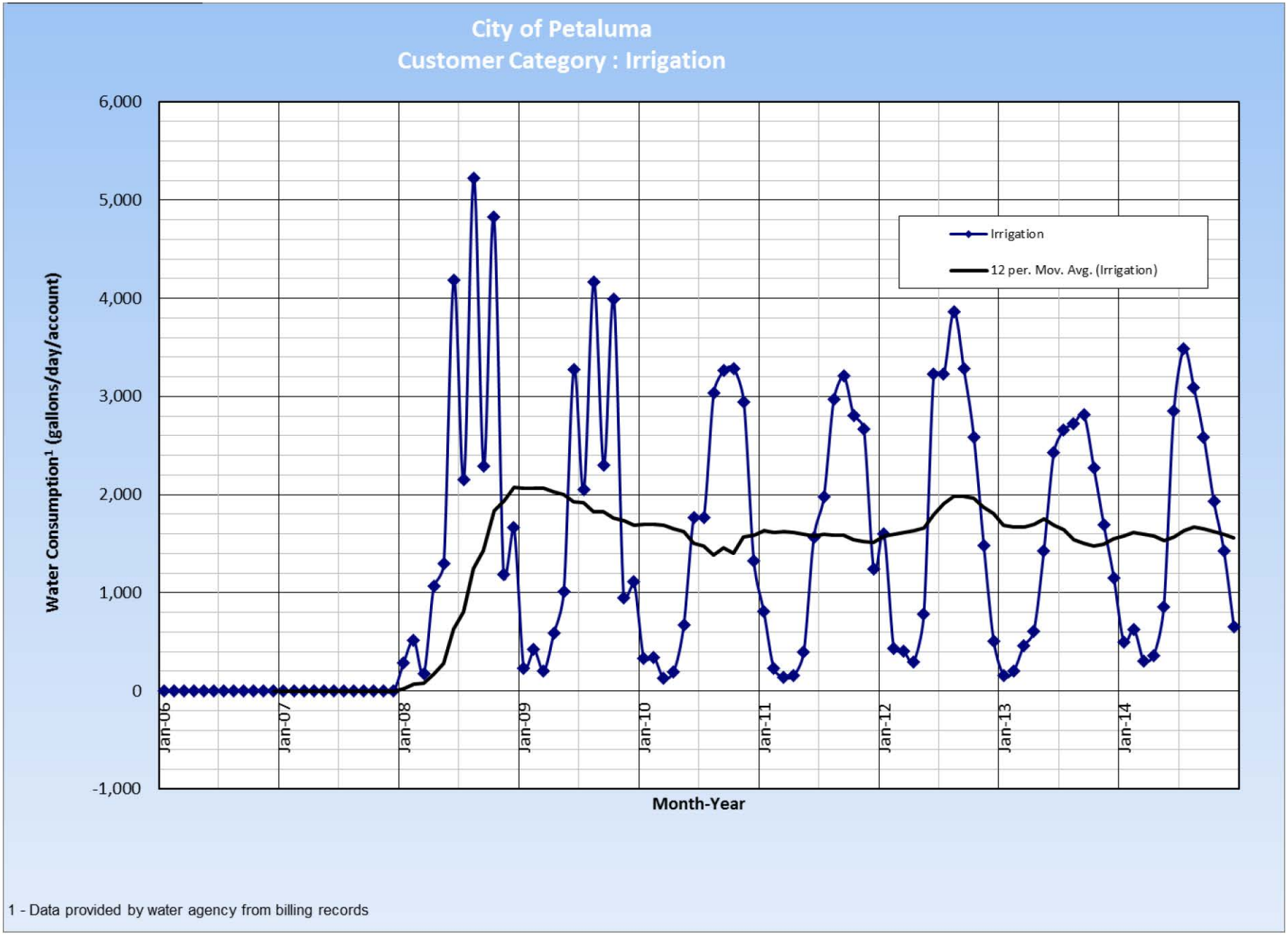

City of Petaluma
Customer Category : Single Family Residential
Water Consumption[1] (gallons/day/account)
700
600
500
400
300
200
100
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Single Family
12 per. Mov. Avg. (Single Family)
1 - Data provided by water agency from billing records


City of Petaluma
Customer Category : Multifamily Residential
Water Consumption[1] (gallons/day/account)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Multifamily
12 per. Mov. Avg. (Multifamily)
1 - Data provided by water agency from billing records


City of Petaluma
Customer Category : Business
Water Consumption[1] (gallons/day/account)
1,400
1,200
1,000
800
600
400
200
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Business
12 per. Mov. Avg. (Business)
1 - Data provided by water agency from billing records


City of Petaluma
Customer Category : Industrial
Water Consumption[1] (gallons/day/account)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Industrial
12 per. Mov. Avg. (Industrial)
1 - Data provided by water agency from billing records


City of Petaluma
Customer Category : Public Authority
Water Consumption[1] (gallons/day/account)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Public Authority
12 per. Mov. Avg. (Public Authority)
1 - Data provided by water agency from billing records


City of Petaluma
Customer Category : Irrigation
Water Consumption[1] (gallons/day/account)
6,000
5,000
4,000
3,000
2,000
1,000
0
-1,000
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Month-Year
Irrigation
12 per. Mov. Avg. (Irrigation)
1 - Data provided by water agency from billing records

APPENDIX C - MEASURE SCREENING PROCESS AND RESULTS

In order to start the cost effectiveness analysis and build a water use efficiency model for each Water Contractor, the SMSWP Water Contractors decided on the list of conservation measures to be analyzed that, once modeled, would serve as the menu to build conservation program scenarios. To this end, two web-based webinars were conducted in February and March 2015 to review and select conservation measures together with staff representatives from each Water Contractor. The library of conservation measure opportunities had more than 50 measures and various implementation strategies (having different unit costs, participation levels and/or unit water savings which must be modeled individually). In order to maximize efficiency and productivity at the workshop, each Water Contractor developed two "top 10" lists of active conservation measures that they wanted to evaluate in order to eventually decide if their Water Contractor would include the measure in their DSS Model:

1. *Regional "Top 10" list* – a suite of measures each Water Contractor wanted to be analyzed for the SMSWP to implement.
2. *Water Contractor "Top 10" list* – a suite of measures that each Water Contractor representative selected for their own Water Contractor to possibly implement individually without SMSWP support.

Furthermore, to help facilitate input and combine results most easily, each Water Contractor completed an online survey to help identify their ideal "top 10" potential conservation measures for both the regional and Water Contractor programs. Water Contractors collaborated internally with others in their Water Contractor as necessary. The results of the survey were treated as the input from each Water Contractor's perspective.

Based on this initial Water Contractor input, subsequent workshop calls were structured to focus on a discussion of measures that received mixed interest from the group, rather than those measures that the group already had consensus on. This approach led to a decision on which measures should initially be included in the DSS Models. Additionally, each Water Contractor also had the ability to add unique measures for their individual DSS Model.

Once finalized, the selected measures on both the SMSWP-led and Water Contractor-led lists were inserted into each Water Contractor's DSS Model, along with the standard utility operations (e.g., water loss control programs) and education measures in order to have a complete standard menu of 25 measures in each Water Contractor's DSS Model. Next, the Project Team worked with each Water Contractor to more specifically analyze measures (participation rates, Water Contractor unit costs and unit water savings, etc.), and build conservation program scenarios. The number of measures, twenty-five, comes from the consultant's past experience on having enough measures to choose from to (a) build program scenarios that are able to meet SB X7-7 water use targets, and (b) still be feasible to be successfully implemented between SMSWP and Water Contractor combined efforts.

The following figures present the regional and Water Contractor measure rankings resulting from this screening process. Measures with the highest priority for being included in the cost effectiveness analysis were ranked with number 1 representing the most important. Note that selections for the top 1-5 measures likely "passed" the screening; measures showing ranking 5-10 received the most debate at the workshop.

Figure C-1. Water Contractor-Only Measures Screening Ranking

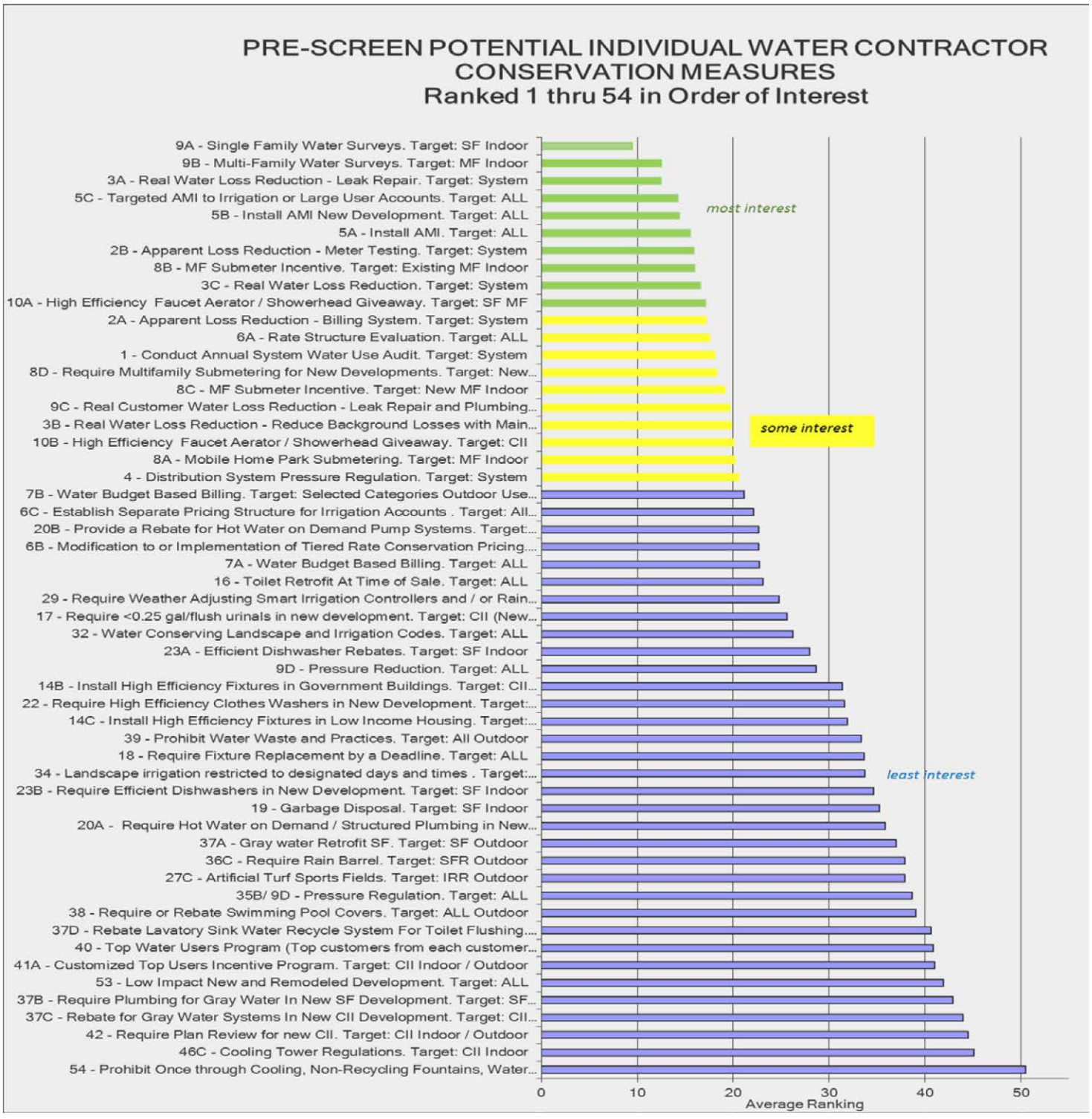
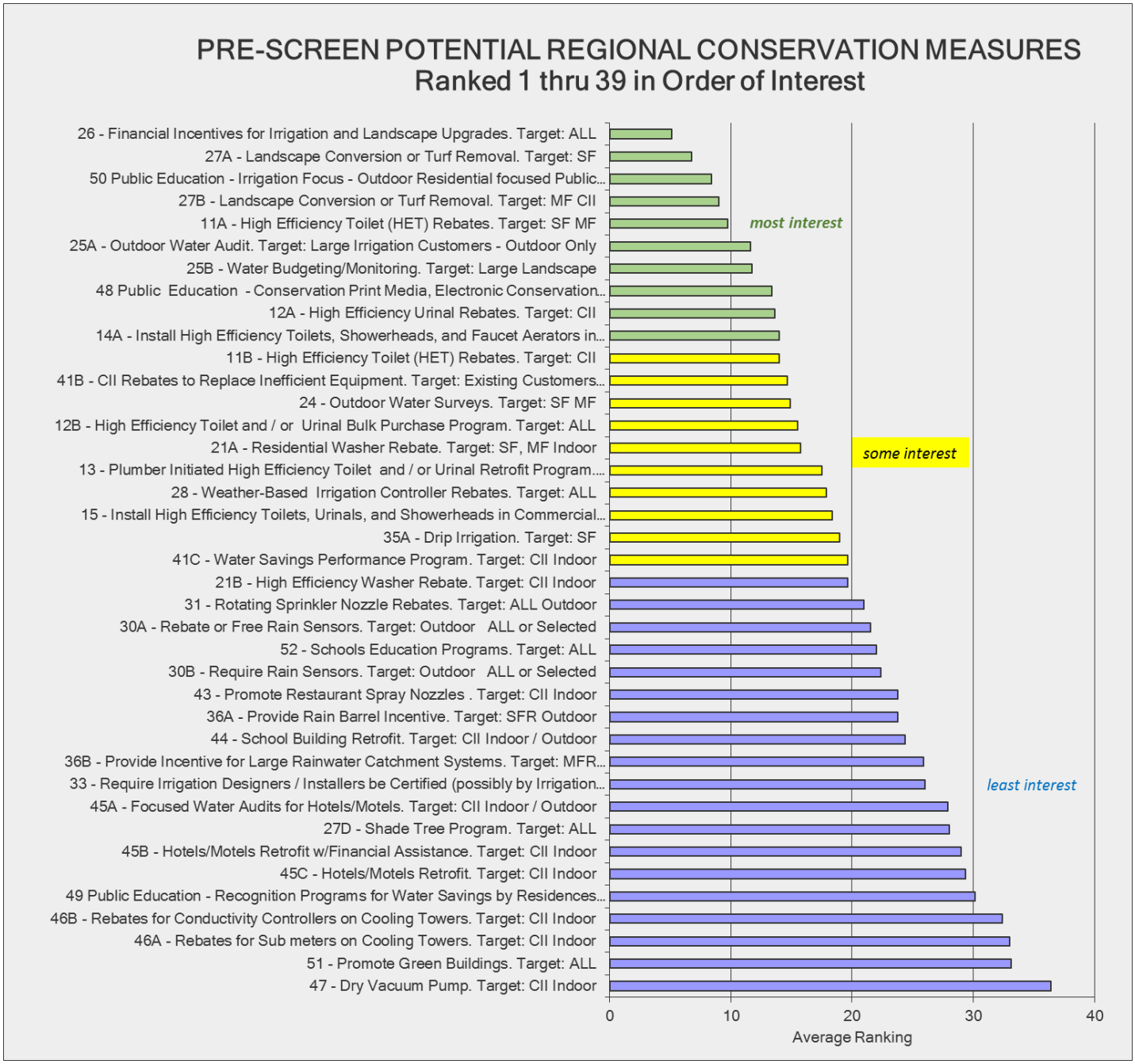


Figure C-2. Regional Measures Screening Ranking



The general discussion screening criteria included:

- **Technology/Market Maturity** – Refers to whether the technology needed to implement the water use efficiency measure, such as an irrigation control device, is commercially available and supported by the local service industry. A measure was more likely to be included if the technology was widely available in the service area and less likely to be included if the technology was not commercially available or not supported by the local service industry.
- **Service Area Match** – Refers to whether the measure or related technology is appropriate for the area's climate, building stock, and lifestyle. For example, promoting native and/or water efficient landscaping may not be appropriate where water use analysis indicates little outdoor irrigation. Thus, a measure was not included if it

was not well suited for the area's characteristics and could not save water; and was more highly considered to be included if it was well suited for the area and could save water.

- **Customer Acceptance/Equity** – Refers to whether retail customers within the service area would be willing to implement and accept the water use efficiency measures. For example, would retail customers attend homeowner irrigation classes and implement lessons learned from these classes? If not, then the water savings associated with this measure would not be achieved and a measure with this characteristic would score low for this criterion. This criterion also considers retail customer equity where one category of retail customers receives benefit while another pays the costs without receiving benefits. Retail customer acceptance may be based on convenience, economics, perceived fairness, and/or aesthetics.

Based on the survey results and previously listed criteria, MWM and Water Contractor staff decided if a measure was a "Yes" or "No". Measures with a "No" were eliminated from further consideration, while those with a "Yes" passed into the next evaluation phase: cost-effectiveness analysis using the DSS Model.

Below was the schedule of measure screening tasks:

- January 2015 - Survey Monkey survey #1 distributed
- February 2015 – Screening web-based workshop with Water Contractors and SMSWP and SCWA representatives
- February 2015 - Survey Monkey survey #2 distributed
- March 2015 – Screening web-based workshop call with Water Contractors and SMSWP and SCWA representatives
- March 2015 – Measure list finalized

APPENDIX D - ASSUMPTIONS FOR WATER CONSERVATION MEASURES EVALUATED IN THE DSS MODEL

This appendix presents various parameter inputs as well as cost and savings results for the conservation measures evaluated in the Water Contractor's DSS Model. Annual utility costs, targets, and water savings were provided for each individual measure for the first 5 years to the year 2020. The actual DSS Model runs measures to the year 2040.

Water Loss

Overview	
Name	Water Loss
Abbr	1
Category	
Measure Type	Water Loss Measure

Time Period	
First Year	2015

Backlog Costs	
Total Backlog Work Costs	$500,000
Years to Complete Backlog	5

Maintenance Costs	
Annual Maintenance Costs	$50,000

Target	
Total GPCD Reduction	2.0

Description

CONTRACTOR MEASURE: Petaluma working on a AMR program which will help to address customer meter inaccuracy. Maintain a thorough annual accounting of water production, sales by customer class and quantity of water produced and billed consumption (to define non-revenue water). In conjunction with system accounting, include water system audits that identify and quantify known legitimate uses of non-revenue water in order to determine remaining potential for reducing real (physcial) water losses. Goal would be to lower the Infrastructure Leakage Index (ILI) and real water losses water every year by a pre-determined amount based on cost-effectiveness. These programs typically pay for themselves based on savings in operational costs (and saved rate revenue can be directed more to system repairs/replacement and other costs) and recovered revenue through addressing apparent losses. Specific goals and methods to be developed by Utility. May include accelerated main and service line replacement. Enhanced real loss reduction may include more ambitious main replacement and active leak detection. Capture water from water main flushing and hydrant flow testing for reuse.

Results	
Average Water Savings (mgd)	
0.125061	
Lifetime Savings - Present Value ($)	
Utility	$3,384,627
Community	$3,384,627
Lifetime Costs - Present Value ($)	
Utility	$1,155,528
Community	$1,155,528
Benefit to Cost Ratio	
Utility	2.93
Community	2.93
Cost of Savings per Unit Volume ($/mg)	
Utility	$973

Comments

Savings is calculated over the life of the program which is tied to the Contractor's current Non Revenue Water percentage which can be found in the GREEN "Non Revenue Water" portion of the DSS Model. All programs are advised to have "Annual Maintenance Costs" inputted to allow for budget estimates for complete program. Additional water savings of "Non-Revenue Water" real water losses may be available when technically feasible. Typical target is minimum system losses based on percent of water system input volume down to approximately 6% (as defined as the difference between production and consumption or alternatively as a percent of System Input Volume using AWWA Water System Audit definitions). For NRW below 6% (which can be found in the GREEN "Non Revenue Water" portion of the DSS Model), input "0%" for new real water savings and "$0" in the Backlog Cost section. For NRW above 6%, a GPCD savings input volume can be computed (an estimate of annual savings volume divided by total population). For example a 4.0 GPCD is equivalent to a 2% reduction for the system with a 150 GPCD water use. Additional Water Loss Control Program budget to achieve these water savings is inputted into the "Backlog Cost" section along with the duration of the years to accomplish the estimated reduction. In other words, $250,000 over 5 years would add $50,000 per year to assist with meeting NRW reduction goals.

Costs

	Utility
2015	$100,000
2016	$100,000
2017	$100,000
2018	$100,000
2019	$100,000
2020	$50,000

Targets

	Projected NRW Percent
2015	8.9%
2016	8.6%
2017	8.3%
2018	8.0%
2019	7.7%
2020	7.7%

Water Savings

	Total Savings
2015	0.024480
2016	0.049350
2017	0.074608
2018	0.100254
2019	0.126290
2020	0.127262

AMI

Overview

Name	AMI
Abbr	2
Category	
Measure Type	Standard Measure

Time Period

First Year	2016
Last Year	2020
Measure Length	5

Measure Life

Permanent: ☑

Fixture Costs

	Utility	Customer	Fix/Acct
SF	$160.00	$0.00	1
MF	$160.00	$0.00	2
BUS	$160.00	$0.00	3
IRR	$160.00	$0.00	3

Administration Costs

Markup Percentage	40%

Description

CONTRACTOR MEASURE: Retrofit system with AMI meters and associated network capable of providing continuous consumption data to Utility offices. Improved identification of system and customer leaks is a major conservation benefit. Some costs of these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and opening and closing accounts are accomplished without the need for a site visit. Also enables enhanced billing options and ability to monitor unauthorized usage, such as use/tampering with closed accounts or irrigation when time of day or days per week are regulated. Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to their usage, which has been shown to improve accountability and reduce water use. A five-year change-out would be a reasonable objective and may take longer if coupled with a full meter replacment program (on the order of 10 years). Require that new, larger or irrigation customers install such AMI meters as described above and possibly purchase means of viewing daily consumption inside their home, business, or by their landscape/property managers, either through the Internet (if available) or separate device. The AMI system would, on demand, indicate to the customer and Utility where and how their water is used, facilitating water use reduction and prompt leak identification. This would require Utility to install an AMI system.

Customer Classes

SF	MF	BUS	IND	PUB	IRR
☑	☑	☑	☐	☐	☑

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets	☐	☐	☐			☐
Urinals			☐			☐
Faucets	☐	☐	☐			☐
Showers	☐	☐	☐			☐
Dishwashers	☐	☐	☐			☐
Clothes Washers	☐	☐	☐			☐
Process			☐			☐
Kitchen Spray Rinse			☐			☐
Internal Leakage	☑	☑	☑			☑
Baths	☐	☐				☐
Other	☐	☐	☐			☐
Irrigation	☑	☑	☑			☑
Pools	☐	☐				
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☑	☑	☑			☑
Outdoor						
Cooling			☐			

Comments

Petaluma has AMR's and will have all meters outfitted with AMR by 2016, so AMR start date should be 2016. Basis for the starting value cost estimate is $160 per AMI unit (Data provided by Santa Rosa $90 per meter, $70 endpoint) where assumes (a) does not include any partial % cost share for the "Utility" of estimated AMI (automatic meter infrastructure) for meter replacement with other water utility departments responsible for the Capital Improvement Plan (CIP) such as engineering and/or operations; and (b) Cost estimate does not include service leak repair (assume included in Water Loss Control program). Program and Costs include provisions to act on "continuous flow" reading that indicate presence of a potential leak including contacting customer, plumber, referal, etc.

Results

Average Water Savings (mgd)	
0.132473	
Lifetime Savings - Present Value ($)	
Utility	$3,868,049
Community	$3,868,049
Lifetime Costs - Present Value ($)	
Utility	$2,419,639
Community	$2,419,639
Benefit to Cost Ratio	
Utility	1.60
Community	1.60
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,923

End Use Savings Per Replacement

	% Savings per Account
SF Internal Leakage	20.0%
SF Irrigation	5.0%
SF External Leakage	20.0%
MF Internal Leakage	20.0%
MF Irrigation	5.0%
MF External Leakage	20.0%
BUS Internal Leakage	20.0%
BUS Irrigation	5.0%
BUS External Leakage	20.0%
IRR Internal Leakage	20.0%
IRR Irrigation	5.0%
IRR External Leakage	20.0%

Targets

Target Method	Percentage
% of Accts Targeted / yr	10.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$518,624	$0	$518,624
2017	$523,705	$0	$523,705
2018	$528,787	$0	$528,787
2019	$533,868	$0	$533,868
2020	$538,950	$0	$538,950

Targets

View: Accounts

	SF	MF	BUS	IRR	Total
2015	0	0	0	0	0
2016	1,690	68	109	54	1,921
2017	1,703	69	111	55	1,938
2018	1,716	69	113	56	1,954
2019	1,730	70	115	57	1,971
2020	1,743	70	116	58	1,987

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.029371
2017	0.059045
2018	0.089022
2019	0.119302
2020	0.149884

Pricing

Overview	
Name	Pricing
Abbr	3
Category	
Measure Type	Pricing Measure

Customer Class	
Customer Class	Single Family

Time Period	
First Year	2015

Description

CONTRACTOR MEASURE: Assumes average annual price increase of 3% for the next 25 years. Measure converts price increases to real price increases net of inflation; Annual increase must be above user set threshold (such as assuming a 2% inflation) to trigger a demand reduction.

Comments

Starting assumptions 2% inflation and 3% annual rate increase.

Rate study costs and annual maintenance costs are industry standard. Price elasticity based on industry standard.

The pricing measure only addresses SF

Planned Rate Increases

Add Rate Increase

Change Year	Price Incr (%)	Price Incr Adjusting for Inflation	
2015	3.0%	1.0%	Delete
2016	3.0%	1.0%	Delete
2017	3.0%	1.0%	Delete
2018	3.0%	1.0%	Delete
2019	3.0%	1.0%	Delete
2020	3.0%	1.0%	Delete
2021	3.0%	1.0%	Delete
2022	3.0%	1.0%	Delete
2023	3.0%	1.0%	Delete
2024	3.0%	1.0%	Delete
2025	3.0%	1.0%	Delete
2026	3.0%	1.0%	Delete
2027	3.0%	1.0%	Delete
2028	3.0%	1.0%	Delete
2029	3.0%	1.0%	Delete
2030	3.0%	1.0%	Delete

Results

Average Water Savings (mgd)	
0.060803	
Lifetime Savings - Present Value ($)	
Utility	$136,412
Community	$136,412
Lifetime Costs - Present Value ($)	
Utility	$319,813
Community	$319,813
Benefit to Cost Ratio	
Utility	0.43
Community	0.43
Cost of Savings per Unit Volume ($/mg)	
Utility	$554

Price Elasticity

Overall	Indoor	Outdoor
-0.12	-0.05	-0.25

Utility Costs

Rate Study Cost	$50,000
Rate Study Frequency (every # yrs)	5
First Year of Rate Study	2021
Annual Maintenance Cost	$10,000

Consumer Price Index

First Year Index	100.0
Annual Increase	2%

Costs

	Utility	Customer	Total (Community)
2015	$10,000	$0	$10,000
2016	$10,000	$0	$10,000
2017	$10,000	$0	$10,000
2018	$10,000	$0	$10,000
2019	$10,000	$0	$10,000
2020	$10,000	$0	$10,000

Projected Price Index

	Price Index	Cummulative Index Increase
2015	100.0	0%
2016	102.0	2%
2017	104.0	4%
2018	106.1	6%
2019	108.2	8%
2020	110.4	10%

Water Savings

	Total Savings (mgd)
2015	0.005007
2016	0.010072
2017	0.015197
2018	0.020382
2019	0.025626
2020	0.030931

Public Info & School Education –

Overview	
Name	Public Info & School Education - S
Abbr	4
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2040
Measure Length	26

Measure Life	
Permanent	☐
Years	2
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$3.00	$0.00	1

Administration Costs	
Markup Percentage	15%

Description

REGIONAL MEASURE: Continue with regional public information and school education campaign. School education includes: school assembly program, classroom presentations, other options for school education.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☑					
Urinals						
Faucets	☑					
Showers	☑					
Dishwashers	☑					
Clothes Washers	☑					
Process						
Kitchen Spray Rinse						
Internal Leakage	☑					
Baths	☑					
Other	☐					
Irrigation	☑					
Pools	☑					
Wash Down	☑					
Car Washing	☑					
External Leakage	☑					
Outdoor						
Cooling						

Comments

Cost assumes SF category but impacts all customer classes. SMWSP public info budget of $160,000 annually for all water contractors is spent on QWEL, Water Wise Gardening Online, Garden Sense, and the Eco-Friendly Garden Tour. Based on 153,770 single family accounts for water contractors in 2014, the expenditures per SF account is approximately $1.00. SMWSP school education is $300,000 per year for all the water contractors which equates to $2.00 per account. The education annual budget is for 20,000 students and 24,000 ciriculum materials distributed. In summary, the total cost of $3.00 per SF account includes $1.00 for public information and $2.00 per SF account for school education.

Results	
Average Water Savings (mgd)	
0.020994	
Lifetime Savings - Present Value ($)	
Utility	$663,871
Community	$1,013,813
Lifetime Costs - Present Value ($)	
Utility	$577,710
Community	$577,710
Benefit to Cost Ratio	
Utility	1.15
Community	1.75
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,898

End Use Savings Per Replacement	% Savings per Account
SF Toilets	0.5%
SF Faucets	0.5%
SF Showers	0.5%
SF Dishwashers	0.5%
SF Clothes Washers	0.5%
SF Baths	0.5%
SF Internal Leakage	0.5%
SF Irrigation	0.5%
SF Pools	0.5%
SF Wash Down	0.5%
SF Car Washing	0.5%
SF External Leakage	0.5%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	50.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$28,916	$0	$28,916
2016	$29,146	$0	$29,146
2017	$29,375	$0	$29,375
2018	$29,605	$0	$29,605
2019	$29,835	$0	$29,835
2020	$30,064	$0	$30,064

Targets — View: Accounts

	SF	Total
2015	8,382	8,382
2016	8,448	8,448
2017	8,515	8,515
2018	8,581	8,581
2019	8,648	8,648
2020	8,714	8,714

Water Savings (mgd)

	Total Savings (mgd)
2015	0.010087
2016	0.020206
2017	0.020321
2018	0.020436
2019	0.020553
2020	0.020670

Public Info & School Education -

Overview	
Name	Public Info & School Education - W
Abbr	5
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2040
Measure Length	26

Measure Life		
Permanent	☐	
Years	2	
Repeat	☐	

Fixture Costs	Utility	Customer	Fix/Acct
SF	$4.65	$0.00	1

Administration Costs	
Markup Percentage	15%

Description

CONTRACTOR MEASURE: Public information dissemination and school education initiatives beyond those conducted by SMWSP.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☑					
Urinals						
Faucets	☑					
Showers	☑					
Dishwashers	☑					
Clothes Washers	☑					
Process						
Kitchen Spray Rinse						
Internal Leakage	☑					
Baths	☑					
Other	☐					
Irrigation	☑					
Pools	☑					
Wash Down	☑					
Car Washing	☑					
External Leakage	☑					
Outdoor						
Cooling						

Comments

Cost assumes SF category but impacts all customer classes. Public infoand school education budget of $4.65 or $45,000 per year is based on annual dollar amount spent on two outside contractors divided by the number of SF accounts.

Results	
Average Water Savings (mgd)	
0.020994	
Lifetime Savings - Present Value ($)	
Utility	$663,871
Community	$1,013,813
Lifetime Costs - Present Value ($)	
Utility	$895,451
Community	$895,451
Benefit to Cost Ratio	
Utility	0.74
Community	1.13
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,491

End Use Savings Per Replacement	% Savings per Account
SF Toilets	0.5%
SF Faucets	0.5%
SF Showers	0.5%
SF Dishwashers	0.5%
SF Clothes Washers	0.5%
SF Baths	0.5%
SF Internal Leakage	0.5%
SF Irrigation	0.5%
SF Pools	0.5%
SF Wash Down	0.5%
SF Car Washing	0.5%
SF External Leakage	0.5%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	50.000%
Only Effects New Accts	☐

Costs — View: Summary

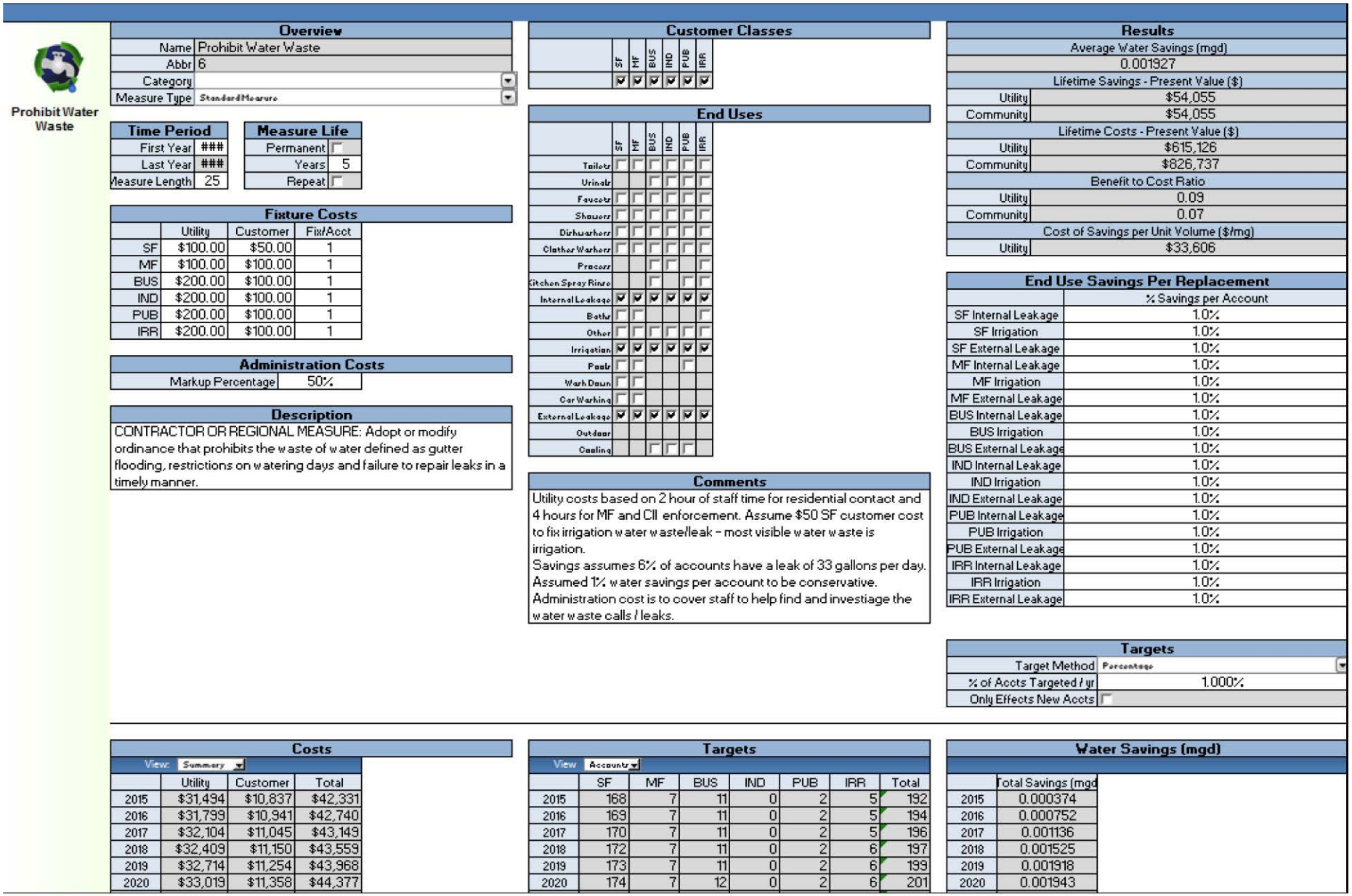
	Utility	Customer	Total
2015	$44,820	$0	$44,820
2016	$45,176	$0	$45,176
2017	$45,532	$0	$45,532
2018	$45,888	$0	$45,888
2019	$46,244	$0	$46,244
2020	$46,599	$0	$46,599

Targets — View: Accounts

	SF	Total
2015	8,382	8,382
2016	8,448	8,448
2017	8,515	8,515
2018	8,581	8,581
2019	8,648	8,648
2020	8,714	8,714

Water Savings (mgd)

	Total Savings (mgd)
2015	0.010087
2016	0.020206
2017	0.020321
2018	0.020436
2019	0.020553
2020	0.020670



Prohibit Water Waste

Overview

Name	Prohibit Water Waste
Abbr	6
Category	
Measure Type	StandardMeasure

Time Period

First Year	###
Last Year	###
Measure Length	25

Measure Life

Permanent	☐
Years	5
Repeat	☐

Fixture Costs

	Utility	Customer	Fix/Acct
SF	$100.00	$50.00	1
MF	$100.00	$100.00	1
BUS	$200.00	$100.00	1
IND	$200.00	$100.00	1
PUB	$200.00	$100.00	1
IRR	$200.00	$100.00	1

Administration Costs

Markup Percentage	50%

Description

CONTRACTOR OR REGIONAL MEASURE: Adopt or modify ordinance that prohibits the waste of water defined as gutter flooding, restrictions on watering days and failure to repair leaks in a timely manner.

Customer Classes

SF	MF	BUS	IND	PUB	IRR
☑	☑	☑	☑	☑	☑

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets	☐	☐	☐	☐	☐	☐
Urinals			☐	☐	☐	☐
Faucets	☐	☐	☐	☐	☐	☐
Showers	☐	☐	☐	☐	☐	☐
Dishwashers	☐	☐	☐	☐	☐	☐
Clothes Washers	☐	☐	☐	☐	☐	☐
Process			☐	☐		☐
Kitchen Spray Rinse			☐		☐	☐
Internal Leakage	☑	☑	☑	☑	☑	☑
Baths	☐	☐				☐
Other	☐	☐	☐	☐	☐	☐
Irrigation	☑	☑	☑	☑	☑	☑
Pools	☐	☐			☐	
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☑	☑	☑	☑	☑	☑
Outdoor						
Cooling			☐	☐	☐	

Comments

Utility costs based on 2 hour of staff time for residential contact and 4 hours for MF and CII enforcement. Assume $50 SF customer cost to fix irrigation water waste/leak – most visible water waste is irrigation.
Savings assumes 6% of accounts have a leak of 33 gallons per day. Assumed 1% water savings per account to be conservative.
Administration cost is to cover staff to help find and investiage the water waste calls / leaks.

Results

Average Water Savings (mgd)	
	0.001927
Lifetime Savings - Present Value ($)	
Utility	$54,055
Community	$54,055
Lifetime Costs - Present Value ($)	
Utility	$615,126
Community	$826,737
Benefit to Cost Ratio	
Utility	0.09
Community	0.07
Cost of Savings per Unit Volume ($/mg)	
Utility	$33,606

End Use Savings Per Replacement

	% Savings per Account
SF Internal Leakage	1.0%
SF Irrigation	1.0%
SF External Leakage	1.0%
MF Internal Leakage	1.0%
MF Irrigation	1.0%
MF External Leakage	1.0%
BUS Internal Leakage	1.0%
BUS Irrigation	1.0%
BUS External Leakage	1.0%
IND Internal Leakage	1.0%
IND Irrigation	1.0%
IND External Leakage	1.0%
PUB Internal Leakage	1.0%
PUB Irrigation	1.0%
PUB External Leakage	1.0%
IRR Internal Leakage	1.0%
IRR Irrigation	1.0%
IRR External Leakage	1.0%

Targets

Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$31,494	$10,837	$42,331
2016	$31,799	$10,941	$42,740
2017	$32,104	$11,045	$43,149
2018	$32,409	$11,150	$43,559
2019	$32,714	$11,254	$43,968
2020	$33,019	$11,358	$44,377

Targets

View: Accounts

	SF	MF	BUS	IND	PUB	IRR	Total
2015	168	7	11	0	2	5	192
2016	169	7	11	0	2	5	194
2017	170	7	11	0	2	5	196
2018	172	7	11	0	2	6	197
2019	173	7	11	0	2	6	199
2020	174	7	12	0	2	6	201

Water Savings (mgd)

	Total Savings (mgd
2015	0.000374
2016	0.000752
2017	0.001136
2018	0.001525
2019	0.001918
2020	0.001943

Indoor and Outdoor Surveys - CII

Overview	
Name	Indoor and Outdoor Surveys -
Abbr	7
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	##
Measure Length	26

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$3,000.00	$2,500.00	1
IND	$3,000.00	$2,500.00	1
PUB	$3,000.00	$2,500.00	1

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR OR REGIONAL MEASURE: Top water customers from each CII category would be offered a professional water survey that would evaluate ways for the business to save water and money. The surveys would be for targeted to large users (accounts that use more than 5,000 gallons of water per day) such as hotels, restaurants, stores and schools. Emphasis will be on supporting the top users in each customer category.
After the free water use survey has been completed at site, SMWSP will analyze the recommendations on the provided findings report and determine if the site qualifies for

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☑	☑	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☑	☑	☑	
Urinals			☑	☑	☑	
Faucets			☑	☑	☑	
Showers			☑	☑	☑	
Dishwashers			☑	☑	☑	
Clothes Washers			☑	☑	☑	
Process			☑	☑		
Kitchen Spray Rinse			☑		☑	
Internal Leakage			☑	☑	☑	
Baths						
Other			☑	☑	☑	
Irrigation			☑	☑	☑	
Pools					☑	
Wash Down						
Car Washing						
External Leakage			☑	☑	☑	
Outdoor						
Cooling			☑	☑	☑	

Comments

Utility costs represent staff site survey time and reporting. Customer costs estimate any costs to implement survey recommendations. Overall average savings for the targeted large customers are per end use since fixture and appliance recommendations will vary. It is recommended target this program to start with the top users in the service area. (an helps to explain why the target percentage is only 1% since targeting the largest users).

Results	
Average Water Savings (mgd)	
	0.029365
Lifetime Savings - Present Value ($)	
Utility	$315,080
Community	$1,677,404
Lifetime Costs - Present Value ($)	
Utility	$1,217,493
Community	$2,029,155
Benefit to Cost Ratio	
Utility	0.75
Community	0.83
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,366

End Use Savings Per Replacement	% Savings per Account
BUS Toilets	25.0%
BUS Urinals	25.0%
BUS Faucets	25.0%
BUS Showers	25.0%
BUS Dishwashers	25.0%
BUS Clothes Washers	25.0%
BUS Process	25.0%
BUS Kitchen Spray Rinse	25.0%
BUS Internal Leakage	25.0%
BUS Other	25.0%
BUS Cooling	25.0%
BUS Irrigation	25.0%
BUS External Leakage	25.0%
IND Toilets	25.0%
IND Urinals	25.0%
IND Faucets	25.0%
IND Showers	25.0%
IND Dishwashers	25.0%
IND Clothes Washers	25.0%
IND Process	25.0%
IND Internal Leakage	25.0%
IND Other	25.0%
IND Cooling	25.0%
IND Irrigation	25.0%
IND External Leakage	25.0%
PUB Toilets	25.0%
PUB Urinals	25.0%
PUB Faucets	25.0%
PUB Showers	25.0%
PUB Dishwashers	25.0%
PUB Clothes Washers	25.0%
PUB Kitchen Spray Rinse	25.0%
PUB Internal Leakage	25.0%
PUB Other	25.0%
PUB Cooling	25.0%
PUB Irrigation	25.0%
PUB Pools	25.0%
PUB External Leakage	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.250%
Only Effects New Accts	☐

Costs

View: Savings

	Utility	Customer	Total
2015	$58,453	$38,969	$97,422
2016	$59,543	$39,696	$99,239
2017	$60,634	$40,423	$101,056
2018	$61,724	$41,149	$102,873
2019	$62,814	$41,876	$104,691
2020	$63,905	$42,603	$106,508

Targets

View: Accounts

	BUS	IND	PUB	Total
2015	13	0	2	16
2016	14	0	2	16
2017	14	0	2	16
2018	14	0	2	16
2019	14	0	2	17
2020	15	0	2	17

Water Savings (mgd)

	Total Savings (mgd)
2015	0.004910
2016	0.009963
2017	0.015159
2018	0.020500
2019	0.025987
2020	0.026753

Replace CII Inefficient Equipment

Overview	
Name	Replace CII Inefficient Equipment
Abbr	8
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2017
Measure Length	3

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$3,000.00	$3,000.00	1

Administration Costs	
Markup Percentage	30%

Description

CONTRACTOR OR REGIONAL MEASURE: After undergoing a free water use survey, SMWSP will analyze the recommendations on the provided findings report and determine if the site qualifies for a financial incentive. Financial incentives will be provided after analyzing the cost benefit ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of SMWSP while funding lasts.
Program to provide rebates for a standard list of water efficient equipment. Included would be x-ray machines, icemakers, air-cooled ice machines, steamers, washers, spray valves, efficient dishwashers, replacing once through cooling, and adding conductivity controller on cooling towers.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☑			
Urinals			☑			
Faucets			☑			
Showers			☑			
Dishwashers			☑			
Clothes Washers			☑			
Process			☑			
Kitchen Spray Rinse			☑			
Internal Leakage			☐			
Baths						
Other			☐			
Irrigation			☐			
Pools						
Wash Down						
Car Washing						
External Leakage			☐			
Outdoor						
Cooling			☐			

Comments

Estimated Utility/Customer 50/50 cost sharing. Ice machines and food steamers are new and just getting started. Limited on any water-cooled ice machines. This measure can be adjusted to incorporate any CII techology that is deemed appropriate by the program participants to allow flexiblity to adapt to new technology advancements.

Results	
Average Water Savings (mgd)	
0.002229	
Lifetime Savings - Present Value ($)	
Utility	$75,628
Community	$178,783
Lifetime Costs - Present Value ($)	
Utility	$55,735
Community	$98,608
Benefit to Cost Ratio	
Utility	1.36
Community	1.81
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,633

End Use Savings Per Replacement	% Savings per Account
BUS Toilets	25.0%
BUS Urinals	25.0%
BUS Faucets	25.0%
BUS Showers	25.0%
BUS Dishwashers	25.0%
BUS Clothes Washers	25.0%
BUS Process	25.0%
BUS Kitchen Spray Rinse	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.450%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$18,814	$14,472	$33,286
2016	$19,138	$14,722	$33,860
2017	$19,463	$14,972	$34,435
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0

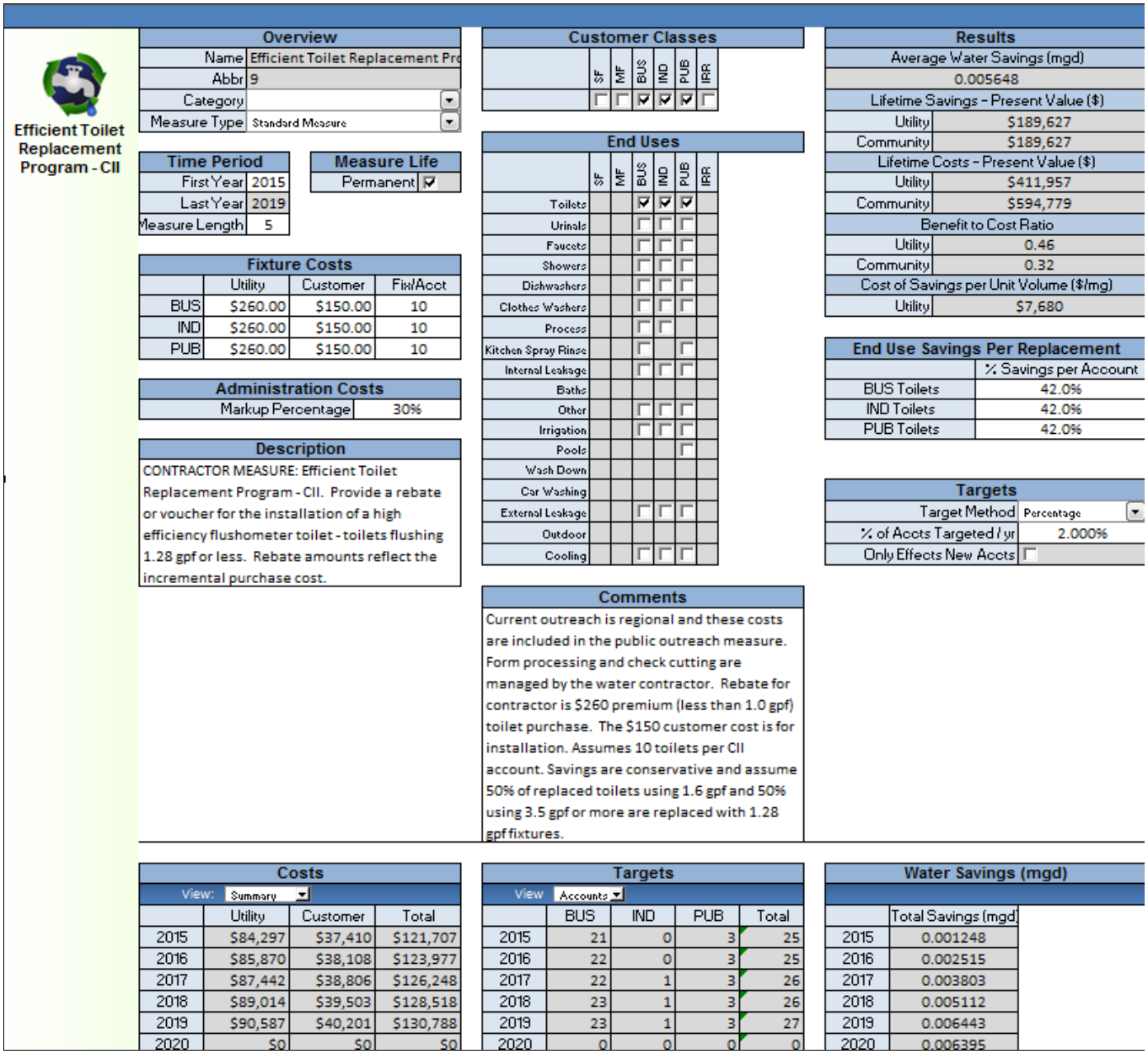
Targets

View: Accounts

	BUS	Total
2015	5	5
2016	5	5
2017	5	5
2018	0	0
2019	0	0
2020	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000774
2016	0.001559
2017	0.002354
2018	0.002349
2019	0.002345
2020	0.002340



Efficient Toilet Replacement Program - CII

Overview	
Name	Efficient Toilet Replacement Pr
Abbr	9
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$260.00	$150.00	10
IND	$260.00	$150.00	10
PUB	$260.00	$150.00	10

Administration Costs	
Markup Percentage	30%

Description

CONTRACTOR MEASURE: Efficient Toilet Replacement Program - CII. Provide a rebate or voucher for the installation of a high efficiency flushometer toilet - toilets flushing 1.28 gpf or less. Rebate amounts reflect the incremental purchase cost.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☑	☑	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☑	☑	☑	
Urinals			☐	☐	☐	
Faucets			☐	☐	☐	
Showers			☐	☐	☐	
Dishwashers			☐	☐	☐	
Clothes Washers			☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage			☐	☐	☐	
Baths						
Other			☐	☐	☐	
Irrigation			☐	☐	☐	
Pools					☐	
Wash Down						
Car Washing						
External Leakage			☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Current outreach is regional and these costs are included in the public outreach measure. Form processing and check cutting are managed by the water contractor. Rebate for contractor is $260 premium (less than 1.0 gpf) toilet purchase. The $150 customer cost is for installation. Assumes 10 toilets per CII account. Savings are conservative and assume 50% of replaced toilets using 1.6 gpf and 50% using 3.5 gpf or more are replaced with 1.28 gpf fixtures.

Results	
Average Water Savings (mgd)	
	0.005648
Lifetime Savings - Present Value ($)	
Utility	$189,627
Community	$189,627
Lifetime Costs - Present Value ($)	
Utility	$411,957
Community	$594,779
Benefit to Cost Ratio	
Utility	0.46
Community	0.32
Cost of Savings per Unit Volume ($/mg)	
Utility	$7,680

End Use Savings Per Replacement	% Savings per Account
BUS Toilets	42.0%
IND Toilets	42.0%
PUB Toilets	42.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	2.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$84,297	$37,410	$121,707
2016	$85,870	$38,108	$123,977
2017	$87,442	$38,806	$126,248
2018	$89,014	$39,503	$128,518
2019	$90,587	$40,201	$130,788
2020	$0	$0	$0

Targets — View: Accounts

	BUS	IND	PUB	Total
2015	21	0	3	25
2016	22	0	3	25
2017	22	1	3	26
2018	23	1	3	26
2019	23	1	3	27
2020	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001248
2016	0.002515
2017	0.003803
2018	0.005112
2019	0.006443
2020	0.006395

Urinal Rebates – CII

Overview	
Name	Urinal Rebates – CII
Abbr	10
Category	
Measure Type	Standard Measure

Time Period	
First Year	2016
Last Year	2020
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$450.00	$100.00	10
IND	$450.00	$100.00	10
PUB	$450.00	$100.00	10

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: Provide a rebate or voucher for the installation of a high efficiency urinals. WaterSense standard is 0.5 gpf or less, though models flushing as low as 0.125 gpf (1 pint) are available and function well, so could be specified. Rebate amounts would reflect the incremental purchase cost.

Customer Classes

SF	MF	BUS	IND	PUB	IRR
☐	☐	☑	☑	☑	☐

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets			☐	☐	☐	
Urinals			☑	☑	☑	
Faucets			☐	☐	☐	
Showers			☐	☐	☐	
Dishwashers			☐	☐	☐	
Clothes Washers			☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage			☐	☐	☐	
Baths						
Other			☐	☐	☐	
Irrigation			☐	☐	☐	
Pools					☐	
Wash Down						
Car Washing						
External Leakage			☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Per Santa Rosa's current program, rebate amount is up to $450 per urinal. Water savings of 75% is based on replacing a 1.0 gpf or more urinal and a 0.25 gpf to 0.125 gpf (1 pint) urinal. Assumes 10 urinals per CII account. Customer cost reflects installation and fixture costs.

Results	
Average Water Savings (mgd)	
	0.000716
Lifetime Savings - Present Value ($)	
Utility	$24,047
Community	$24,047
Lifetime Costs - Present Value ($)	
Utility	$169,382
Community	$199,495
Benefit to Cost Ratio	
Utility	0.14
Community	0.12
Cost of Savings per Unit Volume ($/mg)	
Utility	$24,927

End Use Savings Per Replacement	% Savings per Account
BUS Urinals	75.0%
IND Urinals	75.0%
PUB Urinals	75.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$35,726	$6,351	$42,077
2017	$36,380	$6,468	$42,848
2018	$37,034	$6,584	$43,618
2019	$37,689	$6,700	$44,389
2020	$38,343	$6,817	$45,159

Targets — View: Accounts

	BUS	IND	PUB	Total
2015	0	0	0	0
2016	5	0	1	6
2017	6	0	1	6
2018	6	0	1	7
2019	6	0	1	7
2020	6	0	1	7

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000202
2017	0.000398
2018	0.000589
2019	0.000774
2020	0.000955

Plumber Initiated UHET & HEU Retrofit

Overview	
Name	Plumber Initiated UHET & HE
Abbr	11
Category	
Measure Type	Standard Measure

Time Period	
First Year	2019
Last Year	2023
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$325.00	$100.00	10
IND	$325.00	$100.00	10
PUB	$325.00	$100.00	10

Administration Costs	
Markup Percentage	30%

Description

CONTRACTOR MEASURE: Plumber Initiated High Efficiency Toilet and / or Urinal Retrofit Program. SMWSP would subsidize installation cost of a new UHET/ HEU purchased by SMWSP. Licensed plumbers, pre-qualified by SMWSP would solicit customers directly. Customers would get a new UHET and HEU installed at a

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☑	☑	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☑	☑	☑	
Urinals			☑	☑	☑	
Faucets			☐	☐	☐	
Showers			☐	☐	☐	
Dishwashers			☐	☐	☐	
Clothes Washers			☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage			☐	☐	☐	
Baths						
Other			☐	☐	☐	
Irrigation			☐	☐	☐	
Pools					☐	
Wash Down						
Car Washing						
External Leakage			☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Utility cost based on installation cost of $325 per Carrie Pollard at SCWA provided costs. Customer cost based on the fixture cost plus reduced installation cost.

Water savings based on the average difference between 1.0 gpf urinal and a 0.25 gpf to 0.125 gpf (1 pint) urinal and a 1.6 gpf toilet and 1.0 gpf toilet. Assumes 10 urinals or toilets per CII account.

Results	
Average Water Savings (mgd)	
0.003903	
Lifetime Savings - Present Value ($)	
Utility	$123,024
Community	$123,024
Lifetime Costs - Present Value ($)	
Utility	$242,262
Community	$299,602
Benefit to Cost Ratio	
Utility	0.51
Community	0.41
Cost of Savings per Unit Volume ($/mg)	
Utility	$6,536

End Use Savings Per Replacement	% Savings per Account
BUS Toilets	42.0%
BUS Urinals	75.0%
IND Toilets	42.0%
IND Urinals	75.0%
PUB Toilets	42.0%
PUB Urinals	75.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$56,617	$13,400	$70,017
2020	$57,599	$13,633	$71,232

Targets — View: Accounts

	BUS	IND	PUB	Total
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	11	0	2	13
2020	12	0	2	14

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.001092
2020	0.002183

Require <0.25 gal/flush Urinals in New

Overview	
Name	Require <0.25 gal/flush Urina
Abbr	12
Category	
Measure Type	Standard Measure

Time Period	
First Year	2017
Last Year	2021
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$75.00	$300.00	10
IND	$75.00	$300.00	10
PUB	$75.00	$300.00	10

Administration Costs	
Markup Percentage	10%

Description

CONTRACTOR MEASURE: Require that new buildings be fitted with .125 gpf (1 pint) or less urinals rather than the current standard of 0.5 gal/flush models.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☑	☑	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☐	☐	☐	
Urinals			☑	☑	☑	
Faucets			☐	☐	☐	
Showers			☐	☐	☐	
Dishwashers			☐	☐	☐	
Clothes Washers			☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage			☐	☐	☐	
Baths						
Other			☐	☐	☐	
Irrigation			☐	☐	☐	
Pools					☐	
Wash Down						
Car Washing						
External Leakage			☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Utility costs of $75 reflects inspection costs. Customer costs represent the incremental cost of the more efficient fixture.

Savings assumes 0.5 gpf urinals are being replaced with .125 gpf urinals. Assume 10

Results	
Average Water Savings (mgd)	
0.003885	
Lifetime Savings - Present Value ($)	
Utility	$129,148
Community	$129,148
Lifetime Costs - Present Value ($)	
Utility	$75,545
Community	$350,253
Benefit to Cost Ratio	
Utility	1.71
Community	0.37
Cost of Savings per Unit Volume ($/mg)	
Utility	$2,048

End Use Savings Per Replacement	% Savings per Account
BUS Urinals	75.0%
IND Urinals	75.0%
PUB Urinals	75.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$19,190	$69,780	$88,970
2018	$19,190	$69,780	$88,970
2019	$19,190	$69,780	$88,970
2020	$19,190	$69,780	$88,970

Targets — View: Account

	BUS	IND	PUB	Total
2015	0	0	0	0
2016	0	0	0	0
2017	19	2	3	23
2018	19	2	3	23
2019	19	2	3	23
2020	19	2	3	23

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.001357
2018	0.002598
2019	0.003741
2020	0.004803

HE Faucet Aerator / Showerhead

Overview	
Name	HE Faucet Aerator / Showerhe
Abbr	13
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
BUS	$12.00	$25.00	10
IND	$12.00	$25.00	10
PUB	$12.00	$25.00	10

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: High Efficiency Faucet Aerator / Showerhead Giveaway - CII. Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☑	☑	☑	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets			☐	☐	☐	
Urinals			☐	☐	☐	
Faucets			☑	☑	☑	
Showers			☑	☑	☑	
Dishwashers			☐	☐	☐	
Clothes Washers			☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage			☐	☐	☐	
Baths						
Other			☐	☐	☐	
Irrigation			☐	☐	☐	
Pools					☐	
Wash Down						
Car Washing						
External Leakage			☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Assumes 10 bathrooms per CII account. Utility cost for 1.8gpm showerhead and 1.5 gpm aerator kit is $12. Customer cost $25 is to repair leaks or other minor costs. Assume kits save 27.6% (reduced to be conservative) by assuming only 25% of kits are actually installed in the businesses and yield water savings. Petaluma provided actual cost data: 2.0GPM SH, 1.0 and 0.5 GPM FA. Unit cost per 1.0GPM FA - $0.78 per 2.0GPM SH - $3.51. Or just over $4 per kit. The $12 per kit cost assumes that only 25% are actually installed. ($4 times 4 kits to obtain one installation).

Results	
Average Water Savings (mgd)	
0.000985	
Lifetime Savings - Present Value ($)	
Utility	$42,574
Community	$97,665
Lifetime Costs - Present Value ($)	
Utility	$45,705
Community	$121,881
Benefit to Cost Ratio	
Utility	0.93
Community	0.80
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,886

End Use Savings Per Replacement	% Savings per Account
BUS Faucets	6.9%
BUS Showers	6.9%
IND Faucets	6.9%
IND Showers	6.9%
PUB Faucets	6.9%
PUB Showers	6.9%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	5.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$9,353	$15,588	$24,940
2016	$9,527	$15,878	$25,405
2017	$9,701	$16,169	$25,870
2018	$9,876	$16,460	$26,336
2019	$10,050	$16,751	$26,801
2020	$0	$0	$0

Targets — View: Accounts

	BUS	IND	PUB	Total
2015	54	1	8	62
2016	55	1	8	64
2017	55	1	8	65
2018	56	1	8	66
2019	57	1	8	67
2020	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000970
2016	0.001967
2017	0.002991
2018	0.004043
2019	0.005122
2020	0.004152

HE Faucet Aerator / Showerhead

Overview	
Name	HE Faucet Aerator / Showerhead (
Abbr	14
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$12.00	$25.00	2
MF	$12.00	$25.00	8

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: High Efficiency Faucet Aerator / Showerhead Giveaway - SF, MF. Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office or community events. Need to coordinate this program with the School Education measure on retrofit kit giveaways to the same customer categories.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☑	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☐	☐				
Urinals						
Faucets	☑	☑				
Showers	☑	☑				
Dishwashers	☐	☐				
Clothes Washers	☐	☐				
Process						
Kitchen Spray Rinse						
Internal Leakage	☐	☐				
Baths	☐	☐				
Other	☐	☐				
Irrigation	☐	☐				
Pools	☐	☐				
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☐	☐				
Outdoor						
Cooling						

Comments

Assumes minimum 2 bathrooms per SF account and 4 units or 8 bathrooms per MF account. Utility cost for 1.8gpm showerhead and 1.5 gpm aerator kit is $12. Customer cost $25 is to repair leaks or other minor costs. Assume kits save 27.6% (reduced to be conservative) by assuming only 25% of kits are actually installed in the homes and yield water savings.

Results	
Average Water Savings (mgd)	
0.001842	
Lifetime Savings - Present Value ($)	
Utility	$79,738
Community	$158,433
Lifetime Costs - Present Value ($)	
Utility	$55,947
Community	$149,192
Benefit to Cost Ratio	
Utility	1.43
Community	1.06
Cost of Savings per Unit Volume ($/mg)	
Utility	$3,198

End Use Savings Per Replacement	% Savings per Account
SF Faucets	6.9%
SF Showers	6.9%
MF Faucets	6.9%
MF Showers	6.9%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	2.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$11,683	$19,471	$31,154
2016	$11,775	$19,626	$31,401
2017	$11,868	$19,780	$31,648
2018	$11,961	$19,935	$31,896
2019	$12,054	$20,089	$32,143
2020	$0	$0	$0

Targets — View: Accounts

	SF	MF	Total
2015	335	14	349
2016	338	14	352
2017	341	14	354
2018	343	14	357
2019	346	14	360
2020	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001911
2016	0.003823
2017	0.005738
2018	0.007655
2019	0.009576
2020	0.007668

Indoor and Outdoor Surveys - SF,

Overview	
Name	Indoor and Outdoor Surveys - SF,
Abbr	15
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2040
Measure Length	26

Measure Life	
Permanent	☐
Years	5
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
SF	$162.00	$50.00	1
MF	$534.00	$50.00	1

Administration Costs	
Markup Percentage	30%

Description

REGIONAL OR CONTRACTOR MEASURE: Indoor and outdoor water surveys for existing residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, and toilet devices. Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, with either part of the repair subsidized and/or the cost paid with revolving funds paid back with water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences. May include adjustments to irrigation schedules on automatic irrigation controllers. Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi.

Customer Classes

SF	MF	BUS	IND	PUB	IRR
☑	☑	☐	☐	☐	☐

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets	☑	☑				
Urinals						
Faucets	☑	☑				
Showers	☑	☑				
Dishwashers	☑	☑				
Clothes Washers	☑	☑				
Process						
Kitchen Spray Rinse						
Internal Leakage	☑	☑				
Baths	☑	☑				
Other	☑	☑				
Irrigation	☑	☑				
Pools	☑	☑				
Wash Down	☑	☑				
Car Washing	☑	☑				
External Leakage	☑	☑				
Outdoor						
Cooling						

Comments

Utility costs for staff survey time and any giveaway devices. Customer cost reflects Utility costs for staff survey time and any giveaway devices. Customer cost reflects average cost to address report recommendations. Includes $12 per unit for kit giveaways. Assumes 1 kit for SF and 4 kits for MF units (1 per unit not one per bathroom).

Assume 5% savings for indoor suggestions and 10% savings for outdoor suggestions. Savings reflect average values since survey suggestions, device distribution and fixture and appliance recommendations and upgrades will vary.

Results

Average Water Savings (mgd)	
0.093931	
Lifetime Savings - Present Value ($)	
Utility	$2,795,223
Community	$3,753,609
Lifetime Costs - Present Value ($)	
Utility	$3,996,019
Community	$4,867,094
Benefit to Cost Ratio	
Utility	0.70
Community	0.77
Cost of Savings per Unit Volume ($/mg)	
Utility	$4,480

End Use Savings Per Replacement

	% Savings per Account
SF Toilets	5.0%
SF Faucets	5.0%
SF Showers	5.0%
SF Dishwashers	5.0%
SF Clothes Washers	5.0%
SF Baths	5.0%
SF Internal Leakage	5.0%
SF Other	5.0%
SF Irrigation	10.0%
SF Pools	10.0%
SF Wash Down	10.0%
SF Car Washing	10.0%
SF External Leakage	10.0%
MF Toilets	5.0%
MF Faucets	5.0%
MF Showers	5.0%
MF Dishwashers	5.0%
MF Clothes Washers	5.0%
MF Baths	5.0%
MF Internal Leakage	5.0%
MF Other	5.0%
MF Irrigation	10.0%
MF Pools	10.0%
MF Wash Down	10.0%
MF Car Washing	10.0%
MF External Leakage	10.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	5.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$200,013	$43,600	$243,613
2016	$201,601	$43,946	$245,547
2017	$203,189	$44,292	$247,482
2018	$204,778	$44,639	$249,416
2019	$206,366	$44,985	$251,350
2020	$207,954	$45,331	$253,285

Targets

View: Accounts

	SF	MF	Total
2015	838	34	872
2016	845	34	879
2017	851	34	886
2018	858	35	893
2019	865	35	900
2020	871	35	907

Water Savings (mgd)

	Total Savings (mgd)
2015	0.019104
2016	0.038303
2017	0.057598
2018	0.076990
2019	0.096478
2020	0.097096

Efficient Toilet Replacement Program – SF

Overview	
Name	Efficient Toilet Replacement Prog
Abbr	16
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$150.00	$150.00	2

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: Provide a rebate or voucher for the installation of a ultra high efficiency toilet (UHET). UHET toilets flush 1.28 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost. Replacement program can be either a direct install or rebate program. Includes replacement of 1.6 gpf that are not well functioning.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☑					
Urinals						
Faucets	☐					
Showers	☐					
Dishwashers	☐					
Clothes Washers	☐					
Process						
Kitchen Spray Rinse						
Internal Leakage	☐					
Baths	☐					
Other	☐					
Irrigation	☐					
Pools	☐					
Wash Down	☐					
Car Washing	☐					
External Leakage	☐					
Outdoor						
Cooling						

Comments

Rebate for utility is $150 premium (less than 1.0 gpf) toilet purchase. The $150 customer cost is for installation. Assumes 2 toilets per SF account. Model water savings of 42% and cost/benefits based on MMWD provided data using an average toilet flush volume of 2.2 gpf for existing toilets (weighted average of field measured toilets Sample size=638 toilets.

Results	
Average Water Savings (mgd)	
0.004709	
Lifetime Savings - Present Value ($)	
Utility	$158,794
Community	$158,794
Lifetime Costs - Present Value ($)	
Utility	$165,570
Community	$298,027
Benefit to Cost Ratio	
Utility	0.96
Community	0.53
Cost of Savings per Unit Volume ($/mg)	
Utility	$3,703

End Use Savings Per Replacement	% Savings per Account
SF Toilets	41.8%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$34,574	$27,659	$62,233
2016	$34,848	$27,879	$62,727
2017	$35,123	$28,098	$63,221
2018	$35,397	$28,318	$63,715
2019	$35,672	$28,537	$64,209
2020	$0	$0	$0

Targets — View: Accounts

	SF	Total
2015	84	84
2016	84	84
2017	85	85
2018	86	86
2019	86	86
2020	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001121
2016	0.002229
2017	0.003326
2018	0.004413
2019	0.005490
2020	0.005443

Direct Install UHET, Showerheads,

Overview	
Name	Direct Install UHET, Showerheads,
Abbr	17
Category	
Measure Type	Standard Measure

Time Period	
First Year	2019
Last Year	2025
Measure Length	7

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$325.00	$100.00	2
MF	$325.00	$100.00	4

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR OR REGIONAL MEASURE: Direct Install High Efficiency Toilets, Showerheads, and Faucet Aerators in Residential Buildings. Utility would subsidize installation cost of a new UHET purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new UHET and showerheads and faucet aerators installed at a discounted price.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☑	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☑	☑				
Urinals						
Faucets	☑	☑				
Showers	☑	☑				
Dishwashers	☐	☐				
Clothes Washers	☐	☐				
Process						
Kitchen Spray Rinse						
Internal Leakage	☐	☐				
Baths	☐	☐				
Other	☐	☐				
Irrigation	☐	☐				
Pools	☐	☐				
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☐	☐				
Outdoor						
Cooling						

Comments

Utility cost of current "on bill payment" direct installation program From Santa Rosa costs: $375 for one package and $649 for two. Research for new grant direct install program costs $530 each package. Assume one unit package includes:
- 1 UHET (0.8 gpf) Includes tank, bowl, seat, wax ring, brass bolts.
- 1 Showerhead (1.5 gpm)
- Bathroom aerator (up to 2) (1.5 gpm)
- 1 Kitchen aerator (1.5 gpm)

Assume 2 units per SF acct and 4 per MF acct.
Customer cost based on incremental fixture and installation costs ($100).
Toilet water savings is based on 1.6 gpf and 3.5 gpf toilets being replaced with 1.0 gpf toilets.
Showerhead and faucet aerator savings based on the replacement of 2.0 gpm or more showerheads with 1.5 gpm showerheads; and 3.0 gpm or greater faucets with 1.0 gpm faucet aerators.

Results	
Average Water Savings (mgd)	
0.027595	
Lifetime Savings - Present Value ($)	
Utility	$853,190
Community	$1,387,550
Lifetime Costs - Present Value ($)	
Utility	$442,281
Community	$551,151
Benefit to Cost Ratio	
Utility	1.93
Community	2.52
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,688

End Use Savings Per Replacement	% Savings per Account
SF Toilets	60.0%
SF Faucets	50.0%
SF Showers	50.0%
MF Toilets	60.0%
MF Faucets	50.0%
MF Showers	50.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$75,938	$18,692	$94,630
2020	$76,522	$18,836	$95,359

Targets — View: Accounts

	SF	MF	Total
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	86	3	90
2020	87	4	91

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.005569
2020	0.011127

HE Clothes Washer Rebate - SF, MF

Overview	
Name	HE Clothes Washer Rebate - SF, M
Abbr	18
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$125.00	$675.00	1
MF	$125.00	$675.00	1

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: Provide a rebate for efficient washing machines to residential customers. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☑	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☐	☐				
Urinals						
Faucets	☐	☐				
Showers	☐	☐				
Dishwashers	☐	☐				
Clothes Washers	☑	☑				
Process						
Kitchen Spray Rinse						
Internal Leakage	☐	☐				
Baths	☐	☐				
Other	☐	☐				
Irrigation	☐	☐				
Pools	☐	☐				
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☐	☐				
Outdoor						
Cooling						

Comments

Current outreach is regional and these costs are included in the public outreach measure. Form processing and check cutting are managed by the water contractor. Water savings is based on difference between a 34 gallon per load machine compared to a 12 gallon per load CEE Tier 3 machine. Rebate of $125/unit based on current average rebate amount among water contractors. Customer costs include installation.

Results	
Average Water Savings (mgd)	
0.012747	
Lifetime Savings - Present Value ($)	
Utility	$434,675
Community	$1,000,445
Lifetime Costs - Present Value ($)	
Utility	$130,498
Community	$694,249
Benefit to Cost Ratio	
Utility	3.33
Community	1.44
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,078

End Use Savings Per Replacement	% Savings per Account
SF Clothes Washers	64.7%
MF Clothes Washers	64.7%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$27,250	$117,720	$144,970
2016	$27,466	$118,655	$146,121
2017	$27,683	$119,589	$147,272
2018	$27,899	$120,524	$148,423
2019	$28,115	$121,459	$149,574
2020	$0	$0	$0

Targets — View: Accounts

	SF	MF	Total
2015	168	7	174
2016	169	7	176
2017	170	7	177
2018	172	7	179
2019	173	7	180
2020	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.003093
2016	0.006208
2017	0.009340
2018	0.012486
2019	0.015640
2020	0.015606

Submeters Incentive

Overview	
Name	Submeters Incentive
Abbr	19
Category	
Measure Type	Standard Measure

Time Period	
First Year	2020
Last Year	2040
Measure Length	21

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$150.00	$50.00	100

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: Require or provide a partial cost rebate to meter all remaining mobile home parks that are currently master metered but not separately metered.
Provide a rebate (per unit) to assist MF building owners installing submeters on each existing individual apartment or condominium unit.
Provide a rebate (per unit) to assist MF building owners installing submeters on each new individual apartment unit.
Require the submetering of individual units in new multi-family, condos, townhouses, and mobile-home parks.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☑	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets		☑				
Urinals						
Faucets		☑				
Showers		☑				
Dishwashers		☑				
Clothes Washers		☑				
Process						
Kitchen Spray Rinse						
Internal Leakage		☑				
Baths		☐				
Other		☐				
Irrigation		☑				
Pools		☐				
Wash Down		☐				
Car Washing		☐				
External Leakage		☑				
Outdoor						
Cooling						

Comments

Petaluma may not provide incentives for this measure - it is already a requirement for new development.

Estimated $150 utility cost and $50 customer cost per meter. Assume 100 dwelling units (mobile homes) per account. DU = dwelling unit (i.e., mobile home)." The target/participation rate of 0.1% assumes 1 property per 1,000 MF accounts. This is up to $15,000 per customer.

Consider patterning after Santa Clara Valley Water District program.
http://www.valleywater.org/Programs/SubmeterRebateProgram.aspx

Results	
Average Water Savings (mgd)	
0.001585	
Lifetime Savings - Present Value ($)	
Utility	$41,006
Community	$55,501
Lifetime Costs - Present Value ($)	
Utility	$192,816
Community	$244,234
Benefit to Cost Ratio	
Utility	0.21
Community	0.23
Cost of Savings per Unit Volume ($/mg)	
Utility	$12,813

End Use Savings Per Replacement	% Savings per Account
MF Toilets	15.0%
MF Faucets	15.0%
MF Showers	15.0%
MF Dishwashers	15.0%
MF Clothes Washers	15.0%
MF Internal Leakage	15.0%
MF Irrigation	15.0%
MF External Leakage	15.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.100%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$13,198	$3,519	$16,717

Targets — View: Accounts

	MF	Total
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	1	1

Water Savings (mgd)

	Total Savings (mgd)
2015	0.000000
2016	0.000000
2017	0.000000
2018	0.000000
2019	0.000000
2020	0.000177

Outdoor Large Landscape Audits & Water

Overview	
Name	Outdoor Large Landscape Audits &
Abbr	20
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life		
Permanent	☐	
Years	5	
Repeat	☐	

Fixture Costs	Utility	Customer	Fix/Acct
IRR	$2,500.00	$500.00	1

Administration Costs	
Markup Percentage	35%

Description

CONTRACTOR OR REGIONAL MEASURE: Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multi-family residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Website will provide feedback on irrigation water use (budget vs. actual). May include the cost for dedicated meter conversion.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☐	☐	☐	☐	☑

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets						☐
Urinals						☐
Faucets						☐
Showers						☐
Dishwashers						☐
Clothes Washers						☐
Process						☐
Kitchen Spray Rinse						☐
Internal Leakage						☐
Baths						☐
Other						☐
Irrigation						☑
Pools						
Wash Down						
Car Washing						
External Leakage						☑
Outdoor						
Cooling						

Comments

Regional - Green Business Program and some Contractor (more discussion needed). Assumes all large landscape accounts can apply. Assume an average site is 3 acres and costs $500/acre to survey. Total Utility cost assumes $1,500 per site survey and $1,000 per water budget including some dedicated meter conversions. Savings assumes 15% irrigation and external leakage savings as a result of the survey and an additional 10% savings due to water budgeting and monitoring. Santa Rosa average commercial/irrigation lot size is 33,000 sq feet. Many companies are helping water utilitiles including WaterFluence and Eagleaerial.

Results	
Average Water Savings (mgd)	
0.001205	
Lifetime Savings - Present Value ($)	
Utility	$42,733
Community	$42,733
Lifetime Costs - Present Value ($)	
Utility	$43,676
Community	$50,146
Benefit to Cost Ratio	
Utility	0.98
Community	0.85
Cost of Savings per Unit Volume ($/mg)	
Utility	$3,816

End Use Savings Per Replacement	% Savings per Account
IRR Irrigation	25.0%
IRR External Leakage	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	0.500%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$8,961	$1,328	$10,288
2016	$9,115	$1,350	$10,466
2017	$9,270	$1,373	$10,643
2018	$9,425	$1,396	$10,821
2019	$9,579	$1,419	$10,998
2020	$0	$0	$0

Targets — View: Accounts

	IRR	Total
2015	3	3
2016	3	3
2017	3	3
2018	3	3
2019	3	3
2020	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001212
2016	0.002444
2017	0.003697
2018	0.004971
2019	0.006267
2020	0.005055

Landscape Rebates and Incentives for

Overview	
Name	Landscape Rebates and Incentives for E
Abbr	21
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2019
Measure Length	5

Measure Life	
Permanent	☐
Years	10
Repeat	☐

Fixture Costs	Utility	Customer	Fix/Acct
MF	$500.00	$500.00	1
BUS	$1,000.00	$1,000.00	1
PUB	$1,000.00	$1,000.00	1
IRR	$1,000.00	$1,000.00	1

Administration Costs	
Markup Percentage	50%

Description

CONTRACTOR MEASURE: For MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient upgrades; Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades including: Large Rainwater Catchment Systems, Rain Barrels, Rain Sensors, Rotating Sprinkler Nozzles, Drip Irrigation Equipment, Weather Based Irrigation Controllers and Gray Water Systems.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☑	☑	☐	☑	☑

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets		☐	☐		☐	☐
Urinals			☐		☐	☐
Faucets		☐	☐		☐	☐
Showers		☐	☐		☐	☐
Dishwashers		☐	☐		☐	☐
Clothes Washers		☐	☐		☐	☐
Process			☐			☐
Kitchen Spray Rinse			☐		☐	☐
Internal Leakage		☐	☐		☐	☐
Baths		☐				☐
Other		☐	☐		☐	☐
Irrigation		☑	☑		☑	☑
Pools		☐			☐	
Wash Down		☐				
Car Washing		☐				
External Leakage		☐	☐		☐	☐
Outdoor						
Cooling			☐		☐	

Comments

MF, CII and IRR Program at least 5,000 square feet of area, pay $25 per station, maximum of 12 stations or maximum of $1,000 per account for CII and IRR and $500 for MF. Customer costs assume average installation costs and incremental equipment purchase costs. Average savings of 15% assumed since savings can range from 5%-25% per equipment upgrade. This program can potentially be modified to just target the larger accounts.

Results	
Average Water Savings (mgd)	
0.004762	
Lifetime Savings - Present Value ($)	
Utility	$157,251
Community	$157,251
Lifetime Costs - Present Value ($)	
Utility	$152,775
Community	$254,626
Benefit to Cost Ratio	
Utility	1.03
Community	0.62
Cost of Savings per Unit Volume ($/mg)	
Utility	$3,378

End Use Savings Per Replacement	% Savings per Account
MF Irrigation	15.0%
BUS Irrigation	15.0%
PUB Irrigation	15.0%
IRR Irrigation	15.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$31,433	$20,955	$52,388
2016	$31,928	$21,285	$53,213
2017	$32,423	$21,615	$54,038
2018	$32,918	$21,945	$54,863
2019	$33,413	$22,275	$55,689
2020	$0	$0	$0

Targets — View: Accounts

	MF	BUS	PUB	IRR	Total
2015	7	11	2	5	24
2016	7	11	2	5	25
2017	7	11	2	5	25
2018	7	11	2	6	25
2019	7	11	2	6	26
2020	0	0	0	0	0

Water Savings (mgd)

	Total Savings (mgd)
2015	0.002408
2016	0.004850
2017	0.007326
2018	0.009837
2019	0.012381
2020	0.012381

Turf Removal – MF, CII

Overview	
Name	Turf Removal - MF, CII
Abbr	22
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2024
Measure Length	10

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$1,300.00	$20,000.00	1
BUS	$1,300.00	$20,000.00	1
PUB	$1,300.00	$20,000.00	1
IRR	$1,300.00	$20,000.00	1

Administration Costs	
Markup Percentage	30%

Description

CONTRACTOR MEASURE: Provide a per square foot incentive to remove turf and replace with low water use plants or hardscape. This could be a rebate program or direct delivery of materials. Petaluma does not cap or have an upper limit on the amount of area replaced for commercial or multi-family residential.

Customer Classes

	SF	MF	BUS	IND	PUB	IRR
	☐	☑	☑	☐	☑	☑

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets		☐	☐		☐	☐
Urinals			☐		☐	☐
Faucets		☐	☐		☐	☐
Showers		☐	☐		☐	☐
Dishwashers		☐	☐		☐	☐
Clothes Washers		☐	☐		☐	☐
Process			☐			☐
Kitchen Spray Rinse			☐		☐	☐
Internal Leakage		☐	☐		☐	☐
Baths		☐				☐
Other		☐	☐		☐	☐
Irrigation		☑	☑		☑	☑
Pools		☐			☐	
Wash Down		☐				
Car Washing		☐				
External Leakage		☐	☐		☐	☐
Outdoor						
Cooling			☐		☐	

Comments

City provides direct delivery of free mulch, compost, and sheet cardboard to multi-family and commercial customers to sheet mulch existing turf. Applicants must own the property, or provide written consent from the property owner, have Petaluma water service at the property, and actively maintain a minimum of 500 SF of high water-use turf landscape with in-ground automated irrigation system. No maximum on the amount of mulch, compost and cardboard provided to commercial customers. Utility cost is $0.26 per square foot for commercial and multi-family accounts. Customer costs include incremental landscape square footage development costs and installation costs. Assume average replacement is 5,000 SF.

Results	
Average Water Savings (mgd)	
0.034911	
Lifetime Savings - Present Value ($)	
Utility	$920,337
Community	$920,337
Lifetime Costs - Present Value ($)	
Utility	$381,121
Community	$4,891,424
Benefit to Cost Ratio	
Utility	2.41
Community	0.19
Cost of Savings per Unit Volume ($/mg)	
Utility	$1,150

End Use Savings Per Replacement	% Savings per Account
MF Irrigation	25.0%
BUS Irrigation	25.0%
PUB Irrigation	25.0%
IRR Irrigation	25.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs — View: Summary

	Utility	Customer	Total
2015	$41,135	$486,800	$527,935
2016	$41,738	$493,940	$535,678
2017	$42,341	$501,080	$543,421
2018	$42,945	$508,220	$551,165
2019	$43,548	$515,360	$558,908
2020	$44,151	$522,500	$566,651

Targets — View: Accounts

	MF	BUS	PUB	IRR	Total
2015	7	11	2	5	24
2016	7	11	2	5	25
2017	7	11	2	5	25
2018	7	11	2	6	25
2019	7	11	2	6	26
2020	7	12	2	6	26

Water Savings (mgd)

	Total Savings (mgd)
2015	0.004013
2016	0.008083
2017	0.012210
2018	0.016394
2019	0.020636
2020	0.024934

Turf Removal - SF

Overview	
Name	Turf Removal - SF
Abbr	23
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2024
Measure Length	10

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
SF	$500.00	$1,500.00	1

Administration Costs	
Markup Percentage	30%

Description

CONTRACTOR MEASURE: Provide a per square foot incentive to remove turf and replace with low water use plants or permeable hardscape. Rebate based on dollars per square foot removed and capped at an upper limit for single family residences.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☑	☐	☐	☐	☐	☐

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets	☐					
Urinals						
Faucets	☐					
Showers	☐					
Dishwashers	☐					
Clothes Washers	☐					
Process						
Kitchen Spray Rinse						
Internal Leakage	☐					
Baths	☐					
Other	☐					
Irrigation	☑					
Pools	☐					
Wash Down	☐					
Car Washing	☐					
External Leakage	☐					
Outdoor						
Cooling						

Comments

Per Petaluma website, "A maximum of 15 yards of mulch, 5 yards of compost and 2,000 square feet of cardboard, 3 plants, convert from pop up spray to drip system will be delivered to single family residential customers." With grant funds the cost is $0.5 per sq foot for up to 2,000 sq foot. 1% of homes per year. Average sq foot is approximately 1,000 sq ft.

Results	
Average Water Savings (mgd)	
0.015605	
Lifetime Savings - Present Value ($)	
Utility	$411,556
Community	$411,556
Lifetime Costs - Present Value ($)	
Utility	$989,283
Community	$3,272,243
Benefit to Cost Ratio	
Utility	0.42
Community	0.13
Cost of Savings per Unit Volume ($/mg)	
Utility	$6,676

End Use Savings Per Replacement	% Savings per Account
SF Irrigation	15.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	1.000%
Only Effects New Accts	☐

Costs

View: Summary

	Utility	Customer	Total
2015	$108,960	$251,445	$360,405
2016	$109,825	$253,442	$363,266
2017	$110,690	$255,438	$366,128
2018	$111,555	$257,435	$368,990
2019	$112,420	$259,431	$371,851
2020	$113,285	$261,428	$374,713

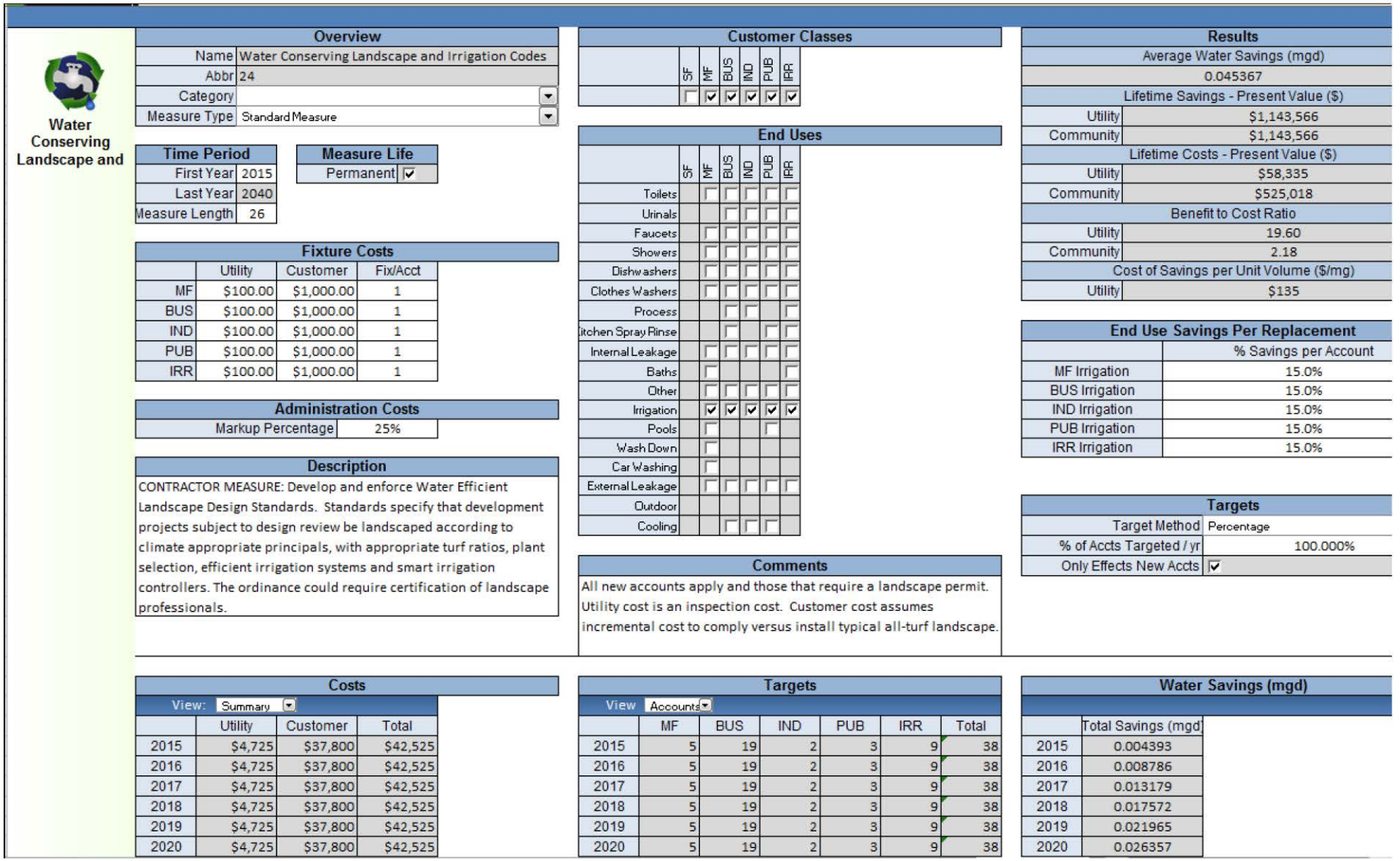
Targets

View: Accounts

	SF	Total
2015	168	168
2016	169	169
2017	170	170
2018	172	172
2019	173	173
2020	174	174

Water Savings (mgd)

	Total Savings (mgd)
2015	0.001827
2016	0.003669
2017	0.005526
2018	0.007397
2019	0.009282
2020	0.011182



Water Conserving Landscape and

Overview	
Name	Water Conserving Landscape and Irrigation Codes
Abbr	24
Category	
Measure Type	Standard Measure

Time Period	
First Year	2015
Last Year	2040
Measure Length	26

Measure Life	
Permanent	☑

Fixture Costs	Utility	Customer	Fix/Acct
MF	$100.00	$1,000.00	1
BUS	$100.00	$1,000.00	1
IND	$100.00	$1,000.00	1
PUB	$100.00	$1,000.00	1
IRR	$100.00	$1,000.00	1

Administration Costs	
Markup Percentage	25%

Description

CONTRACTOR MEASURE: Develop and enforce Water Efficient Landscape Design Standards. Standards specify that development projects subject to design review be landscaped according to climate appropriate principals, with appropriate turf ratios, plant selection, efficient irrigation systems and smart irrigation controllers. The ordinance could require certification of landscape professionals.

Customer Classes	SF	MF	BUS	IND	PUB	IRR
	☐	☑	☑	☑	☑	☑

End Uses	SF	MF	BUS	IND	PUB	IRR
Toilets		☐	☐	☐	☐	☐
Urinals			☐	☐	☐	☐
Faucets		☐	☐	☐	☐	☐
Showers		☐	☐	☐	☐	☐
Dishwashers		☐	☐	☐	☐	☐
Clothes Washers		☐	☐	☐	☐	☐
Process			☐	☐		☐
Kitchen Spray Rinse			☐		☐	☐
Internal Leakage		☐	☐	☐	☐	☐
Baths		☐				☐
Other		☐	☐	☐	☐	☐
Irrigation		☑	☑	☑	☑	☑
Pools		☐			☐	
Wash Down		☐				
Car Washing		☐				
External Leakage		☐	☐	☐	☐	☐
Outdoor						
Cooling			☐	☐	☐	

Comments

All new accounts apply and those that require a landscape permit. Utility cost is an inspection cost. Customer cost assumes incremental cost to comply versus install typical all-turf landscape.

Results	
Average Water Savings (mgd)	
0.045367	
Lifetime Savings - Present Value ($)	
Utility	$1,143,566
Community	$1,143,566
Lifetime Costs - Present Value ($)	
Utility	$58,335
Community	$525,018
Benefit to Cost Ratio	
Utility	19.60
Community	2.18
Cost of Savings per Unit Volume ($/mg)	
Utility	$135

End Use Savings Per Replacement	% Savings per Account
MF Irrigation	15.0%
BUS Irrigation	15.0%
IND Irrigation	15.0%
PUB Irrigation	15.0%
IRR Irrigation	15.0%

Targets	
Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Costs — View: Summary

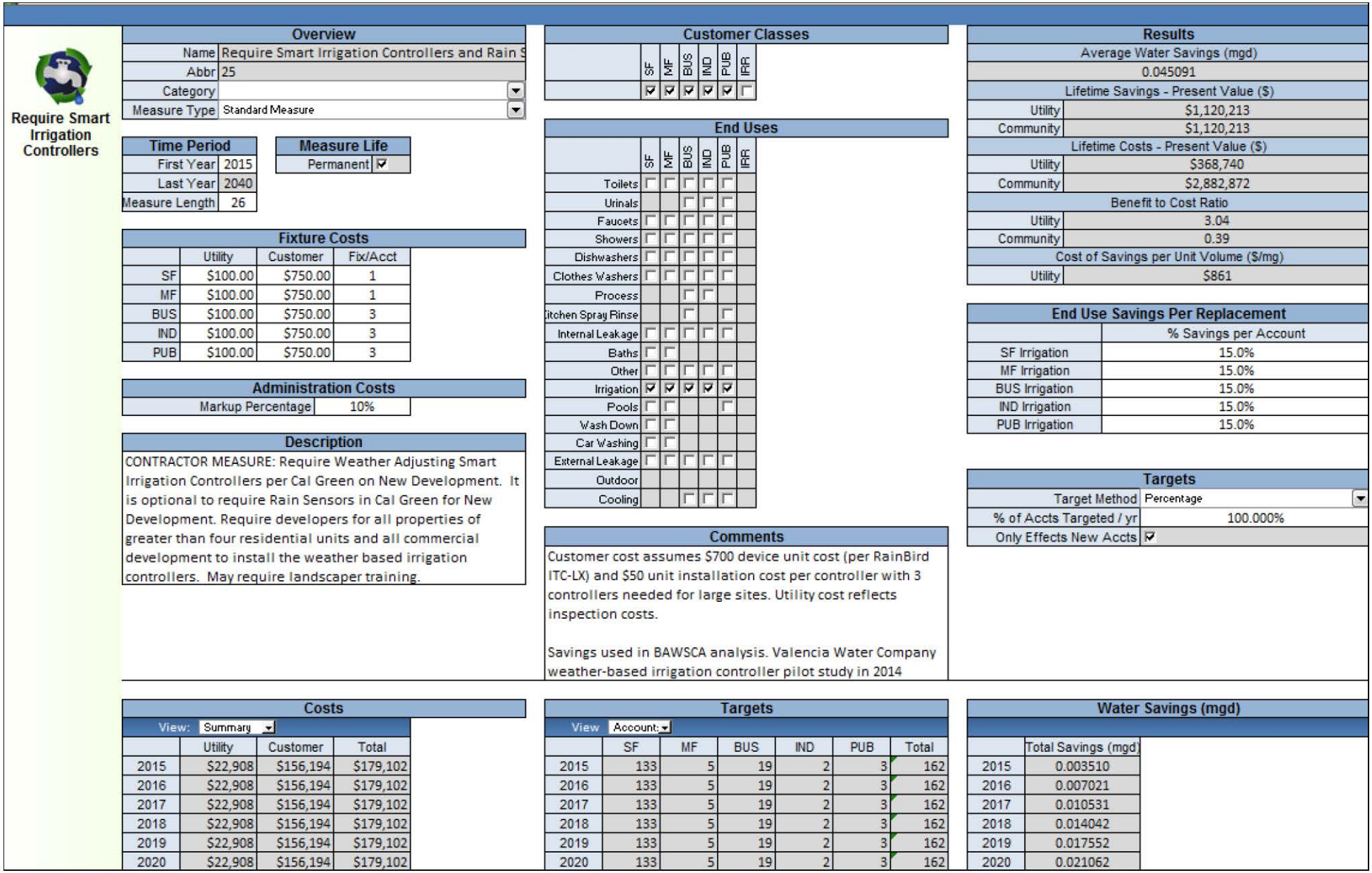
	Utility	Customer	Total
2015	$4,725	$37,800	$42,525
2016	$4,725	$37,800	$42,525
2017	$4,725	$37,800	$42,525
2018	$4,725	$37,800	$42,525
2019	$4,725	$37,800	$42,525
2020	$4,725	$37,800	$42,525

Targets — View: Accounts

	MF	BUS	IND	PUB	IRR	Total
2015	5	19	2	3	9	38
2016	5	19	2	3	9	38
2017	5	19	2	3	9	38
2018	5	19	2	3	9	38
2019	5	19	2	3	9	38
2020	5	19	2	3	9	38

Water Savings (mgd)

	Total Savings (mgd)
2015	0.004393
2016	0.008786
2017	0.013179
2018	0.017572
2019	0.021965
2020	0.026357



Require Smart Irrigation Controllers

Overview

Name	Require Smart Irrigation Controllers and Rain S
Abbr	25
Category	
Measure Type	Standard Measure

Time Period

First Year	2015
Last Year	2040
Measure Length	26

Measure Life

Permanent	☑

Fixture Costs

	Utility	Customer	Fix/Acct
SF	$100.00	$750.00	1
MF	$100.00	$750.00	1
BUS	$100.00	$750.00	3
IND	$100.00	$750.00	3
PUB	$100.00	$750.00	3

Administration Costs

Markup Percentage	10%

Description

CONTRACTOR MEASURE: Require Weather Adjusting Smart Irrigation Controllers per Cal Green on New Development. It is optional to require Rain Sensors in Cal Green for New Development. Require developers for all properties of greater than four residential units and all commercial development to install the weather based irrigation controllers. May require landscaper training.

Customer Classes

SF	MF	BUS	IND	PUB	IRR
☑	☑	☑	☑	☑	☐

End Uses

	SF	MF	BUS	IND	PUB	IRR
Toilets	☐	☐	☐	☐	☐	
Urinals			☐	☐	☐	
Faucets	☐	☐	☐	☐	☐	
Showers	☐	☐	☐	☐	☐	
Dishwashers	☐	☐	☐	☐	☐	
Clothes Washers	☐	☐	☐	☐	☐	
Process			☐	☐		
Kitchen Spray Rinse			☐		☐	
Internal Leakage	☐	☐	☐	☐	☐	
Baths	☐	☐				
Other	☐	☐	☐	☐	☐	
Irrigation	☑	☑	☑	☑	☑	
Pools	☐	☐			☐	
Wash Down	☐	☐				
Car Washing	☐	☐				
External Leakage	☐	☐	☐	☐	☐	
Outdoor						
Cooling			☐	☐	☐	

Comments

Customer cost assumes $700 device unit cost (per RainBird ITC-LX) and $50 unit installation cost per controller with 3 controllers needed for large sites. Utility cost reflects inspection costs.

Savings used in BAWSCA analysis. Valencia Water Company weather-based irrigation controller pilot study in 2014

Results

Average Water Savings (mgd)	
0.045091	
Lifetime Savings - Present Value ($)	
Utility	$1,120,213
Community	$1,120,213
Lifetime Costs - Present Value ($)	
Utility	$368,740
Community	$2,882,872
Benefit to Cost Ratio	
Utility	3.04
Community	0.39
Cost of Savings per Unit Volume ($/mg)	
Utility	$861

End Use Savings Per Replacement

	% Savings per Account
SF Irrigation	15.0%
MF Irrigation	15.0%
BUS Irrigation	15.0%
IND Irrigation	15.0%
PUB Irrigation	15.0%

Targets

Target Method	Percentage
% of Accts Targeted / yr	100.000%
Only Effects New Accts	☑

Costs

View: Summary

	Utility	Customer	Total
2015	$22,908	$156,194	$179,102
2016	$22,908	$156,194	$179,102
2017	$22,908	$156,194	$179,102
2018	$22,908	$156,194	$179,102
2019	$22,908	$156,194	$179,102
2020	$22,908	$156,194	$179,102

Targets

View Account:

	SF	MF	BUS	IND	PUB	Total
2015	133	5	19	2	3	162
2016	133	5	19	2	3	162
2017	133	5	19	2	3	162
2018	133	5	19	2	3	162
2019	133	5	19	2	3	162
2020	133	5	19	2	3	162

Water Savings (mgd)

	Total Savings (mgd)
2015	0.003510
2016	0.007021
2017	0.010531
2018	0.014042
2019	0.017552
2020	0.021062

APPENDIX E - LIST OF CONTACTS

The following table presents each Water Contractor's contact information.

Water Contractor	Name	Phone Number	E-mail	Role
City of Cotati	Damien O'Bid	707-665-3620	dobid@cotaticity.org	City Engineer/Public Works Director
City of Petaluma	Nick Crump	707-778-4487	ncrump@ci.petaluma.ca.us	Environmental Services Technician
	Leah Walker	707-778-4583	lwalker@ci.petaluma.ca.us	Environmental Services Manager
City of Rohnert Park	Mary Grace Pawson	707-588-2234	mpawson@rpcity.org	City Engineer
City of Santa Rosa	Rocky Vogler	707-543-3938	rvogler@srcity.org	Senior Water Resources Planner
	Teresa Gudino	707-543-3942	tgudino@srcity.org	Water Resources Analyst
City of Sonoma	Dan Takasugi	707-933-2230	dtakasugi@sonomacity.org	City Engineer/Public Works Director
	Steve MacCarthy	707-933-2231	steve@sonomacity.org	Water System Supervisor
	Mike Brett	707-933-2247	mbrett@sonomacity.org	Water Conservation Specialist
Marin Municipal Water District	Carl Gowan	415-945-1577	cgowan@marinwater.org	Principal Engineer
	Mike Ban	415-945-1435	mban@marinwater.org	Environmental & Engineering Services Manager
	Oreen Delgado	415-945-1425	odelgado@marinwater.org	Finance Manager
	Dan Carney	415-945-1522	dcarney@marinwater.org	Water Conservation Manager
	Alex Anaya	415-945-1588	aanaya@marinwater.org	Engineering Technician
	Lucy Croy	415-945-1590	lcroy@marinwater.org	Assistant Engineer
North Marin Water District	Chris DeGabriele	415-761-8905	cdegrabriele@nmwd.com	General Manager
	Ryan Grisso	415-761-8933	rgrisso@nmwd.com	Water Conservation Coordinator
	Drew McIntyre	415-761-8912	drewm@nmwd.com	Chief Engineer
Town of Windsor	James M Smith	707-838-5343	jmsmith@Townofwindsor.com	Senior Civil Engineer
	Paul Piazza	707-838-5357	ppiazza@Townofwindsor.com	Management Analyst/ Water Conservation Analyst
	Toni Bertolero	707-838-5978	tbertolero@townofwindsor.com	Town Engineer/Public Works Director
	Mike Cave	707-838-5329	mcave@townofwindsor.com	Utility Systems Superintendent

Water Contractor	Name	Phone Number	E-mail	Role
Valley of the Moon Water District	Daniel Muelrath	707-996-1037	dmuelrath@vomwd.com	General Manager
	Shari Walk	707-996-1037	swalk@vomwd.com	Admin & Finance Manager
Maddaus Water Management	Michelle Maddaus	925-831-0194	michelle@maddauswater.com	MWM Project Manager

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Appendix E

2015 City of Petaluma Water Audit

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Petaluma
Reporting Year: 2015 (1/2015 - 12/2015)

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 (n/a or 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: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

					Master Meter and Supply Error Adjustments		
					Pcnt:	Value:	
Volume from own sources:	8	114.489	MG/Yr	8	1.00%		MG/Yr
Water imported:	8	2,379.565	MG/Yr	8	1.00%		MG/Yr
Water exported:	8	0.000	MG/Yr				MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 2,469.360 MG/Yr

AUTHORIZED CONSUMPTION

				Pcnt:	Value:	
Billed metered:	8	2,219.031	MG/Yr			
Billed unmetered:	10	0.086	MG/Yr			
Unbilled metered:	10	26.881	MG/Yr			
Unbilled unmetered:		30.867	MG/Yr	1.25%		MG/Yr

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

AUTHORIZED CONSUMPTION: 2,276.865 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 192.495 MG/Yr

Apparent Losses

				Pcnt:	Value:	
Unauthorized consumption:		6.173	MG/Yr	0.25%		MG/Yr

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

Customer metering inaccuracies:	8	93.580	MG/Yr	4.00%		MG/Yr
Systematic data handling errors:		5.548	MG/Yr	0.25%		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 105.301 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 87.194 MG/Yr

WATER LOSSES: 192.495 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 250.243 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	268.0	miles	
Number of active AND inactive service connections:	8	19,739		
Service connection density:		74	conn./mile main	
Are customer meters typically located at the curbstop or property line?		No		
Average length of customer service line:	8	10.0	ft	(length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	8	55.0	psi	

COST DATA

Total annual cost of operating water system:	10	$19,789,638	$/Year	
Customer retail unit cost (applied to Apparent Losses):	10	$4.81	$/100 cubic feet (ccf)	
Variable production cost (applied to Real Losses):	8	$8,316.00	$/Million gallons	☐ Use Customer Retail Unit Cost to value real losses

Retail costs are less than (or equal to) production costs; please review and correct if necessary

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: Water imported
2: Unauthorized consumption
3: Systematic data handling errors

Appendix F

DWR Standardized UWMP Tables

NOTES FOR REGIONAL URBAN WATER MANAGEMENT PLANS (RUWMPs)
RUWMPs will report data for each agency in the RUWMP, requiring duplicates of the standardized tables. The supplier will copy the needed tables and notate each of the copies with the name of the agency, or some other designation, identifying the table with the corresponding agency.
WUEdata upload tool for RUWMPs
RUWMPs will submit data to the WUEdata upload tool on an individual agency basis.
If the RUWMP contains a Regional Alliance, the Regional Alliance information will be uploaded separately from the individual agency information.

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
4910006	City of Petaluma	19,739	7,678
	TOTAL	19,739	7,678
NOTES: Numbers based on billing data			

Table 2-2: Plan Identification			
Select Only One ☑	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable* *drop down list*
	Individual UWMP ☐		
	☑	Water Supplier is also a member of a RUWMP	
☐		Water Supplier is also a member of a Regional Alliance	North Marin-Sonoma Alliance
	Regional Urban Water Management Plan (RUWMP)		
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 Date that the Fiscal Year Begins (mm/dd)	
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)*
Sonoma County Water Agency (SCWA)
NOTES:

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	61,798	63,631	66,061	68,490	70,920	73,350
NOTES: 2015 Number based on DOF Tables,population at coast guard base, and out of city boundary connections. 2020-2040 Numbers based on Maddaus report located in Appendices.						

Table 4-1 Retail: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
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)*	Level of Treatment When Delivered *Drop down list*	Volume
Single Family		Drinking Water	3,425
Multi-Family		Drinking Water	761
Commercial		Drinking Water	930
Industrial		Drinking Water	662
Institutional/Governmental		Drinking Water	300
Landscape	All IRR accounts combined	Drinking Water	666
		TOTAL	6,744
NOTES: Volume based on 2015 Billing Records for metered accounts.			

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
Single Family		4,294	4,380	4,416	4,493	4,583
Multi-Family		1,263	1,281	1,300	1,321	1,346
Commercial		939	961	983	1,014	1,048
Industrial		456	601	746	889	1,033
Institutional/Governmental		411	418	428	441	455
Landscape	All Irrigation Accounts	1,035	1,052	1,083	1,119	1,158
TOTAL		8,398	8,693	8,956	9,277	9,623

NOTES: Demands based off Maddaus Report located in Appendices. Projected demands include passive savings (Plumbing Code, etc.), and Conservation Program A. Numbers do not include NRW (Losses). Water Loss is estimated at 9-10%

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*	6,744	8,398	8,693	8,956	9,277	9,623
Recycled Water Demand* *From Table 6-4*	846	1,138	1,301	1,339	1,339	1,424
TOTAL WATER DEMAND	7,590	9,536	9,994	10,295	10,616	11,047
**Recycled water demand fields will be blank until Table 6-4 is complete.*						
NOTES:						

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss*
01/2015	591
** Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.*	
NOTES:Water audit located in Appendices	

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)*	Yes
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.	Section 4.3
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes
NOTES: Demand Projections for Lower Income Residential demands found to be similar to non- lower income demands.	

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*	*177*	*159*	*141*
5 Year	*2003*	*2007*	*157*		

*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 *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*		
111	159	0	0	0	0	111	111	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						
Alluvial Basin	Petaluma Valley	784	194	164	131	375
	TOTAL	784	194	164	131	375
NOTES: High volume in 2011 due to increase in wholesale costs.						

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 from UWMP Service Area 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 Petaluma	Metered	5,207	City of Petaluma	ECWRF	Yes	No
Total Wastewater Collected from Service Area in 2015:		5,207				
NOTES: ECWRF = Ellis Creek Water Recycling Facility						

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.

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*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
ECWRF	E001	Petaluma River		River or creek outfall	No	Tertiary	5,207	2,987	1,313	863
						Total	5,207	2,987	1,313	863

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:	City of Petaluma
Name of Agency Operating the Recycled Water Distribution System:	City of Petaluma
Supplemental Water Added in 2015	
Source of 2015 Supplemental Water	

Beneficial Use Type	General Description of 2015 Uses	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation		Tertiary						
Landscape irrigation (excludes golf courses)		Tertiary	121	371	534	572	572	577
Golf course irrigation		Tertiary	723	765	765	765	765	845
Commercial use		Tertiary	2	2	2	2	2	2
Industrial use								
Geothermal and other energy production								
Seawater intrusion barrier								
Recreational impoundment								
Wetlands or wildlife habitat								
Groundwater recharge (IPR)*								
Surface water augmentation (IPR)*								
Direct potable reuse								
Other *(Provide General Description)*								
		Total:	846	1,138	1,301	1,339	1,339	1,424

**IPR - Indirect Potable Reuse*

NOTES: The ECWR uses up 470 AFY of Recycled Water. Currenlty over 860 AFY of recycled water is used for agriculture outside of the service area. Up to 3,500 AFY of recycled water for agricultural use is planned through to 2040.

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		**2010 Projection for 2015**	**2015 Actual Use**
Agricultural irrigation		1,982	861
Landscape irrigation (excludes golf courses)		0	121
Golf course irrigation		1,216	723
Commercial use		0	2
Industrial use		121	469
Geothermal and other energy production		0	0
Seawater intrusion barrier		0	0
Recreational impoundment		0	0
Wetlands or wildlife habitat		0	0
Groundwater recharge (IPR)		0	0
Surface water augmentation (IPR)		0	0
Direct potable reuse		0	0
Other	*Type of Use*		
Total		3,319	2,176
NOTES: In order to match with the 2010 UWMP Projections, Agricultural use outside of the service area, and recycled water used by the ECWRF was included in the 2015 Actual recycled water use.			

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.		
	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			
Prop 1/Underway	Expand reycled system along City's eastern boundary and to commerical areas with large irrigation use	2016-2020	257 AFY
Phase 1	Expand recycled system into north-east area of city and created a looped system	2020+	163 AFY
Phase 2	Expand recycled sytem into central/soutnern part of City to connect Schools, Parks, commercial irrigation and LAD accounts.	2025+	38 AFY
Phase 3	Expand recycled sytem across river to western portion of City	2040	85 AFY
		Total	0
NOTES: Total Acre Feet equals 657 AFY			

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.					
	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*	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	SCWA	7,303	Drinking Water	13,400
Groundwater	Municipal Wells	375	Drinking Water	
Recycled Water	ECWRF	846	Recycled Water	
	Total	8,524		13,400

NOTES: The recycled water numbers include Golf Course Irrigation which is not considered potable water offset.

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	SCWA	13,400		13,400		13,400		13,400		13,400	
Groundwater	Municipal Wells	0		0		0		0		0	
Recycled Water	ECWRF	1,138		1,301		1,339		1,339		1,424	
Total		14,538	0	14,701	0	14,739	0	14,739	0	14,824	0

NOTES: Volume for Recycled water matches projected demand use. More recycled water is available, but will be used for out of service area agricultural use.

Table 7-1 Retail: Basis of Water Year Data			
Year Type	**Base Year** *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	**Available Supplies if Year Type Repeats**	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☐ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	**% of Average Supply**
Average Year	1962	13400	100%
Single-Dry Year	1977		70%
Multiple-Dry Years 1st Year	1988	13400	
Multiple-Dry Years 2nd Year	1989	13400	
Multiple-Dry Years 3rd Year	1990	13400	
Multiple-Dry Years 4th Year *Optional*	1991	13400	
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: Base years are from 2010 UWMP. During Single Dry year scenario, the SCWA must reduce diversions by 30%.			

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	14,538	14,701	14,739	14,739	14,824
Demand totals *(autofill from Table 4-3)*	9,536	9,994	10,295	10,616	11,047
Difference	5,002	4,707	4,444	4,123	3,777
NOTES: Supply Totals include 13,000 AF and Recycled water supply to meet projected recycled water demand.					

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	7,254	7,530	7,735	7,974	8,254
Demand totals	9,536	9,994	10,295	10,616	11,047
Difference	(2,282)	(2,464)	(2,560)	(2,642)	(2,793)
NOTES: Supply Totals are based on a 30% reduction in the water demand reported to the water agency. This assumes that the Water Agency will only be able to supply 70% of the City's demand. The Supply totals also include Recycled water supply to meet projected recycled water demand. Demand totals include					

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Second year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Third year	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
Fourth year *(optional)*	Supply totals	14,538	14,701	14,739	14,739	14,824
	Demand totals	9,536	9,994	10,295	10,616	11,047
	Difference	5,002	4,707	4,444	4,123	3,777
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: Supply Totals include 13,400 AF and recycled water supply to meet projected recycled water demand.

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		
1	15%	Minimal
2	25%	Moderate
3	35%	Severe
4	50%	Critical
[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			
1	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
1	CII - Restaurants may only serve water upon request		Yes
1	Other - Require automatic shut of hoses		Yes
1	Other - Prohibit use of potable water for washing hard surfaces		Yes
1	Landscape - Other landscape restriction or prohibition	Application of potable water to outdoor landscapes during and within 48 hours after measureable rainfall is prohibited	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner		Yes
2	CII - Lodging establishment must offer opt out of linen service		Yes
2	Landscape - Limit landscape irrigation to specific times		Yes
2	Landscape - Limit landscape irrigation to specific days		Yes
2	Other - Prohibit use of potable water for construction and dust control	Amount of potable water used for dust control limited	Yes
2	Landscape - Prohibit certain types of landscape irrigation	Irrigation with potable water of ornamental turf on public street medians prohibited	Yes
2	Water Features - Restrict water use for decorative water features, such as fountains		Yes
2	Other	Vehicle washing only at commercial facilities	Yes
3	Landscape - Other landscape restriction or prohibition	All landscape irrigation prohibited except for food gardens and mature trees	Yes
3	Landscape - Other landscape restriction or prohibition	Moratorium on landscape installations that require water	Yes
3	Other water feature or swimming pool restriction	Filling or topping off all swimming pools prohibited except for public facilities	Yes
4	Landscape - Prohibit all landscape irrigation	No private landscape irrigation allowed	Yes
4	Landscape - Other landscape restriction or prohibition	Public irrigation use only allowed for playing fields and mature trees or shrubs	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		
1	Expand Public Information Campaign	
1	Provide Rebates on Plumbing Fixtures and Devices	
1	Provide Rebates for Landscape Irrigation Efficiency	
1	Provide Rebates for Turf Replacement	
1	Offer Water Use Surveys	
1	Increase Water Waste Patrols	
2	Implement or Modify Drought Rate Structure or Surcharge	
2	Other	Analyze billing records to conduct outreach to highest water users and identify certain customer account for inclusion in a Customer Demand Reduction Plan.
2	Other	All consumption reduction methods from previous stage
3	Other	All consumption reduction methods from previous stage
4	Other	All consumption reduction methods from previous stage
NOTES:		

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	13,400	13,400	13,400
NOTES:			

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
City of Petaluma	☑	☑
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Sonoma County	☑	☑
	☐	☐

Appendix G

DWR Standardized SB X7-7 Tables

WUEdata Entry Exceptions
The data from the tables below will not be entered into WUEdata tables (the tabs for these tables' worksheets are colored **purple**). These tables will be submitted as separate uploads, in Excel, to WUEdata.
Process Water Deduction SB X7-7 tables 4-C, 4-C.1, 4-C.2, 4-C.3, 4-C.4 and 4-D A supplier that will use the process water deduction will complete the appropriate tables in Excel, submit them as a separate upload to the WUE data tool, and include them in its UWMP.
Target Method 2 SB X7-7 tables 7-B, 7-C, and 7-D A supplier that selects Target Method 2 will contact DWR (gwen.huff@water.ca.gov) for SB X7-7 tables 7-B, 7-C, and 7-D.
Target Method 4 These tables are only available online at http://www.dwr.water.ca.gov/wateruseefficiency/sb7/committees/urban/u4/ptm4.cfm A supplier that selects Target Method 4 will save the tables from the website listed above, complete the tables, submit as a separate upload to WUE data, and include them with its UWMP.

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	10,413	Acre Feet
	2008 total volume of delivered recycled water	613	Acre Feet
	2008 recycled water as a percent of total deliveries	5.89%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	1995	
	Year ending baseline period range[3]	2004	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	
	Year ending baseline period range[4]	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 Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.*

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

[4] 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	50,716
Year 2	1996	52,210
Year 3	1997	53,400
Year 4	1998	54,735
Year 5	1999	56,188
Year 6	2000	57,630
Year 7	2001	57,847
Year 8	2002	57,877
Year 9	2003	58,075
Year 10	2004	58,263
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2003	58,075
Year 2	2004	58,263
Year 3	2005	58,283
Year 4	2006	58,522
Year 5	2007	59,084
2015 Compliance Year Population		
2015		61,798
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *

Baseline Year *Fm SB X7-7 Table 3*		Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	Deductions					Annual Gross Water Use
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	9,499			-		-	9,499
Year 2	1996	9,817			-		-	9,817
Year 3	1997	10,586			-		-	10,586
Year 4	1998	10,763			-		-	10,763
Year 5	1999	12,080			-		-	12,080
Year 6	2000	11,977			-		-	11,977
Year 7	2001	12,286			-		-	12,286
Year 8	2002	11,502			-		-	11,502
Year 9	2003	10,801			-		-	10,801
Year 10	2004	11,000			-		-	11,000
Year 11	0	-			-		-	-
Year 12	0	-			-		-	-
Year 13	0	-			-		-	-
Year 14	0	-			-		-	-
Year 15	0	-			-		-	-
10 - 15 year baseline average gross water use								**11,031**
5 Year Baseline - Gross Water Use								
Year 1	2003	10,801			-		-	10,801
Year 2	2004	11,000			-		-	11,000
Year 3	2005	10,027			-		-	10,027
Year 4	2006	9,712			-		-	9,712
Year 5	2007	9,903			-		-	9,903
5 year baseline average gross water use								**10,289**
2015 Compliance Year - Gross Water Use								
2015		7,678	-		-		-	**7,678**

* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3

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	50,716	9,499	167
Year 2	1996	52,210	9,817	168
Year 3	1997	53,400	10,586	177
Year 4	1998	54,735	10,763	176
Year 5	1999	56,188	12,080	192
Year 6	2000	57,630	11,977	186
Year 7	2001	57,847	12,286	190
Year 8	2002	57,877	11,502	177
Year 9	2003	58,075	10,801	166
Year 10	2004	58,263	11,000	169
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				**177**
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	58,075	10,801	166
Year 2	2004	58,263	11,000	169
Year 3	2005	58,283	10,027	154
Year 4	2006	58,522	9,712	148
Year 5	2007	59,084	9,903	150
5 Year Average Baseline GPCD				**157**
2015 Compliance Year GPCD				
2015		61,798	7,678	**111**
NOTES:				

Appendix H

Climate Change Vulnerability Assessment

The Climate Change Vulnerability Assessment is taken from the Climate Change Handbook for Regional Water Planning, USEPA and DWR, 2011. The vulnerability assessment highlights those water-related resources that are important to a region and are sensitive to climate change.

I. Water Demand

☐ *Are there major industries that require cooling/process water in your planning region?*

- As average temperatures increase, cooling water needs may also increase.
- Identify major industrial water users in your region and assess their current and projected needs for cooling and process water.

☐ *Does water use vary by more than 50% seasonally in parts of your region?*

- Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent.
- Where water use records are available, look at total monthly water uses averaged over the last five years (if available). If maximum and minimum monthly water uses vary by more than 25%, then the answer to this question is "yes".
- Where no water use records exist, is crop irrigation responsible for a significant (say >50%) percentage of water demand in parts of your region?

☐ *Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?*

- Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.

☐ *Do groundwater supplies in your region lack resiliency after drought events?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.

☐ *Are water use curtailment measures effective in your region?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.

☐ *Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?*

- Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are:
    1. not quantified,
    2. not accurate for ecosystem needs under multiple environmental conditions including droughts, and
    3. not met by regional water managers.

II. Water Supply

☐ *Does a portion of the water supply in your region come from snowmelt?*

- Snowmelt is expected to decrease as the climate warms. Water systems supplied by snowmelt are therefore potentially vulnerable to climate change.
- Where watershed planning documents are available, refer to these in identifying parts of your region that rely on surface water for supplies; if your region contains surface water supplies originating in watersheds where snowpack accumulates, the answer to this question is "Yes."
- Where planning documents are not available, identify major rivers in your region with large users. Identify whether the river's headwaters are fed by snowpack.

☐ *Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?*

- Some imported or transferred water supplies are sources from climate-sensitive watersheds, such as water imported from the Delta and the Colorado River.

☐ *Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?*

- Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.

☐ *Would your region have difficulty in storing carryover supply surpluses from year to year?*

- Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.

☐ *Has your region faced a drought in the past during which it failed to meet local water demands?*

- Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.

☐ *Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?*

- As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.

III. Water Quality

☐ *Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?*

- Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research (PIER) Program has posted wildfire susceptibility projections as a Google Earth application at: http://cal-adapt.org/fire/. These projections are only the results of a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

☐ *Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?*

- Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.

☐ *Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?*

- In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

☐ *Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?*

- In the future, low flows are expected decrease, and to last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

☐ *Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?*

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.

IV. Sea Level Rise

☐ *Has coastal erosion already been observed in your region?*

- Coastal erosion is expected to occur over the next century as sea levels rise.

☐ *Are there coastal structures, such as levees or breakwaters, in your region?*

- Coastal structures designed for a specific mean sea level may be impacted by sea level rise.

☐ *Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?*

- Coastal flooding will become more common, and will impact a greater extent of property, as sea levels rise. Critical infrastructure in the coastal floodplain may be at risk.
- Digital elevation maps should be compared with locations of coastal infrastructure.

☐ *Are there climate-sensitive low-lying coastal habitats in your region?*

- Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water.

☐ *Are there areas in your region that currently flood during extreme high tides or storm surges?*

- Areas that are already experiencing flooding during storm surges and very high tides, are more likely to experience increased flooding as sea levels rise.

☐ *Is there land subsidence in the coastal areas of your region?*

- Land subsidence may compound the impacts of sea level rise.

☐ *Do tidal gauges along the coastal parts of your region show an increase over the past several decades?*

- Local sea level rise may be higher or lower than state, national, or continental projections.
- Planners can find information on local tidal gauges at http://tidesandcurrents.noaa.gov/sltrends/sltrends_states.shtml?region=ca .

V. Flooding

☐ *Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at:*

http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/.

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to higher peak flows and more severe floods.
- Refer to FEMA floodplain maps and any recent FEMA, US Army Corps of Engineers, or DWR studies that might help identify specific local vulnerabilities for your region. Other follow-up questions that might help answer this question:

    1. What public safety issues could be affected by increased flooding events or intensity? For example, evacuation routes, emergency personnel access, hospitals, water treatment and wastewater treatment plants, power generation plants and fire stations should be considered.

    2. Could key regional or economic functions be impacted from more frequent and/or intense flooding?

☐ *Does part of your region lie within the Sacramento-San Joaquin Drainage District?*

- The SSJDD contains lands that are susceptible to overflows from the Sacramento and San Joaquin Rivers, and are a key focus of the Central Valley Flood Protection Plan. (http://www.water.ca.gov/cvfmp/program.cfm).

☐ *Does aging critical flood protection infrastructure exist in your region?*

- Levees and other flood protection facilities across the state of California are aging and in need of repair. Due to their overall lowered resiliency, these facilities may be particularly vulnerable to climate change impacts.
- DWR is evaluating more than 300 miles of levees in the San Joaquin and Sacramento Rivers Valleys and the Delta (http://www.water.ca.gov/levees/).

☐ *Have flood control facilities (such as impoundment structures) been insufficient in the past?*

- Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable.

☐ *Are wildfires a concern in parts of your region?*

- Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research Program (PIER) has posted wildfire susceptibility projections as a Google Earth application at: http://cal-adapt.org/fire/. These projections are the results of only a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

VI. Ecosystem and Habitat Vulnerability

☐ *Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?*

- Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change.

☐ *Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?*

- Seasonal high and low flows, especially those originating from snowmelt, are already shifting in many locations.

☐ *Do climate-sensitive fauna or flora populations live in your region?*

- Some specific species are more sensitive to climate variations than others.

☐ *Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?*

- Species that are already threatened or endangered may have a lowered capacity to adapt to climate change.

☐ *Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?*

- Economic values associated with natural habitat can influence prioritization.

☐ *Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?*

- Constrained water quality and quantity requirements may be difficult to meet in the future.

☐ *Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?*

- Storm surges are expected to result in greater damage in the future due to sea level rise. This makes fragile coastal ecosystems vulnerable.

☐ *Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?*

- These ecosystems are particularly vulnerable to climate change.

☐ *Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement**?***

- These ecosystems are particularly vulnerable to climate change.

VII. Hydropower

☐ *Is hydropower a source of electricity in your region?*

- As seasonal river flows shift, hydropower is expected to become less reliable in the future.

☐ *Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?*

- Energy needs are expected to increase in many locations as the climate warms. This increase in electricity demand may compound decreases in hydropower production, increasing its priority for a region.

Appendix I

Petaluma City Municipal Code
Section 15.17: Water Conservation Regulations

Appendix I

CHAPTER 15.17
WATER CONSERVATION REGULATIONS

15.17.010 Title and purpose.

This chapter shall be known as and may be cited as the "City of Petaluma Water Conservation Regulations Ordinance." The purpose of this chapter is to promote the efficient use and reuse of water by all city of Petaluma water service customers by requiring that all new construction projects and existing customers use water as efficiently as possible and comply with new development standards, landscape water use efficiency standards and water waste prohibition regulations. (Ord. 2316 NCS §3 (part), 2009.)

15.17.020 Definitions.

A. Unless a provision in this chapter specifies otherwise, the following terms and phrases, as used in this chapter, shall have the meanings hereinafter designated:

1. "Applied water" means the portion of water supplied by the irrigation system to the landscape.

2. "Authorized representative" or "agent" means any person(s) with written authorization from the property owner to sign documents and bind the property owner to compliance with this chapter.

3. "Automatic irrigation controller" means a timing device used to remotely control valves that operate an irrigation system. Automatic irrigation controllers are able to self-adjust and schedule irrigation events using either evapotranspiration (weather-based) or soil moisture data.

4. "Backflow prevention device" means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

5. "Certificate of completion" means the document required in Section 15.17.050(D).

6. "Certified irrigation designer" means a person certified to design irrigation systems by an accredited academic institution, a professional trade organization or other program such as the U.S. Environmental Protection Agency's WaterSense irrigation designer certification program and Irrigation Association's certified irrigation designer program.

7. "Certified landscape irrigation auditor" means a person certified to perform landscape irrigation audits by an accredited academic institution, a professional trade organization or other program such as the U.S. Environmental Protection Agency's WaterSense irrigation auditor certification program and Irrigation Association's certified landscape irrigation auditor program.

8. "Check valve" or "anti-drain valve" means a valve located under a sprinkler head or other location in the irrigation system, to hold water in the system to prevent drainage from sprinkler heads when the sprinkler is off.

9. "City" means the city of Petaluma. The city council of Petaluma may designate the position (s) or person(s) to whom responsibilities and authority of the city are delegated and may from

time to time modify such delegations. Absent any further specific delegation by the city council, the authority and responsibility set forth in this chapter shall be delegated to the director of publics works and utilities, including his or her designee(s).

10. "Compost" means the safe and stable product of controlled biologic decomposition of organic materials that is beneficial to plant growth.

11. "Conversion factor (0.62)" means the number that converts acre-inches per acre per year to gallons per square foot per year.

12. "Distribution uniformity" means the measure of the uniformity of irrigation water over a defined area.

13. "Drip irrigation" means any nonspray low-volume irrigation system utilizing emission devices with a flow rate measured in gallons per hour. Low-volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

14. "Dwelling unit" means a room or group of internally connected rooms that have sleeping, cooking, eating and sanitation facilities, but not more than one kitchen, which constitutes an independent housekeeping unit, occupied or intended for one household on a long-term basis, or such other definition as may be subsequently adopted by the city as part of its implementing zoning ordinance and/or Smart Code.

15. "Ecological restoration project" means a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

16. "Effective precipitation" or "usable rainfall" (Eppt) means the portion of total precipitation which becomes available for plant growth.

17. "Emitter" means a drip irrigation emission device that delivers water slowly from the system to the soil.

18. "Established landscape" means the point at which plants in the landscape have developed significant root growth into the soil. Typically, most plants are established after one or two years of growth.

19. "Establishment period of the plants" means the first year after installing the plant in the landscape or the first two years if irrigation will be terminated after establishment. Typically, most plants are established after one or two years of growth. Native habitat mitigation areas and trees may need three to five years for establishment.

20. "Estimated total water use" (ETWU) means the total water used for the landscape as described in the water efficient landscape worksheet in Section 15.17.050(C)(2).

21. "ET adjustment factor" (ETAF) means a factor of 0.55 for residential areas and 0.45 for nonresidential areas, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. The ETAF for new and existing (nonrehabilitated) special landscape areas shall not exceed 1.0. The ETAF for existing nonrehabilitated landscapes is 0.8.

22. "ET controller" or "smart controller" means an irrigation system controller or timer that automatically adjusts irrigation run times and run days based on data received from local weather stations. ET stands for evapotranspiration, which is the amount of water that has evaporated from the soil and has transpired through the plant.

23. "Evapotranspiration rate" means the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specified time.

24. "Flow rate" means the rate at which water flows through pipes, valves and emission devices, measured in gallons per minute, gallons per hour, or cubic feet per second.

25. "Flow sensor" means an inline device installed at the supply point of the irrigation system that produces a repeatable signal proportional to flow rate. Flow sensors must be connected to an automatic irrigation controller, or flow monitor capable of receiving flow signals and operating master valves. This combination flow sensor/controller may also function as a landscape water meter or submeter.

26. "Friable" means a soil condition that is easily crumbled or loosely compacted down to a minimum depth per planting material requirements, whereby the root structure of newly planted material will be allowed to spread unimpeded.

27. "Graywater" means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Graywater" includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

28. "Hardscapes" means any durable material (pervious and nonpervious).

29. "Head-to-head coverage" means coverage resulting from placement of irrigation sprinklers so that the water from one sprinkler throws all the way to adjacent sprinklers.

30. "Hydrozone" means a portion of the landscaped area having plants with similar water needs and rooting depth. A hydrozone may be irrigated or nonirrigated.

31. "Infiltration rate" means the rate of water entry into the soil expressed as a depth of water per unit of time (e.g., inches per hour).

32. "Invasive plant species" means species of plants not historically found in California that spread outside cultivated areas and can damage environmental or economic resources. Invasive species may be regulated by county agricultural agencies as noxious species. "Noxious weeds" means any weed as described in the Food and Agricultural Code Section 5004. Lists of invasive plants are maintained at the California Invasive Plant Inventory and USDA invasive and noxious weeds database.

33. "Irrigation audit" means an in-depth evaluation of the performance of an irrigation system conducted by a certified landscape irrigation auditor. An irrigation audit includes, but is not

limited to: inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted in a manner consistent with the Irrigation Association's landscape irrigation auditor certification program or other U.S. Environmental Protection Agency "WaterSense" labeled auditing program.

34. "Irrigation efficiency" (IE) means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The irrigation efficiency for purposes of this chapter is 0.75 for overhead spray devices and 0.81 for drip systems.

35. "Irrigation season" means the time of year when irrigation first begins at a location and last occurs. The irrigation season in Petaluma is typically March/April through October/November.

36. "Landscape architect" means a person who holds a license to practice landscape architecture in the State of California Business and Professions Code Section 5615.

37. "Landscape area" means all the planting areas, turf areas, and water features in a landscape design plan subject to the maximum applied water allowance calculation. The landscape area does not include footprints of buildings or structures, sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or nonpervious hardscapes, and other nonirrigated areas designated for nondevelopment (e.g., open spaces and existing native vegetation).

38. "Landscape contractor" means a person licensed by the state of California to construct, maintain, repair, install, or subcontract the development of landscape systems.

39. "Landscape documentation package" means the documents required under Section 15.17.050(C).

40. "Landscape project" means total area of landscape in a project as defined in "landscape area" for the purposes of this chapter.

41. "Landscape water meter" means an inline device installed at the irrigation supply point that measures the flow of water into the irrigation system and is connected to a totalizer to record water use.

42. "Lateral line" means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

43. "Local agency" means a city or county, including a charter city or charter county, that is responsible for adopting and implementing this chapter. The local agency is also responsible for the enforcement of this chapter, including but not limited to, approval of a permit and plan check or design review of a project.

44. "Local water purveyor" means any entity, including a public agency, city, county, or private water company that provides retail water service.

45. "Low-volume irrigation" means the application of irrigation water at low pressure through a system of tubing or lateral lines and low-volume emitters such as drip, drip lines, and bubblers. Low-volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

46. "Main line" means the pressurized pipeline that delivers water from the water source to the valve or outlet.

47. "Master shut-off valve" is an automatic valve installed at the irrigation supply point, which controls water flow into the irrigation system. When this valve is closed, water will not be supplied to the irrigation system. A master valve will greatly reduce any water loss due to a leaky station valve.

48. "Maximum applied water allowance" (MAWA) means the upper limit of annual applied water for the established landscaped area as specified in Section 15.17.050(C)(2). It is based upon the area's reference evapotranspiration, the ET adjustment factor, and the size of the landscape area. The estimated total water use shall not exceed the maximum applied water allowance. Special landscape areas, including recreation areas, areas permanently and solely dedicated to edible plants such as orchards and vegetable gardens, and areas irrigated with recycled water are subject to the MAWA with an ETAF not to exceed 1.0.

$$MAWA = (ETo)(0.62)[(ETAF \times LA) + ((1 - ETAF) \times SLA)]$$

49. "Median" is an area between opposing lanes of traffic that may be unplanted or planted with trees, shrubs, perennials, and ornamental grasses.

50. "Microclimate" means the climate of a small, specific area that may contrast with the climate of the overall landscape area due to factors such as wind, sun exposure, plant density, or proximity to reflective surfaces.

51. "Mined-land reclamation projects" means any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975.

52. "Mulch" means any organic material such as leaves, bark, straw, compost, or inorganic mineral materials such as rocks, gravel, or decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

53. "New construction," for the purposes of Section 15.17.050, means a new building with a landscape or other new landscape, such as a park, playground, or greenbelt without an associated building.

54. "Nonresidential landscape" means landscapes in commercial, institutional, industrial and public settings that may have areas designated for recreation or public assembly. It also includes portions of common areas of common interest developments with designated recreational areas.

55. "Operating pressure" means the pressure at which the parts of an irrigation system are designed by the manufacturer to operate.

56. "Overhead sprinkler irrigation systems" or "overhead spray irrigation systems" means systems that deliver water through the air (e.g., spray heads and rotors).

57. "Overspray" means the irrigation water which is delivered beyond the target area.

58. "Parkway" means the area between a sidewalk and the curb or traffic lane. It may be planted or unplanted, and with or without pedestrian egress.

59. "Permit" means an authorizing document issued by local agencies.

60. "Pervious" means any surface or material that allows the passage of water through the material and into the underlying soil.

61. "Plant factor" or "plant water use factor" is a factor, when multiplied by ETo, estimates the amount of water needed by plants. For purposes of this chapter, the plant factor range for very low water use plants is 0 to 0.1, the plant factor range for low water use plants is 0.1 to 0.3, the plant factor range for moderate water use plants is 0.4 to 0.6, and the plant factor range for high water use plants is 0.7 to 1.0. Plant factors cited in this chapter are derived from the publication "Water Use Classification of Landscape Species." Plant factors may also be obtained from horticultural researchers from academic institutions or professional associations as approved by the California Department of Water Resources (DWR).

62. "Precipitation rate" means the amount of water applied by an irrigation emission device measured in inches per hour.

63. "Project applicant" means the individual or entity submitting a landscape documentation package, to request a permit, plan check, or design review from the local agency. A project applicant may be the property owner or his or her designee.

64. "Rain sensor" or "rain-sensing shutoff device" means a component which automatically suspends an irrigation event when it rains.

65. "Record drawing" or "as-built" means a set of reproducible drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor.

66. "Recreational area" means areas, excluding private single-family residential areas, designated for active play, recreation or public assembly in parks, sports fields, picnic grounds, amphitheaters or golf course tees, fairways, roughs, surrounds and greens.

67. "Recycled water," "reclaimed water," or "treated sewage effluent water" means treated or recycled waste water of a quality suitable for nonpotable uses such as landscape irrigation and water features. This water is not intended for human consumption.

68. "Reference evapotranspiration" or "ETo" means a standard measurement of environmental parameters which affect the water use of plants. ETo is expressed in inches per day, month, or

year, and is an estimate of the evapotranspiration of a large field of four- to seven-inch-tall, cool-season grass that is well watered. Reference evapotranspiration is used as the basis of determining the maximum applied water allowances so that regional differences in climate can be accommodated.

69. "Rehabilitated project" means any project that requires a permit, plan check, or design review, and the modified landscape area is equal to or greater than two thousand five hundred square feet.

70. "Residential landscape" means landscapes surrounding single- or multifamily homes.

71. "Reverse osmosis" means a process by which a solvent such as water is purified of solutes by being forced through a semipermeable membrane through which the solvent, but not the solutes, may pass.

72. "Runoff" means water which is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a slope.

73. "Soil moisture sensing device" or "soil moisture sensor" means a device that measures the amount of water in the soil. The device may also suspend or initiate an irrigation event.

74. "Soil texture" means the classification of soil based on its percentage of sand, silt, and clay.

75. "Special landscape area" (SLA) means an area of the landscape dedicated solely to edible plants, cemeteries, recreational areas, areas irrigated with recycled water, or water features using recycled water.

76. "Sprinkler head" or "spray head" means a device which delivers water through a nozzle.

77. "Static water pressure" means the pipeline or municipal water supply pressure when water is not flowing.

78. "State" means the state of California.

79. "Station" means an area served by one valve or by a set of valves that operate simultaneously.

80. "Swing joint" means an irrigation component that provides a flexible, leak-free connection between the emission device and lateral pipeline to allow movement in any direction and to prevent equipment damage.

81. "Submeter" means a metering device to measure water applied to the landscape that is installed after the primary utility water meter.

82. "Turf" means a groundcover surface of mowed grass. Annual bluegrass, Kentucky bluegrass, perennial ryegrass, red fescue, and tall fescue are cool-season grasses. Bermuda

grass, kikuyu grass, seashore paspalum, St. Augustine grass, zoysia grass, and buffalo grass are warm-season grasses.

83. "Valve" means a device used to control the flow of water in the irrigation system.

84. "Water feature" means a design element where open water performs an aesthetic or recreational function. Water features include ponds, lakes, waterfalls, fountains, artificial streams, spas, and swimming pools (where water is artificially supplied).

85. "Watering window" means the time of day irrigation is allowed.

86. "WUCOLS" means the Water Use Classification of Landscape Species published by the University of California Cooperative Extension, and the Department of Water Resources 2014.

(Ord. 2562 NCS §2, 2016.)

15.17.030 Development standards.

The development standards established in this section apply to all new commercial, industrial, institutional, agricultural, single-family and multifamily residential construction, including tenant improvements or a change in use requiring any city entitlement or permit for existing commercial, industrial and institutional accounts. The development standards are intended to ensure that all installed water using fixtures, appliances, irrigation systems, and any other water using devices apply water as efficiently as possible.

A. Indoor Water Use Development Standards—New Single-Family Residential Construction. Any water using device installed in any new development shall meet the standards of the California Plumbing Code (Part 5, Title 24, California Code of Regulations), and the following.

B. Standards for New Single-Family Residential Construction.

1. Water closets must be an approved high efficiency toilet (HET) as designated on the city's list of qualifying HETs.

2. Showerheads must not use more than two gallons per minute. Where more than one showerhead exits in a shower unit, each showerhead must be plumbed so that each showerhead can be turned on and off independently from each other.

3. Any clothes washing machine provided with the residence must have a water factor of six or lower.

4. Lavatory and/or bar faucets must not exceed 1.5 gallons per minute.

5. Kitchen and/or utility sink faucets must not exceed 2.2 gallons per minute.

6. All dishwashers must have the EPA's Energy Star label.

C. Standards for New Multifamily Residential Dwellings.

1. Water closets must be an approved high efficiency toilet (HET) as designated on the city's list of qualifying HETs.

2. Showerheads must not use more than two gallons per minute. Where more than one showerhead exits in a shower unit, each showerhead must be plumbed so that each showerhead can be turned on and off independently from each other.

3. Any clothes washing machine installed on the premises must have a water factor of six or lower.

4. Lavatory and/or bar faucets must not exceed 1.5 gallons per minute.

5. Kitchen and/or utility sink faucets must not exceed 2.2 gallons per minute.

6. All dishwashers must have the EPA's Energy Star label.

7. Each dwelling unit must be separately metered or sub-metered.

D. Standards for New Commercial, Industrial, or Institutional (CII) Accounts and Tenant Improvements or Change of Use Requiring Any City Entitlement or Permit for Existing CII Accounts.

1. Water closets and/or urinals must be an approved high efficiency toilet (HET) as designated on the city's list of qualifying CII HETs.

2. Showerheads must not use more than two gallons per minute. Where more than one showerhead exits in a shower unit, each showerhead must be plumbed so that each showerhead can be turned on and off independently from each other.

3. Commercial clothes washing machines shall have a water factor of 4.5 or lower.

4. Lavatory faucets must be self-closing and not exceed 1.5 gallons per minute. All faucets must be equipped with an aeration device.

5. Kitchen and/or utility sink faucets must not exceed 2.2 gallons per minute. All faucets must be equipped with an aeration device.

6. Dishwashers must have the EPA's Energy Star and/or Water Sense designation and must recycle the final rinse into the next wash cycle.

7. Pre-rinse hand-held dish-rinsing wands must not exceed 1.6 gpm and must utilize positive shut-off valves.

8. Cooling towers (see Section 15.48.070 of this code, Sewer Use and Source Control Regulations).

9. Ice makers must be air-cooled.

10. Any other water-using apparatus not mentioned above must use or reuse water as efficiently as possible and must be approved by the city prior to installation.

(Ord. 2316 NCS §3 (part), 2009.)

15.17.040 Standards for new or renovated vehicle wash facilities.

A. Vehicle wash facilities using conveyorized, touchless, and/or rollover in-bay technology shall reuse a minimum of fifty percent of water from previous vehicle rinses in subsequent washes.

B. Vehicle wash facilities using reverse osmosis to produce water rinse with a lower mineral content shall incorporate the unused concentrate in subsequent vehicle washes.

C. Self-service spray wands shall emit no more than three gallons of water per minute.

(Ord. 2316 NCS §3 (part), 2009.)

15.17.050 Landscape water use efficiency standards.

A. Applicability. This chapter shall apply to all of the following projects:

1. New construction projects with an aggregate landscape area equal to or greater than five hundred square feet requiring a building permit, plan check or design review.

2. Rehabilitated projects with an aggregate landscape area equal to or greater than two thousand five hundred square feet within one twelve-month period requiring a building permit, plan check, or design review.

3. Cemeteries. Recognizing the special landscape management needs of cemeteries, new and rehabilitated cemeteries shall be designated as special landscape areas.

4. Any project with an aggregate landscape area of two thousand five hundred square feet or less may comply with the performance requirements of this chapter or conform to the prescriptive measures of this section.

a. Prescriptive requirements may be used as a compliance option to the landscape water use efficiency standards.

b. Compliance with subsections (A)(4)(c) through (h) of this section is mandatory and must be documented on a landscape plan in order to use the prescriptive compliance option.

c. Submit a landscape documentation package (the director of public works and utilities will develop appropriate forms to carry out this section) which includes the following elements:

(1) Date.

(2) Project applicant.

(3) Project address (if available, parcel and/or lot number(s)).

(4) Total landscape area (square feet), including a breakdown of turf and plant material.

(5) Project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed).

(6) Water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well.

(7) Contact information for the project applicant and property owner.

(8) Applicant signature and date with statement, "I agree to comply with the requirements of the prescriptive compliance option to the Landscape Water Use Efficiency Standards."

d. Plant material shall comply with all of the following:

(1) For residential areas, install climate-adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for eighty percent of the plant area excluding edibles and areas using recycled water; for nonresidential areas, install climate-adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for one hundred percent of the plant area excluding edibles and areas using recycled water.

(2) A minimum three-inch layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated.

e. Turf shall comply with all of the following:

(1) Turf shall not exceed twenty percent of the landscape area in residential areas, and there shall be no turf in nonresidential areas.

(2) Turf shall not be planted on sloped areas which exceed a slope of one foot vertical elevation change for every four feet of horizontal length.

(3) Turf is prohibited in parkways less than ten feet wide, unless the parkway is adjacent to a parking strip and used to enter and exit vehicles. Any turf in parkways must be irrigated by sub-surface irrigation or by other technology which creates no overspray or runoff.

f. Irrigation systems shall comply with the following:

(1) Automatic irrigation controllers are required and must use evapotranspiration or soil moisture sensor data and utilize a rain sensor.

(2) Irrigation controllers shall be of a type which does not lose programming data in the event the primary power source is interrupted.

(3) Pressure regulators shall be installed on the irrigation system to ensure the dynamic pressure of the system is within the manufacturer's recommended pressure range.

(4) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be installed as close as possible to the point of connection of the water supply.

(5) All irrigation emission devices must meet the requirements set in the ANSI standard, ASABE/ICC 802-2014, "Landscape Irrigation Sprinkler and Emitter Standard." All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(6) Areas less than ten feet in width in any direction shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

g. All nonresidential landscape projects shall install a private submeter(s) to measure landscape water use.

h. At the time of final inspection, the permit applicant must provide the owner of the property with a certificate of completion, certificate of installation, irrigation schedule and a schedule of landscape and irrigation maintenance.

5. Properties Excluded from Applicability. This chapter does not apply to registered local, state or federal historical sites; properties irrigated with recycled water; ecological restoration projects that do not require a permanent irrigation system; mined-land reclamation projects that do not require a permanent irrigation system; or existing plant collections, as part of botanical gardens and arboretums open to the public. Owners of these excluded properties are encouraged to implement efficient water use practices.

B. Standards Applicable to All Projects.

1. For residential projects, the percentage of the residential landscape area that can be planted with high water use plants including turf shall not exceed twenty percent.

2. For nonresidential projects, the use of high water use plants including turf is limited to special landscape areas.

3. All multifamily residential and nonresidential projects must install a dedicated irrigation meter(s).

4. The maximum amount of water that can be applied to a landscape is fifty-five percent of the reference evapotranspiration rate for residential projects and forty-five percent of the evapotranspiration rate for nonresidential projects. This water allowance reduces the landscape area that can be planted with high water use plants including turf.

5. Irrigation systems are required to have pressure regulators and master shut-off valves.

6. All irrigation emission devices must meet the national standard stated in this chapter to ensure that only high efficiency sprinklers are installed.

7. The irrigation efficiency of devices used to irrigate landscapes is one of the factors that goes into determining the maximum amount of water allowed.

8. Flow sensors that detect and report high flow conditions due to broken pipes and/or popped sprinkler heads are required for landscape areas greater than five thousand square feet.

9. The minimum width of areas that can be overhead irrigated is ten feet; areas less than ten feet wide must be irrigated with subsurface drip or other technology that produces no over spray or runoff.

10. Friable soil is required in planting areas.

11. For landscape installations, four yards of compost per one thousand square feet of area must be incorporated to a depth of six inches into the soil.

12. All landscape and/or irrigation systems shall be installed so as not to violate the city's water waste prohibition (Section 15.17.070).

C. Application Process. Prior to commencing any construction activities related to implementation of the project, the applicant shall submit to the city a landscape documentation package consisting of the following information on forms prepared by the city's director of public works and utilities as described in further detail below:

1. Project Application Form. The project application form shall contain the following information:

a. Project information.

b. Date.

c. Project applicant.

d. Project address (if available, parcel and/or lot number(s)).

e. Total landscape area (square feet).

f. Project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed).

g. Water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well.

h. Checklist of all documents in landscape document package.

i. Project contacts to include contact information for the project applicant and property owner.

j. Applicant signature and date with statement, "I agree to comply with the requirements of the Landscape Water Use Efficiency Standards and submit a complete Landscape Documentation Package."

2. Water Efficient Landscape Worksheet.

a. The form shall contain information on the plant factor, irrigation method, irrigation efficiency, and area associated with each hydrozone. The worksheet shall include calculation methods to demonstrate that the ETAF for the landscape project does not exceed a factor of 0.55 for residential areas and 0.45 for nonresidential areas, exclusive of

special landscape areas. The ETAF for a landscape project is based on the plant factors and irrigation methods selected. The MAWA is calculated based on the maximum ETAF allowed (0.55 for residential areas and 0.45 for nonresidential areas) and expressed as annual gallons required. ETWU is calculated based on the plants used and irrigation method selected for the landscape design. ETWU must be below the MAWA.

(1) For the purpose of determining ETWU, average irrigation efficiency is assumed to be 0.75 for overhead spray devices and 0.81 for drip system devices.

(2) In calculating the MAWA and ETWU, a project applicant shall use the ETo values from the Reference Evapotranspiration Table below:

Reference Evapotranspiration (ETo) Table for Petaluma, CA

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
1.2	1.5	2.8	3.7	4.6	5.6	4.6	5.7	4.5	2.9	1.4	0.9	39.6

b. Water budget calculations shall adhere to the following requirements:

(1) The plant factor used shall be from WUCOLS or from horticultural researchers with academic institutions or professional associations as approved by the California Department of Water Resources (DWR). The plant factor ranges from 0 to 0.1 for very low water using plants, 0.1 to 0.3 for low water use plants, from 0.4 to 0.6 for moderate water use plants, and from 0.7 to 1.0 for high water use plants.

(2) All water features shall be included in the high water use hydrozone and temporarily irrigated areas shall be included in the low water use hydrozone.

(3) All special landscape areas shall be identified and their water use calculated.

(4) ETAF for new and existing (nonrehabilitated) special landscape areas shall not exceed 1.0.

(5) The surface area of water features is included in the high water use hydrozone of the landscape area. Constructed wetlands used for on-site wastewater treatment or stormwater best management practices that are not irrigated and used solely for water treatment or stormwater retention are not water features and, therefore, are not subject to the water budget calculation.

3. Soil Management Report. The purpose of the report is to facilitate reduction in runoff and encouragement of healthy plant growth, and shall be completed by the project applicant as follows:

a. Submit soil samples to a laboratory for analysis. Soil sampling shall be conducted in accordance with laboratory protocol, including protocols regarding adequate sampling depth for the intended plants.

(1) The soil analysis shall include soil texture, infiltration rate determined by laboratory test or soil-infiltration rate table, pH, total soluble salts, sodium, percent organic matter, and recommendations.

(2) In projects with multiple landscape installations (e.g., production home developments), a soil-sampling rate of at least fifteen percent of the lots will satisfy this requirement.

b. The director of public works and utilities or his/her designee shall determine the timing of the submission of the report based on the following:

(1) If significant mass grading is not planned, the soil analysis report shall be submitted to the city as part of the landscape documentation package; or

(2) If significant mass grading is planned, the soil analysis report shall be submitted to the city as part of the certificate of completion.

c. The soil analysis report shall be made available, in a timely manner, to the professionals preparing the landscape design plans and irrigation design plans to make any necessary adjustments to the design plans.

d. The project applicant, or his/her designee, shall submit documentation verifying implementation of soil analysis report recommendations to the city with certificate of completion.

4. Landscape Design Plan. A landscape design plan meeting the following design criteria shall be submitted as part of the landscape documentation package:

a. Plant Material. Plants selected for the landscape shall not cause the ETWU in the landscape area to exceed the MAWA.

(1) Methods to achieve water efficiency shall include the following: invasive species as listed by the California Invasive Plant Council are prohibited; selection of water-conserving plant, tree and turf species, especially local native plants; selection of plants based on local climate suitability, disease and pest resistance; selection of trees based on shading and size at maturity as appropriate for the planting area; and selection of plants from local and regional landscape program plant lists.

(2) Plants with similar water needs shall be grouped together in distinct hydrozones and where irrigation is required the distinct hydrozones shall be irrigated with separate valves.

(3) High water use plants shall not be mixed with very low, low or moderate water use plants in the same hydrozone.

(4) Plants shall be selected and planted appropriately based upon their adaptability to the climatic, geologic, and topographical conditions of the project site. Methods to achieve water efficiency shall include one or more of the following: use the Sunset Western Climate Zone System which takes into account temperature, humidity,

elevation, terrain, latitude, and varying degrees of continental and marine influence on local climate; recognize the horticultural attributes of plants (i.e., mature plant size, invasive surface roots) to minimize damage to property or infrastructure (e.g., buildings, sidewalks, power lines); allow for adequate soil volume for healthy root growth; and consider the solar orientation for plant placement to maximize summer shade and winter solar gain.

(5) Turf and high water use plants characterized by a plant factor of 0.7 to 1.0 shall not be planted in the following conditions: slopes exceeding ten percent; street medians, traffic islands, planter strips or bulbouts of any size.

(6) Turf shall not be used in planting areas ten feet wide or less.

(7) High water use plants including turf shall occupy no more than a combined twenty percent of the total irrigated landscaped area in residential landscape projects. High water use plants including turf are limited to special landscape areas for all nonresidential landscape projects.

(8) The architectural guidelines of a common interest development, which include community apartment projects, condominiums, planned developments, and stock cooperatives, shall not prohibit or include conditions that have the effect of prohibiting the use of low-water use plants as a group.

(9) Landscape design shall be in compliance with Chapter 8.28, Heritage and Landmark Trees.

b. Water Features.

(1) Recirculating water systems shall be used for water features.

(2) Where available, recycled water shall be used as a source for decorative water features.

(3) Surface area of a water feature shall be included in the high water use hydrozone area of the water budget calculation.

(4) Pool and spa covers are required.

c. Soil Preparation, Mulch and Amendments. Prior to the planting of any materials, compacted soils shall be transformed to a friable condition. On engineered slopes, only amended planting holes need meet this requirement.

(1) Soil amendments shall be incorporated according to recommendations of the soil report and what is appropriate for the plants selected.

(2) For landscape installations, compost at a rate of a minimum of four cubic yards per one thousand square feet of permeable area shall be incorporated to a depth of six inches into the soil or per specific amendment recommendations from a soils report.

Soils with greater than six percent organic matter in the top six inches of soil are exempt from adding compost and tilling.

(3) A minimum three-inch layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated. To provide habitat for beneficial insects and other wildlife, up to five percent of the landscape area may be left without mulch. Designated insect habitat must be included in the landscape design plan as such.

d. In addition, the landscape design plan, at a minimum, shall:

(1) Delineate and label each hydrozone by number, letter, or other method.

(2) Identify each hydrozone as very low, low, moderate, high water, or mixed water use. Temporarily irrigated areas of the landscape shall be included in the low water use hydrozone for the water budget calculation.

(3) Identify recreational areas.

(4) Identify areas permanently and solely dedicated to edible plants.

(5) Identify areas irrigated with recycled water.

(6) Identify type of mulch and application depth.

(7) Identify soil amendments, type, and quantity.

(8) Identify type and surface area of water features.

(9) Identify hardscapes (pervious and nonpervious).

(10) Identify new and existing trees, shrubs, groundcovers, turf and any other planting areas.

(11) Identify plant sizes and quantity.

(12) Identify plants by botanical name and common name.

(13) Identify property lines, new and existing building footprints, streets, driveways, sidewalks, and other hardscape features (pervious and nonpervious).

(14) Identify location and installation details of any applicable stormwater best management practices that encourage on-site retention and infiltration of stormwater.

(15) Identify any applicable rain harvesting or catchment technologies.

(16) Identify any applicable graywater discharge piping, system components and area (s) of distribution.

(17) Contain the following statement: "I have complied with the criteria of the ordinance and applied them for the efficient use of water in the landscape design plan."

(18) Bear the signature of a licensed landscape architect, licensed landscape contractor, or any other person authorized to design a landscape. (See Sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the Business and Professions Code, Section 832.27 of Title 16 of the California Code of Regulations, and Section 6721 of the Food and Agriculture Code.)

5. Irrigation Design Plan. This section applies to landscaped areas requiring permanent irrigation, not areas that require temporary irrigation solely for the plant establishment period. An irrigation design plan meeting the following design criteria shall be submitted as part of the landscape documentation package.

a. System.

(1) For the efficient use of water, an irrigation system shall meet all the requirements listed in this section and the manufacturers' recommendations. The irrigation system and its related components shall be planned and designed to allow for proper installation, management, and maintenance.

(2) Landscape water meters, defined as either a dedicated water service meter or private submeter, shall be installed for all multi-family residential landscape, nonresidential landscape and all residential irrigated landscapes of five thousand square feet or greater.

(3) Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data utilizing nonvolatile memory shall be required for irrigation scheduling in all irrigation systems.

(4) Pressure regulating devices shall be installed to ensure the dynamic pressure at each emission device is within the manufacturer's recommended pressure range for optimal performance.

(5) Pressure regulating devices such as inline pressure regulators, booster pumps, or other devices shall be installed to meet the required dynamic pressure of the irrigation system.

(6) Static water pressure, dynamic or operating pressure, and flow reading of the water supply shall be measured at the point of connection. These pressure and flow measurements shall be conducted at the design stage. If the measurements are not available at the design stage, the measurements shall be conducted at installation.

(7) Sensors (rain, freeze, wind, etc.), either integral or auxiliary, that suspend or alter irrigation operation during unfavorable weather conditions shall be required on all irrigation systems, as appropriate for local climatic conditions. Irrigation should be avoided during windy or freezing weather or during rain.

(8) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be required, as close as possible to the point of connection of the water supply, to minimize water loss in case of an emergency (such as a main line break) or routine repair.

(9) Backflow prevention devices shall be required to protect the water supply from contamination by the irrigation system.

(10) Flow sensors that detect high flow conditions created by system damage or malfunction are required for all nonresidential landscapes and residential landscapes of five thousand square feet or larger.

(11) Master shut-off valves are required on all projects except landscapes that make use of technologies that allow for the individual control of sprinklers that are individually pressurized in a system equipped with low pressure shut down features.

(12) Isolation valves shall be installed at the point of connection and before each valve or valve manifold.

(13) The irrigation system shall be designed to prevent runoff, low head drainage, overspray, or other similar conditions where irrigation water flows onto nontargeted areas, such as adjacent property, nonirrigated areas, hardscapes, roadways, or structures.

(14) Relevant information from the soil management plan, such as soil type and infiltration rate, shall be utilized when designing irrigation systems.

(15) The design of the irrigation system shall conform to the hydrozones of the landscape design plan.

(16) The irrigation system must be designed and installed to meet, at a minimum, the irrigation efficiency criteria regarding the MAWA.

(17) All irrigation emission devices must meet the requirements set in the American National Standards Institute (ANSI) standard, American Society of Agricultural and Biological Engineers'/International Code Council's (ASABE/ICC) 802-2014 "Landscape Irrigation Sprinkler and Emitter Standard." All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(18) The project applicant shall inquire with the local water purveyor about peak water operating demands (on the water supply system) or water restrictions that may impact the effectiveness of the irrigation system.

(19) In mulched planting areas, the use of low volume irrigation is required to maximize water infiltration into the root zone.

(20) Sprinkler heads and other emission devices shall have matched precipitation rates, unless otherwise directed by the manufacturer's recommendations.

(21) Head-to-head coverage is required unless otherwise directed by the manufacturer's recommendations. Sprinkler spacing shall be designed to achieve the highest possible distribution uniformity.

(22) Swing joints or other riser-protection components are required on all risers.

(23) Check valves or anti-drain valves are required on all sprinkler heads where low point drainage could occur.

(24) Areas less than ten feet in width in any direction shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

(25) Overhead irrigation shall not be permitted within twenty-four inches of any nonpermeable surface. Allowable irrigation within the setback from nonpermeable surfaces may include drip, drip line, or other low flow nonspray technology. The setback area may be planted or unplanted. The surfacing of the setback may be mulch, gravel, or other porous material. These restrictions may be modified if: The landscape area is adjacent to permeable surfacing and no runoff occurs; or the adjacent nonpermeable surfaces are designed and constructed to drain entirely to landscaping; or the irrigation designer specifies an alternative design or technology, as part of the landscape documentation package and clearly demonstrates strict adherence to irrigation system design criteria. Prevention of overspray and runoff must be confirmed during the irrigation audit.

(26) Slopes greater than fifteen percent shall be irrigated with point source or other low-volume irrigation technology. Prevention of runoff and erosion must be confirmed during the irrigation audit.

(27) Point source irrigation is required where plant height at maturity will affect the uniformity of an overhead system.

b. Hydrozone.

(1) Each valve shall irrigate a hydrozone with similar site, slope, sun exposure, soil conditions, and plant materials with similar water use.

(2) Sprinkler heads and other emission devices shall be selected based on what is appropriate for the plant type within that hydrozone.

(3) Trees shall be placed on separate valves from shrubs, groundcovers, and turf to facilitate the appropriate irrigation of trees. The mature size and extent of the root zone shall be considered when designing irrigation for the tree.

(4) Individual hydrozones that mix plants of moderate and low water use, or moderate and high water use, may be allowed if: plant factor calculation is based on the proportions of the respective plant water uses and their plant factor; or the plant factor of the higher water using plant is used for calculations.

(5) Individual hydrozones that mix high and low water use plants shall not be permitted.

(6) On the landscape design plan and irrigation design plan, hydrozone areas shall be designated by number, letter, or other designation.

(7) The landscape design plan shall include a hydrozone table listing each hydrozone and the respective description, plant factor, irrigation method, landscape area in square feet, and percent of total landscape area.

c. In addition, the irrigation design plan, at a minimum, shall contain:

(1) Location and size of separate water meters for landscape.

(2) Location and size of irrigation system point of connection.

(3) Location, type and size of all components of the irrigation system, including controllers, main and lateral lines, master valves, valves, sprinkler heads and other application devices, moisture-sensing devices, rain sensors, check valves, quick couplers, flow sensors, pressure regulators, and backflow-prevention devices.

(4) Designate the areas irrigated by each valve, and assign a number to each valve.

(5) Static water pressure at the point of connection to the public water supply.

(6) Flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station.

(7) Recycled water irrigation systems (if applicable).

(8) The hydrozone table.

(9) The following statement: "I have complied with the criteria of the ordinance and applied them accordingly for the efficient use of water in the irrigation design plan"; and

(10) The signature of a licensed landscape architect, certified irrigation designer, licensed landscape contractor, or any other person authorized to design an irrigation system. (See Sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the Business and Professions Code, Section 832.27 of Title 16 of the California Code of Regulations, and Section 6721 of the Food and Agricultural Code.)

6. Grading Design Plan. A comprehensive grading plan shall be submitted and include:

a. The grading design plan shall indicate finished configurations and elevations of the landscape area including:

(1) Height of graded slopes.

(2) Drainage patterns.

(3) Pad elevations.

(4) Finish grade.

(5) Stormwater retention improvements, if applicable.

b. The grading design plan shall demonstrate:

(1) That all irrigation and normal rainfall remains within property lines and does not drain onto nonpermeable hardscapes.

(2) Avoids disruption of natural drainage patterns and undisturbed soil.

(3) Avoids soil compaction in landscape areas.

c. The grading design plan shall contain the following statement: "I have complied with the criteria of the ordinance and applied them accordingly for the efficient use of water in the grading design plan" and shall bear the signature of a licensed professional as authorized by law.

d. A comprehensive grading plan prepared by a civil engineer for other local agency permits may satisfy this requirement.

D. Certificate of Completion. Prior to the final city permit being issued, the project applicant or applicant shall submit a completed certificate of completion on a form prepared by the director of public works.

1. The certificate of completion form shall include the following elements:

a. Project information.

b. Date.

c. Project name.

d. Project applicant name, telephone, and mailing address.

e. Project address and location.

f. Property owner name, telephone, and mailing address.

g. Certification by either the signer of the landscape design plan, the signer of the irrigation design plan, or the licensed landscape contractor that the landscape project has been installed per the approved landscape documentation package.

2. The certificate of completion shall be submitted to the city for review with the following attachments:

a. Irrigation Schedule. All irrigation schedules shall be developed, managed and evaluated to utilize the minimum amount of water required to maintain plant health. Irrigation schedules shall meet the following criteria:

(1) Irrigation scheduling shall be regulated by automatic irrigation controllers.

(2) For implementation of the irrigation schedule, particular attention must be paid to irrigation run times, emission device, flow rate, and current reference evapotranspiration, so that applied water meets the ETWU. Total annual applied water shall be less than or equal to MAWA. Actual irrigation schedules shall be regulated by automatic irrigation controllers using current reference evapotranspiration data or soil moisture sensor data.

(3) Parameters used to set the automatic controller shall be developed and submitted for each of the following:

(A) Plant establishment period.

(B) The established landscape.

(C) Temporarily irrigated areas.

(4) Each irrigation schedule shall consider for each station all of the following that apply:

(A) Irrigation interval (days between irrigation).

(B) Irrigation run times (hours or minutes per irrigation event to avoid runoff).

(C) Number of cycle starts required for each irrigation event to avoid runoff.

(D) Amount of applied water scheduled to be applied on a monthly basis.

(E) Application rate setting.

(F) Root depth setting.

(G) Plant type.

(H) Slope factor setting.

(I) Shade factor setting.

(J) Irrigation uniformity or efficiency setting.

b. Landscape and Irrigation Maintenance Schedule. A regular maintenance schedule shall be developed, which meets the following criteria:

(1) Landscapes shall be maintained to ensure water use efficiency.

(2) The schedule shall include, but not be limited to, routine inspection; auditing, adjustment and repair of the irrigation system and its components; aerating and dethatching turf areas; topdressing with compost, replenishing mulch; fertilizing; pruning; weeding in all landscape areas; and removing any obstructions to emission devices.

(3) Operation of the irrigation system outside the normal watering window is allowed for auditing and system maintenance.

(4) Repair of all irrigation equipment shall be done with the originally installed components or their equivalents or with components with greater efficiency.

(5) An irrigation maintenance schedule timeline that includes routine inspections, adjustments and repairs to the irrigation system, aerating and dethatching turf areas, replenishing mulch, fertilizing, pruning and weeding.

c. Landscape Irrigation Audit Report. An audit report shall be developed which meets the following criteria:

(1) Operating pressure of the irrigation system.

(2) Distribution uniformity of overhead irrigation.

(3) Precipitation rate of overhead irrigation.

(4) Report of any overspray or broken irrigation equipment.

(5) Irrigation schedule: plant establishment irrigation schedule and regular irrigation schedule by month that includes plant type, root depth, soil type, slope factor, shade factor, irrigation interval, irrigation runtimes, number of start times per irrigation day, gallons per minute for each valve, precipitation rate, distribution uniformity and monthly estimated water use calculations.

(6) Verification that a diagram of the irrigation plan showing hydrozones is kept with the irrigation controller for subsequent management purposes.

(7) All landscape irrigation audits shall be conducted by a certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who designed the landscape or installed the landscape.

(8) In large projects or projects with multiple landscape installations an auditing rate of fifteen percent is required.

d. Soil management report, if not submitted with the landscape documentation package, and documentation verifying implementation of soil report recommendations.

3. Copies of the approved certificate of completion shall be provided to the property owner or his or her designee.

E. Public Education. All model homes that are landscaped shall use signs that provide written information to demonstrate the principles of water efficient landscapes described in this chapter.

1. Signs shall be used to identify the model as an example of a water efficient landscape featuring elements such as hydrozones, irrigation equipment, and others that contribute to the overall water-efficient theme. Signage shall include information about the site water use as designed per the local ordinance; specify who designed and installed the water efficient

landscape; and demonstrate low water use approaches to landscaping such as using native plants.

2. Information shall be provided about designing, installing, managing, and maintaining water-efficient landscapes.

(Ord. 2562 NCS §3, 2016.)

15.17.060 Water budgets for new and existing dedicated irrigation accounts.

The city shall provide any account with a dedicated irrigation meter(s) a landscape water budget. The water budget will be calculated by the city or its agent by measuring the total irrigated landscaped area and the plant type(s) that exist per water meter. Any account assigned a water budget may not exceed the water budget for that billing period by more than twenty percent during that billing period. Accounts that exceed their water budget by more than twenty percent will be notified by the city. The city will work with the property owner or its authorized representative to ensure corrective actions are taken. Exceeding an account's water budget by more than twenty percent more than two times in one twelve-month period and/or failure to cooperate with the city in taking corrective action after notification by the city of specific action(s) to be taken shall constitute a violation of this chapter. (Ord. 2316 NCS §3 (part), 2009.)

15.17.070 Water waste prohibition.

The purpose this section is to promote water conservation and efficient use of potable water furnished by the city of Petaluma by eliminating nonessential water use and intentional or unintentional water waste when a reasonable alternative solution is available and by prohibiting the use of water equipment that is wasteful.

A. Nonessential Uses Defined and Prohibited. No customer of the city shall use or permit the use of potable water from the city for residential, commercial, institutional, industrial, agricultural, or other purpose for the following nonessential uses:

1. The washing of sidewalks, walkways, driveways, parking lots and other hard-surfaced areas by direct hosing not equipped with a shutoff nozzle, except as may be necessary to properly dispose of flammable or other dangerous liquids or substances and/or to prevent or eliminate materials dangerous to the public health and safety;

2. The escape of water through breaks or leaks within the customer's plumbing or private distribution system for any substantial period of time within which such break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of one hour to stop the flow of water from such break or leak after the consumer discovers such a break or leak or receives notice from the city, and seventy-two hours to correct such break or leak after the consumer discovers such a break or leak or receives notice from the city, is a reasonable time period;

3. Irrigation in a manner or to the extent that allows runoff of water or over-spray of the areas being irrigated. Every customer is deemed to have their irrigation system under control at all

times, to know the manner and extent of their water use and any runoff and overspray, and to employ available alternatives to apply irrigation water in an efficient manner;

4. Washing cars, boats, trailers, or other vehicles, equipment and machinery directly with a hose not equipped with a hose-end shutoff nozzle;

5. Using water for nonrecycling water features;

6. Using water for single pass evaporative cooling systems for air conditioning in all connections installed after July 1, 2001, unless required for health or safety reasons;

7. Using water for new nonrecirculating conveyor car wash systems; self-service car wash spray wands shall emit no more than three gallons of water per minute;

8. Using water for new nonrecirculating industrial clothes washing systems;

9. Dedicated irrigation accounts exceeding the allocated water budget by more than twenty percent in any billing period.

B. Pressure Regulation. A pressure-regulating valve shall be installed and maintained by the consumer if static service pressure at the meter exceeds eighty pounds per square inch. The pressure-regulating valve shall be located between the meter and the structure valve, and set at not more than sixty pounds per square inch when measured at the structure valve. This requirement may be waived if the consumer presents evidence satisfactory to the city that high pressure is necessary in the design and that no water will be wasted as a result of high-pressure operation.

C. Swimming Pool and Spa Covers. Covers are required for all outdoor swimming pools and spas.

D. Exempt Water Uses. All water use associated with the operation and maintenance of fire suppression equipment or employed by the city for water quality flushing and sanitation purposes shall be exempt from the provisions of this section. Use of water supplied by a private well or from properly authorized recycled water, gray water, or rainwater catchment system is also exempt.

(Ord. 2316 NCS §3 (part), 2009.)

15.17.080 Exceptions.

Any customer of the city may make written application for an exception to the water conservation regulations ordinance. Said application shall describe in detail why applicant believes an exception is justified:

A. The director of water resources and conservation may grant exceptions for use of water otherwise prohibited by this chapter if an exception is necessary to avoid an adverse impact on health, sanitation or safety of the applicant or the public, and/or to avoid undue hardship for the applicant or the public. Any exception granted shall not be broader than necessary, or of a duration longer than necessary to avoid the adverse effect on health, sanitation, fire protection or safety and/or to avoid the undue hardship.

B. The decision of the director of water resources and conservation may be appealed to the city council by submitting a written appeal to the city clerk within fifteen calendar days of the date of the

decision. Upon granting any appeal, the council may impose any conditions it determines to be just and proper. Exceptions granted by the council shall be prepared in writing, and the council may require the exception be recorded at applicant's expense.

(Ord. 2316 NCS §3 (part), 2009.)

15.17.090 Applicability of water shortage emergency regulations.

In the event of conflict between the provisions of this chapter and the provisions of Chapter 15.18, the provisions of Chapter 15.18 shall supersede the provisions of this chapter from such time as the city council has determined and declared by resolution that a water shortage emergency exists pursuant to Chapter 15.18, as it may be subsequently amended, until such time as the declaration of emergency has been suspended by later resolution of the city council. (Ord. 2316 NCS §3 (part), 2009.)

15.17.100 Enforcement and fees.

A. Depending on the extent of the water waste, the city may, after written notification to customer and a reasonable time to correct the violation as solely determined by the city, take some or all of the following actions. Seventy-two hours from notice of the violation shall be considered a reasonable time for correction, absent unusual circumstances that lengthen or shorten the reasonable time for correction. Penalties, fees and charges noted below shall be established by resolution of the city:

1. Personal contact with the customer at the address of the water service. If personal contact is unsuccessful, written notice of the violation including a date that the violation is to be corrected may be left on the premises, with a copy of the notice sent by certified mail to the customer.

2. The city may install a flow-restricting device on the service line.

3. The city may levy a water waste fine to the customer.

4. The city may shut off water service, and the charge for same shall be billed to the customer. Except in cases of extreme emergency as solely determined by the city manager, service shall not be reinstated until verified by the city that the violation has been corrected and all charges and fees have been paid.

B. Depending on the nature and extent of water waste and/or the condition creating water waste, the city may discontinue water services without notice, pursuant to Section 15.12.070, and/or discontinue water services pursuant to Section 15.12.080.

C. In addition to discontinuance of water services, any violation of this chapter is subject to enforcement as specified in Chapters 1.10 through 1.16.

(Ord. 2316 NCS §3 (part), 2009.)