

2015 RETAIL WATER CONSERVATION PLAN



San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission



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2015 Retail Water Conservation Plan

San Francisco Public Utilities Commission
Water Enterprise

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List of Acronyms & Abbreviations

AF	acre-feet
CAP	Community Assistance Program
CEE	Consortium for Energy Efficiency
CII	Commercial, Industrial, and Institutional
City	City and County of San Francisco
CUWCC	California Urban Water Conservation Council
GPCD	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
HET	high-efficiency toilet
HEU	high-efficiency urinal
IWF	integrated water factor
LEED	Leadership in Energy & Environmental Design
mgd	million gallons per day
MOU	Memorandum of Understanding
R-GPCD	residential gallons per capita per day
SB X7-7	Senate Bill X7-7 Water Conservation Act of 2009
SFPUC	San Francisco Public Utilities Commission
ULFT	Ultra-low flow toilet
UWMP	Urban Water Management Plan
WF	Water Factor
WSIP	Water System Improvement Program

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EXECUTIVE SUMMARY

The San Francisco Public Utilities Commission (SFPUC) has long been committed to conserving water. For over 25 years, the SFPUC's increasingly comprehensive water conservation program has offered a variety of incentives and services, as well as educational assistance aimed at promoting efficient water use among its retail water customers. This *2015 Retail Water Conservation Plan* (2015 Plan) provides an overview of the retail water conservation program, the factors that shaped the program, estimated water savings, and the program's effect on the overall retail water demand forecast.

The main purposes of the 2015 Plan are to:

- Serve as a broad guidance document that helps inform annual activities, such as staffing and budget needs both internally and for stakeholders;
- Summarize the mix of measures that the SFPUC plans to implement going forward, including the estimated water savings, costs, and effects on retail water demand;
- Explain the evaluation process and factors considered in selecting conservation measures; and
- Provide an update to the *2011 San Francisco Public Utilities Commission Retail Water Conservation Plan* (2011 Plan) as part of a five-year review cycle to assess program performance and identify the need for any adjustments.

The 2015 Plan also addresses several major changes and updates that have occurred since the completion of the 2011 Plan. These changes include the introduction of new codes and regulations, a better understanding of plumbing fixture saturation rates as a result of a market saturation analysis, and refined program participation rates. Additionally, the SFPUC adopted an updated demand model, which necessitated the development and use of a new model for tracking water conservation activities. This new conservation model tracks water savings derived from adherence to plumbing codes (referred to as passive conservation savings) as well as those resulting from the SFPUC water conservation program (referred to as active conservation savings). The 2015 Plan has been updated to reflect the impact that these changes have had on water demand projections and the design of the conservation program.

The planning horizon for the 2015 Plan spans a 25-year period (from 2015 to 2040) to coincide with the planning horizon of the *2015 Urban Water Management Plan* (UWMP), although this analysis of the water conservation program primarily focuses on the next five years (2015-2020). Beyond this timeframe, there is less certainty regarding measure parameters and program design because of such unknown factors as potential new technology and changes in plumbing codes.

The SFPUC's Water Resources Division is responsible for the implementation of its water conservation program, as well as the development of local water supplies such as groundwater, recycled water, and non-potable water. Together these programs supplement and diversify the SFPUC's portfolio of water resources and reduce demand on our regional water system. While outside the scope of the conservation program, the SFPUC also proactively replaces miles of its mains and pipelines a year to reduce water loss from breaks and leaks.

The SFPUC's current retail water conservation program consists of an extensive mix of measures, including incentives, services, and educational assistance. A complete list of measures can be found in Section 5 of this document. In summary, incentives include rebates for high-efficiency fixtures; free toilets and installations for qualifying customers; discounts for graywater and rainwater systems; grants for large landscape irrigation efficiency improvements; and free efficient devices. Services include conservation surveys, landscape plan review, and school education programs. The SFPUC also provides a host of tools to help customers understand and manage their water use, including an online portal (My

Account) for viewing daily, weekly, and monthly water use; alerts to single family customers with continuous water use; and a bill adjustment program for leak repair.

Table 1 summarizes the effects of the SFPUC’s conservation program on the overall retail water demand, and includes all retail customers within and outside of San Francisco. The Unadjusted Baseline Demand indicates the projected retail demand if there were no conservation efforts. The Plumbing Code adjustment is the projected savings resulting from water efficiency-related codes and legislation (passive savings) and the SFPUC Programs adjustment is the projected savings resulting from SFPUC-initiated conservation activities (active savings). Distribution System Losses refer to non-revenue water such as water lost through leaks and breaks in SFPUC system pipes, mains and infrastructure, and water used for main flushing, and are based on historical losses. The Adjusted Retail Demand is the result of subtracting the three adjustments from the Unadjusted Baseline Demand, which, when divided by the population, provides the per capita water use picture of the retail system.

Table 1: Retail Water Demands with Water Conservation

	2005	2010	2015	2018	2020	2025	2030	2035	2040
	million gallons per day (mgd)								
Unadjusted Baseline Demand	81.2	76.7	74.1	79.9	83.8	87.6	93.0	98.4	104.1
Adjustments:									
1. Plumbing Code	-3.8	-4.9	-6.9	-8.3	-9.5	-12.5	-14.9	-17.0	-18.9
2. SFPUC Programs	-0.1	-1.2	-2.7	-3.3	-3.4	-2.6	-2.3	-2.0	-1.8
3. Distribution System Losses	8.3	6.4	5.3	6.0	6.0	6.0	6.0	6.0	6.0
Adjusted Retail Demand	85.6	76.9	69.8	74.4	77.0	78.5	81.8	85.4	89.4
Population (1,000)	782	807	859	879	892	937	984	1,034	1,087
Gross Per Capita Use (GPCD)	110	95	81	85	86	84	83	83	82
Residential GPCD (R-GPCD)	61	53	44	44	44	43	44	44	45

Note: Sum of demands and adjustments may not match the totals due to rounding.

Key points for the water conservation program and its effect on water demands:

- Since its inception, the conservation program has incentivized the replacement of thousands of inefficient plumbing fixtures, contributing to current saturation rates of 74% for water-efficient toilets and 57% for efficient clothes washers.
- Moving forward, the program will continue to consist of an extensive mix of incentives, services, and tools and serve all three customer sectors (i.e., single family residential, multi-family residential, and non-residential). Foundational customer assistance measures, including water evaluation surveys, site usage reports and tools, free devices, and public education and outreach will continue to be offered with no definite end date. Fixture incentive measures for toilets, urinals and washers, however, are expected to be phased out by 2020 or earlier because of new legislation and codes, as well as high market saturation rates for toilets, in particular. It is likely that the SFPUC will pursue new measures in the future, but information on these measures is not well enough defined to be included in the program analysis.
- From 2005 through 2015, an estimated 9.6 million gallons per day (mgd) of water savings have been achieved through active and passive conservation efforts, and over 11.5 mgd in 2018 and 12.8 mgd by 2020 are projected. The 2015 Plan’s estimated active water savings for 2018 is 3.3 mgd, which is lower than the 5.0 mgd projected in the 2011 Plan; the estimated passive water savings for 2018 is 8.3 mgd, which is also lower than projections in the 2011 Plan. This change

can be attributed to three factors: lowered participation targets for a number of measures based on historical participation data; lowered savings assumptions for residential toilets and washers to account for new efficiency standards that affect potential water savings; and earlier end dates for measures related to toilets due to anticipated high market saturation.

- San Francisco's retail water demand has continued to decline through 2015 despite population growth. In 2005, its gross per capita water use was 110 gallons per capita per day (GPCD) and its residential per capita water use was 61 R-GPCD. In 2015, these figures dropped to 81 GPCD and 44 R-GPCD and are projected to remain low at 86 GPCD and 44 R-GPCD by 2020. These figures indicate that the SFPUC is already in compliance with the 2015 interim conservation goal of 102 GPCD set forth in Senate Bill X7-7 (SB X7-7). In addition, the SFPUC is expected to meet the 2020 final goal of 96 GPCD.
- While overall demand has continued to decline through 2015, projections show that at around 2018 the retail water use will reach a point where water savings from conservation will no longer outpace anticipated population and job growth; thus, demand is forecasted to increase after 2018.
- In response to California's drought, SFPUC's call for cutbacks resulted in over 13 percent water use reduction in 2015 compared to 2013, exceeding the 8 percent reduction requirement set forth in the State of Emergency Drought Declaration of 2014.

The focus of the SFPUC's Conservation Program over the next five years will be on the greatest water-savings opportunities, including:

- Replacing remaining old, inefficient fixtures and equipment, particularly in multi-family dwellings and non-residential facilities;
- Improving the efficiency of irrigation systems and increasing the amount of drought-resistant vegetation in the largest landscaped areas;
- Helping the largest water users in each customer sector understand, monitor, and improve the efficiency of their water use, as feasible; and
- Helping water users across all customer sectors to understand and monitor their water use and to address leaks and water waste in an effort to achieve and maintain efficient water use.

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1. INTRODUCTION

The San Francisco Public Utilities Commission (SFPUC), a department within the City and County of San Francisco (City or San Francisco), has been implementing a retail conservation program for over 25 years to help ensure that future water demands can be supported. The conservation program, along with development of local supplies through recycled water, groundwater, and non-potable water, are part of the SFPUC's efforts to stretch its water resources, increase reliability should drought or disaster interrupt regional water sources, and increase flexibility to meet the diverse needs of customers. This *2015 Retail Water Conservation Plan (2015 Plan)* presents an overview of the SFPUC's water conservation program and serves as a broad guidance document for both the SFPUC and its stakeholders; explains the evaluation process and factors considered when designing the program; documents changes and evolution in the approach to estimating water savings; and summarizes the estimated water savings to date, the projected savings over the planning horizon, as well as the anticipated effects of water savings on the overall retail water demand.

Retail Water System and Customers

The SFPUC owns and operates the Hetch Hetchy Regional Water System, a complex water supply network of pipelines and facilities that conveys high-quality drinking water from the Tuolumne River and local reservoirs in the Alameda and Peninsula watersheds to 2.6 million customers in the San Francisco Bay Area (**Figure 1**). Approximately one-third of this water is delivered to the residents and businesses in San Francisco and to a small number of retail customers in areas outside of the City, while two-thirds is provided through wholesale deliveries to 27 municipalities, water suppliers, and private entities in Alameda, Santa Clara, and San Mateo counties. In addition to providing water through the Regional Water System, the SFPUC has diversified its supply portfolio for retail customers by increasing use of groundwater and implementing a number of recycled water projects that serve large irrigation customers.

Figure 1: Regional Water System Overview



“Retail customers” refers to all residents and businesses located in San Francisco, as well as a number of residential customers and facilities outside of the City that pay for and receive water directly from the SFPUC. These customers include clusters of residential houses in Sunol, Redwood City, Daly City,

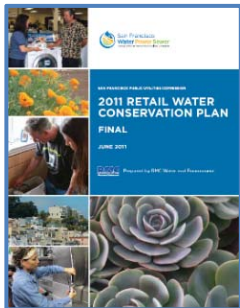
Fremont, Millbrae, Castlewood, and Groveland¹; and a number of large, non-residential facilities such as the San Francisco County Jail in San Bruno, the Sunol Valley Golf Course, the San Francisco International Airport in Millbrae, the Lawrence Livermore National Laboratory in Livermore, and the NASA Ames Research Center in Mountain View.

The SFPUC coordinates and directly manages the water conservation program for its retail customers, while the Bay Area Water Supply and Conservation Agency represents the interests of the wholesale customers and coordinates water conservation assistance on their behalf.

In addition to helping customers use water efficiently, the SFPUC also proactively funds and implements pipeline and infrastructure repair and replacement to reduce water loss in its own system.

Water Conservation Program Planning

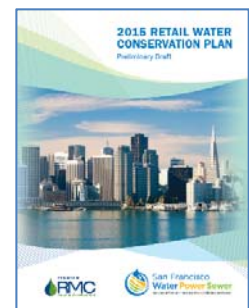
The SFPUC established the first water conservation program with modeled water savings and goals in 2004. The SFPUC identified three levels of water conservation options and conducted a detailed cost-benefit analysis for each option, ultimately selecting the most ambitious of the three, which estimated a potential active conservation savings of 4 million gallons per day (mgd) by 2018. Details of the analysis are documented in the report *City and County of San Francisco 2004 Retail Water Demands and Conservation Potential* (2004 Plan).



In 2010, the SFPUC conducted another assessment of the program to account for updated demographic data and regulations that may have influenced the water use trends among the retail customers. The 2010 effort consisted of both qualitative and quantitative evaluations of over 30 conservation measures and their specifications, such as participation rates, costs, target customer sectors, and potential water savings. Details of the analysis are included in the *2011 San Francisco Public Utilities Commission Retail Water Conservation Plan* (2011 Plan). The SFPUC also set forth a five-year review cycle to reassess its program and update program plans.

This 2015 Plan is the first scheduled update. This update is driven by several factors other than the need to meet the five-year review cycle, including:

- **New Codes and Regulations:** Since the completion of the 2011 Plan, a number of new conservation codes and ordinances impacting retail water use have been enacted and needed to be incorporated into the program design.
- **Transition of Forecasting Models:** In 2014, the SFPUC adopted a new approach to forecasting retail water demands using an econometric demand model, which also led to the decision to develop a Water Conservation Tracking Model for estimating conservation water savings and the effects on water demand.



1 Groveland Community Services District (CSD) is contractually defined as a retail customer of the SFPUC and is accounted as such in the SFPUC's previous planning documents. However, for the 2015 Urban Water Management Plan (UWMP) Update, SFPUC was directed by the Department of Water Resources to report Groveland CSD as a wholesale customer. For consistency, the analysis presented in this 2015 Plan also refers to Groveland CSD as a wholesale customer instead of a retail customer.



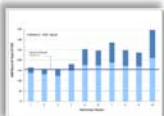

- **Updated Understanding of Market Saturation:** The SFPUC conducted a market saturation and fixture inventory study in 2014 that provided updated information on market opportunities, which needed to be incorporated into its conservation program design.
- **Refined Program Parameters:** Participation rates and customer feedback collected in the past eight years were used to refine and adjust future participation rates for certain measures, leading to more realistic estimates of water savings and of the appropriate duration for particular water programs.
- **Retail Customers outside of San Francisco:** While the SFPUC's retail conservation program is offered to retail customers both within and outside of the City, the 2011 Plan analysis focused solely on in-city customers whereas the 2015 Plan analysis includes all retail customers.
- **State Drought:** As California enters the fourth year of a record drought, a number of state laws and SFPUC initiatives have been enacted to address water demand and potential shortages. The SFPUC has made adjustments to many of its conservation measures to encourage participation in response to the drought.

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2. CONSERVATION GOALS AND PROGRESS

The SFPUC’s conservation program is guided by goals established under the Water System Improvement Program (WSIP), California Urban Water Conservation Council’s (CUWCC) Memorandum of Understanding (MOU) Regarding Urban Water Conservation, and conservation targets set forth by the Senate Bill X7-7 Water Conservation Act of 2009 (SB X7-7). The SFPUC’s conservation program is also shaped by requirements in local legislation and building codes such as the San Francisco water-efficient irrigation ordinance, residential, and commercial conservation ordinances guiding indoor water use, water efficiency requirements for municipal buildings, and others. **Table 2** presents a snapshot of the SFPUC’s progress toward meeting these broader goals that shape its retail conservation program.

Table 2: Conservation Goals and Progress

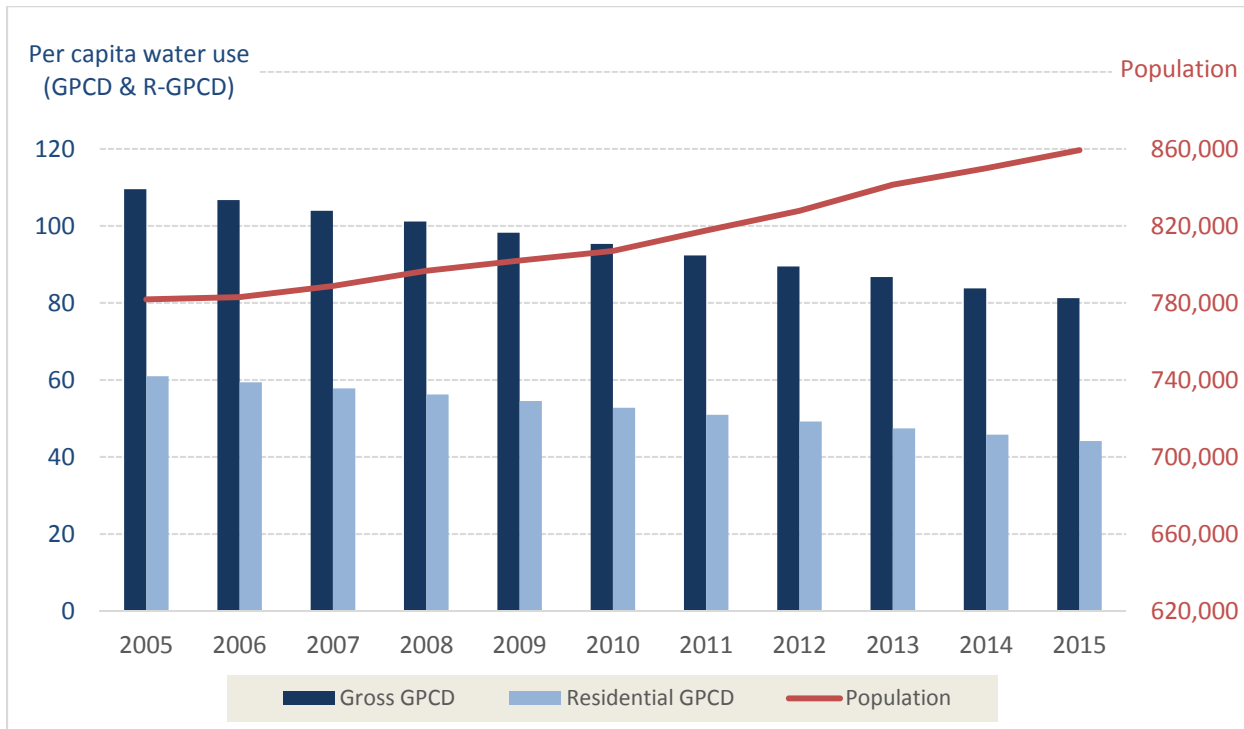
Conservation Goal	Progress
Water System Improvement Program (WSIP)	
 <p>Achieve up to 4 million gallons per day (mgd) of active water savings through a water conservation program, and 6 mgd through recycled water and groundwater programs by 2018.</p>	<p>Currently, the SFPUC is projecting approximately 3.3 mgd of active water savings and 8.3 mgd of passive savings by 2018. The active savings projection is slightly lower than the WSIP goal due to more extensive data available on actual customer participation levels and market saturation, as well as additional code requirements that moved active savings into passive savings.</p>
California Urban Water Conservation Council’s (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation	
 <p>Implement the conservation program according to the terms set forth in the MOU and comply with Best Management Practice requirements.</p>	<p>The SFPUC has been in compliance with all Best Management Practices submitted since reporting began.</p>
Senate Bill X7-7 Water Conservation Act of 2009 (SB X7-7)	
 <p>Reduce gross per capita water use to below 102 GPCD by 2015 and 96 GPCD by 2020 for the SFPUC’s entire retail service area.</p>	<p>The SFPUC’s current (2015) gross per capita water use is about 81 GPCD, which is well below both the 2015 and 2020 targets; and the SFPUC remains in compliance with the SB X7-7 requirements.</p>
State of Emergency Drought Declaration of 2014	
 <p>Reduce R-GPCD by 8 percent for the months of June 2015 through February 2016 when compared to the same period in 2013.</p>	<p>In response to the drought and as of June 2015, the SFPUC has requested all customers to reduce water use by 10 percent, established mandatory reduction requirements for irrigation customers from an initial 10 percent to 25 percent, initiated a water waste education program to implement water use restrictions, increased incentives for many rebate measures, and developed a number of tools and materials to assist customers. SFPUC’s call for cutbacks resulted in an over 13 percent water use reduction in 2015 as compared to 2013, exceeding the 8 percent reduction requirement set forth in the State of Emergency Drought Declaration of 2014.</p>

Since the early 1990s, the SFPUC has incentivized the replacement of roughly 80,000 toilets and 30,000 clothes washers and conducted over 100,000 surveys for residents and businesses. Program highlights between 2005 and 2015 include the following:

- ✓ Conducted over 32,000 residential and over 1,500 commercial building evaluations
- ✓ Issued over 30,000 high-efficiency toilet (HET)² rebates to residential customers and over 10,000 HET rebates to commercial properties
- ✓ Issued over 1,000 high-efficiency urinal (HEU)³ rebates to commercial properties
- ✓ Issued over 35,000 rebates for high-efficiency residential clothes washers and over 500 rebates for commercial clothes washers

Despite steady population and job growth in the retail service area, the SFPUC’s per capita water use rate has declined, due in large part to conservation efforts. **Figure 2** shows the decline in both gross GPCD⁴ and R-GPCD⁵ even as population was increasing. The SFPUC’s gross GPCD declined from 110 in 2005 to 81 in 2015, and its R-GPCD declined from 61 in 2005 to 44 in 2015, one of the lowest in California.

Figure 2: Historical Population and Per Capita Water Use Trends



² High-efficiency toilets refer to toilets that use 1.28 gallons of water per flush or less.

³ High-efficiency urinals refer to urinals that use 0.5 gallons of water per flush or less. Starting 2016, the SFPUC will only rebate urinals that use 0.125 gallons per flush or less.

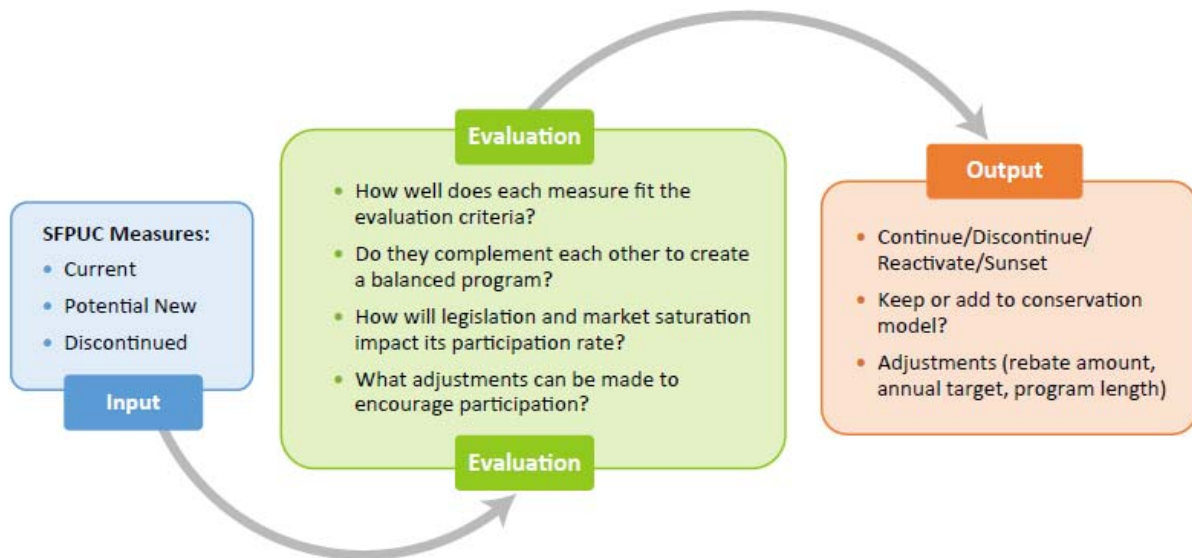
⁴ GPCD is total demand divided by total population, which includes people living in both households and group quarters.

⁵ R-GPCD is residential demand divided by residential population.

3. EVALUATION PROCESS

Since the 2004 development of its original conservation potential and demand forecast model, the SFPUC has considered a wide range of conservation measures. During the measure evaluation process for the 2015 Plan, the SFPUC, together with consultants who contributed a statewide and national conservation perspective, evaluated current measures, as well as potential new measures and those that had been discontinued. The team also reviewed each measure in the context of historical participation rates, the specific attributes of the SFPUC service area, the results of market analyses, and the potential impacts of code and legislative changes, as well as estimated water savings. The evaluation process is illustrated in **Figure 3**.

Figure 3: Conservation Measure Evaluation Process



The SFPUC reviewed the criteria considered during the qualitative evaluation of conservation measures that shaped the development of the 2011 Plan and recommended streamlining the criteria to the following: Water Savings Potential, Certainty of Water Savings, Implementation Feasibility, Customer Receptivity, Adaptability, Research Benefits, and Cost. These criteria are described in **Table 3**.

Table 3: Criteria for Evaluating Conservation Measures

Criteria	Description
Water Savings Potential	The amount of water a measure could potentially save over the lifespan of a measure or device (such as a toilet rebate measure) or over a certain period after an action that encourages behavioral change (such as a Water Wise evaluation audit).
Certainty of Water Savings	The certainty of the water savings estimated in Water Savings Potential. A high potential of water savings does not necessarily translate into a high certainty of water savings. Certain measures, such as a leak and high water use alert program, may have a high potential to save water, but the actual savings is not guaranteed because the SFPUC does not have control over implementation of the action (e.g., identifying and fixing the leak). Some measures, on the other hand, could have a high certainty of savings but a relatively low potential of water savings due to technology or other constraints (e.g., dishwasher rebate program).
Implementation Feasibility	The ease with which a measure could be implemented, such as adequate budget and staff resources to handle outreach and ongoing administrative needs.
Customer Receptivity	The degree to which customers are receptive to a measure, such as how easy or difficult it is for a customer to apply for a certain rebate or arrange for a water audit.
Adaptability	The ease with which a measure could be scaled to react to a changing market (e.g., increasing or decreasing a toilet rebate to ramp up/down the participation rate), or adjusted to accommodate a different market sector (e.g., redesigning the incentives or other parameters of a single family landscape turf replacement program to target the multi-family sector).
Research Benefits	To what degree a measure enables research and analysis of an emerging technology
Cost	How cost effective the measure is per acre foot of water saved.

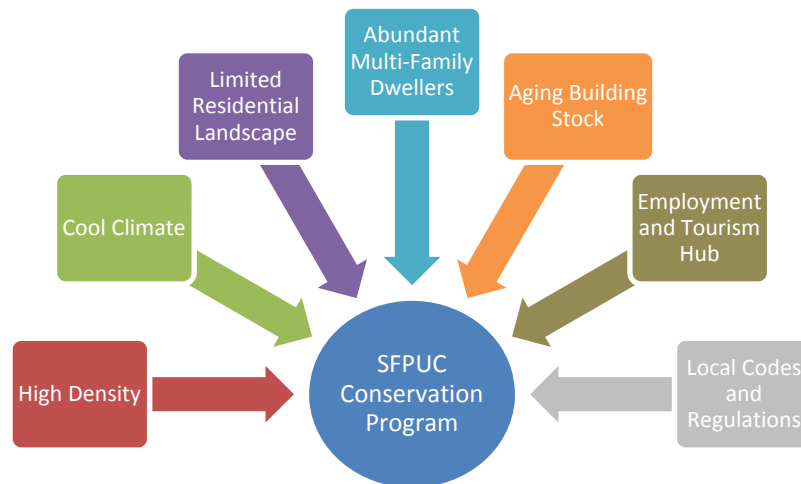
The purpose of establishing and using criteria as part of the qualitative review is to help ensure that each measure is evaluated thoroughly and consistently. This approach ultimately ensures that the selected measures meet multiple criteria and lead to a balanced conservation program. While the SFPUC’s overall focus is on measures that deliver the greatest water savings, measures with a lower water savings potential may be valuable for the purposes of researching new or emerging technologies or providing a high level of customer service.

4. FACTORS SHAPING THE CONSERVATION PROGRAM

During development of its water conservation program, the SFPUC considered multiple factors specific to San Francisco, including the City's high density, cool climate, minimal amount of residential landscaping, high number of multi-family dwellings, prevalence of old and pre-1994 homes and buildings, and role as an employment and tourism hub. Additionally, because water use in newly constructed homes and buildings will continue to decline with adherence to local, state, and federal codes and requirements that increasingly call for more water-efficient plumbing fixtures and landscaping, the SFPUC focused its conservation program on existing sites.

Figure 4 illustrates the main factors that have shaped the SFPUC's conservation program. An understanding of these factors helps the SFPUC to identify those water savings opportunities with the greatest potential to ensure efficient water use within existing homes, buildings, and irrigated landscapes.

Figure 4: Factors Shaping San Francisco's Conservation Program



Residential Water Use

Most residential water use in San Francisco occurs indoors because of the limited amount of residential landscaping. Residential outdoor water use is typically concentrated in neighborhoods composed of single family homes with irrigated landscape. For homes with irrigated landscape, outdoor water use is generally well under 50 percent of the home's overall use.⁶ The SFPUC's retail service area also includes approximately 300 single family homes in Redwood City and Sunol. To address indoor water use, the SFPUC plans to continue offering toilet replacement incentives for the next two years, clothes washer incentives for the next five years, and free water-saving devices for the foreseeable future. Additionally, the SFPUC will increase focus on foundational measures such as audits, home water use tools and reports, and education and outreach to help all single family customers monitor and maintain efficient water use and to prevent leaks and water waste.

Approximately 68 percent of San Francisco's residential housing units are in multi-family dwellings compared with 31 percent in the rest of California. Of this 68 percent, about 30 percent are in two- to four-unit multi-family dwellings and 70 percent are in dwellings of five units or more.⁷ Moving forward, the SFPUC will continue to provide fixture replacement incentives and will increase foundational measure assistance to educate home and apartment owners, apartment managers, and tenants about ways

⁶ San Francisco Single Family Home Water Use Efficiency Study, Aquacraft Inc., 2010

⁷ United States Census Bureau 2009-2013 American Community Survey 5-Year Estimates.

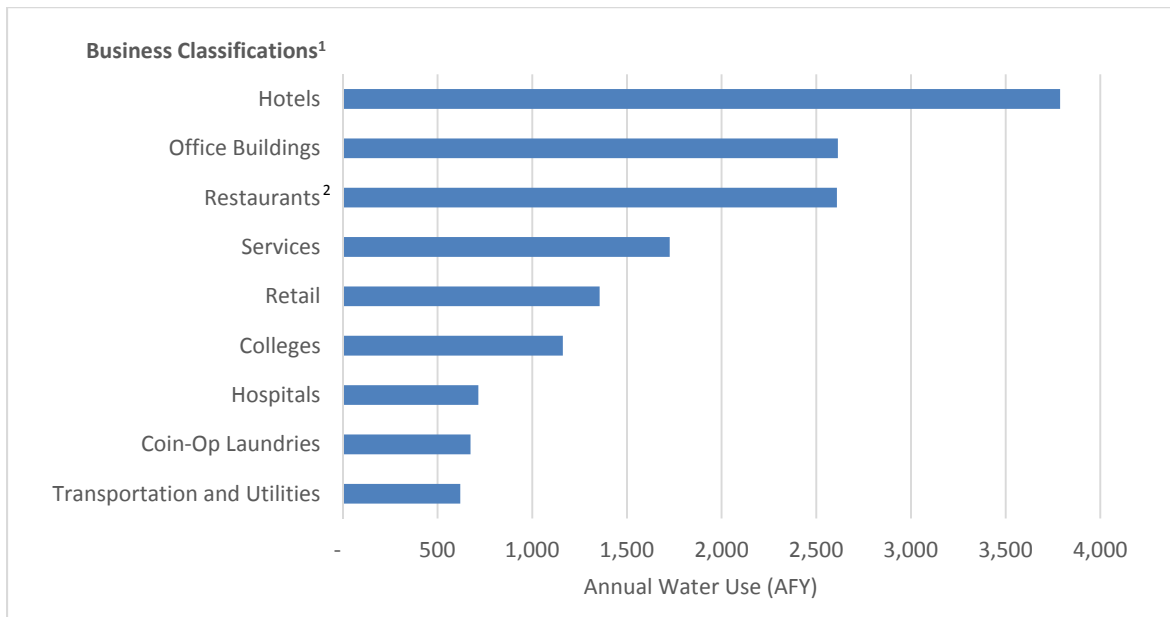
they can monitor and either improve or maintain high water efficiency within their units or buildings. These measures will be focused on indoor water use, and fixture leak repair and replacement.

Non-Residential Water Use

Among the top non-residential (i.e., municipal and commercial/industrial) water-using sectors in San Francisco are hotels; office buildings; restaurants; universities, colleges, and schools; hospitals and medical clinics; government facilities; and laundromats (**Figure 5**). The SFPUC has conducted focused market assessments of conservation opportunities within several business sectors, including, most recently, laundromats and fitness clubs. Additionally, in order to comply with a 2014 mayoral executive order, all San Francisco City and County departments are required to prepare, submit to the SFPUC, and implement a water conservation plan that includes an inventory of old fixtures.

To continue promoting efficient water use in the non-residential sector, the SFPUC will work closely with these departments to provide water usage reports and monitoring, indoor and outdoor site evaluations, and fixture replacement incentives. The SFPUC will also continue outreach to top water-using sectors and work with organizations that represent them to both promote water efficiency and provide information about the SFPUC’s applicable assistance programs. The SFPUC plans to evaluate additional non-residential sectors to help expand the current market understanding of feasible, industry-specific water-saving opportunities.

Figure 5: Non-Residential Sectors with Top Water Use



Notes:

- Business classifications are based on the Standard Industrial Classification (SIC) code information from the SFPUC’s billing system, and represent water used in fiscal year 2014-2015. Data does not include most municipal department use; and may not reflect all businesses/institutions in a particular sector, as some businesses may not have a SIC code in the SFPUC’s billing system, and businesses that are part of a mixed use commercial meter do not have their own water accounts.*
- Restaurant water use does not include bars.*

For all customer sectors, the SFPUC will continue to evaluate the market for potential non-SFPUC financing mechanisms similar to the Property Assessed Clean Energy⁸ program or other loan or on-bill, customer-financed mechanisms to help customers replace remaining old plumbing fixtures or undertake major water efficiency projects not covered through SFPUC incentives. These programs can potentially minimize upfront customer costs and encourage home and property owners to continue making water-efficiency retrofits when the SFPUC incentives are no longer available.

Landscape Water Use

As previously noted, the residential sector has a limited amount of landscape areas. For that reason, the SFPUC's landscape assistance programs have focused on large irrigated landscapes, which primarily include parks and public open spaces, university and medical facility campuses, and large homeowner association sites. Starting in 2014 and continuing into 2016, all of the approximately 1,600 irrigation account holders are subject to mandatory water reductions. These mandatory reductions have increased interest in long-term efficiency improvements. To support irrigation account holders, the SFPUC will continue providing key services such as water usage monitoring, onsite evaluations, consultations with conservation experts, and incentives for irrigation system and turf replacement. The SFPUC will also continue offering classes, trainings, and guides; hands-on, onsite evaluations and consultation; and incentives for graywater and rainwater reuse for irrigation for all customers.

Local Codes and Regulations

In addition to considering the criteria described in the previous section, the SFPUC evaluated legislative codes and standards pertaining to efficiency for water-using fixtures, appliances, and devices in order to understand the impact of legal requirements on customer participation levels and market gaps. **Table 4** provides a summary of some of the applicable legislation and local codes that affect incentives and services provided by the SFPUC. The table only provides a partial list of the codes and standards affecting the SFPUC and does not represent a complete list of all national, state, and local codes and requirements related to water efficiency.

⁸ Property Assessed Clean Energy program provides financing for property owners to fund energy-efficiency, water-efficiency, and renewable energy projects with little or no upfront costs. Under this program, residential and commercial property owners living within a participating district can finance up to 100% of their project and pay it back over time as a voluntary property tax assessment through their existing property tax bill.

Table 4: Summary of Codes and Standards

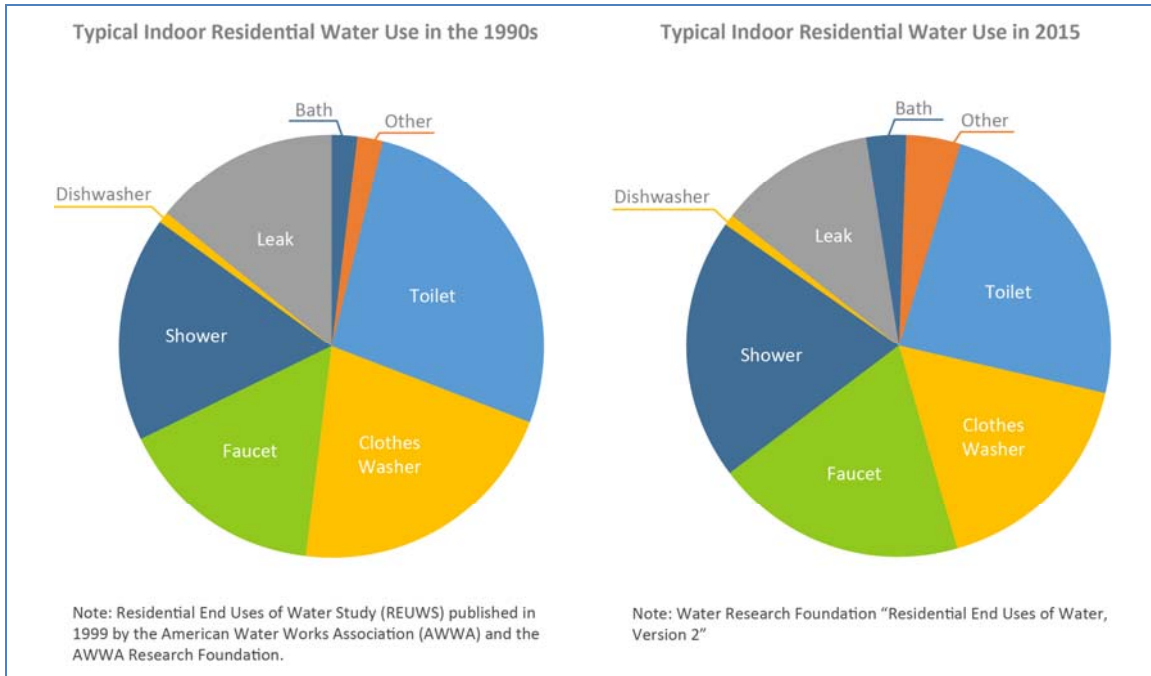
Code/Standard	Effective Date	Affected Sector	Requirements
Assembly Bill 715 (AB 715)	January 1, 2014	Any building installing new fixtures in California	All toilets and urinals (other than blow-out) sold or installed must be: <ul style="list-style-type: none"> Toilets: 1.28 gallons per flush (gpf) or less Urinals: 0.5 gpf or less (this requirement will be superseded by the California Energy Commission [CEC] water appliance standards, effective January 1, 2016, which will limit flush volumes to 0.125 gpf)
Senate Bill 407 (SB 407)	Single Family: January 1, 2017 Others: January 1, 2019	All customer sectors by deadlines noted; before then, when customers undergo alterations or improvements	All plumbing fixtures must be in compliance with current plumbing code standards.
Title 24, California Building Standards Code	January 1, 2014 Updates effective January 2016	Any building installing new fixtures in California	<ul style="list-style-type: none"> Plumbing, residential, energy, and green building standards sections Toilets: ≤ 1.28 gpf Urinals: ≤ 0.25 wall mounted effective 2016; 0.5 for floor mounted Residential Kitchen Faucets: ≤ 1.8 gpm effective Jan 2016 Commercial Lavatory Faucets: ≤ 0.5 gpm Residential Lavatory Faucets: ≤ 1.5 gpm in 2016, 1.2 gpm after July 2016 Showerheads: ≤ 2.0 gpm; 1.8 after July 2018
Residential Water Conservation Ordinance – SF Building Code	At time of sale or transfer of title or upon major improvement	Single family, Multi-family, and Residential hotels	Buildings must meet or exceed the following water use requirements: <ul style="list-style-type: none"> Showerheads: 2.5 gallons per minute (gpm) Faucets: 2.2 gpm Toilets: 1.6 gpf (≤ 1.28 gpf per plumbing code) Leak Repair
Commercial Water Conservation Ordinance – SF Building Code	January 1, 2017 or upon major improvement	Commercial	Buildings must meet or exceed the following water use requirements: <ul style="list-style-type: none"> Showerheads: 2.5 gpm Faucets: 2.2 gpm Toilets: 1.6 gpf (≤ 1.28 gpf per plumbing code) Urinals: 1.0 gpf (≤ 0.125 gpf per CEC water appliance standards) Leak Repair
Water Conservation in Landscaping Act (AB 1881)	January 1, 2010	New or renovation landscape projects	<ul style="list-style-type: none"> Water-efficient landscape design and practices. Requirements vary depending on project size.

Code/Standard	Effective Date	Affected Sector	Requirements
San Francisco Water Efficient Irrigation Ordinance	January 1, 2011	New or renovation projects with landscaped areas ≥ 500 square feet (ft ²)	<ul style="list-style-type: none"> Water-efficient landscape design and practices. Requirements vary depending on project size. Effective January 2016, the SFPUC's ordinance will be updated to reflect state-required changes dropping the threshold to 500 square feet for new construction projects.
Energy Star High Efficiency Washer Standards	February 1, 2013	All	<ul style="list-style-type: none"> Residential Clothes Washer: Water Factor (WF) ≤ 6.0 Commercial Clothes Washer: WF ≤ 4.5 Most Efficient Standard: WF ≤ 3.0
Federal Energy Conservation Standards for Residential Clothes Washers	March 2015	Residential	<ul style="list-style-type: none"> Front-Loading Clothes Washer: Integrated Water Factor (IWF) ≤ 4.7 Top-Loading Clothes Washer: IWF ≤ 8.4 by March 2015; IWF ≤ 6.5 by January 2018
WaterSense Label		All	<ul style="list-style-type: none"> Toilets: ≤ 1.28 gpf Urinals: ≤ 0.5 gpf Showerhead: 2.0 gpm Faucets: 1.5 gpm Pre-rinse Spray Valves: 1.28 gpm Smart Controllers: able to meet watering needs of a landscape without overwatering
San Francisco Green Building Ordinance	Varies (LEED 1994)	New construction or renovated buildings	<ul style="list-style-type: none"> Local implementation of state's CalGreen LEED building certification includes a section for water conservation techniques
San Francisco Non-Potable Reuse Ordinance	November 1, 2015	Commercial, Multi-Family Residential, and Mixed Use over 250,000 square feet	<ul style="list-style-type: none"> All new buildings of 250,000 ft² or more of gross floor area located must be constructed, operated, and maintained using available alternate water sources for toilet and urinal flushing and irrigation; by 2015 for buildings within the boundaries of San Francisco's designated recycled water use area and by 2016 for buildings outside the boundaries All new buildings in San Francisco of 40,000 ft² or more of gross floor area must prepare water budget calculations.

Market Saturation Analysis

Across the country, as well as in the SFPUC’s service area, average indoor water use in homes and many buildings has decreased significantly over the past 20 years due in great part to replacement of old fixtures with water-efficient models. Replacement of old, high-volume toilets and clothes washers, in particular, have played a major role in reducing indoor water use and what water is used for within homes. Nationwide, the amount of water used for toilets and clothes washers in a typical home has shrunk from about 50 percent in the 1990s to about 40 percent in homes today that have new fixtures (**Figure 6**).

Figure 6: Typical Indoor Residential Water Use in the 1990s and 2015



In 2014, the SFPUC conducted a market saturation investigation to assess potential remaining water savings opportunities that could be achieved by replacing standard plumbing fixtures across all customer sectors. The assessment identified indoor plumbing fixture populations and estimated the percentage of remaining inefficient fixtures within the SFPUC’s in-city retail service areas. Fixture population and efficiency saturation estimates were developed for the following categories of plumbing fixtures:

- Single Family and Multi-Family Residential Toilets
- Single Family and Multi-Family Residential Clothes Washers
- Non-Residential Toilets and Urinals
- Non-Residential Coin-Op Clothes Washers

In late 2015, the SFPUC conducted an additional analysis of the efficiency saturation of showerheads.

Figure 7 illustrates the market saturation of select fixtures across the three major market sectors in 2015. Efficient fixtures within each fixture category are defined as follows:

- Toilets: 1.6 gpf or less
- Urinals: 0.5 gpf or less
- Clothes Washers: Energy Star designations (6 WF or less)
- Showerheads: 1.8 gpm or less

As shown, the study indicated that the SFPUC’s long-running fixture replacement programs have been very effective, as more than 70 percent of all toilets in the service area are efficient, and the saturation rates for residential clothes washers and showerheads are approximately 50 to 60 percent. For non-residential urinals, it is much lower at only 14 percent.

Figure 7: Market Saturation of Select Fixtures in 2015



Table 5 presents a summary of fixture population and the estimated percentage of inefficient and efficient fixtures in the market for the next 25 years after taking into considerations such as participation rates of applicable incentive measures, fixture natural turnover, and projected fixture growth.

As previously shown, the study indicated that the SFPUC’s long-running fixture replacement programs have been very effective, as more than 70 percent of all toilets in the service area are efficient. Nevertheless, roughly 200,000 inefficient toilets remain in service. As such, the SFPUC will make a continued, concerted effort over the next few years to provide incentives and promote the benefits of replacing old fixtures to expedite the replacement of as many inefficient toilets as possible before fixture replacement incentives are sunset due to code and saturation rates. The SFPUC anticipates that after the current toilet rebate and direct install programs end, the remaining inefficient toilets will drop to below 10 percent by 2030 through normal fixture turnover and compliance with mandatory ordinances.

The study also revealed that the remaining number of inefficient clothes washers is not as high as previously expected. The SFPUC could reach full market saturation (i.e., replacement of all or most inefficient clothes washers for its retail customers) by around 2030. The findings support a continuation of the residential washer incentive program for the next five years, given that nearly half of washers are still not efficient. After 2020, the SFPUC may consider discontinuing the program because the federal energy standards for residential clothes washers will begin ratcheting down in 2018. With future technology, it is possible that higher efficiency clothes washers would enter the market, at which time the SFPUC could consider adjusting the measures to provide rebates for the newer models.

With saturation rates for showerheads meeting California’s updated standards at about 60 percent for single family homes and about 50 percent for multi-family and nonresidential, the SFPUC plans to continue free showerhead distribution through about 2020 when saturation rates are expected to jump to closer to 70 percent.

Table 5: Estimated Fixture Population and Percentage of Efficient Fixtures

	2015		2018		2020		2030		2040	
	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures
Toilets										
Single Family	63,962 25%	187,337 75%	51,313 20%	201,823 80%	45,896 18%	208,465 82%	26,273 10%	234,324 90%	15,040 6%	251,947 94%
Multi-Family	84,228 24%	265,829 76%	66,841 19%	291,322 81%	58,527 16%	305,040 84%	35,208 9%	369,506 91%	21,180 5%	424,772 95%
Non-Resi.	48,933 31%	110,557 69%	34,648 21%	127,802 79%	28,778 18%	135,644 82%	21,222 12%	156,908 88%	15,649 8%	178,062 92%
Total	197,123 26%	563,723 74%	152,802 20%	620,947 80%	133,201 17%	649,149 83%	82,703 10%	760,738 90%	51,869 6%	854,782 94%
Clothes Washers										
Single Family	39,616 38%	65,191 62%	32,409 31%	73,164 69%	25,866 24%	80,218 76%	12,328 11%	96,357 89%	5,875 5%	105,475 95%
Multi-Family	57,482 48%	61,832 52%	54,667 45%	67,411 55%	50,035 40%	73,884 60%	23,837 17%	114,107 83%	11,361 7%	140,639 93%
Coin-Op	2,718 46%	3,150 54%	2,487 42%	3,381 58%	2,212 38%	3,656 62%	1,036 18%	4,832 82%	494 8%	5,374 92%
Total	99,816 43%	130,174 57%	89,563 38%	143,956 62%	78,114 33%	157,758 67%	37,201 15%	215,296 85%	17,730 7%	251,488 93%
Urinals										
Total	34,362 86%	5,510 14%	29,790 73%	10,822 27%	27,559 67%	13,547 33%	20,323 46%	24,210 54%	14,986 31%	33,441 69%
Showerheads										
Single Family	62,823 41%	89,518 59%	53,895 35%	99,560 65%	40,405 26%	113,793 74%	11,144 7%	146,834 93%	3,080 2%	158,772 98%
Multi-Family	162,182 53%	143,771 47%	144,954 46%	168,083 54%	110,982 35%	206,778 65%	30,762 9%	322,960 91%	8,531 2%	381,234 98%
Non-Resi.	17,680 52%	16,320 48%	15,558 46%	18,442 54%	12,048 35%	21,952 65%	3,355 10%	30,645 90%	935 3%	33,065 97%
Total	242,685 49%	249,609 51%	214,407 43%	286,084 57%	163,435 32%	342,522 68%	45,262 8%	500,439 92%	12,545 2%	573,072 98%

Note: Total numbers of fixtures per year includes existing and projected fixture growth.

5. WATER CONSERVATION PROGRAM

The SFPUC's retail water conservation program consists of a mix of financial incentives, technical assistance, and educational tools. Most of the current measures in the conservation program have been available to retail customers located both within and outside of San Francisco. The SFPUC plans to continue providing its conservation program to all retail customer sectors. The conservation measures included in the program can be broadly categorized as:

- Foundational customer assistance measures that the SFPUC anticipates continuing with no definite end date, such as WaterWise evaluations, site usage reports and tools, free devices, and public education and outreach; and
- Fixture, equipment, and landscape incentive measures that have varying end dates depending on factors such as plumbing code impacts and market saturation rates.

These measures will facilitate the SFPUC's ability to tap into what it anticipates to be the most significant remaining water-saving opportunities among existing residential and non-residential sites, including:

- Replacing old, inefficient fixtures and equipment, particularly in multi-family dwellings and non-residential facilities;
- Improving the efficiency of irrigation systems and increasing the amount of drought-resistant vegetation in the largest landscaped areas;
- Helping the largest water users in each customer sector understand, monitor, and improve the efficiency of their water use, as feasible; and
- Helping water users across all customer sectors to understand and monitor their water use and to address leaks and water waste in an effort to achieve and maintain efficient water use.

Table 6 summarizes the conservation measures that the SFPUC currently provides.

Table 6: SFPUC Water Conservation Program Measures

<p>Single Family Residential Measures</p>	<ul style="list-style-type: none"> • Mandatory Audits for Rate Discount Recipients • WaterWise Evaluations • HET Direct Install and Rebates • High-Efficiency Clothes Washers Rebates • Laundry-to-Landscape Kits • Graywater Permit Rebates • Showerhead Distribution & Direct Install • Rain Barrels & Cisterns Incentives • Continuous Usage Alerts • Site Water Usage Reports through My Account • Education, Training, and Informational Materials
<p>Multi-Family Residential Measures</p>	<ul style="list-style-type: none"> • WaterWise Evaluations for HET Direct Install • WaterWise Evaluations • HET Direct Install and Rebates • High-Efficiency Clothes Washers Rebates • Showerhead Distribution & Direct Install • Rain Barrels & Cisterns Incentives * • Site Water Usage Reports through My Account • Education, Training, and Informational Materials
<p>Non-Residential Measures</p>	<ul style="list-style-type: none"> • WaterWise Evaluations • Direct Install Audits • Surveys (Hospitals, Hotels, Schools) and CII Audits • Landscape Surveys • HET and HEU Direct Install and Rebates • Coin-Op High-Efficiency Clothes Washers Rebates • Landscape Grants • Rain Barrels & Cisterns * • Equipment Retrofit Rebates • Site Water Usage Reports through My Account • Education, Training, and Informational Materials

* The SFPUC also offers a Non-Potable Water Program that provides technical assistance and incentives for onsite reuse of rainwater, graywater, black water, and seepage water in large new commercial, multi-family, and mixed use developments.

The conservation measures have varying durations based on anticipated market saturation. Some of the fixture incentive measures will be phased out as they begin to reach saturation levels, as shown in **Figure 7**. The SFPUC will continue most of the conservation measures that are not impacted by legislation and/or are not expected to reach full market saturation before 2040 (final year of the planning horizon). Among these measures are the various educational programs as well as ongoing partnerships with community groups; device distribution (e.g., showerheads, faucet aerators, etc.); incentives for large equipment retrofits for commercial properties; and residential water audit services. Assembly Bill 715 requires the sale and installation of HETs (beginning in 2014), and Senate Bill 407 requires up-to-code plumbing fixtures in all residential homes by 2017 and commercial buildings by 2019; therefore, the SFPUC plans to phase out its HET and HEU rebates over the next few years, allowing SFPUC to reallocate its resources to other measures that will continue to yield active savings. Non-SFPUC financed measures and other measures, such as on-bill financing, may be further evaluated for their feasibility in encouraging customer water-efficiency retrofits after the SFPUC sunsets its fixture rebates.

Figure 8: Conservation Measure Implementation Timeline

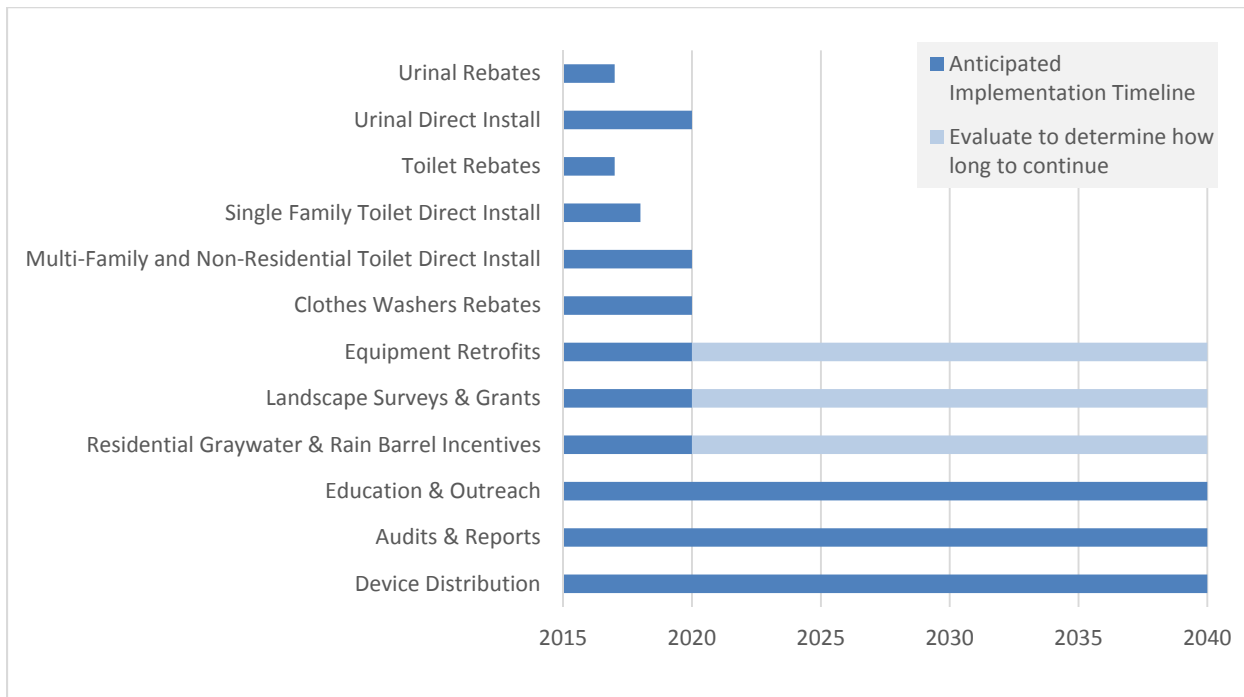


Table 7 summarizes all the conservation measures that the SFPUC has evaluated to be included in the program. Each measure is grouped and labeled by customer sector. The measure name, description, and implementation plan are detailed along with a graphical key as to whether the measure is a continued measure, will be discontinued, or is a new measure included in the program.

Table 7: Conservation Program Measures

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
Single Family Residential Conservation Measures					
S1	Mandatory CAP Audits	Free site evaluation. Required for single family residents to participate in the Community Assistance Program (CAP) for discounted water and sewer rates. Identify inefficient plumbing fixtures and leaks, and suggest improvements.	▶ Continue. This is a requirement for the CAP rate discount. Revise annual target in the model to reflect actual rate of new CAP enrollments. Identify site-specific opportunities and encourage customers to participate in other measures.	6,000	2040
S2	WaterWise Evaluations	Free consultation. Review consumption history, check for toilet leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for rebate programs, and provide repair parts, water-saving devices, and materials.	▶ Continue. This measure drives participation in other assistance programs. Revise annual target to reflect actual rates and savings estimates. Continue to conduct outreach to top water users and provide tools to help monitor home water use, including My Account portal and customized reports.	800	2040
S3a	Leak Alerts	Using automated metering infrastructure (AMI) data to flag accounts that trigger continuous usage thresholds.	▶ Continue. Pilot program was launched in April 2015 and will be expanded in 2016 to include more means of notifying customers.	N/A	2040
S3b	Custom Water Use Reports	Provides customers a home and site-specific water use report to provide better understanding of water use patterns and trends.	+ New measure. The SFPUC currently provides customers reports and information on home water use through its My Account portal for those who sign up, as part of water-wise evaluations, and to customers receiving leak alerts. SFPUC is considering ways to more proactively reach customers who don't participate in either service.	N/A	2040
S4	1.5 GPM Showerheads Distribution	Up to two free showerheads (as part of measure S2 or in-person pickup from SFPUC) per household.	▶ Continue.	4,000	2020
S5	1.5 GPM Showerheads Direct Install	Free installation of 1.5-gpm showerheads to single family residents. Prerequisite: Direct Install Audit (Measure S1).	▶ Continue.	3,900	2020

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
S6	HET Rebates (Tank-Style)	Up to \$125 rebate to replace old toilets (≥ 3.5 gpf) with approved HETs (1.28 gpf or less).	▶ Continue until 2017 and then possibly sunset due to high market saturation (70%) and high free ridership possibility. May consider extending if the current drought continues.	7,000	~2017
S7	CAP Direct Install thru SFPUC Funding	Free installation of high-efficiency toilets (HETs) for single family CAP participant residents. Replace toilets installed before 1994 that have ≥ 3.5 gallons per flush (gpf). Prerequisite: Mandatory CAP Audits (S1).	▶ Continue while the SFPUC offers a direct install incentive program.	2,100	~2018
S8	Direct Install (Non-CAP)	Same as measure S7, but open to single family residents who are not CAP participants.	+ New measure. This measure will be implemented together with the multi-family direct install measure (measure M7) under one contract. The focus of the effort will be on multi-family customers, but will also accommodate single family customers if needed.	N/A	~2018
S9	HET Vouchers	A voucher issued to eligible residents to replace their older toilets with HETs.	✘ Remain discontinued. The resources required to implement the measure when compared to its water savings do not warrant reactivating the measure.	0	N/A
S10	HET/Fixture Install thru On- Bill Financing	On-bill financing is an alternative means to provide direct installation of water-saving fixtures such as toilets and showerheads that recovers some of agency's costs over time. The customer finances the project through water bill savings.	✘ Not offered at this time. Continue to study. Single family market already served by SFPUC's existing rebate and direct install programs. On-bill financing could potentially be considered after SFPUC's HET incentives sunset as a way to help customers who still have old fixtures.	N/A	N/A
S11	CEE Tier 2 Rebates	Rebate from the Consortium for Energy Efficiency (CEE) for clothes washers with a Water Factor (WF) of ≤ 4.5. Measure recently discontinued.	✘ Remain discontinued. Focus on Energy Star Most Efficient (ESME) Rebates (Measure S12) to drive market for most efficient clothes washers with WF of ≤ 4.0.	4,900	N/A

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
S12	Energy Star Most Efficient (ESME) Clothes Washer Rebates	Up to \$100 rebate from SFPUC and \$50 rebate from PG&E for a washer with a WF of ≤ 3.5.	▶ Continue. This measure has been part of a regional program. Market saturation for efficient washers is currently 62%; closely monitor the participation rate and re-evaluate the rebate structure and amount as needed, and reset the model end year if saturation is reached before 2020.	12,800	~2020
S13	High- Efficiency Dishwasher Rebates	Rebate for high-efficiency dishwasher.	✘ Not offered due to a low potential to save water. Dishwashers represent approximately 1.4% of residential indoor water use with estimated use of 1 gallon per capita per day. Most are already energy- and water-efficient.	N/A	N/A
S14	Laundry-to-Landscape Kits	A subsidy towards the cost of a graywater kit and installed within 60 days of completing a laundry-to-landscape training workshop.	▶ Continue. Program offers customer education and allows for data collection on how such systems are used. Re-evaluate this measure in 2020 at contract end date.	100	2020
S15	Graywater Permit Rebates	Rebate of up to \$225 for obtaining a permit from the Department of Building Inspections for the installation of a graywater system.	▶ Continue. Program offers customer education and opportunity to help assess how many systems are installed.	1	TBD
S16	Rain Barrels and Cisterns	Subsidy program that covers the purchase cost of rain barrels and cisterns and provides training.	+ New measure. Water savings may be low, but there is high customer interest. This measure can also help in the collection of valuable data in terms of utility costs and water savings.	N/A	2020
S17	Turf Removal Incentive	A per-square-foot rebate to replace turf with drought appropriate plants.	✘ Not offered due to limited opportunity and high cost per potential water savings. Continue instead to offer educational materials, trainings, and onsite assistance through water-wise evaluations to help customers improve landscape water efficiency.	N/A	N/A

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
S18	WBIC Incentive	Incentive to install a weather-based irrigation controller (WBIC) that uses site-specific data and adjusts the irrigation time depending on the local weather.	✘ Not offered at this time due to limited opportunity and high program cost. Continue instead to offer educational materials, trainings, and onsite assistance through water-wise evaluations to help customers improve landscape water efficiency.	N/A	N/A
S19	Irrigation Nozzle Distribution	Free irrigation nozzles for eligible customers.	✘ Not recommended. Re-evaluate in the future.	N/A	N/A
Multi-Family Residential Conservation Measures					
M1	WaterWise Direct Install Evaluations	Free evaluation for multi-family residents to participate in the SFPUC's High-Efficiency Toilet/Urinal (HET/HEU) Direct Install Program. Identify inefficient plumbing fixtures and leaks and suggest improvements.	▶ Continue. Revise the annual target to reflect past-year participation, work to identify additional site-specific opportunities, and encourage customers to participate in other programs such as clothes washer rebates.	9,000	2040
M2	WaterWise Evaluations	Free consultation. Review consumption history, check for toilet leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for rebate programs, and provide repair parts, water-saving devices, and materials.	▶ Continue. This measure drives participation for other assistance programs. Revise the annual target to reflect past-year participation and savings estimates, and conduct outreach to top water accounts.	10,000	2040
M3a	Leak Alerts	Using automated metering infrastructure (AMI) data to flag accounts that trigger continuous usage and possibly high usage thresholds.	+New measure. Expand single family leak alert program to include small multi-family buildings and consider high usage alerts for larger sites	N/A	2040
M3b	Custom Water Use Reports	Provides customers a site-specific water use report to provide better understanding of water use patterns and trends.	+ New measure. The SFPUC currently provides customers reports and information on site water use through its My Account portal for those who sign up and as part of water-wise evaluations. SFPUC is considering ways to more proactively reach customers.	N/A	2040
M4	Showerheads - Distribution	Buildings with ≤ 10 units limited to one showerhead per unit. Buildings with ≥ 10 units must schedule a WaterWise Evaluation (Measure M2) to receive the free devices.	▶ Continue.	12,000	~2020

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
M5	Showerheads - Direct Install	Free installation of showerheads. Prerequisite: WaterWise Direct Install Evaluations (Measure M1).	▶ Continue through direct install program.	7,600	~2020
M6	HET Rebates	Cash rebates of up to \$125 per tank-style HET or up to \$500 per flushometer HET to replace a high-flow toilet (≥ 3.5 gpf).	▶ Continue until 2017 and then possibly sunset rebates due to likelihood of high market saturation rate and high free ridership. Rebate increased to \$500 for flushometer HETs in 2014.	6,500	~2017
M7	HET Direct Install	Free installation of tank-style or flushometer-valve HETs. Prerequisite: WaterWise Direct Install Evaluations (Measure M1).	▶ Continue. New program launching in 2016 and focusing on sites with five or more toilets that flush at 3.5 gpf or more.	4,800	~2020
M8	HET Voucher	A voucher issued to eligible residents to replace their older toilets with HETs.	✘ Remain discontinued.	0	N/A
M9	HET/Fixture Install thru On-Bill Financing	On-bill financing is an alternative means to provide direct installation of water-saving fixtures such as toilets and showerheads that recovers some of agency's costs over time. The customer finances the project through water bill savings	■ Not offered at this time. Continue to study. On-bill financing could potentially be considered after SFPUC's HET incentives sunset as a way to help customers who still have old fixtures.	N/A	N/A
M10	CEE Tier 2 Rebates	Rebate for clothes washer with WF of ≤ 4.5 or lower.	✘ Remain discontinued.	100	N/A
M11	Energy Star Rebates	Rebate for common-area coin-op washers with WF of 4.0 or lower.	▶ Continue and increase rebate incentives. These washers are more expensive than household washers, and a higher rebate is needed to generate interest. Rebate was increased to \$500 in 2014	200	~2020

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
M12	Submetering Incentives for Existing Units	Rebate for cost of submeters installed per dwelling unit, assuming the building maintains a master meter. Submeters to be installed by the building owner, working with the California Department of Food and Agriculture, Division of Measurement Standards, with water billing conducted by a third party.	■ Needs further study. The SFPUC will clarify the process of submetering through the Division of Measurement Standards, evaluate market interest and feasibility of administering, and estimate water savings to determine if this measure merits further consideration. In meantime, focus continues on helping customers first replace old fixtures, repair leaks, and use existing tools such as My Account to monitor building water use.	N/A	N/A
M13	Submetering Incentives for Future New Units	Rebate or other financial incentives for new developments to install submeters for each unit instead of connecting all units to a master meter.	■ Needs further study. Will monitor potential legislative requirements.	N/A	N/A
M14	Large Landscape Grant	Funding under the Large Landscape Grant Program to implement retrofits and install conservation equipment on landscapes with over 2.5 irrigated acres.	▶ Continue. Possibly lower site size requirement to 1 acre to increase pool of customers. Continue to provide device-based incentives for nozzles, controllers, and spray bodies and custom incentives for other items. Continue to provide project evaluation/implementation support.	< 100	~2020
M15	Rain Barrels and Cisterns	Subsidy program that covers the purchase cost of rain barrels and cisterns and provides training.	+ New measure. Water savings may be low, but there is high customer interest. This measure can also help in the collection of valuable data in terms of utility costs and water savings.	N/A	2020
M16	Turf Removal Incentive	A per-square-foot rebate to replace turf with regionally appropriate plants.	✘ Not offered as an independent measure due to limited opportunity and high program cost (estimated unit cost was \$1 to \$2 per square foot of turf removal). Turf removal is provided through the SFPUC's Large Landscape Grant measure open to multi-family customers with large irrigated landscapes.	N/A	N/A

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
M17	WBIC Incentive	Incentive for installing WBIC that uses site-specific data and adjusts irrigation time to the local weather.	✘ Not offered as an independent measure due to limited opportunity and high program cost (estimated unit cost was \$100 to \$500 per controller). WBIC incentive is provided through the SFPUC's Large Landscape Grant measure open to multi-family customers with large irrigated landscapes.	N/A	N/A
M18	Irrigation Nozzle Distribution	Provide free irrigation nozzles to customers, such as homeowners associations and multi-family properties.	■ Not offered as an independent measure. Nozzles are provided through the SFPUC's Large Landscape Grant measure open to multi-family customers with large irrigated landscapes.	N/A	N/A
Non-Residential Conservation Measures					
N1	WaterWise Evaluations for Commercial Buildings	Free consultation. Review consumption history, check for toilet leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for rebate programs, and provide repair parts, water-saving devices, and materials.	▶ Continue. Conduct data analysis and targeted outreach to top water users. Provide (technical/financial) support to encourage participants to move forward with projects.	400	2040
N2	Surveys - Commercial Direct Install Audits	Free consultation similar to measure N1. Required for commercial buildings that apply for direct install programs.	▶ Continue.	< 100	2040
N3	Surveys - Hospitals, Hotels/Motels, Schools	Free consultation for hospitals, hotels, and schools.	▶ Continue.	< 100	2040
N4	Surveys - Landscape	Free survey for eligible customers (≥ 0.5 acres of irrigated landscape) under the Landscape Technical Assistance Program. Evaluate water delivery system for inefficiencies, determine the water budget, and generate improvement recommendations and cost estimates.	▶ Continue. Identify and target high water users. Provide support to assist customers in moving forward with projects.	100	2040

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
N5	CII Audits - Other (Funded Analysis)	Free consultation for non-residential customers provided by third-party consultant or other funding sources.	▶ Continue.	< 100	2040
N6a	High Usage Alerts	Using automated metering infrastructure (AMI) data to flag accounts that trigger high usage thresholds.	+New measure. Expand residential continuous usage alert program and consider high usage alerts for nonresidential sites.	N/A	2040
N6b	Custom Water Use Reports	Provides customers a site-specific water use report to provide better understanding of water use patterns and trends.	+ New measure. The SFPUC currently provides customers reports and information on site water use through its My Account portal for those who sign up, as part of water-wise evaluations. SFPUC is considering ways to more proactively reach customers.	N/A	2040
N7	1.5 GPM Showerheads - Distribution	Free, high-efficiency 1.5-gpm showerheads for San Francisco businesses.	▶ Continue.	4,300	~2020
N8	1.5 GPM Showerheads - Direct Install	Free installation of high-efficiency 1.5-gpm showerheads for San Francisco businesses. Prerequisite: Direct Install Audit (Measure N2).	▶ Continue.	2,000	~2020
N9	Device Distribution	Free water-efficient fixtures such as aerators (0.5/1.0/1.5 gpm for bathrooms, 1.5/2.2 gpm for kitchens, or 1.5/2.0/2.2 gpm for other utilities), kitchen/bathroom laminar (1.5 gpm), pre-rinse spray nozzles, garden spray nozzles, toilet flappers, toilet fill valves, and soil moisture meters.	▶ Continue.	125,000	2040
N10	HET Rebates – CII	Rebate up to \$125 per tank-style toilet and up to \$500 per flushometer toilet for replacing high-flow toilets (≥ 3.5 gpf) with approved HET models (≤ 1.28 gpf).	▶ Continue.	3,700	~2017

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
N11	HET Rebates – Schools, Hotels, Muni	Rebate up to \$125 per tank-style toilet and up to \$500 per flushometer valve toilet for replacing high-flow toilets (≥ 3.5 gpf) with approved HET models (≤ 1.28 gpf).	▶ Continue.	5,300	~2017
N12	HET Direct Install – CII	Free installation of HETs for non-residential customers. Prerequisite: Direct Install Audit (Measure N2).	▶ Continue. Open to any qualified non-residential building type. The Direct Install program also includes urinals. See N18.	700	~2020
N13	HET Direct Install – School/Hotel	Free installation of HETs for schools or hotels in San Francisco. Prerequisite: Direct Install Audit (Measure N2).	▶ Continue.	0	~2020
N14	HET Voucher – CII	A voucher for HET purchase.	✘ Remain discontinued.	N/A	N/A
N15	HET Voucher – School/Hotel	A voucher for HET purchase.	✘ Remain discontinued.	N/A	N/A
N16	HET/Fixture Install thru On-Bill Financing	On-bill financing is an alternative means to provide direct installation of water-saving fixtures such as toilets and showerheads that recovers some of agency’s costs over time. The customer finances the project through water bill savings	■ Not offered at this time. Continue to study. On-bill financing could potentially be considered after SFPUC’s HET incentives sunset as a way to help customers who still have old fixtures.	N/A	N/A
N17	HEU Rebates	Rebate up to \$500 per urinal for eligible commercial businesses when high-flow urinals (≥ 1.5 gpf) are replaced with HEUs.	▶ Continue.	1,000	~2017
N18	HEU Direct Install	A program for replacing 1.5-gpf HEUs with pint-flush urinals.	▶ Continue.	200	~2020
N19	Urinal Retrofit	A turnkey program for the replacement of the flush valve only. Free product and free installation of HEU flush valves.	+ New measure. Including this provision in new, expanded toilet and urinal direct install program. Will focus on restaurants, retail establishments, office buildings and other high-foot-traffic buildings.	N/A	~2020

No.	Measure	Description	Recommendation (▶ Continue; + New; ■ Needs Further Study; ✘ Discontinue or Not Offered)	Total Activities in 2010-2015	Anticipated End Date
N20	Coin-Op CEE Tier 2 (WF 4.5) Rebate	Rebates for commercial high-efficiency clothes washers with a WF of ≤ 4.5. Measure discontinued.	✘ Remain discontinued.	100	N/A
N21	Energy Star (WF 4.0) Rebate	Rebate up to \$500 for commercial high-efficiency clothes washers with a WP of ≤ 4.0.	▶ Continue. Aggressively target laundromats.	100	~2020
N22	Landscape Grants	Funding under the Large Landscape Grant Program to implement retrofits and install conservation equipment on landscapes with over 2.5 irrigated acres. Note that this measure is open to any site with qualifying acreage, including multi-family sites. See M14.	▶ Continue. Possibly lower site size requirement to 1 acre to increase pool of customers. Provide device-based incentives for nozzles, controllers, and spray bodies and custom incentives for other items. Provide project evaluation/implementation support.	< 100	~2020
N23	Rain Barrels and Cisterns	Subsidy program that covers the purchase cost of rain barrels and cisterns and provides training.	+ New measure. Water savings may be low, but there is high customer interest. This measure can also help in the collection of valuable data in terms of utility costs and water savings.	N/A	2020
N24	Equipment Retrofit Rebates	Offered to customers who can significantly reduce their use of potable water through upgrade or replacement of existing onsite indoor water using equipment such as ice machines, steam cookers, sterilizers, cooling tower connectivity controllers, etc.	▶ Continue.	<100	2040
N25	Equipment Retrofit Rebates – Customized Projects	Similar to Measure N24, but allows applicants to create a customized project tailored to their specific business needs and water use patterns. Eligible projects must achieve a water savings of 200 ccf (149,000 gallons) or more a year to qualify. SFPUC will provide qualifying projects grant funding of \$1.00 per ccf over a 10-year lifespan up to 50% of the project's equipment costs, with a maximum amount of \$75,000 per project.	▶ Continue. Conduct outreach to high water users and provide project evaluation and implementation technical support.	<100	2040

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6. WATER SAVINGS AND COST

Water savings presented in this 2015 Plan were projected using a different approach than was used for the 2011 Plan. For the 2011 Plan, the SFPUC used the Retail Demand Model, which forecasted both retail water demand and water savings from conservation activities. In 2014, the SFPUC adopted a new approach to forecast demand using an econometric demand model, which uses socioeconomic factors in addition to population and employment growth patterns to project water demands. By including socioeconomic factors, the model is able to capture a more complete demand picture. The new demand model, however, does not project water savings from conservation activities; those savings must be estimated separately and then used to adjust the demand forecast.

While it would have been possible to continue estimating conservation savings using the Retail Demand Model, its complex structure limited its usability and maintaining and updating it would require extensive re-programming and operational knowledge. This led to the decision to develop a new model that would be better equipped to project conservation savings. The new Water Conservation Tracking Model (Conservation Model) is a customization of the Alliance for Water Efficiency's (AWE's) Water Conservation Tracking Tool, which has a much simpler user interface, and employs a user-friendly data table structure that makes adding, modifying, and deleting conservation measures more straightforward. This new model provides greater flexibility for the SFPUC conservation staff. For the 2015 Plan, the SFPUC used this new Conservation Model to estimate and project water conservation program activity, water savings, and the costs and benefits of conservation measures.

The Conservation Model contains the individual measures that the SFPUC has implemented in the past, is planning to implement as part of its overall conservation program, and is considering implementing in the future. The model estimates the water savings associated with each measure as a product of the estimated water savings per unit of activity and the amount of activity completed. The savings are then adjusted based on parameters such as the useful life of fixtures, annual decay, and plumbing code interaction over time. Some measures, such as school education programs, do not have well-defined water savings and are therefore not included in the model.

The active savings and passive savings reported in this 2015 Plan, when compared to those reported in the 2011 Plan, are generally lower after 2020. This decline can be attributed to several factors:

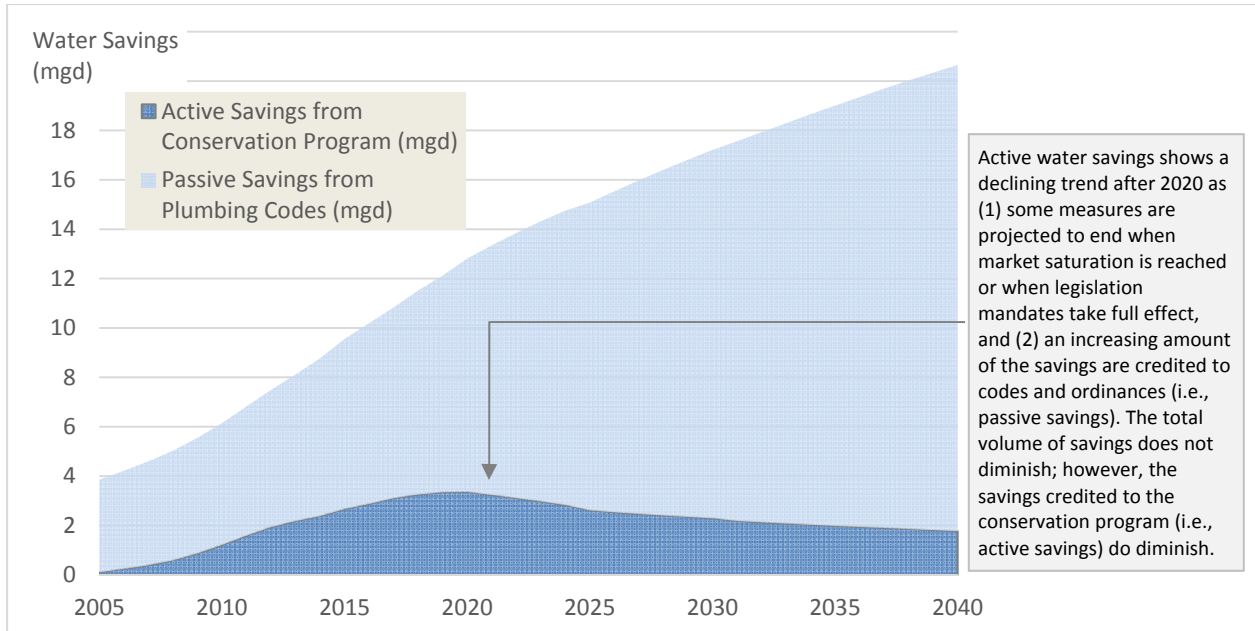
- (1) The participation targets for a number of measures were lowered based on historical participation data;
- (2) Savings assumptions for residential toilets and washers were both lowered to account for new efficiency standards that affect the water saving potentials; and
- (3) Measures for toilets, urinals, and washers were assigned an earlier end date due to anticipated high market saturation.

This third factor is a change in approach compared to the 2011 analysis in which all toilet and urinal measures were set to continue at high participation levels throughout the planning horizon, based on the assumption that discontinued measures would be replaced by new measures that achieved similar savings. The new approach used in this analysis is more conservative, and the actual savings are likely to be higher than the currently modeled savings. While it is likely that the SFPUC will implement new measures after 2020 to replace the discontinued measures, the savings and costs associated with these measures are not well enough defined to include in this analysis.

Although active water savings provide a direct indication of conservation program effectiveness, a more meaningful way to understanding the overall impact of a conservation program is to consider both its

active and passive savings. As illustrated in **Figure 9**, the overall water savings are expected to continue increasing through 2040, even though the active water savings show a declining trend after 2020. One of the SFPUC’s established conservation goals is to achieve 4.0 mgd of active water savings by 2018. The goal focuses on active savings but fails to account for the fact that an increasing amount of water savings achieved by program measures are credited to passive savings over time. As a result, even though the projected active savings by 2018 is only 3.3 mgd, the overall savings is over 11.5 mgd by 2018.

Figure 9: Conservation Water Savings Forecast for 2005-2040



The subsequent sections discuss the active water savings projected for each of the three customer sectors.

Single Family Residential Program Savings

Single family residential conservation measures primarily focus on the installation of higher efficiency plumbing fixtures over the next few years and repair of leaks in toilets, clothes washers, and showerheads, as well as customer assistance and education through onsite water audits and tools to understand and monitor water use over the remainder of the planning horizon. Due to San Francisco’s highly urbanized setting, indoor water use accounts for the majority of the City’s residential water use. As such, the SFPUC currently offers conservation measures targeted at encouraging residents to install HETs and other high-efficiency fixtures such as clothes washers and showerheads. Measures include direct installation of high-efficiency toilets, rebate programs for customers who install HETs and efficient clothes washers, and free distribution and direct installation of high-efficiency showerheads for eligible customers.

Toilets account for a significant portion of indoor water use, and older toilets use significantly more water than HETs. To encourage participation in toilet-related conservation programs, the SFPUC offers several measures specifically targeted at toilet replacement, including a direct install program for Community Assistance Program participants and rebates for eligible residents who purchase qualifying high-efficiency toilets. In 2009, the City adopted an updated Residential Water Conservation Ordinance, referred to as the “Retrofit on Resale” program, which requires homes to be equipped with water-efficient fixtures prior to being sold. It called for replacing inefficient toilets with ultra-low flow toilets (ULFTs) or HETs until July 2011, and subsequently with only HETs per local building code updates. The ordinance

also requires efficient showerheads with a maximum flow rate of 2.5 gpm. Together, these measures achieve the highest cumulative savings of all single family conservation measures.

While the Retrofit-on-Resale (ROR) Program is related to local plumbing codes, the SFPUC has worked extensively at the local level to ensure compliance with this ordinance by coordinating with the Department of Building Inspection, meeting with the San Francisco Department of the Environment, and conducting customer outreach. As a result, the Retrofit on Resale program is categorized as an active measure.

As previously discussed, the SFPUC plans to conclude its toilet rebate programs in the next few years as Assembly Bill 715 and Senate Bill 407 take full effect. At that point, the SFPUC will not include toilet-related measures in its conservation plan. The increasing water savings from past fixture replacements are credited to the relevant plumbing code, which is reflected as a gradual decline in savings after 2020.

The projected annual water savings in selected years and the cumulative savings from 2005 through 2040 are summarized in **Table 8**. The cumulative savings from all single family residential measures are projected to reach over **26,000** acre-feet (AF). The table depicts the “active” component of water savings (i.e., the amount of water savings that can be directly attributed to a conservation measure). For some measures—notably those related to toilets, urinals, and clothes washers—active water savings per unit of activity diminish over time because new fixtures are required to adhere to plumbing codes and appliance standards. In the absence of active conservation measures, these codes and standards would eventually generate some or all of the water savings created by the measures. The measures accelerate water savings so that their benefits can be realized sooner than would have otherwise been the case; however, over the long term, the codes and standards would have eventually achieved the same effect, which is why the water savings for toilets, urinals, and washers shown in the figure decrease over time. The rate of decrease depends on the turnover rate for fixtures and appliances. Thus, the rate of decrease is faster for clothes washers than for toilets because clothes washers are normally replaced more frequently than toilets.⁹

Table 8: Single Family Annual and Cumulative Water Savings Projection

Measure Category	Annual Water Savings in Selected Years (AF/Yr)								2005-2040 Cumulative Savings (AF)
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	
Audits & Reports	0	41	93	33	33	33	33	33	1,500
Showerheads	0	44	87	29	10	0	0	0	832
Ultra-Low Flow Toilets (ULFTs)	0	13	12	10	9	7	6	5	318
High-Efficiency Toilets (HETs)	0	71	212	225	193	166	143	122	5,450
Clothes Washers	0	407	673	696	230	77	0	0	10,519
Reuse Incentives ⁽¹⁾	0	0	0	1	1	1	0	0	17
Retrofit on Resale	0	68	189	262	300	314	312	301	8,082
Total Annual Savings (AF/Yr) ⁽²⁾	0	645	1,266	1,256	776	598	494	461	26,719
Total Annual Savings (mgd) ⁽²⁾	0.00	0.58	1.13	1.12	0.69	0.53	0.44	0.41	

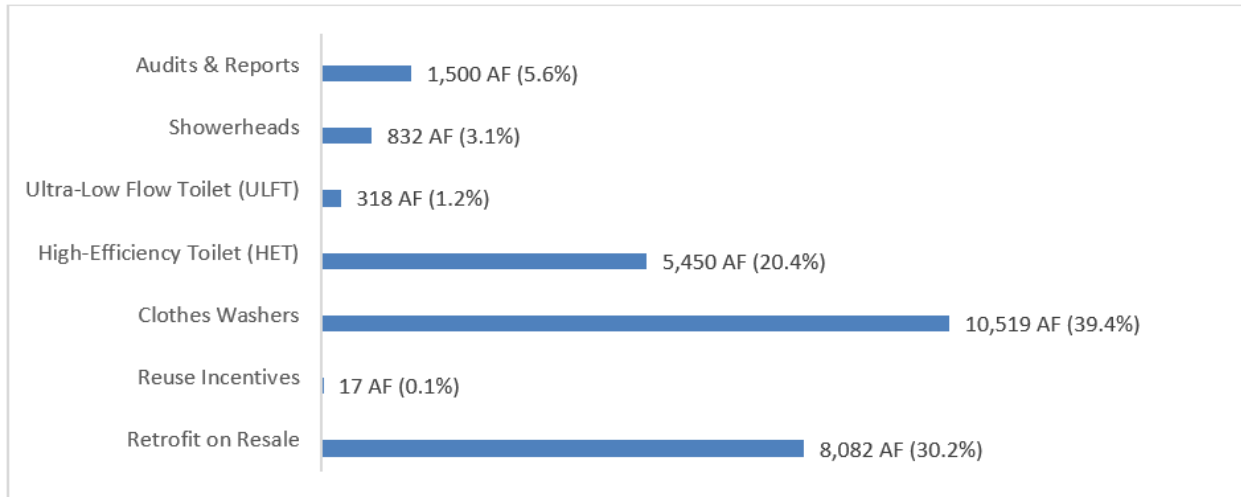
(1) Incentive measures related to residential use of graywater, rain barrels, and cisterns.

(2) 1 mgd equals to 1,121 AF/Yr. Values may show a difference of 1 AF/Yr or 0.1 mgd due to rounding.

⁹ The average useful life of a clothes washer is 12 to 14 years, whereas the average useful life of a toilet is 25 to 30 years.

Figure 10 shows the cumulative savings from each measure category and their corresponding percentages of the total cumulative savings.

Figure 10: Single Family Conservation Measures Cumulative Water Savings Projection



Multi-Family Residential Program Savings

Approximately two-thirds of the City’s housing stock consists of multi-family residential buildings, which are expected to constitute the majority of the City’s future household growth. Similar to water use in the single family residential sector, water use in multi-family properties is primarily generated by indoor plumbing fixtures such as toilets, clothes washers, and showerheads. Outdoor water use in much of the multi-family sector, aside from large complexes with landscaping, is low.

Multi-family measures are similar to those prescribed for the single family sector, including water surveys, direct install and rebates for high-efficiency toilets, rebates for clothes washers, and free distribution and direct installation of low-flow showerheads, as well as onsite water audits and water usage measurement and monitoring tools and tenant education. Multi-family properties are subject to compliance with the Residential Water Conservation Ordinance (the Retrofit on Resale program). Property owners are therefore required to replace inefficient plumbing fixtures with efficient fixtures before selling the property.

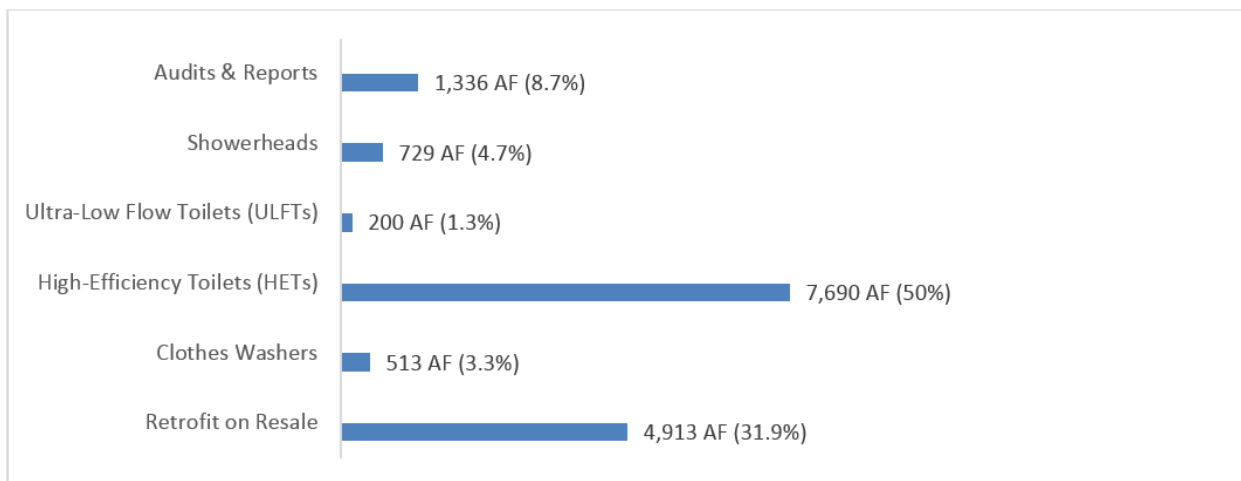
Table 9 presents the projected annual water savings through 2040 resulting from implementation of the multi-family retail conservation measures. The cumulative savings from conservation activities during the planning period (2005-2040) are projected to be over **15,000 AF**. Water savings in the multi-family sector are relatively low prior to 2010 because some of the measures, such as the direct install of HETs, had just launched.

Table 9: Multi-Family Annual and Cumulative Water Savings Projection

Measure Category	Annual Water Savings in Selected Years (AF/Yr)								2005-2040 Cumulative Savings (AF)
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	
Audits & Reports	0	7	137	40	20	20	20	20	1,336
Showerheads	0	7	71	65	12	0	0	0	729
Ultra-Low Flow Toilets (ULFTs)	0	8	7	6	5	5	4	3	200
High-Efficiency Toilets (HETs)	0	64	257	341	293	251	216	185	7,690
Clothes Washers	0	2	30	37	28	8	0	0	513
Retrofit on Resale	0	40	115	159	181	191	191	185	4,913
Total Annual Savings (AF/Yr)	0	129	618	648	539	474	431	394	15,381
Total Annual Savings (mgd)	0.00	0.12	0.55	0.58	0.48	0.42	0.38	0.35	

Note: 1 mgd equals to 1,121 AF/Yr. Values may show a difference of 1 AF/Yr or 0.1 mgd due to rounding.

Figure 11 shows the cumulative savings from each measure category and their corresponding percentages of the total cumulative savings.

Figure 11: Multi-Family Conservation Measures Cumulative Water Savings Projection

Non-Residential Program Savings

A significant number of non-residential facilities, such as parks and hospitals, have large landscaped areas. These properties present the potential to achieve significant outdoor water savings. The SFPUC offers a wide range of incentives and free audit measures aimed at capturing these savings. **Table 10** presents the projected annual and cumulative water savings resulting from implementation of the non-residential retail conservation measures. The cumulative savings from these measures are projected to reach over **43,000 AF**. Some of the conservation measures, such as the customized equipment retrofit rebates, are relatively new, and participation levels are uncertain at this time. As such, the activity levels assigned to these measures may be conservative, showing less water savings than they may ultimately achieve.

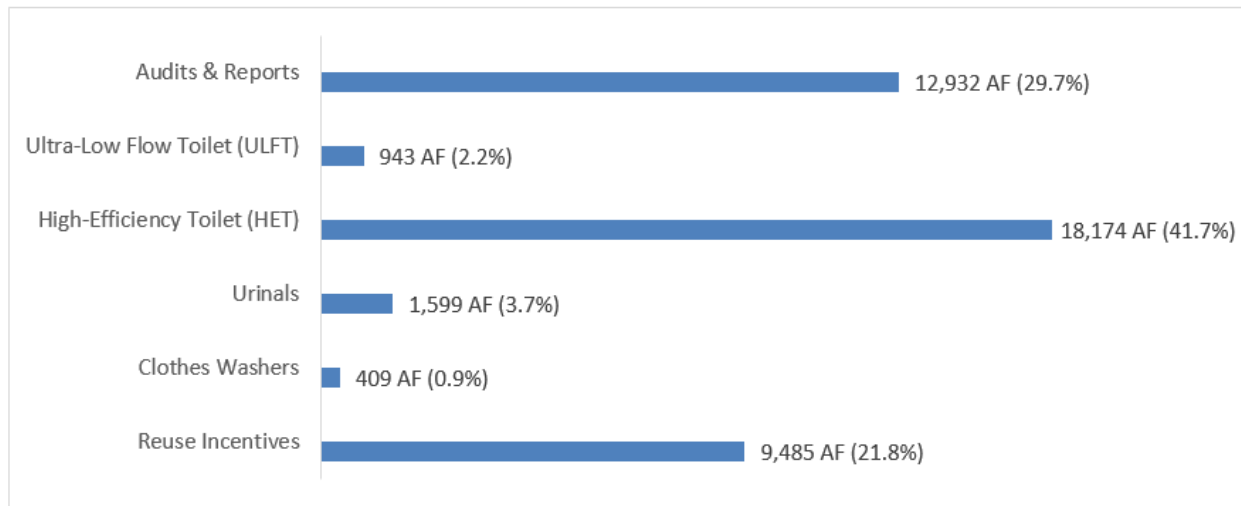
Table 10: Non-Residential Annual and Cumulative Water Savings Projection

Measure Category	Annual Water Savings in Selected Years (AF/Yr)								2005-2040 Cumulative Savings (AF)
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	
Audits & Reports	5	291	267	440	440	440	440	440	12,932
Ultra-Low Flow Toilets (ULFTs)	0	40	34	29	25	22	19	16	943
High-Efficiency Toilets (HETs)	0	124	514	846	726	624	536	460	18,174
Urinals	0	3	29	75	68	61	56	51	1,599
Clothes Washers	0	16	24	28	12	5	0	0	409
Reuse Incentives	108	108	230	440	335	335	245	159	9,485
Total Annual Savings (AF/Yr) ⁽¹⁾	113	581	1,098	1,858	1,606	1,487	1,295	1,126	43,542
Total Annual Savings (mgd) ⁽¹⁾	0.10	0.52	0.98	1.66	1.43	1.33	1.16	1.01	

Note: 1 mgd equals to 1,121 AF/Yr. Values may show a difference of 1 AF/Yr or 0.1 mgd due to rounding.

Figure 12 shows the cumulative savings from each measure category and their corresponding percentages of the total cumulative savings.

Figure 12: Non-Residential Conservation Measures Cumulative Water Savings Projection



Unit Costs of Water Savings

Table 11 shows the estimated total cost to the SFPUC to implement each measure (Present Value Cost), the estimated lifetime water savings from each measure in acre feet (Discounted Savings) and each measure’s cost per acre foot of water saved (Unit Cost). Present value is a typical measurement that indicates the total cost of the program in today’s dollars, while unit cost indicates the present cost per unit of water. Present value and unit cost calculations assume a nominal discount rate of 5 percent and a long-term inflation rate of 3 percent.

The unit cost is defined as an unvarying price which if applied to the volume of saved water over the life of the forecast would exactly recover the present value cost of generating the water savings. Algebraically

this price (or unit cost) can be determined by discounting project costs to their present value, discounting water savings to their present value, and then dividing the former by the latter. The unit cost is analogous to a fixed mortgage payment on a loan which is calculated so that it exactly recovers the present value of the loan over the loan's repayment period.

To provide an accurate estimate of the cost of program water savings, the present value of program costs is divided by the discounted cumulative water savings. The average unit cost of water savings across all the SFPUC's retail measures is **\$784/AF**. The average unit cost is \$697/AF for single family residential measures, \$963/AF for multi-family residential measures, and \$777/AF for non-residential measures.

Table 11: Unit Costs by Conservation Measure and Customer Sector

Conservation Measure Category	Present Value Cost (\$1,000)	Discounted Savings (AF)	Unit Cost (\$/AF)
Single Family Residential			
Audits & Reports ⁽¹⁾	\$1,829	1,144	\$1,598
Showerheads	\$151	686	\$220
Toilets	\$3,957	4,955	\$799
Washers	\$4,462	8,334	\$535
Reuse Incentives ⁽²⁾	\$152	12	\$12,683
All Single Family Measures:	\$10,550	15,132	\$697
Multi-Family Residential			
Audits & Reports ⁽¹⁾	\$809	1,035	\$782
Showerheads	\$99	577	\$172
Toilets	\$7,441	6,783	\$1,097
Washers	\$106	384	\$276
All Multi-Family Measures:	\$8,456	8,779	\$963
Non-Residential			
Audits & Reports	\$2,582	9,311	\$277
Toilets	\$10,329	16,451	\$628
Urinals	\$2,568	1,475	\$1,741
Clothes Washers	\$179	319	\$562
Reuse Incentives	\$11,066	6,846	\$1,616
All Non-Residential Measures:	\$26,724	34,402	\$777
All Measures:	\$45,729	58,314	\$784

Notes:

- (1) Single family and multi-family surveys provide valuable customer service and educational assistance that support plumbing fixture replacement measures. As such, much of the water savings associated with surveys are assigned to the toilet, washer and showerhead savings above, which makes the relative unit cost for surveys appear high.
- (2) Single family reuse incentives refer to measures that provide incentives for residential use of graywater and rain barrels and cisterns. Due to limited data available on actual water savings, a very conservative and low savings estimate was set, which significantly increases their unit cost. The measures will be re-evaluated in two years to determine a future implementation strategy.

The unit costs for a measure do not necessarily mean the SFPUC spends more on a yearly basis to implement that particular measure compared to measures with lower unit costs, and a higher unit cost does not necessarily mean the measure doesn't have as much value as one with a lower unit cost. For example, single family audits typically generate savings in conjunction with other measures, particularly the replacement of plumbing fixtures, and the water savings are primarily captured through these latter measures. Additionally, residential rainwater and graywater measures have a higher unit cost due to limited data available on water savings. The SFPUC, however, issues a much lower volume of these incentives than toilet and washer incentives and as such spends less a year administering the reuse incentives. The reuse measures also add value in aligning with the SFPUC's mission of diversifying the conservation program and encouraging the use of non-potable water for irrigation needs and helping with the collection of cost and water savings data for use in evaluating similar types of projects in the future.

7. CONSERVATION EFFECT ON RETAIL WATER DEMAND

As described in the previous section, the SFPUC used a new approach to project water demand and forecast water savings for this 2015 Plan. The retail water demand forecast shows the effect of passive and active conservation savings on water use over time and helps the SFPUC assess its compliance with GPCD targets. As shown in the tables and figures in this section, the SFPUC's retail per capita water use is expected to continue declining despite steady population and employment growth, which is due in large part to its water conservation efforts.

Table 12 presents the water demand projections for each of the three customer sectors and for the entire retail service area, including the suburban retail customers. Historical water billing data and census data were used to estimate the suburban water use and population, respectively. There are four projections included in the table:

1. **Unadjusted Baseline Demand:** This is the gross retail water demand forecast and does not include reductions in demand due to plumbing codes, appliance standards, and SFPUC conservation measures. This forecast is driven by population growth, employment growth, and various socioeconomic factors.
2. **Plumbing Code Adjustment:** This is the forecast of future water savings from plumbing codes and appliance standards (i.e., passive conservation savings). The adjustment is presented as a negative value, indicating a deduction from the Unadjusted Baseline Demand.
3. **SFPUC Program Adjustment:** This is the forecast of future water savings from SFPUC-initiated water conservation programs (i.e., active conservation savings). The adjustment, like the plumbing code adjustment, is presented as a negative value, indicating a deduction from the Unadjusted Baseline Demand.
4. **Adjusted Demand:** This is the water demand after accounting for both passive and active water savings from the plumbing code and SFPUC program adjustments, respectively.

The table below also includes distribution system losses, which represents the unallocated water in the distribution system. The SFPUC is in the process of completing a water loss study to estimate its distribution system losses, in accordance with the Department of Water Resources guidelines. System water losses presented in the table were estimated based on historical water losses and will be updated upon completion of the study.

The adjusted demand divided by the corresponding population projection is the gross per capita water use of the retail system, or GPCD. It is used to assess the SFPUC's expected compliance with the interim and final conservation goals set forth by SB X7-7.

Also, in response to the recent drought, the SFPUC started tracking residential per capita water use in addition to the overall gross per capita water use. Residential per capita water use, or R-GPCD, is calculated by dividing residential demand by residential population, whereas the gross per capita water use, or GPCD, is calculated by dividing total demand by total population, which includes people living in both households and group quarters.

Table 12: SFPUC Retail Water Demands for 2005-2040

	2005	2010	2015	2018	2020	2025	2030	2035	2040
Single Family									
million gallons per day (mgd)									
Unadjusted Baseline Demand	19.8	18.7	17.9	18.9	19.5	20.7	22.6	24.7	26.7
Adjustments:									
Plumbing Code	-1.3	-1.6	-2.2	-2.5	-2.8	-3.6	-4.2	-4.7	-5.1
SFPUC Program	0.0	-0.6	-1.1	-1.2	-1.1	-0.7	-0.5	-0.4	-0.4
Adjusted Demand	18.5	16.5	14.6	15.2	15.6	16.4	17.9	19.6	21.2
Multi-Family									
Unadjusted Baseline Demand	29.4	27.2	26.0	26.8	27.3	29.7	32.3	34.5	36.8
Adjustments:									
Plumbing Code	-1.7	-2.2	-3.3	-4.0	-4.6	-6.4	-7.9	-9.1	-10.2
SFPUC Program	0.0	-0.1	-0.6	-0.6	-0.6	-0.5	-0.4	-0.4	-0.4
Adjusted Demand	27.8	24.8	22.2	22.3	22.1	22.8	24.0	25.0	26.2
Non-Residential									
Unadjusted Baseline Demand	32.0	30.8	30.1	34.2	37.0	37.2	38.1	39.2	40.6
Adjustments:									
Plumbing Code	-0.8	-1.0	-1.5	-1.8	-2.0	-2.5	-2.8	-3.2	-3.6
SFPUC Program	-0.1	-0.5	-1.0	-1.5	-1.7	-1.4	-1.3	-1.2	-1.0
Adjusted Demand	31.1	29.2	27.7	31.0	33.3	33.3	33.9	34.8	36.0
Total SFPUC Retail Demand									
Unadjusted Baseline Demand	81.2	76.7	74.1	79.9	83.8	87.6	93.0	98.4	104.1
Adjustments:									
Plumbing Code	-3.8	-4.9	-6.9	-8.3	-9.5	-12.5	-14.9	-17.0	-18.9
SFPUC Program	-0.1	-1.2	-2.7	-3.3	-3.4	-2.6	-2.3	-2.0	-1.8
Adjusted Demand	77.3	70.5	64.5	68.4	71.0	72.5	75.8	79.4	83.4
System-wide Adjustment:									
Distribution System Losses	8.3	6.4	5.3	6.0	6.0	6.0	6.0	6.0	6.0
Adjusted Total Demand	85.6	76.9	69.8	74.4	77.0	78.5	81.8	85.4	89.4
In-City Demand	80.6	72.6	65.6	70.0	72.5	74.0	77.3	80.9	84.9
Suburban Demand	5.0	4.3	4.2	4.4	4.5	4.5	4.5	4.5	4.5
Retail Population (1,000)	782	807	859	879	892	937	984	1,034	1,087
In-City Population (1,000)	780	805	858	877	890	935	982	1,033	1,086
Suburban Population (1,000)	2	2	2	2	2	2	2	2	2
Gross Per Capita Use (GPCD)	110	95	81	85	86	84	83	83	82
Residential GPCD (R-GPCD)	61	53	44	44	44	43	44	44	45

Notes:

- (1) System losses for 2016-2040 are estimated based on historical losses and will be updated upon completion of the water loss study.
- (2) Active savings from the SFPUC conservation program was zero in 2005, the starting year of the model. The table does not reflect the savings achieved from conservation activities prior to 2005.
- (3) Sum of demands and adjustments may not match the totals due to rounding.

Table 13 summarizes the various water uses by in-city and suburban retail customers to provide another perspective on the breakdown of the retail demands.

Table 13: Retail Water Demand Projections with Water Conservation

	2015	2020	2025	2030	2035	2040
Adjusted In-City Retail Demands	million gallons per day (mgd)					
Single Family Residential	14.5	15.5	16.3	17.8	19.5	21.1
Multi-Family Residential	22.2	22.1	22.8	24.0	25.0	26.2
Non-Residential ⁽¹⁾	23.6	28.9	28.9	29.5	30.4	31.6
Distribution System Losses ⁽²⁾	5.3	6.0	6.0	6.0	6.0	6.0
In-City Retail Demand Subtotal ⁽³⁾	65.6	72.5	74.0	77.3	80.9	84.9
Adjusted Suburban Retail Demands						
Suburban Retail Customers ⁽⁴⁾	3.5	3.8	3.8	3.8	3.8	3.8
Castlewood and Sunol Golf Courses ⁽⁵⁾	0.7	0.7	0.7	0.7	0.7	0.7
Suburban Retail Demand Subtotal ⁽³⁾	4.2	4.5	4.5	4.5	4.5	4.5
Total Retail Demand ⁽³⁾	69.8	77.0	78.5	81.8	85.4	89.4

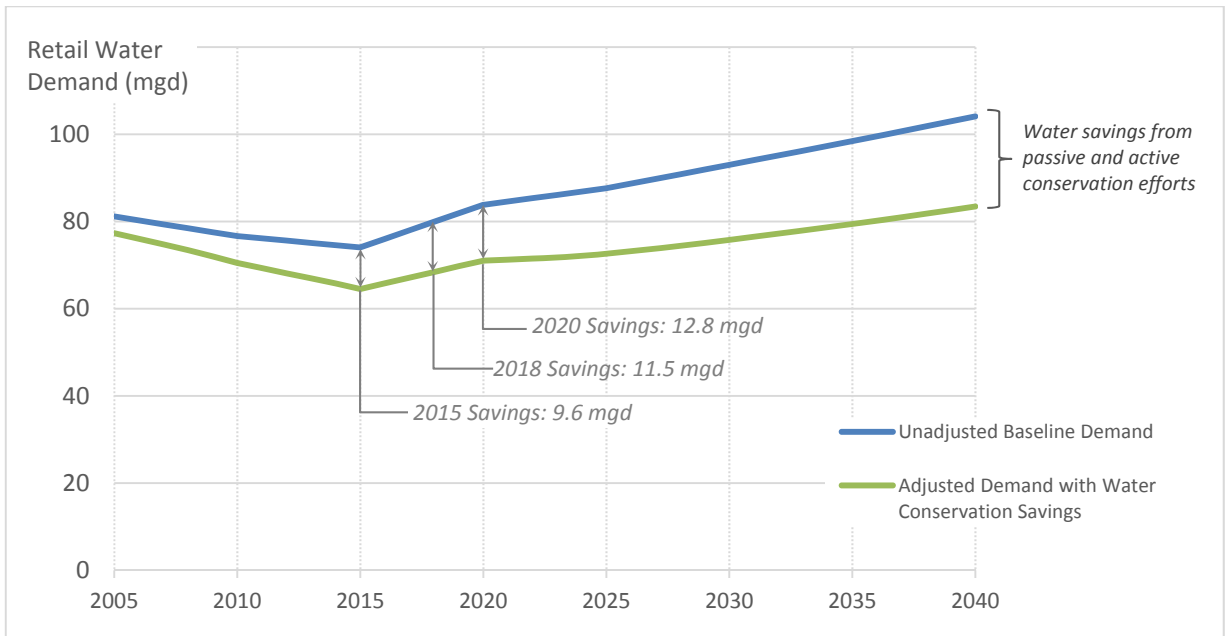
Notes:

- (1) Includes 1.5 mgd of in-city irrigation demand for Golden Gate Park, the Great Highway, and San Francisco Zoo.
- (2) System losses for 2016-2040 are estimated based on historical losses, and will be updated upon completion of the water loss study.
- (3) Sum of demands may not match the totals due to rounding.
- (4) Large facilities and residential houses outside of San Francisco that receive water from and are billed directly by the SFPUC.
- (5) 100 percent of Castlewood's demand (0.4 mgd) and 75 percent of Sunol Golf Course demand (0.3 mgd) is served by groundwater in Sunol. Projected demands are based on average use from 2000-2014 and remain unchanged over the 25-year planning horizon.

Figure 13 graphically illustrates the effect of the SFPUC’s water conservation program on the overall retail water demand. Demand reflects actual water use for all years through 2015 and projected water use for all years after 2015; and includes all retail customers within and outside of San Francisco. While the overall demand has continued to decline through 2015 due in large part to increasingly more efficient plumbing fixtures, projections show that by around 2018 retail water use will reach a point where water savings from conservation will no longer outpace anticipated population and job growth; thus, demand is forecasted to increase. In the absence of water conservation efforts, retail demand is projected to increase by 40 percent over the next 25 years, from 74.1 mgd in 2015 to 104.1 mgd in 2040. However, after accounting for the projected savings from water conservation, the retail demand would only increase by about 29 percent, from 64.5 mgd in 2015, to 83.4 mgd in 2040.

In terms of conservation savings, 9.6 mgd of water has been saved through active and passive conservation efforts in 2015; over 11.5 mgd is expected to be saved in 2018; and the savings would further increase to 12.8 mgd by 2020.

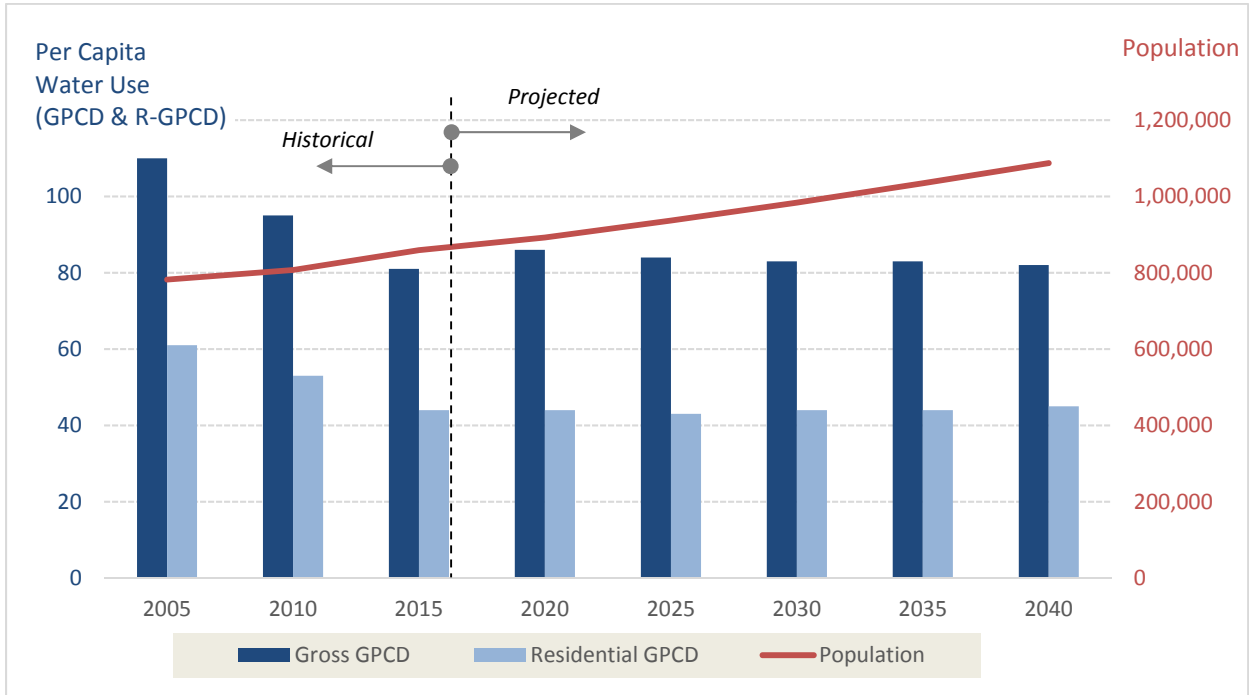
Figure 13: Effect of Water Conservation on Retail Water Demand



The estimated active and passive water savings for 2018 (3.3 mgd and 8.3 mgd, respectively) are lower than had been projected in the 2011 Plan (5.0 mgd and 9.0 mgd, respectively). As previously explained, this decrease in savings can be attributed to three factors: lowered participation targets for a number of measures to align with historical participation data; lowered savings assumptions for residential toilets and washers to account for new efficiency standards that affect the potential for water savings; and earlier end dates for measures related to toilets, due to anticipated high market saturation. These factors, coupled with the fact that an increasing amount of savings from previous active conservation activities is credited to passive savings over time, resulted in a gradual decline in active water savings, from 3.4 mgd in 2020 to 1.8 mgd in 2040. It is possible that new technologies in plumbing fixtures would trigger the SFPUC to pursue new fixture incentive measures, but these factors are too speculative at this time to be included in the analysis.

Figure 14 shows the effect of the SFPUC’s water conservation effort in terms of per capita water use. Similar to the previous figure, this figure reflects actual water use and historical population estimates for years through 2015 and projected water use and population for years after 2015. Gross retail system GPCD dropped significantly in 2015 due to extreme drought conditions and water restrictions in effect. It is unknown when the current drought will end or how climate change will affect long-term demands; thus, gross GPCD is projected to increase after this year if water use trends preceding the drought are restored and some discretionary water use rebounds.

Figure 14: Historical and Projected Population and Per Capita Water Use Trends



While the SFPUC’s retail service area population is expected to grow by over 26 percent over the next 25 years (from 859,000 in 2015 to 1,087,000 in 2040), the retail per capita water use is estimated to remain almost constant. The SFPUC’s current residential per capita water use is 44 R-GPCD, which is one of the lowest in the state of California. Through continuous aggressive conservation efforts, the SFPUC expects to maintain residential water usage at 44 R-GPCD in 2020.

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8. CONCLUSIONS AND NEXT STEPS

The SFPUC plans to continue implementing a robust conservation program, meeting conservation goals established under the WSIP, CUWCC's MOU, SB X7-7, and, most recently, the State of Emergency Drought Declaration of 2014. The conservation program outlined in this 2015 Plan includes an extensive mix of incentives, services, and tools that serves all three customer sectors, as well as foundational customer assistance measures, such as water evaluation surveys, site usage reports and tools, free devices, and public education and outreach. These foundational measures will continue to be offered with no definite end date. Fixture incentive measures for toilets and washers, however, are expected to be phased out by 2020 or earlier because of new legislation and codes as well as high market saturation rates.

The SFPUC will continually evaluate and adapt its conservation measures to respond to changing conditions and regulations. This dynamic approach to conservation has contributed to significant reductions in water demand, despite population growth. As a result, the SFPUC currently has one of the lowest residential water use levels in the state of California. In 2005, gross per capita water use was 110 gallons per capita per day (GPCD) and residential per capita water use was 61 R-GPCD. In 2015, these figures dropped to 81 GPCD and 44 R-GPCD due in large part to increasingly more efficient plumbing fixtures; and are expected to be at about 86 GPCD and 44 R-GPCD by 2020. These figures indicate that the SFPUC is already in compliance with the 2015 interim conservation goal of 102 GPCD set forth in Senate Bill X7-7 (SB X7-7) and that the SFPUC is on track to meet the 2020 final goal of 96 GPCD.

On an annual or even more frequent basis, the SFPUC plans to review the model results against actual program activity to generate current water savings, costs, and demand projections. The SFPUC will update the forecasting model and conduct a major review of the Conservation Plan every five years, coinciding with its update of the UWMP. Moving forward, the SFPUC will use this 2015 Plan and the findings as a broad guidance document to inform the development of annual action plans and identify staffing, resource, and budget needs. The levels of funding, resources, and public participation for each conservation measure will change over time; thus, the recommendations contained herein will be revisited and adapted as needed to meet the SFPUC's needs and to ensure its conservation goals are met.

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San Francisco Water Power Sewer

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