SAN FRANCISCO PUBLIC UTILITIES COMMISSION

2025 RETAIL WATER CONSERVATION PLAN

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

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DRAFT

2025 Retail Water Conservation Plan

San Francisco Public Utilities Commission
Water Enterprise

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CONTENTS

APPENDICES

Appendix A: SFPUC Plumbing Fixture Population and Efficiency Saturation Estimates - 2025 Update

Appendix B: SFPUC Plumbing Fixture Population and Efficiency Saturation Estimates - 2014 Base Study

Appendix C: Detailed Table of Fixture Populations and Saturation Rates 2025 - 2050

Appendix D: Updated SFPUC Water Conservation Tracking Model Overview and Water and Energy Savings Specifications for Conservation Program Measures (2025)

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS & ABBREVIATIONS

2020 Plan	2020 SFPUC Retail Water Conservation Plan
2025 Plan	2025 SFPUC Retail Water Conservation Plan
AF	acre-feet
AMI	Advanced Metering Infrastructure
AWR	American Water Resources
BAWSCA	Bay Area Water Supply and Conservation Agency
BMP	Best Management Practices
BOMA	San Francisco Building Owner and Managers Association
CAP	Community Assistance Program
CCF	100 Cubic Feet
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CII	Commercial, Industrial, and Institutional
City	City and County of San Francisco
DIM	dedicated irrigation meter
DWR	California Department of Water Resources
EPA	United States Environmental Protection Agency
ft2	square feet
FY	Fiscal year (The SFPUC uses the fiscal year from July 1 to June 30 to track financial and conservation activities. Fiscal Year 2024-2025 is presented as FY 24-25 in this plan)
gal	gallon
GPCD	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
HET	high-efficiency toilet (1.28 gallons per flush)
HEU	high-efficiency urinal
IWF	integrated water factor
lb	pound
LEED	Leadership in Energy & Environmental Design
MGD	million gallons per day
MOU	Memorandum of Understanding
MUM	mixed-use meter (i.e., a standard meter that provides water to a building and landscape)
MWELO	Model Water Efficient Landscape Ordinance
NFT	non-functional turf
ozf	ounce force
R-GPCD & G-GPCD	residential gallons per capita per day and gross gallons per capita per day
ROR	Retrofit on Resale
SB X7-7	Senate Bill X7-7 Water Conservation Act of 2009
SFPUC	San Francisco Public Utilities Commission
SIC	Standard Industrial Classification
STEM	science, technology, engineering, math

SWRCB	State Water Resources Control Board
UHET	ultra-high efficiency toilet that flushes at 1.1 gallons a flush or less
ULFT	ultra-low flow toilet (1.6 gallons per flush)
UWMP	Urban Water Management Plan
WBIC	Weather Based Irrigation Controller
WEIO	Water Efficient Irrigation Ordinance
WER	water efficiency ratio
WF	Water Factor
WRF	Water Research Foundation
WSCP	Water Shortage Contingency Plan

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EXECUTIVE SUMMARY

The San Francisco Public Utilities Commission (SFPUC) has long been committed to conserving water. For over 35 years, the SFPUC's 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. In addition, the SFPUC has helped to develop and implement local requirements that mandate water efficiency. Together, these voluntary assistance services and requirements have resulted in a significant reduction of SFPUC retail water use. This *2025 Retail Water Conservation Plan* (2025 Plan) provides an overview of the retail water Conservation Program, the factors that shape the program, estimated water savings, and the program's effect on the overall retail water demand projection. The main purposes of the 2025 Plan are to:

- Summarize the mix of measures that the SFPUC has implemented to date and plans to offer over the next five years and beyond, including the estimated water savings, costs, and effects on retail water demand;
- Explain the factors considered in evaluating and selecting conservation measures and recap measures implemented to date;
- Serve as a broad guidance document that helps inform annual activities, such as staffing and budget needs, both internally and for interested parties; and
- Provide an update to the *2020 San Francisco Public Utilities Commission Retail Water Conservation Plan* (2020 Plan) as part of a five-year review cycle to assess program performance and identify the need for adjustments.

The planning horizon for the 2025 Plan spans a 25-year period from 2025 to 2050 to coincide with the planning horizon of the *2025 Urban Water Management Plan* (UWMP). The most precise analysis of the water Conservation Program, however, is over the next five years. Beyond this timeframe, there is less certainty regarding measure parameters, because of the difficulty in anticipating future changes in technology, customer participation rates, and codes and standards. For this reason, the SFPUC plans to continue to update its retail water conservation plan every five years to provide the most realistic future estimates of conservation actions and savings. The Bay Area Water Supply and Conservation Agency (BAWSCA), which coordinates conservation assistance among the SFPUC's wholesale customers, separately estimates conservation measures and savings anticipated over the next 25 years, as reflected in its *Regional Water Demand and Conservation Projections Report* and other related documents.

The following is a summary of each section in the 2025 Plan.

About the SFPUC and Conservation Program Planning

The SFPUC's Water Resources Division is responsible for the implementation of its retail water Conservation Program, as well as the development of local water supplies, including 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.

Several SFPUC programs beyond conservation are expected to contribute to potable water savings, including recycled water facilities that reduce potable use for large landscape irrigation, stormwater management projects that use rainwater for irrigation, and the supply-side linear asset management and water loss programs that reduce water loss from breaks and leaks in SFPUC mains and pipelines. Estimated water reduction from these programs is not included in Conservation Program savings in the 2025 Plan, although these programs are anticipated to help lower potable water use over the next 25 years.

In 2004, the SFPUC developed its first conservation forecast model and used it to estimate three levels of potential Conservation Programs, choosing to pursue the most aggressive scenario that assumed a suite of measures implemented at the highest level of customer participation to achieve maximum savings. Over the past 20 years, the SFPUC has implemented most of the recommended measures, as well as new measures identified since then, and refined its estimate of attainable water savings through analysis of customer participation and water use, saturation studies, and industry and market data. This feasibly attainable approach now guides SFPUC's program planning and is intentionally conservative to minimize over estimating water savings. For example, it assumes that savings estimates over the next five years are more precise than those 20 years from now, and it only models water savings for measures with accepted industry standards or methodologies for calculating savings. SFPUC's Conservation Program includes a mix of measures we model water savings for and some we do not model. While SFPUC is aware that unmodeled measures may generate some water savings, they are not included in the estimated water savings in the 2025 Plan.

Conservation Goals and Progress

The SFPUC's Conservation Program is guided by a mix of agency and City policy directives, and state and local water efficiency requirements that have evolved over time. On the state level, these shifted from meeting Best Management Practices (BMP) established by the California Urban Water Conservation Council in the 1990s (now the California Water Efficiency Partnership) to the state per capita water reduction targets set by the Water Conservation Action of 2009 (SB X7-7) to water efficiency targets per Making Conservation a California Way of Life regulations that require urban suppliers to meet standards for efficient indoor and outdoor water use as well as supply-side water loss. Locally, San Francisco has adopted state requirements for mandating water-efficient plumbing fixtures, landscapes, and irrigation systems; sub-metering in new multi-family construction; and restrictions against outdoor water waste. The SFPUC met BMP goals for the many years those were in effect, was well below its state-imposed SB X7-7 per capita use target for 2020 and has also been well under California's volumetric efficiency targets for the first two years since the regulations became effective.

The SFPUC regularly evaluates and adapts its Conservation Program to respond to changing conditions and requirements. This dynamic approach has contributed to significant reductions in water demand, despite population and job growth. From 2005-2025, the SFPUC's retail residential per capita water use declined by 29 percent while experiencing an 8 percent increase in population. With an average indoor/outdoor residential per capita usage of 43 R-GPCD for fiscal year 2024-2025, it remains among the lowest in the state.

Remaining Conservation Potential

Much of the SFPUC's Conservation Program focuses on increasing the long-term water efficiency of existing properties and customer actions. Many regulations, codes and standards mandate water-efficiency in new construction, and the SFPUC's Onsite Water Reuse Program also requires and incentivizes water efficiency in large new commercial and mixed-use construction. Most core measures concentrate on helping customers with existing properties, which may be older and less water-efficient, in achieving long-term, permanent water savings. Measures like the Onsite Water Reuse Program focus on achieving maximum efficiency in new development. Per the City and County of San Francisco Water Shortage Contingency Plan (WSCP), the SFPUC may expand some conservation measures and take additional actions to seek short-term reductions in water use during droughts or other emergencies that restrict water supply. Drought actions are not factored into the modeled conservation water savings in this plan.

Key points the SFPUC considered in assessing remaining feasibly attainable conservation potential include our low per capita water use; Advanced Metering Infrastructure (AMI) customer engagement tools; saturation of water-efficient plumbing fixtures and appliances; customer, property, and land use

characteristics; customer participation in conservation measures; third party evaluations of our efficiency programs; and interested party input.

Based on this, the following broad actions are deemed to have the most potential for remaining water savings and guide the mix of measures planned for the Conservation Program in 2025 and beyond:

- Maintain efficiency among customers, properties, and sites that already have a water-wise approach.
- Improve efficiency among customers, properties, and sites with above average water use or constant use due to leaks, old fixtures, inefficient irrigation, or other forms of water waste.
- Increase commercial customer awareness of abnormally high-water use, with a focus on non-residential sectors with the overall highest water use.
- Promote compliance with new efficiency standards among large landscapes served by dedicated irrigation meters (DIMs) and mixed-use meters (MUMs).
- Explore additional opportunities for onsite reuse in new development.

Measure Evaluation Process

The SFPUC follows a thorough process to evaluate and select measures suitable for our retail service area, drawing on input from national and state water efficiency studies and experts, customers, and interested parties. We also compare our program to other water utilities with major conservation resources, including conservation measures offered by BAWSCA that serves the SFPUC's wholesale service area. The SFPUC regularly evaluates new measures and adjusts existing ones to be more effective. Key updates and new efforts since the SFPUC's 2020 Plan include:

- Expansion of the commercial equipment rebate, commercial clothes washer rebate, residential toilet direct install, and leak alert programs
- Launch of a new residential and commercial irrigation controller rebate program, a new ultra-high efficiency toilet rebate program, and courtesy landscape irrigation reports to all irrigation account holders
- Reduction of the SFPUC's aggregate residential per capita goal to 45 GPCD communicated to customers on its online customer portal
- Completion of a third-party evaluation of the SFPUC's water efficiency programs by the Pacific Institute
- Demographic analysis of Conservation Program participation

Scope of the Conservation Program

Between 2005 and 2025, the SFPUC evaluated and implemented over 85 different conservation measures and mandates, providing extensive customer water-savings assistance that has played a major role in the significant decline in per capita water use. These measures include conservation best management practices followed by major water utilities and efficiency experts; measures that third-party studies demonstrate have water savings and customer benefits; and measures that make sense for the site conditions and characteristics unique to San Francisco's water use. The 2025 Plan includes the SFPUC's Onsite Water Reuse Program among its conservation measures and its estimated water savings and effect on demand. The Onsite Water Reuse Program includes an ordinance that requires new developments of 100,000 square

feet or more to install and operate an onsite water reuse system. The program also provides grant funding for projects that aren't required to install onsite reuse systems, including projects that are installing onsite water systems on a voluntary basis, projects that are installing onsite water systems in compliance with the Non-potable Water Ordinance that go above and beyond their compliance requirements, and breweries that collect, treat, and reuse process water. Estimated 2025-2050 Onsite Water Reuse Program savings are based on existing water budget applications and reported data from operating onsite water reuse projects.

Moving forward, the SFPUC will continue to use a mix of demand-side, customer water-saving strategies, including voluntary incentives, assistance services, tools to help customers understand and manage their water use, education and outreach, and mandates that require indoor and outdoor water efficiency. See **Table 6-2** in **Section 6** for a list of current and planned conservation measures and **Table 6-3** for a list of completed and evaluated measures.

Water Savings and Cost

The SFPUC estimates its Conservation Program and efficient plumbing codes have achieved "past savings" of approximately 151,415 AF (49,339 MG or 7.1 MGD) between 2005 (the year the SFPUC developed its first conservation forecast model) and 2024. "Future savings" are estimated at 123,636 AF (40,287 MG or 4.4 MGD) between 2025 and 2050. The future savings reflect anticipated savings from modelled measures described in **Section 6**, including anticipated savings from the Onsite Water Reuse Program. The past and future estimates do not reflect water savings from conservation measures the SFPUC offers but does not model, or from SFPUC efforts that are not part of its Conservation Program but may generate potable water savings, such as its supply-side water loss program, recycled water program, and stormwater management program. Additionally, the conservation measure savings that are modeled and presented in this 2025 Plan do not reflect potential savings from short-term drought actions that could be taken if the SFPUC had to activate its WSCP. The estimated average unit cost of water savings across all the conservation measures the SFPUC plans to implement is $969/acre foot.

Effect on Demand

Estimated water savings from the SFPUC's Conservation Program, Onsite Water Reuse Program, and efficient plumbing codes are anticipated to help to reduce overall demand for water. **Table ES-1** below shows the effects the estimated water savings from active Conservation Programs and onsite reuse could have on retail water demand. The unadjusted baseline demand indicates the projected retail demand if there were no water savings from SFPUC conservation measures. Retail demand projections are from the SFPUC's Retail Demand Projection Model prepared in 2026 for use in SFPUC's 2025 UWMP. The adjusted retail demand is calculated by subtracting the savings from SFPUC's conservation and onsite reuse programs from the unadjusted baseline demand (which includes distribution system losses). The adjusted retail demand divided by the population provides the estimated per capita water use for the retail system.

Table ES-1: Retail Water Demands with Water Conservation

	2025	2030	2035	2040	2045	2050
	million gallons per day (MGD)					
Unadjusted Baseline Demand	62.7	68.2	68.6	70.7	72.8	75.5
Adjustments:						
1. SFPUC Active Conservation Program Savings	0.0	-0.6	-0.7	-0.6	-0.5	-0.5
2. Onsite Water Reuse Program Savings *	-0.2	-0.6	-1.4	-1.6	-1.6	-1.6
Adjusted Retail Demand	**62.5**	**67.0**	**66.5**	**68.6**	**70.7**	**73.4**
Population (1,000)	**844**	**1,010**	**1,066**	**1,122**	**1,177**	**1,232**
Residential Population (1,000)	**813**	**973**	**1,027**	**1,081**	**1,134**	**1,187**
Gross Gallons Per Capita Use (GPCD)	**74**	**66**	**62**	**61**	**60**	**60**
Residential GPCD (R-GPCD)	**43**	**41**	**39**	**39**	**38**	**38**

Note: Sum of demands and adjustments may not match the totals due to rounding.
** Onsite Water Reuse Program is being counted as a conservation measure for water savings purposes, but because of its size and focus on new development, it is also being called out in this table to show its effect on demand*

For several reasons described in Chapter 8 (Conservation Effect on Retail Water Demand) of the 2025 Plan, the SFPUC's 2025 Retail Demand Model does not explicitly adjust for passive savings outputs from the Water Conservation Tracking Model. Savings from active Conservation Programs and the Onsite Water Reuse Program are explicitly called out in future projections, while passive savings are assumed to be captured as part of the unadjusted baseline demand. For the 2025 Plan, the potential future passive savings are called out in **Table ES-2** below and total an estimated 4.1 MGD by 2050. The volumes shown here are normalized to 2025; all passive water savings achieved prior to 2025 are inherently included in existing 2025 demands; future passive savings are projected relative to 2025 demands.

Table ES-2: Projected Passive Savings (Relative to 2025)

Sector	2025	2030	2035	2040	2045	2050
	million gallons per day (MGD)					
Single Family	0.0	-0.4	-0.7	-1.0	-1.2	-1.3
Multi-Family	0.0	-0.7	-1.2	-1.5	-1.8	-2.0
Non-Residential	0.0	-0.3	-0.4	-0.6	-0.7	-0.9
Total Passive Savings	**0.0**	**-1.4**	**-2.4**	**-3.1**	**-3.7**	**-4.1**

Conclusions and Next Steps

The SFPUC will continue to 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. Between now and the issuance of our next 2030 Retail Water Conservation Plan, the SFPUC plans to continue to review its forecasted conservation savings against actual program activity on an annual basis. The SFPUC has committed to updating its conservation savings model and conducting a major review of implemented and potential new conservation measures every five years, coinciding with its update of the UWMP. Moving forward, the SFPUC will use this 2025 Plan and its findings as a broad guidance document to inform the implementation of conservation measures over the next five years. 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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1. About the SFPUC

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 30 years to help ensure that future water demands can be supported. The Conservation Program, along with the development of local supplies through recycled water, groundwater, and non-potable water, and the SFPUC's program to reduce water loss within its distribution system due to pipe breaks and leaks, are part of overall efforts to stretch water resources, increase reliability should drought or disaster interrupt regional water sources, and increase flexibility to meet the diverse needs of customers. This *2025 Retail Water Conservation Plan* (2025 Plan) presents an overview of the SFPUC's water Conservation Program and serves as a broad guidance document for both the SFPUC and its interested parties. It explains the evaluation process and factors considered when designing the program, documents changes and evolution in the approach to estimate water savings and summarizes the estimated water savings. Estimated water savings include savings accumulated to date, projected savings over the planning horizon, and the anticipated effects of water savings on the overall retail water demand.

Regional Water System and Customers

The SFPUC owns and operates the 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 2.7 million customers in the San Francisco Bay Area (**Figure 1-1**). 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 the use of groundwater, implementing recycled water projects that serve large irrigation customers, and establishing an Onsite Water Reuse Program that mandates and promotes reuse in large new developments.

Figure 1-1: Regional Water System Overview

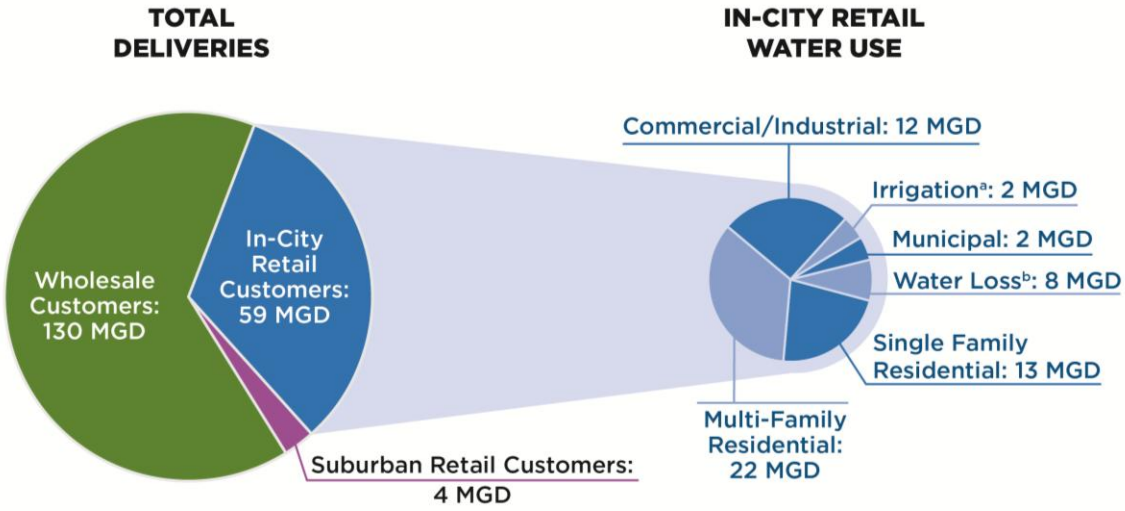
"Retail customers" refer to all residents and businesses located in San Francisco, as well as customers outside of the City that pay for and receive water directly from the SFPUC. Retail customers outside San Francisco include clusters of residential customers in Sunol, Redwood City, Daly City, Fremont, Millbrae, Castlewood, and Groveland[1]; and several 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 National Aeronautics and Space Administration Ames Research Center in Mountain View.

The SFPUC coordinates and directly manages the water Conservation Program for its retail customers, while BAWSCA represents the interests of the 26 wholesale customers and coordinates water conservation assistance on their behalf. BAWSCA's Regional Water Demand and Conservation Projections Project identifies conservation measures anticipated to be implemented over the next 25 years and their estimated water savings.

Figure 1-2 below shows overall water system deliveries for the last complete fiscal year (FY 24-25) and retail water system billed consumption. While the specific delivery and consumption amounts vary from year to year, the relative breakdown of wholesale versus retail deliveries and retail consumption by customer sector remains fairly consistent.

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, 2020, & 2025 Urban Water Management Plan (UWMP) Updates, SFPUC was directed by the DWR to report Groveland CSD as a wholesale customer. For consistency, the analysis presented in this 2025 Plan also refers to Groveland CSD as a wholesale customer instead of a retail customer.

Figure 1-2: SFPUC FY 24-25 Total Water Deliveries Water Use

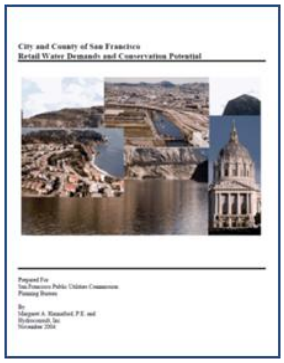


Notes:

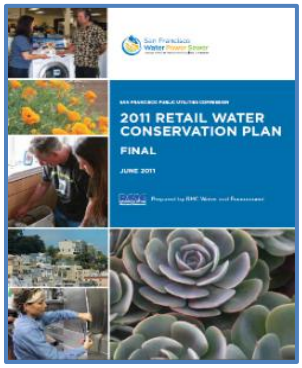
(a) This data is from dedicated irrigation accounts only, and does not include irrigation use from water accounts that jointly serve both indoor and outdoor demands. Irrigation use includes use of local groundwater and recycled water.

(b) Water loss includes apparent losses (e.g. inaccuracies associated with customer billing, illegal use), real losses (e.g. distribution system losses, main breaks), and unbilled authorized consumption for operational uses (e.g. pipe flushing, street cleaning).

Water Conservation Program Planning


City and County of San Francisco
Retail Water Demands and Conservation Potential

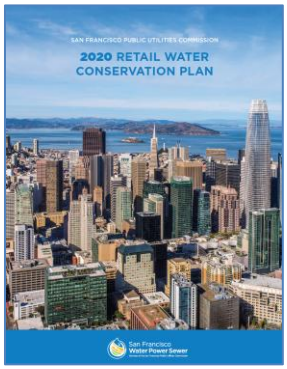
The SFPUC established its first retail water Conservation Program with modeled water savings and goals in 2004. The SFPUC identified three levels of water conservation options and conducted a detailed cost-benefit analysis for each option, ultimately selecting the most ambitious of the three. Details of the analysis are documented in the report *City and County of San Francisco 2004 Retail Water Demands and Conservation Potential* (2004 Plan).

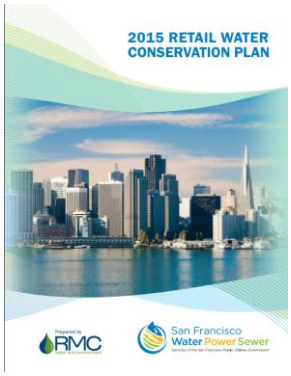


In 2010, the SFPUC conducted another assessment of its retail water Conservation Program to account for updated demographic data and regulations that may have influenced the water use trends among the retail customers. The 2010 effort consisted of both qualitative and quantitative evaluations of over 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.

In 2015, the SFPUC conducted an update to reflect new codes and regulations, a transition to an econometric demand model and a separate Water Conservation Tracking Model for estimating conservation water savings and the effects on water demand, the incorporation of market saturation estimates from a fixture inventory study, and the refinement of various conservation measure program parameters.

In 2020, the SFPUC updated codes and regulations, conservation measure program parameters, saturation estimates and related information in its 2020 Conservation Plan. It also updated its retail service area econometric demand model and its Water Conservation Tracking Model to estimate conservation water savings and effects on demand.





The SFPUC has continued to refine its approach to conservation planning through analysis of customer participation and water use, saturation studies, and industry and market data to better estimate attainable savings. This feasibly attainable approach now guides the SFPUC's program planning and is intentionally conservative to minimize the over-estimation of water savings. For example, it assumes that savings estimates over the next 5 years are more precise than estimates from 20 years ago, and it models water savings only for measures with accepted industry standards or methodologies for calculating savings. Our Conservation Program includes a mix of measures we model savings for and some we do not model. While it is assumed that unmodeled measures likely generate some water savings, those water savings are not estimated or counted until the SFPUC deems there is enough available data or valid savings methodologies. For more detail about the SFPUC's conservation forecast model, see **Appendix D** (SFPUC Water Conservation Tracking Model Overview and Water and Energy Savings Specifications for Conservation Program Measures).

The 2025 Plan outlines planned conservation strategies and measures over the next 25 years and draws on an updated Water Conservation Tracking Model for estimating conservation water savings and an econometric retail system demand model updated for the SFPUC's 2025 UWMP for the estimated effects on water demand.

Key updates reflected in the 2025 Plan include:

- Updated retail demand projections as modeled in the SFPUC's Retail Demand Forecast Model
- Updated active and passive conservation water savings estimates as modeled in the SFPUC's Water Conservation Tracking Tool
- Updated goals and progress, as well as legislation and codes
- Updated suite of conservation measures planned for implementation, including measures ended or added since the 2020 Plan, and parameter adjustments to some ongoing measures
- Updated water-savings calculations for several conservation measures and added parameters for some new measures
- Reviewed market saturation and verified fixture estimates where possible via literature search

2. Conservation Goals and Progress

The SFPUC's Conservation Program is guided by state water efficiency directives, local legislation and building codes, and SFPUC and rules governing water service to its customers. **Table 2-1** presents a broad snapshot of the SFPUC's progress toward meeting these goals.

Table 2-1: Conservation Goals and Progress

Conservation Goal	Progress
Making Conservation a California Way of Life Regulations	
Effective January 1, 2025, the "Making Conservation a California Way of Life" regulation establishes unique efficiency goals for each urban retail water supplier in California. Urban water suppliers must report progress annually toward meeting a water use objective based on efficiency standards for indoor residential water use, outdoor residential water use, dedicated irrigation account use, and water loss; the regulation also includes performance goals for commercial, industrial, and institutional (CII) water use. Water suppliers are responsible for meeting efficiency objectives for their service area in aggregate; individual households and businesses will not be held to the specific objective standards per sector.	The State Water Resources Control Board deemed the SFPUC compliant with the regulations for the most recent reporting period of FY 2024-2025. SFPUC water use is well below its total volumetric water use objective. The SFPUC also meets the CII performance measures, maintains a classified billing system, identifies and notifies top CII users and customers with large landscapes irrigated with mixed use meters, and continues to offer a wide suite of CII water-saving assistance measures. For more information and to see the SFPUC's reports submitted, visit https://wuedata.water.ca.gov/uwuo_plans.
Local Water Efficiency Requirements and Codes	
San Francisco established local ordinances to meet state requirements, including a Water Efficient Irrigation Ordinance (WEIO), residential and commercial conservation ordinances that mandate water-efficient plumbing fixtures, submetering in new multi-family construction, onsite reuse in new construction over 100,000 square feet, local green building codes for new construction and retrofits, and water waste restrictions banning runoff from outdoor watering, use of hoses without shut off nozzles, use of non-recirculating cooling systems and water features, and use of potable water to irrigate non-functional, ornamental turf (NFT) in public medians and non-residential settings.	The SFPUC remains actively involved in directly administering or supporting and tracking compliance with these requirements.

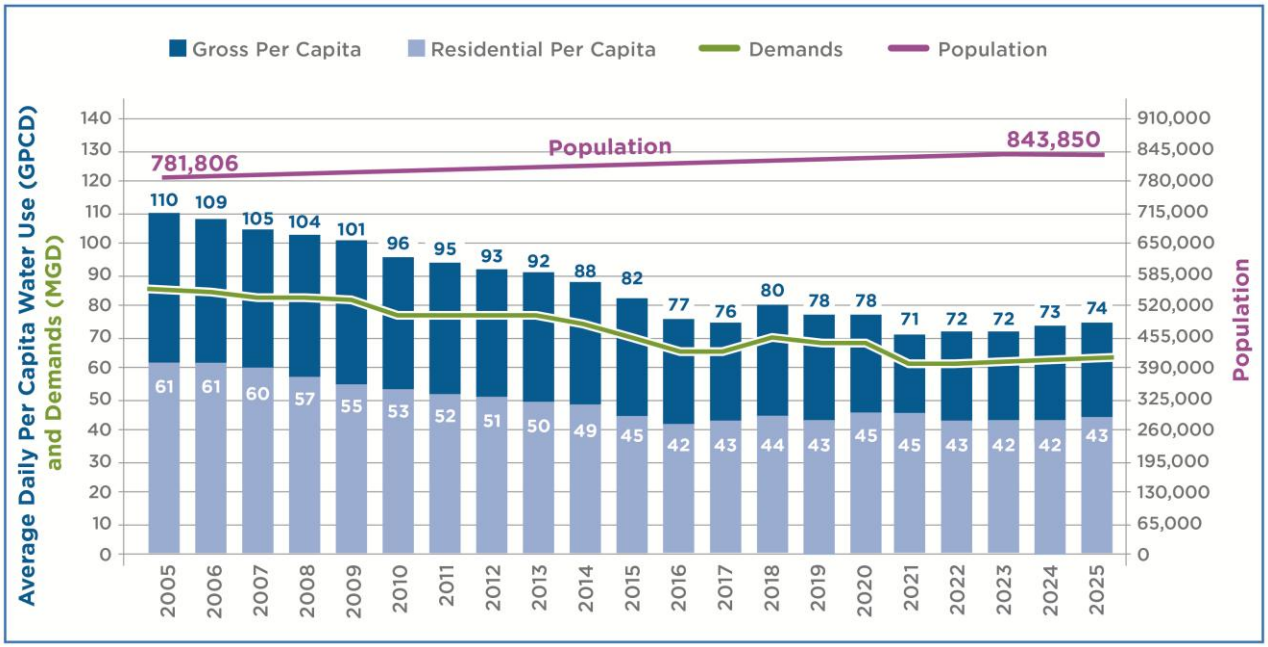
The SFPUC has provided water-saving assistance to many thousands of residential and non-residential customers. Between 2010 and 2025, highlights include:

- ✓ Conducted over 51,000 residential and commercial building and landscape evaluations

- ✓ Incentivized the replacement of over 52,000 inefficient toilets and urinals through rebate and direct install programs
- ✓ Issued over 29,000 rebates for high-efficiency residential clothes washers and commercial clothes washers
- ✓ Provided water-saving incentives and conducted evaluations of over 530 acres of irrigated landscape
- ✓ Reviewed and approved new and retrofitted landscape compliance with San Francisco's Water Efficient Irrigation Ordinance for over 315 sites, reflecting over 270 acres of irrigated landscape
- ✓ Issued more than 152,000 leak alerts to customers
- ✓ Distributed over 252,000 water-saving showerheads, aerators and other devices to customers
- ✓ Registered over 112,000 customers for use of the SFPUC's online bill and water use tracking portal
- ✓ Reviewed over 120 water budget applications to install onsite water reuse systems

The SFPUC's per capita water use rate has declined since the 2020 Conservation Plan and significantly so over the past 20 years, due in large part to SFPUC conservation efforts. For its full retail area (in-City plus suburban), the SFPUC's FY 24-25 residential GPCD of 43 and gross GPCD of 74 are among the lowest in the state of California. **Figure 2-1** shows the decline in both gross GPCD[2] and R-GPCD[3] in relation to population. Since 2005, per capita water use has decreased by 32 percent while population increased by 8 percent. Total demands have decreased by approximately 28 percent.

Figure 2-1: SFPUC Retail Populations and Per Capita Water Use Trends



[2] GPCD is total demand divided by total population, which includes people living in both households and group quarters.
[3] R-GPCD is residential demand divided by residential population.

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3. Remaining Conservation Potential

Many of the SFPUC's Conservation Program measures focus on increasing the long-term water efficiency of existing properties and customer actions. Various regulations, codes and standards and the SFPUC's Onsite Water Reuse Program mandate water efficiency in new construction. Per its Water Shortage Contingency Plan (WSCP), the SFPUC also identifies additional actions to seek short-term reductions during droughts or other emergencies that restrict water supply.

The SFPUC draws on many sources to assess the potential for water savings within its retail service area, identify conservation measures that align with savings opportunities, and select the most feasible mix to implement. Sources include studies and information from national and state water efficiency organizations and experts, such as the Alliance for Water Efficiency, California Water Efficiency Partnership, Water Research Foundation (WRF); water efficiency consultants and academics; internal staff research and input; surveys of other water utilities' Conservation Programs; and input and suggestions from community representatives and customers.

National Research Studies

The SFPUC participates in important national and state level water efficiency-related research to expand its understanding of remaining water-savings opportunities and effective strategies, technologies and approaches to tap these markets. As of 2025, the SFPUC is a utility partner in the WRF third Residential End Uses of Water Study, which is expanding the sample size of single family homes significantly compared to previous studies and adding analysis of multi-family end uses of water. The study is evaluating disaggregated indoor water use and how it has changed over the past 25 years and is examining variability in multi-family water use. The study compares residential water use across geographies, including indoor and outdoor use.

The SFPUC is also a utility partner and provides data for a California Department of Water Resources (DWR) study to quantify the benefits and impacts associated with California's new indoor residential water use standard. State statute directs DWR to conduct a residential saturation end-use study to quantify the implementation of efficient fixtures and appliances, and identify indoor residential water use patterns. The SFPUC and other water suppliers will use the findings from this study to evaluate their Conservation Programs.

As of 2026, the SFPUC is working on a case study to provide the Alliance for Water Efficiency (AWE) for its "Characterizing Water Use in Low-Income Households Seeking Bill Pay Assistance" report. The SFPUC is analyzing water use, frequency and rates of leaks, participation in Conservation Programs, and other characteristics of its single family customers on bill pay assistance compared to those not receiving bill assistance. The findings are intended to support AWE's proposal that low-income homes may be disproportionately affected by leaks and inefficient plumbing fixtures and have the greatest need for continued efficiency assistance measures that cover these areas.

In 2025, the SFPUC also participated in a WRF study as a utility partner. The study evaluated expanding potential uses of Automated Metering Infrastructure (AMI) data and a project advisory committee member of a 2023 Alliance for Water Efficiency evaluation of AMI-enabled leak notification programs.

Pacific Institute Evaluation

In 2024, the SFPUC asked the Pacific Institute, a global non-profit water think tank that works on efforts to develop sustainable water policies, to conduct a third-party evaluation of the SFPUC's water efficiency programs and provide its assessment of potential ways the SFPUC might achieve additional water savings within its retail service area.

Overall, the Pacific Institute concluded that the SFPUC offers a robust portfolio of policies and programs, and these efforts have achieved significant reductions in potable water demand. The evaluation suggests adjustments to existing incentives, tools and customer outreach, as well as some new measures. The Pacific Institute report did not analyze potential water savings and costs or potential implementation feasibility. Staff considered all recommendations and implemented or plan to implement many of the recommendations identified in the report. **Table 3-1** below summarizes the recommendations and the SFPUC's response.

Table 3-1: Pacific Institute Recommendations and SFPUC Responses

Pacific Institute Recommendation	SFPUC Response as of January 2026
Plumbing Fixtures	
• Replace 1.6 gallons per flush (gpf) toilets in SFPUC's toilet direct install program	Implemented
• Establish a new toilet replacement incentive program	Implemented, new ultra-high efficiency toilet rebate program December 2025
• Update San Francisco's residential and commercial conservation ordinances to require replacement of 1.6 gpf toilets	SFPUC plans to continue to incentivize replacements for next 5 years and will then revisit potentially mandating it
Commercial Equipment	
• Increase incentive, reduce required metering period, expand outreach for commercial equipment rebates	Implemented August 2024
Leaks	
• Consider toilet/leak detection sensor rebate for large residential and commercial properties	Plan to develop a rebate program in next few years
• Expand leak repair assistance program and more explicitly describe assistance & resources	Implemented. Updated fix leaks web page and leak guide to explain breadth of resources. Ongoing Water-Wise Evaluation, leak alert, high bill adjustment, and plumbing fixture, appliance, and equipment incentive programs offer extensive leak assistance.
• Pilot leak detection innovations through artificial intelligence (AI)	Continue to explore ways to increase data analysis and automation to refine its leak alert program and build off previous engagement with AI researchers
Landscape & Irrigation	
• Offer incentive for weather-based irrigation controllers and soil moisture sensors and target to customers with inefficient water use	Implemented April 2025
• Stack conservation incentives with Wastewater Enterprise-administered Green Infrastructure Grants	Continue to coordinate programs
• Provide assistance to navigate the large landscape grant program application process	Continue to provide consultation and guidance to applicants. City grant requirements minimize options for streamlining.
• Support removal of non-functional turf (NFT) through design incentives and enforcement	Near-term focus remains on identifying and contacting sites with potential NFT and offering SFPUC resources to help with replacement. Per state requirements, SFPUC will implement a permanent ban of potable irrigation of non-functional CII turf in 2026.
Reuse	
• Reduce threshold for requiring water budget calculations from 40,000 square feet to 10,000.	Evaluated and determined reduction does not make sense to implement

Pacific Institute Recommendation	SFPUC Response as of January 2026
• Once approved by code, investigate incentives for recirculating devices and appliances	Completed an Independent Advisory Panel for Single Family Water Reuse Applications Report in 2024. Will continue to monitor regulatory and market progress as those evolve
Meters	
• Evaluate installation of more sensitive water meters	Feedback shared with operational staff that manage meter procurement and maintenance
Education & Tools	
• Enhance functionality of My Account online portal	Plan to develop and migrate to a new customer platform in 2027
• Engage marketing expert to help with strategic communications and materials	Implemented and ongoing
• Expand high-use alerts and direct messages to more residential accounts	Continue to use multiple means for direct outreach to residential customers
• Expand targeted outreach to top CII accounts and send annual notifications	Implemented and ongoing
• Feature water savings in Green Business Program	Continue to seek opportunities
Demand Forecast Strategies	
• Seek 3rd party review of water demand forecasting	Done to support the 2025 Urban Water Management Plan (UWMP)
• Review forecast model specification for adherence to best practices	Completed. Reviewed demand forecasting for comparable water utilities
• Explore opportunities to further disaggregate commercial customer water demand by land use or category.	Evaluated
• Assess alternate model specifications (i.e., terms within regression model) and data transformations used to improve model fit	Completed. Addressed as part of model development. Developing coefficients based on data and optimizing model fit
• Validate passive conservation savings in demand forecast	Evaluated. Passive savings are not considered explicitly part of the water demand forecast. They are implicitly included in the water savings because of conservation due to rate increases. The SFPUC can investigate incorporating them directly based on alternate approaches from other agencies.
• Explore a wider range of growth scenarios in demand forecasts	Done. Conducted sensitivity analyses for housing and job growth to support the 2025 UWMP
• Further disaggregate water demand forecasts	Evaluated
Water Loss	
• Validate and expand utility-side water loss projections and methods • SFPUC is already a top performer in the industry, but additional savings from further reductions in water loss volumes should be investigated.	Evaluated and in progress**.** Continue to investigate feasibility and applicability of approaches to attain additional savings from further reductions in water loss volumes, including methods for proactive leak detection or pressure management.

Input for 2025 Conservation Plan

As part of the 2025 Conservation Plan development, SFPUC conservation staff sought input on its retail Conservation Program from individuals and organizations reflecting different sectors of customers, properties and populations in its retail water service area, including other SFPUC and City departments. Among interested parties consulted or contacted:

- SFPUC Citizens' Advisory Commission Water Subcommittee

- SFPUC Southeast Community Center, Community Benefits, Environmental Justice, Wastewater and Power Enterprise staff
- San Francisco Green Business Program
- San Francisco Hotel Council Sustainability Committee
- San Francisco Apartment Association
- San Francisco Building Owner and Managers Association (BOMA)
- Small Property Association

SFPUC conservation staff provided an overview of its current and planned conservation assistance programs and sought input on suggested additional measures or other program improvements, as well as ways to help inform and engage the public.

SFPUC staff also participated in several other public input processes that provided relevant input for the conservation plan, including the creation and update of a Water Supply Chapter for San Francisco's Climate Action Plan and the coordination of interested party interviews conducted for a Multifamily and Renter Utility Services Needs Assessment.

Feedback mainly included questions and suggestions about ways to let people know about the SFPUC's Conservation Program. Suggestions included to run public service announcements and ads on radio and TV, including in Spanish and Chinese, tabling at street fairs and community events, sharing information through other City publications such as the Assessor's Office and Board of Supervisor newsletters, engaging with community-based organizations, among other ideas. The SFPUC's Conservation Program uses all these outreach methods and others, as described below.

The SFPUC received limited feedback about specific conservation measures that the SFPUC isn't doing now and should consider adding, or about the potential remaining opportunities that could provide the highest water savings.

Ongoing Conservation Outreach and Education

The SFPUC has long used a variety of means to inform people about its Conservation Programs and requirements and to provide opportunities for public engagement. The SFPUC recognizes that diverse audiences get information and provide feedback in different ways and therefore strives to ensure that its messaging is culturally competent and translated into Spanish, Chinese, and Tagalog. In addition, the SFPUC uses a mix of print and digital media to reach its non-technical audiences and varied strategies and messages to reach renters, owners, account holders, as well as residents and businesses.

Core outreach methods include but are not limited to:

- Bill inserts to promote awareness of and encourage participation in new or updated Conservation Programs, one of the most effective outreach tools to reach diverse residential customers (see example in **Figure 3-1**)
- Paper and digital SFPUC *Currents* newsletters (issued 6 times a year as a bill insert and monthly in digital format). Brief articles highlight new and expanded Conservation Programs or include conservation tips and reminders about ongoing programs, often tied to a seasonal theme, such as checking irrigation systems in the spring and turning them off in the fall.
- Direct mail and email notices to let people know about new programs, or provide courtesy alerts about potential high or wasteful water use
- Leak alerts are issued daily through multiple means to water account holders, occupants and property owners and provide guidance on SFPUC conservation resources

- My Account online platform allows customers to track their water use down to the hourly level and to handle account services. It also highlights conservation resources and messaging.
- Social media posts and online ads through Google search, Google display, NextDoor, Meta, and other platforms are used to geo-target conservation messaging. Print ads are particularly effective in Chinese language newspapers.
- Partnerships with other city departments and community organizations
- Community events and presentations including tabling at diverse events
- Muni and Bay Area Rapid Transit in-car signage are used for core program marketing and drought outreach
- Welcome emails are sent to monthly to every new water account holder, providing information on the SFPUC's conservation services and assistance
- Door hangers are distributed widely by conservation inspectors to residential and small properties to raise awareness of SFPUC conservation services, and to inform properties about possible leaks or water waste
- Water waste outreach includes investigation of all reports of potential water waste submitted through San Francisco's 311 system, with a focus on educating residents and businesses how to correct and avoid wasteful and prohibited uses of water
- A public info phone line allows conservation staff to answer calls, provide guidance, conduct targeted outreach to promote Conservation Programs and address ongoing leaks and water waste. Staff can help in any language via an on-demand phone interpretation vendor.
- Monthly courtesy water use reports to City departments and irrigation customers
- Feedback surveys, including regular surveys to leak alert recipients for thoughts on conservation resources and other helpful insights, as well as questions about Conservation Program awareness in periodic citywide polls

Figure 3-1: Example Toilet Rebate Program Bill Insert (front and back)

Education and Professional Development

SFPUC's Conservation Program includes a variety of school and adult training and education opportunities, including Save Our Water presentations for public and private schools and student field trips to local demonstration gardens that feature water-efficient plantings and irrigation. SFPUC also provides education, career awareness, and professional development programs related to water conservation, including project learning grants to local nonprofits to fund projects providing youth and young adults from underserved communities with educational and employment programs. Additionally, the SFPUC partners with a local vocational public high school to promote science, technology, engineering, math (STEM), public service, and building trades and construction pathways for students.

Expanded Outreach During Drought

During droughts, the SFPUC significantly increases outreach and education across its retail and wholesale service area. The SFPUC creates specific drought campaign messages and artwork aimed at catching attention. The SFPUC also uses its core outreach channels with more urgent messaging to appeal to everyone to do their part to reduce water waste. This includes actionable ways people can help whether they own or rent. It also promotes participation in ongoing conservation assistance programs and awareness of permanent water waste restrictions and response actions. Increased drought-time outreach typically includes:

- Earned media, including press events, press releases and media interviews and tours
- TV, radio and print ad, which are particularly effective for Chinese, Spanish and Tagalog communities through KTSF Chinese TV, Sing Tao, Univision, Fil-AM, and streaming radio
- On bill messaging
- Outdoor billboards and transit shelter and transit ads
- Direct and targeted messaging to excessive and top users

Customer Participation Analysis

In 2025, the SFPUC mapped and analyzed demographic and socio-economic characteristics of San Francisco participation in its conservation assistance programs over the past ten years. The analysis looked at neighborhood, property type, water customer sector type, income, race, English proficiency, owner/renter status, and location within environmental justice-burdened areas[4] for participation by program by year.

Overall, the 150,000-plus cases of participation analyzed occurred in all neighborhoods across San Francisco. In addition, the analysis indicated that there has been extensive Conservation Program participation in neighborhoods designated by the SFPUC and San Francisco Planning Department as having a high environmental justice burden and facing socioeconomic challenges. For example, higher levels of participation in toilet incentives, evaluations and free devices, occurred in areas with higher incidences of households under the City's median income and linguistically isolated households (non-English speakers).

The SFPUC plans to update this analysis and mapping annually and plans to use it to inform opportunities for expanded or targeted outreach, potential program enhancements and new offerings.

Focus Areas

The SFPUC determined that the following areas reflect the most feasibly attainable potential for remaining water savings within its Conservation Program. These areas guide the implementation strategies and specific measures planned over the next five years:

- Maintain efficiency among customers, properties, and sites that already have water-wise use
- Improve efficiency among residential customers with above average water use due to leaks, old fixtures, inefficient irrigation, or other forms of water waste.
- Increase commercial property awareness of opportunities for equipment retrofits, reuse technologies, and efficiency audits and action plans
- Increase commercial customer awareness of constant and/or abnormally high-water use, particularly among hotels, restaurants, office buildings, and schools that represent the non-residential sectors with the overall highest water use
- Promote compliance with new efficiency standards among large landscapes served by dedicated irrigation meters (DIMs) and mixed-use meters (MUMs) and smaller sites with inefficient irrigation
- Explore additional opportunities for onsite reuse in new developments

[4] The San Francisco Planning Department developed and maintains an Environmental Justice Communities Map to identify areas in San Franciso that face disproportionate burden of environmental health challenges, informed by state and local data.

To address these focus areas, the SFPUC plans to continue expanding the use of AMI and other data for customer engagement and research, providing incentives to improve the efficiency of indoor water fixtures in homes and businesses, mandating and promoting onsite reuse, providing direct assistance to all customer types through virtual and onsite audits, and expanding outreach, training and education virtually and in-person.

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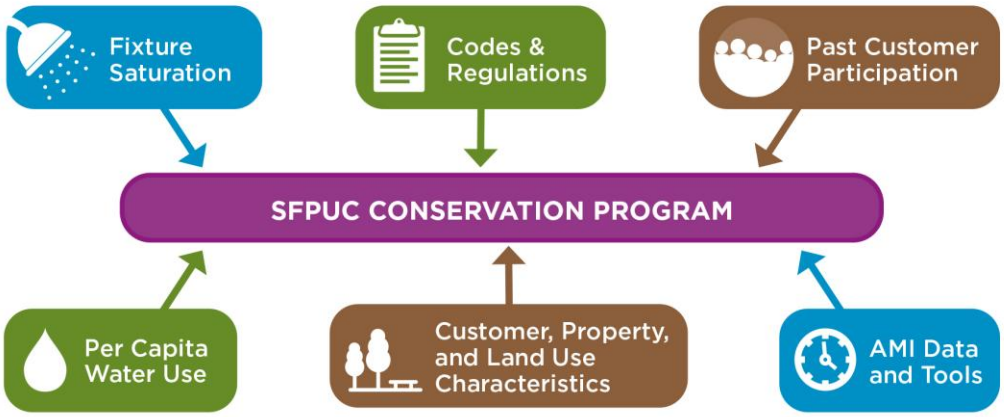
4. Factors Shaping the Conservation Program

This section covers key factors the SFPUC considers in assessing opportunities for feasibly attainable remaining water savings opportunities in existing homes, buildings, and irrigated landscapes.

Figure 4-1: Factors Shaping Remaining Conservation Potential



Per Capita Water Use

The SFPUC's average indoor and outdoor retail residential per capita use has declined significantly over the past 20 years, remains among the lowest in California, and is anticipated to decline further. While opportunities for more water savings remain, the SFPUC's low per capita water use limits how much more long-term residential savings can feasibly be achieved through demand-side conservation measures.

The SFPUC's combined indoor and outdoor average residential per capita has been in the low 40s in recent years and is estimated to decrease. Studies underway in 2025 by the WRF and California DWR to assess residential indoor use nationwide and in California are expected to provide additional insights on current indoor use and help inform the state's current indoor residential standard of 47 GPCD, which will drop to 42 GPCD in 2030.

AMI-Enabled Customer Engagement and Research

The SFPUC was the first large California water utility to fully automate most of its meters. Over the past 5 years and since the 2020 Conservation Plan, the SFPUC has continued to expand the ways it uses daily and hourly data generated from its AMI system to help customers monitor, manage, and reduce their water use. During this period, the SFPUC also began using its extensive data to conduct among the first empirical studies of water savings from leak alert programs and of effective indicators of high or unusual water use in large multi-family and commercial properties. The SFPUC has been actively involved in state and national-level efforts through the Alliance for Water Efficiency and California Water Efficiency Partnership to further the study of AMI water-saving benefits and has shared the results of its own research.

AMI data has enabled the SFPUC to undertake significant water-savings, customer service, and resource maintenance efforts, including:

- Expanding staff ability to help customers address water use issues remotely versus only through onsite inspections and meter reads

- Switching from bimonthly to monthly billing and adding fractional billing
- Developing an automated maintenance system to quickly locate and more efficiently repair AMI system components
- Providing customers an online platform (My Account) for conducting account services, accessing current and past bills, and reviewing water use down to the hourly level. **Figure 4-2** shows a typical daily water use view on My Account, which can help customers identify their typical water use patterns and high water use days.
- Sending constant usage alerts to customers about potential leaks

After conducting a two-year pilot program that started in 2015, the SFPUC automated its leak alert program and has continued to regularly expand and enhance it. The program now notifies single family, small multi-family (2-5 dwelling units), and irrigation customers when the AMI system detects 48 hours or more of continuous water use of at least one cubic foot per hour, indicating a leak may be occurring. For CII and large multi-family (6+ dwelling units) properties, the AMI system flags potential leaks when 72 hours of continuous use is observed, combined with a spike in nighttime water use higher than recent nightly average use.[5] When an alert is triggered, the account holder, property owner, and occupant (if not the same as the owner) receive an email, text message, recorded phone message (if contact information is available), and a mailed letter. Notifications are sent in English, Spanish, Chinese, and Tagalog.

The SFPUC also issues surveys to better understand the cause of leaks, how customers repair them, and what resources are most helpful. **Figure 4-3** illustrates the distribution of small residential customer-reported causes of leaks. Information gathered from these surveys and other contact with alert recipients has provided valuable insights regarding which conservation and customer support measures are most beneficial. For example, the high prevalence of toilet leaks not only highlights the value of continuing a leak alert program and leak detection guides and resources, but it also supports continuing water-wise evaluations and consultations from conservation technicians, distribution of free toilet flappers and other toilet repair parts, and outreach about the importance of fixture maintenance even if already efficient.

[5] More information about SFPUC's leak alert program can be found at https://www.sfpuc.gov/frequently-asked-questions-leaks

Figure 4-2: My Account Daily Water Use Graph

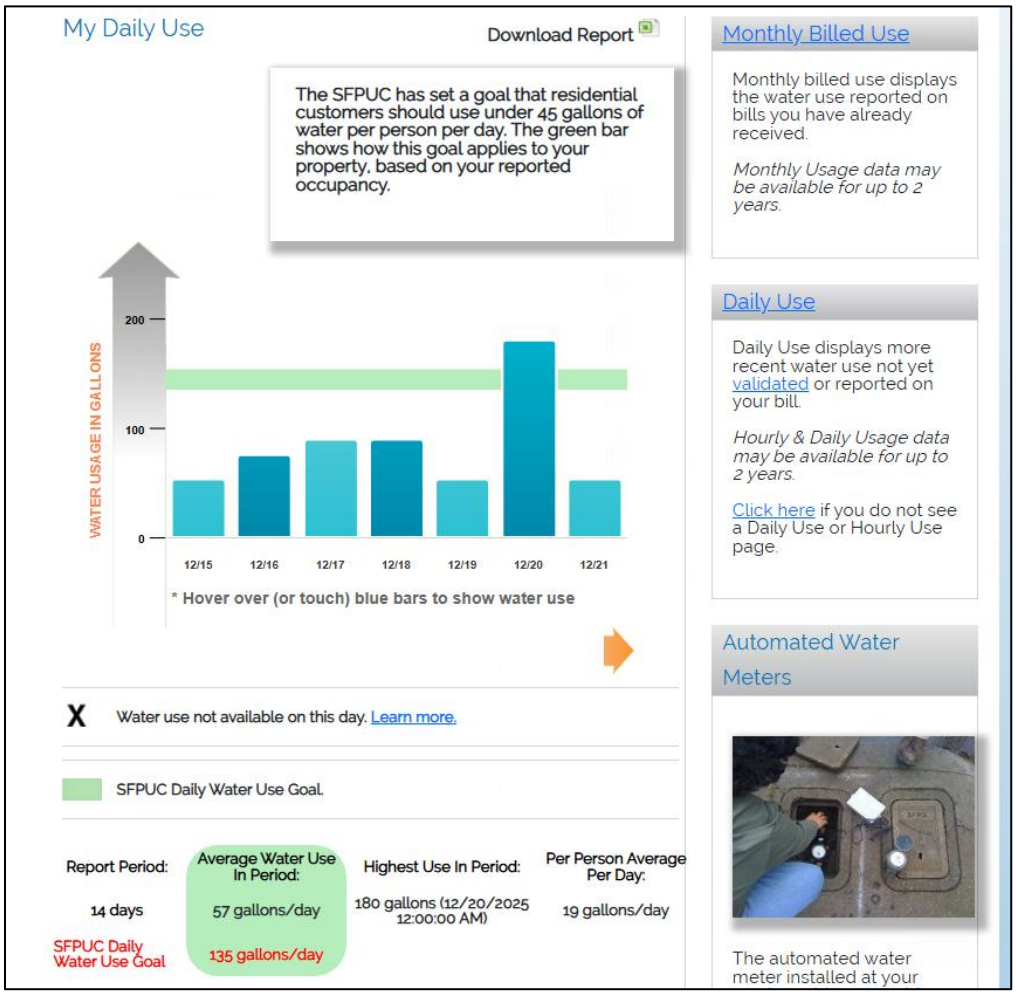
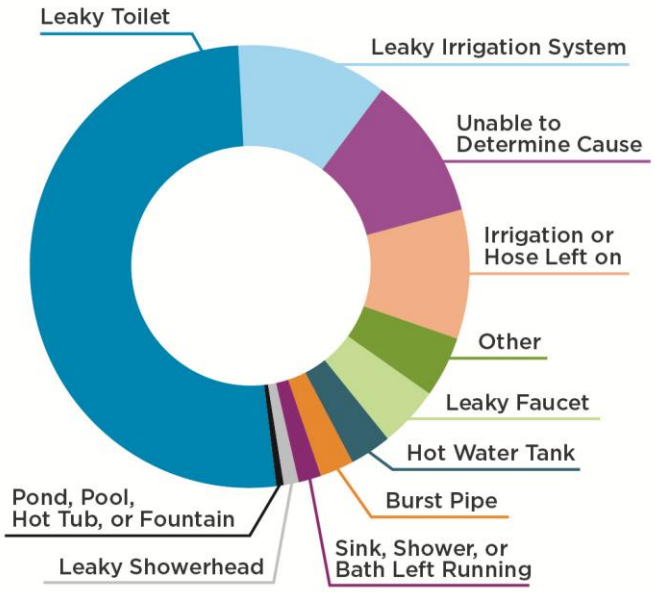


Figure 4-3: SFPUC Residential Customer Reported Causes of Leaks



Note: Based on 5,061 survey responses from single- and small multi-family leak participants surveyed January 2020 - June 2025.

The SFPUC plans to continue updating the estimated water savings from its leak alert programs every few years. Additionally, the SFPUC will continue sending alerts to irrigation customers who water during major rain events or drought periods. By 2027, the SFPUC plans to replace its My Account portal to provide customers with expanded account management, water use tracking, and conservation functions.

Efficient Fixture Saturation

Across the country, as well as within the SFPUC's service area, average indoor water use in homes and buildings has decreased significantly over the past 30 years due in great part to replacement of old toilets, clothes washers, faucet aerators, and showerheads with water-efficient models.

In 2014, the SFPUC developed a plumbing fixture population and efficiency saturation forecast model to estimate efficient plumbing fixture and appliance saturation rates, as well as water use and savings potential by customer sector in the in-City retail service area. This saturation model, in turn, helps the SFPUC determine the most cost-effective, feasible, and strategic approaches to achieve remaining saving opportunities, through SFPUC-issued incentives, services, or codes and mandates. The SFPUC has updated some of the model assumptions since then (see **Appendix A** and **Appendix B** for details). The general economic principle of the "law of diminishing returns" aptly applies to utility water Conservation Programs, reflecting that it can take substantially greater efforts and costs to incentivize inefficient fixture replacement as the population of inefficient fixtures shrinks over time. The fixture population and efficiency saturation model is also the main tool the SFPUC uses to estimate passive water savings associated with plumbing codes and appliance efficiency standards. Using data from the saturation analysis, the SFPUC's conservation forecast model estimates passive savings for toilets, urinals, showerheads, and clothes washers, which represent the highest indoor water uses in most residential properties and many commercial properties. While there are water efficiency codes and requirements for other types of fixtures and appliances, such as residential hot water systems and multi-family building submeters, the SFPUC deemed there is not yet enough data available to reliably estimate their populations and potential effect on water savings. The SFPUC will continue to evaluate this data availability assessment in future conservation plan updates and will revisit if sufficient data exists to warrant adding additional fixtures, appliances, and equipment to the saturation analysis.

Key findings from the SFPUC's saturation model and assessment:

- **Toilets**: As of 2025, approximately 83 percent of properties are estimated to have toilets with rated flush volumes of 1.6 gallons per flush (gpf) or less, which is generally considered efficient. Of these, approximately 43 percent are estimated to be 1.6 gpf and 40 percent are 1.28 gpf or lower. The small remaining population of high flow toilets with flush volumes of 3.5 gpf or higher reflects the efficacy of the SFPUC's long-running fixture replacement programs, as well as the ongoing effect of mandates and codes that require efficient fixtures in certain circumstances, such as property resale, new housing, or per "natural replacement".[6] Given California's new and increasingly stringent indoor residential use standards, the SFPUC and other water suppliers are continuing to assess ways to achieve more indoor savings. This has led to an increased interest in incentivizing the replacement of the relatively large population of 1.6 gpf toilets with ultra-high efficiency models that use as little as 0.8 gpf. These findings support the continuance of the SFPUC's toilet replacement incentives that encourage properties to go beyond current California code.

- **Showerheads**: As of 2025, an estimated 84 percent of properties have the most efficient showerheads with flow rates of 1.8 gpm or less, increasing to over 96 percent by 2035, which supports the SFPUC's plan to continue its free efficient showerhead distribution program over the next 10 years.

- **Clothes Washers:** As of 2025, 76 percent of washers are estimated to be efficient, which supports the continuance of the SFPUC's residential and commercial washer incentive programs over the next five years and potentially to 2035, when residential washer efficiency is estimated to reach close to 91 percent overall, and approximately 89 percent for commercial washers. Because there are only federal water efficiency standards for clothes washers and they are considerably higher than the most efficient washers available, the SFPUC's financial incentives continue to help transform the market. The SFPUC also continues to engage in studies assessing the potential viability, regulations and market potential for recirculating devices and appliances, and may consider future incentives once codes are established.

- **Urinals:** Urinals are generally found in commercial buildings and represent the smallest fixture population when compared to toilets, showerheads, and clothes washers. As of 2025, about 76 percent of installed urinals are estimated to be efficient, projected to increase to 80 percent by 2030. The data supports the SFPUC's continued education and outreach to commercial properties, which promotes compliance with mandates and accelerates natural replacement, and its continued services such as water-wise evaluations and free replacement parts that help customers maintain urinal performance and fix leaks promptly.

Table 4-1 shows the estimated percentage of remaining inefficient fixtures between 2025 and 2050, factoring in anticipated participation rates in the SFPUC's incentive measures, natural turnover rates, and projected growth in fixture populations from new developments. The SFPUC uses the estimated percentages of inefficient fixtures to help determine the best strategies to seek additional water savings from replacements. Using voluntary financial incentives to reach the last 10 to 20 percent of customers that have not made upgrades may be less efficient and cost-effective than relying on natural replacement, mandates, and education to reach them. See **Appendix C** for more detailed estimates of fixture populations.

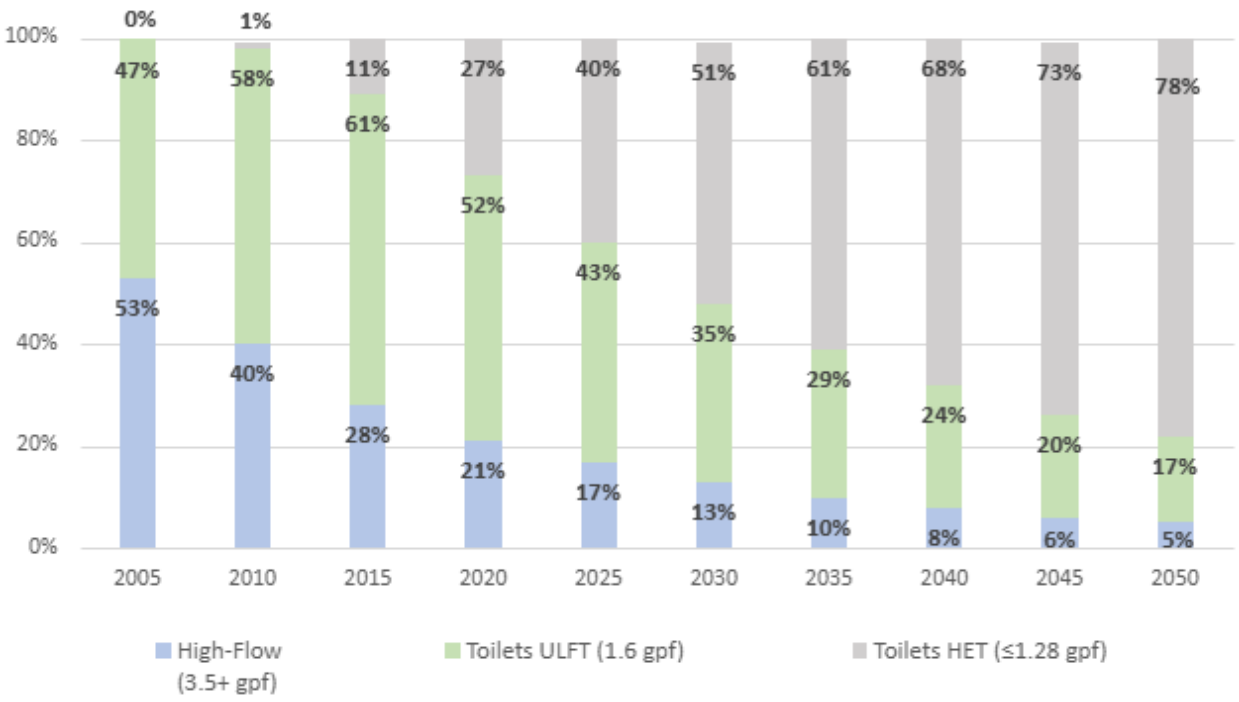
[6] Natural replacement is the assumption that a certain number of inefficient fixtures are replaced every year for reasons other than mandates or SFPUC incentive programs, such as to replace broken fixtures, but only efficient models can be purchased for replacement.

Table 4-1: Remaining Inefficient Fixture Estimates

Fixture	Class	Inefficient Is	2025	2030	2035	2040	2045	2050
Showerheads	Single Family	>1.8 gpm	13%	7%	3%	2%	1%	0%
	Multi-Family	>1.8 gpm	17%	9%	5%	2%	1%	1%
	Non-Residential	>1.8 gpm	19%	10%	5%	3%	1%	1%
Toilets	Single Family	>1.6 gpf	14%	11%	8%	6%	5%	3%
	Multi-Family	>1.6 gpf	13%	10%	8%	6%	5%	4%
	Non-Residential	>1.6 gpf	36%	28%	20%	16%	14%	11%
Urinals	Non-Residential	>1.0 gpf	24%	21%	18%	15%	13%	11%
Clothes Washers	Single Family	>6.0 Water Factor (WF)	21%	13%	8%	5%	3%	2%
	Multi-Family	>6.0 WF	27%	17%	11%	7%	4%	3%
	Non-Residential	>6.0 WF	30%	19%	12%	7%	4%	3%

Figure 4-5 presents the historical and projected breakdown of toilets installed in San Francisco based on three main efficiency categories: high-flow toilets (at 3.5 gpf or more), ultra-low flush toilets (ULFT) (1.6 gpf), and high-efficiency toilets (HET) (1.28 gpf or less).

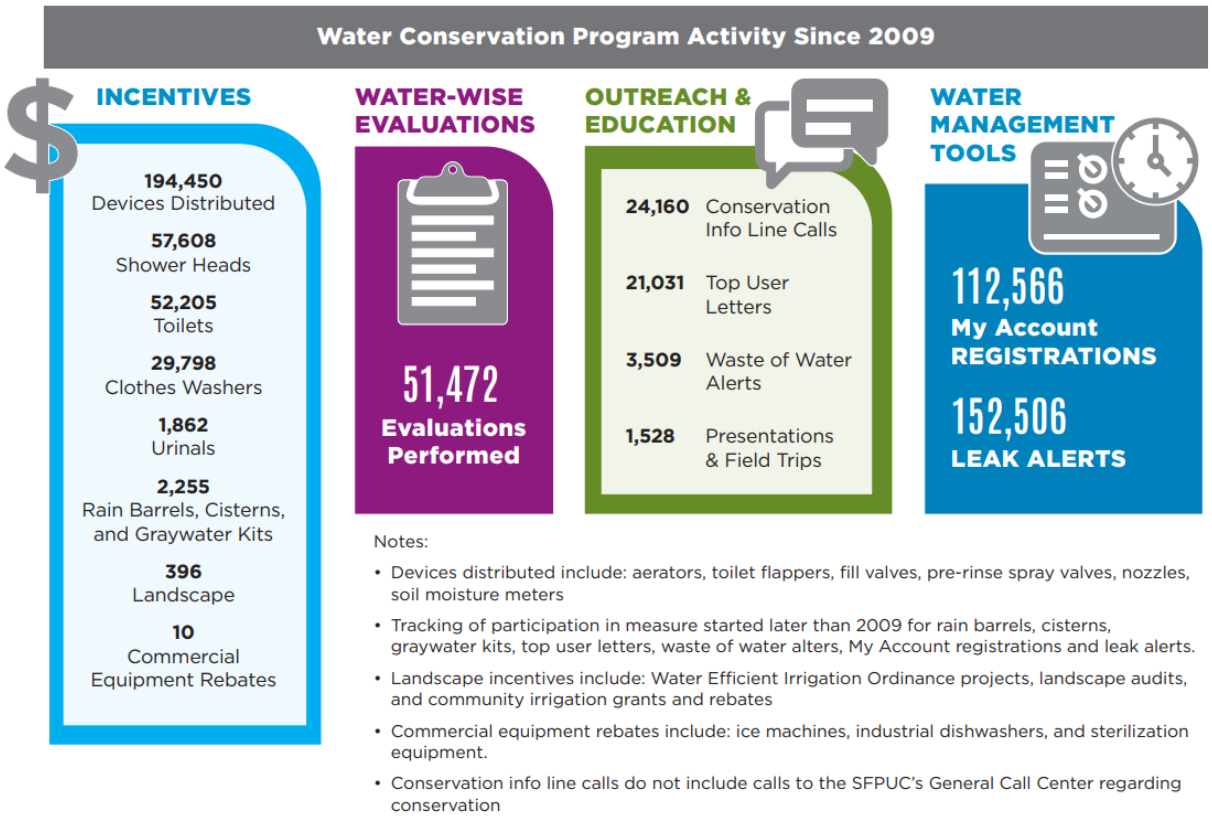
Figure 4-4: 2005-2050 Toilet Efficiency Breakdown



Participation in Conservation Measures

The SFPUC regularly analyzes customer participation rates in measures implemented to date. This analysis considers the most and least popular measures and customer feedback. The analysis also considers water use trends of customers that participated to help assess which measures will work best moving forward and to estimate anticipated future participation levels for purposes of estimating water savings, SFPUC expenditures, and resources needed. For example, the SFPUC's free device distribution measures have had high participation due to their applicability to many residential and nonresidential customers, their ease of participation, and the low cost and administrative effort by the SFPUC to implement them. Therefore, although there has been a decline in participation since the last drought, the SFPUC anticipates sustained participation over the next 10 years and beyond. For other measures that apply to larger projects, have many more participation requirements, or apply to a much smaller subset of customers, participation rates may be low. It is important to note that customer participation levels by some key measures as shown in **Figure 4-5** do not reflect the relative water savings of these measures. Some lower participation measures, such as large landscape retrofits and commercial equipment rebates, may have very high water savings per project, and a single project may represent more savings than a year or more of a measure with high participation. See **Section 7** (Water Savings and Cost) for more details on estimated water savings by measure.

Figure 4-5: Key Conservation Measure Activity FY 09-10 through FY 24-25



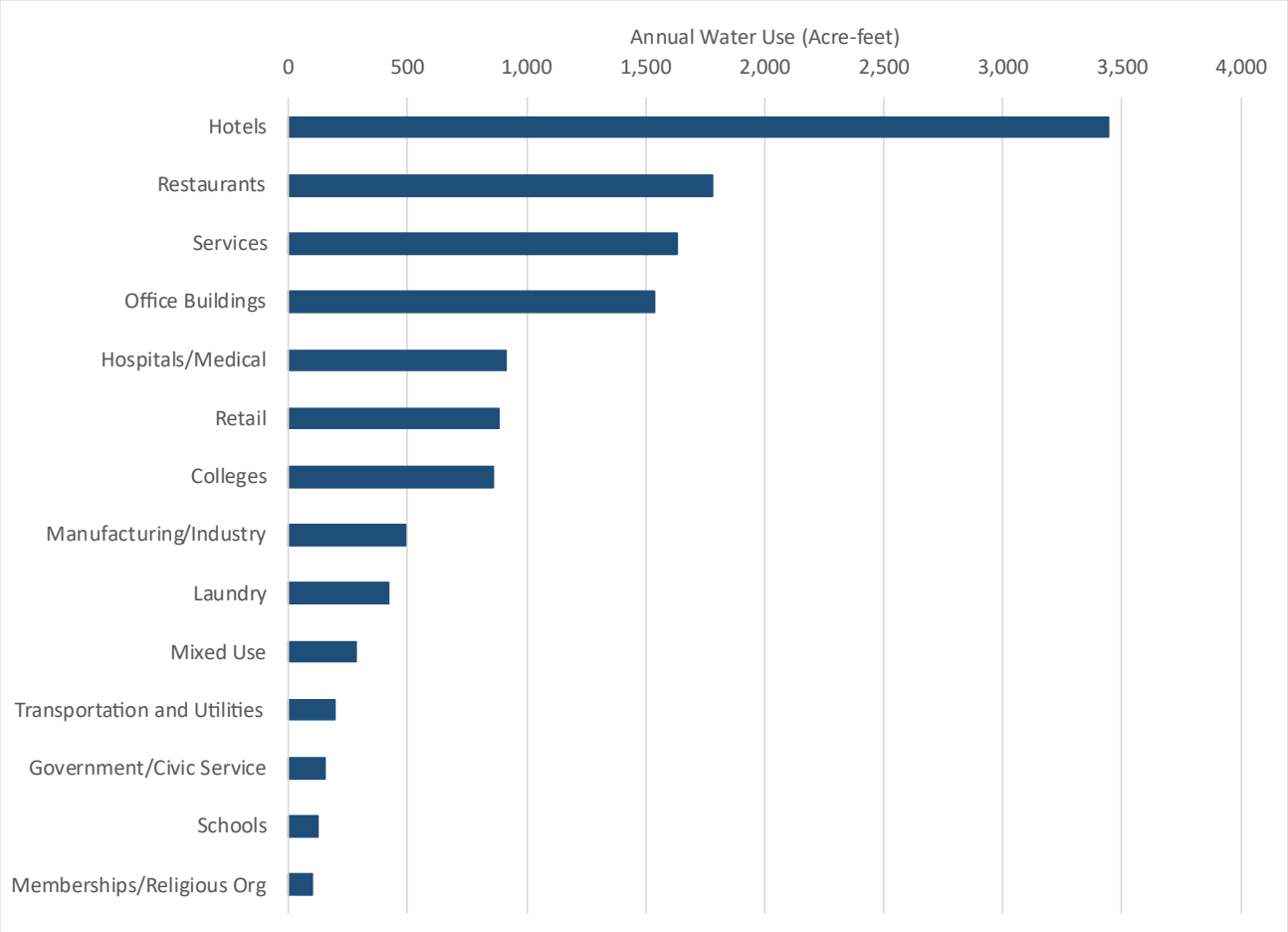
Customer, Property, and Land Use Characteristics

The SFPUC regularly analyzes water use by customer and business sector, as well as by characteristics of customers with higher-than-average water use for their sector or unusual increases based on their water use patterns. For example, **Figure 4-6** shows the top water-using non-residential sectors. Another overall consideration is that irrigation use represents a relatively low percentage of total retail water use.

San Francisco'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 are major factors in water use trends. Additionally, because water use in newly constructed homes and buildings is anticipated to continue to decline per local, state, and federal codes and requirements that increasingly call for more water-efficient plumbing fixtures and landscaping, the SFPUC focuses its Conservation Program on existing sites and its Onsite Water Reuse Program focuses on large, new development.

These characteristics support the SFPUC's focus on tools, services, and incentives for helping customers avoid or promptly fix leaks, maintain indoor fixtures and efficient water use; cost-effective small landscape assistance programs with most financial incentives for outdoor water savings focused on the largest landscapes; providing tools, services, and assistance that promote entire building water savings in multi-family properties and efficient tenant water use; and working with non-residential business sectors with the highest water use, including hotels, office buildings, restaurants, schools, hospitals, government facilities, and laundromats. The SFPUC will also continue outreach to the top residential water users and the top non-residential water-using sectors, while working with the organizations that represent them to promote water efficiency and provide information about the SFPUC's applicable assistance programs.

Figure 4-6: 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 FY 24-25. Data does not include most municipal department use. Data 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. Note that the "Services"

category includes a wide variety of account types that provide nonprofit, social, professional, trade, financial, real estate, or other services to customers.

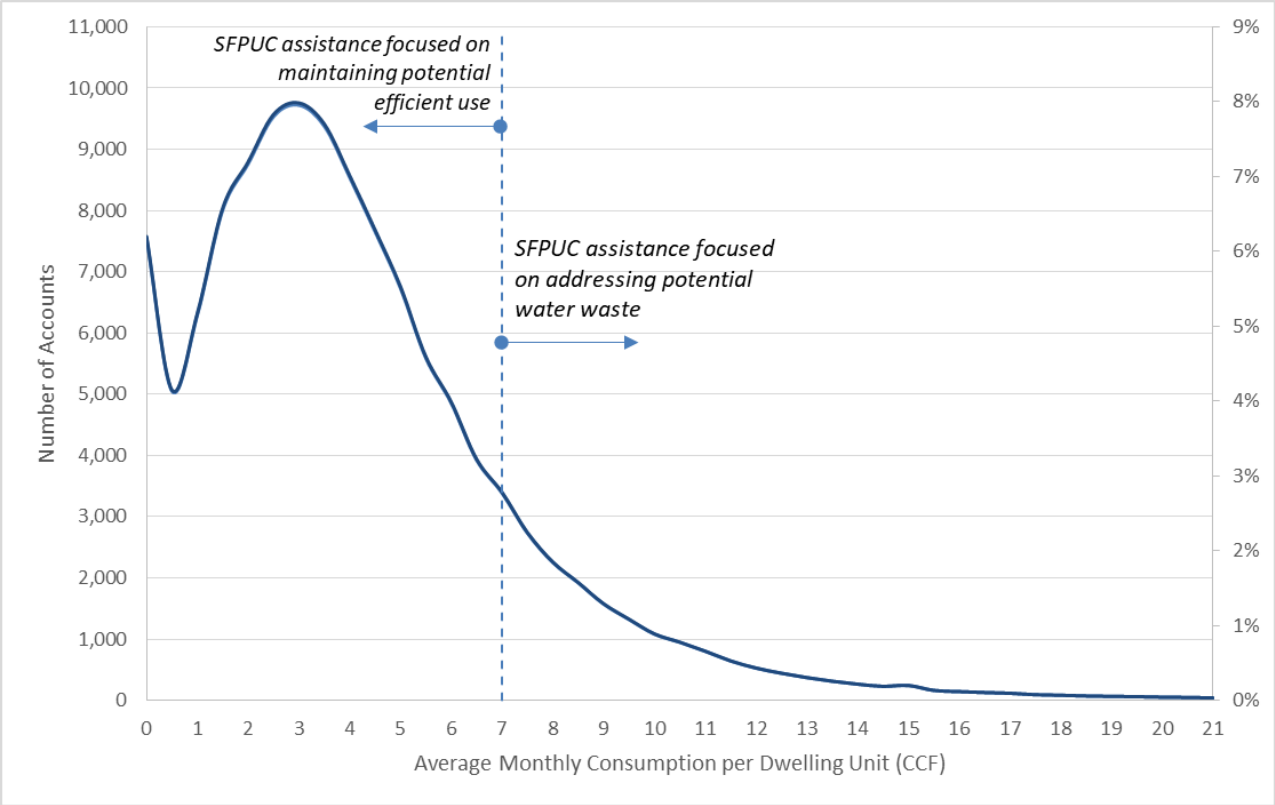
Analysis of residential customer water use in FY 24-25 shows that average monthly use is higher among single family customers than multi-family households and decreases somewhat among multi-family households in larger buildings (see **Table 4-2**). The data reflects that most single family and multi-family household use is low compared to typical national and state residential household use. The data also highlights that a relatively small number of residential households have monthly use well over the average (see **Figure 4-7**). This information supports the SFPUC's continuation of outreach aimed at helping customers who may already be conserving maintain efficient use, while also providing more extensive assistance to customers with high water use that may be due to inefficient fixtures, leaks, or other forms of water waste.

Table 4-2: Most Frequent Average Monthly Consumption per Dwelling Unit in FY 24-25

Class	Average Monthly Water Use per Dwelling Unit	
	CCF[7]	*Gallons*
Single Family	4.5	3,366
Multi-Family (2-5 Dwelling Units)	3.2	2,394
Multi-Family (6-10 Dwelling Units)	3.0	2,244
Multi-Family (>10 Dwelling Units	3.1	2,319

[7] A CCF is 100 cubic feet of water, or 748 gallons.

Figure 4-7: Distribution of Average Monthly Consumption for Single Family Dwelling Units in FY 24-25



While SFPUC retail system irrigation use is generally considered low compared to other parts of the state, many residential customers have some outdoor water use and not all customers have efficient outdoor use. Analyzing single family, multi-family, and irrigation account outdoor water use trends helps SFPUC conservation staff evaluate which landscape conservation assistance measures may be most valuable and cost effective for our service area, how many customers may benefit from such assistance, and helps the SFPUC meet California's new residential and CII outdoor water use efficiency targets.

Relevant Water Efficiency Codes, Regulations, Standards, and Laws

The SFPUC evaluates legislative codes and standards pertaining to efficiency for water-using fixtures, appliances, and devices to understand the impact of legal requirements on customer participation levels and market gaps. Generally, the SFPUC does not provide customer financial incentives for water efficiency actions that are required by law, unless the actions exceed the requirement. The SFPUC does, however, conduct outreach and education and provide information to encourage compliance with requirements. **Table 4-3** provides a summary of key 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. For more information on water-related requirements affecting new development and retrofits in the SFPUC's retail service area, visit https://www.sfpuc.gov/construction-contracts/new-developments.

Table 4-3: Summary of Codes and Standards

Code/Standard/Law	Effective Date or Last Update	Affected Sector	Requirements
Federal: Energy Conservation Standards for Residential Clothes Washers	2024, effective 2028	Residential customers	• New standards (effective 2028) use water efficiency ratio (WER) (lb/gal/cycle) • Front-Loading Clothes Washer: o Current: Integrated Water Factor (IWF) ≤ 4.7 o Effective 2028: WER > 0.77 • Top-Loading Clothes Washer: o Current: IWF ≤ 6.5 o Effective 2028: WER > 0.57
Federal: Energy Star High Efficiency Washer Standards	2021	Residential and commercial customers	• Residential Clothes Washer o Top-Loading: IWF ≤ 4.3 o Front-Loading: IWF ≤ 3.2 • Commercial Clothes Washer: IWF ≤ 4.0
Federal: Other WaterSense Fixtures & Appliances	Varies	Residential and commercial customers	• Toilets: ≤ 1.28 gpf (Single flush toilets 2014, 2024 revision to require dual flush toilets to have an effective flush of ≤1.28, effective 2025) • Urinals: ≤ 0.5 gpf (2009) • Showerheads: ≤ 2.0 gpm (2018) • Faucets: 1.5 gpm (2007, Notice of Intent to revise to 1.2 gpm as of 2024) • Irrigation controller: able to meet watering needs of a landscape without overwatering (2021) • Spray sprinkler bodies: pressure regulated (2017)
Federal: Energy Star Dishwashers	2023	Residential customers	• Residential dishwashers: ≤ 2.0 gallons/cycle for compact and ≤ 3.2 gallons/cycle for standard
Federal: Energy Conservation Standards for Pre-Rinse Spray Valves	2019	Commercial and Institutional kitchens	• Product Class 1 (≤ 5.0 ounce force [ozf]): ≤ 1.00 gpm • Product Class 2 (> 5.0 ozf and ≤ 8.0 ozf): ≤ 1.20 gpm • Product Class 3 (> 8.0 ozf): ≤ 1.28 gpm • ** EPA's WaterSense specification for commercial pre-rinse spray valves was sunset in 2019 and replaced by U.S. Department of Energy federal energy conservation standards that include a water requirement as well.*

Code/Standard/Law	Effective Date or Last Update	Affected Sector	Requirements
California: Conservation Framework (AB 1668, SB 606)	Legislation 2018; Regulation 2024	Urban Water Suppliers	• Meet an urban water use objective based on efficiency standards for indoor residential water use, outdoor residential water use, dedicated irrigation account use, and water loss and performance goals for commercial, industrial, and institutional (CII) use. • Urban retail water suppliers required to annually calculate its urban water use objective and demonstrate compliance with its objective. The urban water use objective is calculated based on budgets for efficient indoor residential water use, efficient outdoor residential water use, efficient water use on commercial, industrial and institutional landscapes with dedicated irrigation meters (DIMs), efficient real water losses, approved variances, temporary provisions, and a bonus incentive for potable reuse.
California: Water Conservation Act of 2009 (SB X7-7)	2009 through 2020	Urban Water Suppliers	• Reduce gross per capita water use to below GPCD target established for supplier by 2020 • SFPUC achieved a lower than initially predicted per capita water use with a 2020 per capita water use of 76 GPCD, in compliance with the final 2020 target of 96 GPCD
California: Water Loss Regulation and Senate Bill 555 (SB 555)	Legislation 2015; Regulation 2022	Urban Water Suppliers	• Conduct an annual supply-side water loss audit and system component analysis • Meet a supplier-specific water loss target by 2028 as determined by the State Water Resources Control Board
California: Water Conservation: low-flush water closets and urinals Assembly Bill 715 (AB 715)	2014	Any building installing new fixtures in California	All toilets and urinals (other than blow-out) sold or installed must be: • Toilets: 1.28 gallons per flush (gpf) or less • Urinals: 0.125 gpf or less
California: Water Efficient Plumbing Fixture Requirements Senate Bill 407 (SB 407)	Single Family: 2017 Others: 2019	All customer sectors by deadlines noted; before then, when customers undergo alterations or improvements	All plumbing fixtures must comply with current plumbing code standards.

Code/Standard/Law	Effective Date or Last Update	Affected Sector	Requirements
California: Title 24, Building Standards Code	2022 (next update is in 2025)	Any building installing new fixtures in California	• Plumbing, residential, energy, and green building standards sections • Toilets: ≤ 1.28 gpf • Urinals: ≤ 0.125 gpf wall mounted; ≤ 0.5 gpf floor mounted • Residential Kitchen Faucets: ≤ 1.8 gpm at 60 psi • Commercial Lavatory Faucets: ≤ 0.5 gpm at 60 psi • Residential Lavatory Faucets: > 0.8 gpm at 20 psi, ≤ 1.2 gpm at 60 psi • Showerheads: ≤ 1.8 gpm at 80 psi
California Title 24 Recirculating Hot Water Requirements	2022	New residential development (and water heater replacements)	• Requires certain new residential developments (depending on distance to heat source) to include efficient hot water on demand systems that reduce hot water waiting times.
San Francisco: Residential Water Conservation Ordinance – SF Building Code (Based on State's SB 407)	Legislation: 2009; effective: At time of sale or transfer of title or upon major improvement	Existing single family and multi-family properties, and residential hotels	Existing fixtures must be replaced if they do not meet or exceed the following water use requirements: • Showerheads: 2.5 gallons per minute (gpm) • Faucets: 2.2 gpm • Toilets: 1.6 gpf (≤ 1.28 gpf per plumbing code) • Leak Repair
San Francisco: Commercial Water Conservation Ordinance – SF Building Code (Based on State's SB 407)	2017 or upon major improvement	Commercial properties	Existing fixture must be replaced if they do not meet or exceed the following water use requirements: • 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

Code/Standard/Law	Effective Date or Last Update	Affected Sector	Requirements
San Francisco: Water Efficient Irrigation Ordinance (Based on State's Model Water Efficient Landscape Ordinance – MWELO)	2011, updated 2015 and 2022.	Residential, commercial, municipal, and mixed-use properties, new projects with landscaped areas ≥ 500 square feet (ft^2) or project with modified landscape area ≥ 1,000 ft^2	• Projects must design, install, and maintain efficient irrigation systems, utilize low water-use plantings and set an annual water budget. Requirements vary depending on project size.
San Francisco: Submetering for New Multi-Family Construction (Based on State Water Code, Division 1, Chapter 8, Article 5, Sections 537 per SB 7)	2018	New multi-family construction	• Requires buildings to submeter each dwelling unit and to bill tenants in apartment buildings accordingly for their water use.
San Francisco: Water Waste Restrictions	2016, updated 2022, 2023	All single family, multi-family and non-residential sites and customers in SFPUC retail service area	• Bans wasteful water uses, including water waste from irrigation runoff onto non-irrigated areas, use of potable water for outdoor hardscape cleaning, potable irrigation of non-functional CII turf, specific construction uses, outdoor irrigation within 48 hours of rainfall, use of single pass cooling systems and water features, use of hoses without shutoff nozzles, and other practices
San Francisco: Water Shortage Contingency Plan	2015, updated 2021, 2025	All customers in SFPUC retail service area	• California Water Code Section 10632 requires urban water suppliers to prepare a Water Shortage Contingency Plan (WSCP) as part of the UWMP process. The WSCP outlines actions the water supplier could impose on its customers to reduce water use during declared water shortages.
San Francisco: Green Building Ordinance (Based on State's CalGreen)	Varies (LEED 1994)	New construction or renovated buildings	• LEED building certification includes a section for water conservation techniques

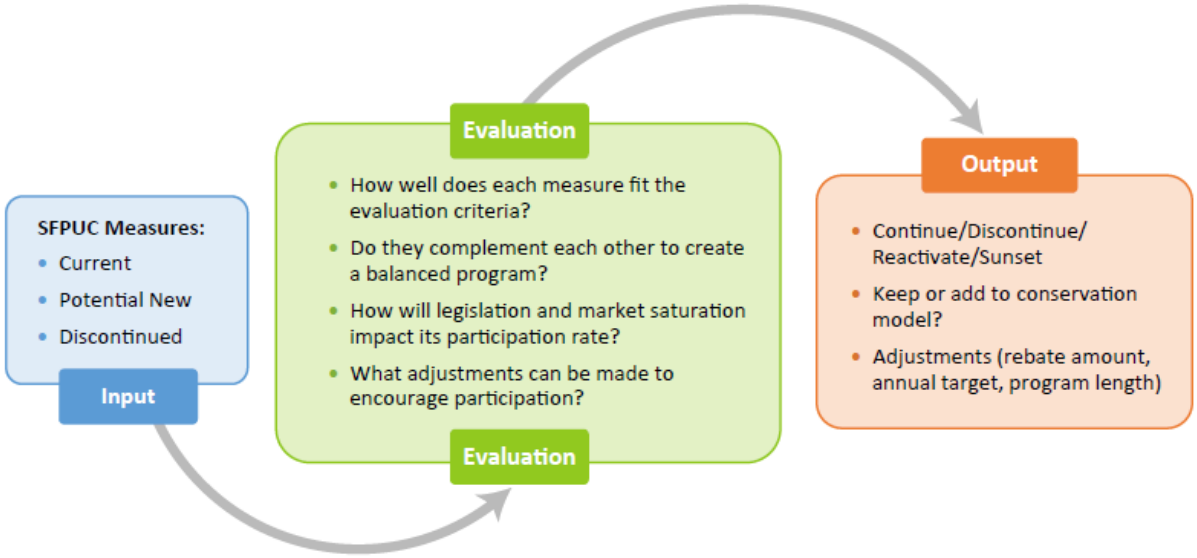
Code/Standard/Law	Effective Date or Last Update	Affected Sector	Requirements
San Francisco: Non-Potable Reuse Ordinance	2015, updated 2021	New development projects over 100,000 ft^2	• All new buildings of 100,000 ft^2 or more of gross floor area must install and operate an onsite water reuse system that allows for the collection, treatment, and use of alternate water sources for non-potable applications in individual buildings and at the district-scale. The type of alternate water source and non-potable uses are based on the project type. • All new buildings in San Francisco of 40,000 ft^2 or more of gross floor area must prepare water budget calculations
San Francisco: Stormwater Management Ordinance	2010, updated 2016	New and redevelopment projects that create or replace ≥ 5,000 ft^2 of impervious surface in combined sewer areas or ≥ 2,500 ft^2 of impervious surface in separate sewer areas	• Requires new and redevelopment projects to manage stormwater using green infrastructure (i.e., stormwater controls or best management practices) and to maintain that green infrastructure for the lifetime of the project

5. Evaluation Process

Since the 2004 development of its original conservation potential and demand forecast model, the SFPUC has evaluated a wide range of over 85 measures, including financial and educational assistance programs and mandates. For details on current measures and measures previously implemented or evaluated, see the following tables in **Section 6**: **Table 6-2 (**SFPUC Conservation Strategies and Measures Planned for 2025-2030) and **Table 6-3 (**SFPUC Conservation Measures Completed before 2025 or Evaluated and Not Implemented).

During its conservation plan updates in 2011, 2015, 2020, and 2025, the SFPUC conducted thorough analyses of all current measures implemented at the time of each plan, potential new measures the agency had not implemented before, and measures previously offered and discontinued. **Figure 5-1** below illustrates the general measure evaluation and review process.

Figure 5-1: Conservation Measure Evaluation Process



The SFPUC considers several criteria to determine which measures most effectively provide the greatest benefit and work best together as a balanced Conservation Program that serves all customer sectors. 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.

Table 5-1: Criteria for Evaluating Conservation Measures

Criteria	Description
Water savings potential	Amount of water a measure could save over its lifespan
Certainty of water savings	Likelihood actual water savings will be achieved
Implementation feasibility	Ease with which a measure could be implemented
Customer receptivity & customer service value	Degree to which customers like or want a measure and will participate, and customer service value of the measure to the SFPUC
Adaptability	Ease with which a measure could be scaled to react to a changing market
Research benefits	To what degree a measure enables research and analysis of an emerging technology
Cost	How cost effective a measure is per acre foot of water saved
Other program co-benefits	To what extent a measure benefits programs other than conservation
Staff resources needed	What level of staffing resources are needed to administer the program and to what extent the measure utilizes the SFPUC's conservation field technician team

6. WATER CONSERVATION PROGRAM

The SFPUC's retail water Conservation Program has historically consisted of a mix of financial incentives, technical assistance, water management tools, education, outreach, and mandates. These offerings are planned to continue over the next five years and beyond.

Between 2005 and 2025, the SFPUC evaluated and implemented over 80 different conservation measures and mandates, providing extensive customer water-savings assistance that has played a major role in this significant decline in water use. These measures include conservation best management practices found successful by major water utilities and efficiency experts across the nation; measures that third-party studies demonstrate have water savings and customer benefits; and measures that make sense for the site conditions and characteristics unique to San Francisco water use.

The measures also include the SFPUC's Onsite Water Reuse Program. In September 2012, the City of San Francisco adopted the Onsite Water Reuse for Commercial, Multi-family, and Mixed-Use Development Ordinance, commonly known as the Non-potable Water Ordinance. It was added to the San Francisco Health Code and allows for the collection, treatment, and use of alternate water sources for non-potable applications. The ordinance requires new developments of 100,000 square feet or more to install and operate an onsite water reuse system. The required alternate water sources and required non-potable uses are based on development project type (e.g. commercial vs. residential). New commercial buildings must reuse blackwater and condensate for toilet flushing and drain trap priming. New mixed-use and multi-family residential buildings must reuse graywater and condensate for toilet flushing, irrigation, clothes washing, and drain trap priming. Additionally, new development projects of 40,000 gross square feet or more are required to submit water budget calculations assessing the supply available from the required alternate water sources and the demand from required non-potable uses. It is not required to install and operate an onsite water reuse system. The program also provides grant funding for projects that aren't required to install onsite reuse systems, including projects that are installing onsite water systems on a voluntary basis, projects that are installing onsite water systems in compliance with the Non-potable Water Ordinance that go above and beyond their compliance requirements, and breweries that collect, treat, and reuse process water.

The SFPUC regularly reviews the water-saving measures and strategies undertaken by other water utilities in California and other states and reviews information on advancements in conservation best management practices provided by national and state water-efficiency experts. **Table 6-1** shows how the SFPUC aligns with 17 other water utilities' Conservation Programs that the SFPUC reviewed in 2025. Overall, it shows that the SFPUC offers the same core measures, with expected variations among agencies in how measures are structured and implemented. The SFPUC also offers additional measures beyond those noted in the table.

Table 6-1: How the SFPUC Conservation Measures Compare to Other Water Utilities

Measure	# of Agencies that Offer Measure	Currently Offered by SFPUC?
Devices	13	Yes
Education & Training	12	Yes
Turf Replacement	14	Yes, for irrigated landscapes over 10,000 square feet
Audits	14 outdoor 11 indoor	Yes
Clothes Washers	11	Yes
Toilets	10	Yes
Commercial Equipment	13	Yes
Irrigation System Components	13	Yes
Urinals	10	No
Non-Potable Reuse	10	Yes, for indoor and outdoor
Pools (Covers)	2	No
Mulch	2	No
Water Use Reports & Online Portals	5	Yes
Leak Alerts	2	Yes
Dishwashers	2	Yes, for large commercial systems
Hot Water On Demand Systems	2	Yes
Pressure Reducing Valves	2	No
Agency Web Pages Surveyed:		
a. Alameda County Water District *b. Austin Water Utility* *c. Bay Area Water Supply and Conservation Agency* *d. City of San Diego Public Utilities Department* *e. Contra Costa Water District* *f. East Bay Municipal Utility District* *g. Irvine Ranch Water District* *h. Los Angeles Department of Water and Power* *i. Marin Municipal Water District*		*j. Metropolitan Water District of Southern California* *k. Municipal Water District of Orange County* *l. San Diego County Water Authority* *m. Santa Clara Valley Water District* *n. Sonoma County Water Agency* *o. Soquel Creek Water District* *p. South Florida Water Management District* *q. Southern Nevada Water Authority*

The SFPUC's conservation measures can be broadly characterized as foundational customer assistance measures that the SFPUC anticipates continuing through the 2050 planning horizon with no definite end date. Examples include evaluations, site usage reports and tools, free devices, education and outreach, and mandates or incentive-based measures that have specific and varying end dates, depending on factors such as plumbing code impacts and market saturation rates. Collectively, the measures proposed for 2025 and beyond support the SFPUC's strategies to tap into anticipated remaining water-saving opportunities, specifically:

- Maintaining efficiency among customers, properties, and sites that already have a water-wise approach
- Improving efficiency among residential customers with above average water use due to leaks, old fixtures, inefficient irrigation, or other forms of water waste
- Increasing commercial property compliance with requirements for efficient plumbing fixtures and awareness of opportunities for equipment retrofits, reuse technologies, and efficiency audits and action plans

- Increasing commercial customer awareness of constant and/or abnormally high-water use, with focus on hotels, restaurants, office buildings, and schools that represent the non-residential sectors with the overall highest water use
- Promoting compliance with new efficiency standards among large landscapes served by dedicated irrigation meters and smaller sites with inefficient irrigation
- Maximizing opportunities for onsite reuse in new development

Moving forward, the SFPUC will continue to utilize a mix of demand-side, customer water-saving strategies, including voluntary incentives, assistance services, tools to help customers understand and manage their water use, education and outreach, and mandates that require indoor and outdoor water efficiency. **Table 6-2** below notes the conservation measures the SFPUC already is implementing or plans to start implementing within the next five years and which ones are modeled for water savings. Measures marked as "New" have been added since the 2020 Plan. The SFPUC only models water savings for measures with established water-savings methodologies, engineering calculations or enough empirical data of our own to meet a sufficient level of confidence in the estimates. The SFPUC implements several measures that are not modeled but are likely to generate some water savings. The SFPUC also implements several programs beyond conservation that likely contribute to reductions in potable water use, including its supply-side water loss, recycled water facility, and stormwater management programs. Additionally, per its WSCP, the SFPUC also has identified and is prepared to take actions beyond the measures or level of effort described in its 2025 Plan to seek short-term reductions in water use during droughts or other emergencies that restrict water supply. For example, these actions could include voluntary calls for reduction or mandatory rationing, irrigation restrictions, and other actions. Drought actions are not factored into the modeled conservation water savings in this 2025 Plan.

For detailed information about how water savings are calculated for each modeled conservation measure, see **Appendix D**.

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Table 6-2: SFPUC Conservation Strategies and Measures Planned for 2025-2030

Measure	Markets Served	Description	Are Water Savings Modeled?	Model Reference Number **
INCENTIVES				
Toilet direct installations	SF, MF	Free replacement (installation and fixture) of existing 1.6 gpf-plus toilets with toilets 1.0 gpf or less. Program ended November 2025.	Yes	S8b, M7c
Toilet rebates	SF, MF, NR	Rebates for replacement of existing tank-style 1.6gpf-plus toilets with ultra-high efficiency toilets 1.1 gpf or less. Program started December 2025. Will consider similar program for flushometer toilets and urinals after 2026.	Yes	S22, M22, N30
Rebates for residential and commercial clothes washers	SF, MF, NR	Rebates for installation of Energy Star Most Efficient residential washers in single family, multi-family and commercial properties, and rebates for installation of coin-operated commercial washers in common areas of multi-family properties and laundromats.	Yes	S12, M10, N21
Rebates for rain barrels and cisterns	SF, MF, NR	Rebate off the purchase cost of rain barrel or cistern.	Yes	S16c, S16d
Rebates for laundry to landscape graywater systems	SF, MF	Rebate off the purchase of components to install laundry to landscape graywater systems in up to 2-unit residential homes.	No	
Grants for large landscape & irrigation upgrades	MF, NR, IRR	Grants to existing, irrigated landscape sites over 10,000 square feet that provide funding up to 50% of project design and construction for landscape and irrigation system component upgrades that reduce potable water use by 25 percent or more.	Yes	N22a, N22b
Rebates for large commercial equipment	MF, NR	Rebates for up to 100% of purchase cost for installed equipment in existing sites that save over 74,900 gallons annually for metered projects and up to 50% of purchase cost for equipment with predictable water savings that can't be metered.	Yes	N24, N25a, N25b
Grants for irrigation meters and backflow devices for community gardens	IRR	Waiver of SFPUC fees for installation of a dedicated irrigation meter for community gardens and rebate off the purchase cost of installed backflow devices. Participants receive monthly water budget report from the SFPUC.	No	
Onsite Water Reuse Program (Grants)	MF, NR	Grant funding for projects that install Onsite Water Systems 1) on a voluntary basis 2) on a mandatory basis that go above and beyond required compliance or 3) for brewery process water.	Yes	N/A**

Measure	Markets Served	Description	Are Water Savings Modeled?	Model Reference Number **
Rebates for weather-based irrigation controllers and sensors)	SF, MF, NR, IRR	Rebates to reduce the purchase cost of installed weather-based irrigation controllers and sensors for small and large landscapes.	Yes	S18, M17, N29
Rebates for recirculating hot water pumps	SF, MF	Rebates off the cost of installed, on-demand recirculating hot water pumps used to reduce hot water wait time in single family and small multi-family properties.	No	
Free water-saving devices	SF, MF, NR	Free distribution or direct install of water-efficient devices, including showerheads, faucet aerators, pre-rinse spray nozzles, garden spray hose nozzles, toilet flappers, toilet fill valves, soil moisture meters.	Yes	S4, S5, S20, M4, M5, M20, N7, N8, N9, N27
Grants for installation of green infrastructure for stormwater management *	SF, MF, NR, IRR	Grants to provide financing for planning, design, and construction of green stormwater management facilities, including projects that harvest and use rainwater, remove impervious surfaces, install vegetated roofs, or implement other green infrastructure like bioswales and rain gardens.	No	
Bill reductions for leak repair *	SF, MF, NR	To encourage prompt repairs of leaking pipes or fixtures, the SFPUC's Customer Service Bureau grants allowances for excessive bills resulting from leakage beyond the meter.	No	
ASSISTANCE SERVICES				
Onsite indoor and outdoor water-wise evaluations and reports	SF, MF, NR, IRR	Free site consultation that reviews consumption history, checks plumbing fixtures and irrigation system components for leaks, determines fixture flow rates, recommends improvements, identifies fixtures eligible for replacement through rebate programs, provides standard repair parts for faulty toilets and free water-saving devices and materials, and provides a report of findings and recommendations.	Yes	S2, M1, M2, N1, N2, N3, N4, N5
Virtual evaluations and consultations)	SF, MF, NR, IRR	Free consultations by phone and/or video that review consumption history, provide input on plumbing fixture and irrigation system efficiency and potential eligibility for incentives, and provide general guidance on ways to reduce water use and waste from leaks.	No	
WATER MANAGEMENT TOOLS				

Measure	Markets Served	Description	Are Water Savings Modeled?	Model Reference Number **
My Account online platform for viewing water use	SF, MF, NR, IRR	Online portal where customers can view their bills, perform account service, and view and download hourly, daily, weekly, and monthly water use. Residential customers can compare their use to the SFPUC's goal to keep indoor/outdoor residential use under 45 GPCD and can compare household water use to the previous year. Drought targets can be added during water shortages.	No	
Irrigation account monthly water use budgets	IRR	Informational monthly report indicates how water use compares with the estimated amount allotted for their site based on state efficiency calculations.	Yes	A3, A4a, A4b
Leak and high usage alerts	SF, MF, NR, IRR	Alerts sent by text, email, phone, mail, and door hanger to customers with constant water use, which could indicate leaks.	Yes	S3a, M3a, M3b, N6, N26
MANDATES				
Retrofit on Resale (ROR)	SF, MF	Existing residential properties are required to replace inefficient plumbing fixtures upon sale.	Yes	N/A
Onsite Water Reuse Program (Ordinance)	MF, NR	New development projects of 100,000 square feet or more of gross floor area are required to install and operate an onsite non-potable water system to treat and reuse available graywater, rainwater, and foundation drainage for toilet and urinal flushing and irrigation. New development projects of 40,000 square feet or more of gross floor area are required to prepare water budget calculations assessing the amount of available rainwater, graywater, and foundation drainage, and the demands for toilet and urinal flushing and irrigation.	Yes	N/A**
EDUCATION & OUTREACH				
School presentations and field trips	SF, MF	In-person presentations about the SFPUC's water supply, local water program and conservation to K-12, and field trips to a water efficiency demonstration garden.	No	
Demonstration garden and adult landscape trainings	SF, MF	Maintenance of publicly accessible demonstration garden with educational signage about water efficient plants, irrigation and rainwater harvesting, and in-person adult classes conducted on site.	No	

Measure	Markets Served	Description	Are Water Savings Modeled?	Model Reference Number **
Waste of water notifications and outreach	SF, MF, NR, IRR	Inclusion of waste of water in San Francisco's 311 public complaint reporting system and program of escalating letters, warnings, calls, and inspector dispatch to sites of reported water waste.	No	
Top user notifications and outreach	SF, MF, NR	Periodic (approximately annual) issuance of letters to single family customers with top water usage and multi-family customers with highest average usage per dwelling unit. Starting in 2025, annual letters and outreach to the top 20% and top 2.5% of CII users per the State's Making Conservation a Way of Life regulations.	No	
Social media, direct customer notification, community events	SF, MF, NR, IRR	Regular notifications and outreach through multiple platforms to promote conservation services and assistance.	No	

**SFPUC programs funded/implemented outside the Conservation Program and their estimated water savings not reflected in this Conservation Plan.*
SF - single family; MF - multi-family; NR - non-residential; IRR – irrigation.
*** Refers to the reference number assigned to measures modeled for water savings in the Conservation Tracking Model; these reference numbers are noted in* ***Appendix D****: Updated SFPUC Water Conservation Tracking Model Overview and Water and Energy Savings Specifications for Conservation Program Measures (2025). Water savings for the Onsite Water Reuse Program are estimated outside of the Conservation Tracking Model but are included in water savings and effect on demand presented in this 2025 Conservation Plan.*

Table 6-3 summarizes the conservation measures the SFPUC implemented or evaluated since 2005 and terminated by 2025 or has not offered.

Table 6-3: SFPUC Conservation Measures Completed before 2025 or Evaluated and Not Implemented

Measure	Description	Status	Model Reference No.
SINGLE FAMILY MEASURES			
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.	**Completed.** Measure provided 2009-2019.	S1
HET Rebates (Tank-Style)	Up to $125 rebate to replace old toilets (≥ 3.5 gpf) with approved high-efficiency toilets (HETs) (1.28 gpf or less).	**Completed.** Rebate program provided until 2017. Replaced by toilet direct install program that started in 2016 and ended November 2025. The SFPUC started a new ultra-high efficiency toilet rebate program in 2025. Before HET rebates, between approximately 1997 and 2000, the SFPUC provided $10 fixture sales and rebates to replace high-flow toilets with 1.6 gpf toilets. These earlier toilet incentives are not counted as active conservation measures in the SFPUC's conservation forecast models.	S6
CAP Direct Install thru SFPUC Funding	Free installation of HETs for single family customers getting discounted water and wastewater rates through the SFPUC's Customer Assistance Program (CAP).	**Completed.** Measure provided 2010-2015. Replaced by new direct install program that started in 2016, is open to all eligible single family customers and continues as of 2020.	S7
HET Vouchers	A voucher issued to eligible residents to replace their older toilets with HETs.	**Completed.** Measure provided 2010-2015. Replaced by new direct install program that started in 2016, is open to all eligible single family customers and continues as of 2020.	S9
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.	**Completed.** Measure replaced by rebate for Energy Star Most Efficient to continue to drive market for most efficient clothes washers.	S11
Custom Water Use Reports	Provides all residential customers a monthly home water use report to provide better understanding of water use patterns and trends.	**Evaluated, not offered.** 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.	S3b

Measure	Description	Status	Model Reference No.
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.	**Evaluated, not offered.** Single family market already served by SFPUC's extensive incentive programs. On-bill financing could potentially be considered after all SFPUC's HET incentives expire if the remaining estimated quantity of inefficient fixtures warrants it.	S10
High- Efficiency Dishwasher Rebates	Rebate for high-efficiency residential dishwashers.	**Evaluated, not offered.** Very 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. The SFPUC's current commercial equipment rebate program covers water-saving upgrades or replacements of commercial dishwashing systems.	S13
Discounts for rain barrels and cisterns	Discount on the purchase cost of rain barrel or cistern.	**Discontinued.** After 10 years of providing point of purchase discounts through a gardening supply store, the SFPUC switched to a rebate program format to continue incentives for rain barrels and cistern**s.**	S16a, S16b
Turf Removal Incentive	A per-square-foot rebate to replace turf for small residential and non-residential properties with drought appropriate plants.	**Evaluated, not offered.** Limited opportunity and high cost per potential water savings. SFPUC instead continues to provide educational materials, trainings, incentives for irrigation controllers, and onsite assistance through water-wise evaluations. Additionally, the SFPUC's large landscape grant covers turf replacement for retrofits to irrigated landscapes over 10,000 square feet.	S17
Irrigation Nozzle Distribution	Free irrigation nozzles for eligible customers.	**Evaluated, not offered.** Limited opportunity and high cost per potential water savings. SFPUC instead continues to provide educational materials, trainings, incentives for smart irrigation controllers, and onsite assistance through water-wise evaluations.	S19

Measure	Description	Status	Model Reference No.
Flow Sensor Incentives	Devices that strap on to meters, or on/in customer-side pipes, or on specific water-using equipment of fixtures that provide customers "real-time" water use dashboards available through apps, including high usage and leak alerts.	**Evaluated, not yet offered.** Currently, several technologies are incentivized by some water agencies that do not have AMI and the ability to provide customers daily and hourly water use info. The SFPUC provides water use information through the previous day on My Account and courtesy leak alerts, though neither of these provide "real-time" data or alarms. SFPUC restricts customer installation of devices on SFPUC meters due to potential damage to AMI equipment. The SFPUC will continue to evaluate and monitor this evolving field and consider an incentive program.	N/A
Pressure Reducing Valve Incentives	Devices installed in-flow in house pipe that reduces pressure to home and could be beneficial to leak-prone homes in known areas of high pressure.	**Evaluated, not offered.** May require a permit to install in-flow. Few water agencies offer such rebates, and it is unclear how any water-savings could be attributed or measured. The SFPUC will continue to evaluate as data on homes located in potentially high-pressure areas become available in conjunction with SFPUC's operations team.	N/A
Insurance for water lateral replacements	SFPUC had an agreement with American Water Resources (AWR) that enabled them to offer water (and sewer) lateral coverage that pays for the cost of replacing broken or damaged laterals in single family and small multi-family properties up to 4 dwelling units. Broken water laterals can be a source of extensive water loss and high bills.	**Program ran from 2019 to 2023.**	N/A
MULTI-FAMILY MEASURES			
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).	**Completed.** Offered until 2017. Replaced by toilet direct install program that started in 2016 and ended in November 2025. The SFPUC started a new ultra-high efficiency toilet rebate program in 2025. Before HET rebates, between approximately 1997 and 2000, the SFPUC provided $10 fixture sales and rebates to replace high-flow toilets with 1.6 gpf toilets. These earlier toilet incentives are not counted as active conservation measures in the SFPUC's conservation forecast models.	M6

Measure	Description	Status	Model Reference No.
HET Voucher	A voucher issued to eligible residents to replace their older toilets with HETs.	**Completed.** Offered 2010-2017. Replaced by a direct install program open to all eligible multi-family customers that ended in November 2025.	M8
CEE Tier 2 Rebates	Rebate for clothes washer with WF of ≤ 4.5 or lower.	**Completed.** Measure replaced by rebate for Energy Star Most Efficient to continue to drive market for most efficient clothes washers.	M10
Custom Water Use Reports	Provides customers a site-specific water use report to provide better understanding of water use patterns and trends.	**Evaluated, not offered.** The SFPUC instead 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 and leak alert notifications.	M3b
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 the agency's costs over time. The customer finances the project through water bill savings.	**Evaluated, not offered.** Multi-family market already served by SFPUC's extensive toilet incentive programs. On-bill financing could potentially be considered after all SFPUC's incentives expire if the remaining estimated quantity of inefficient fixtures warrants it.	M9
Submetering Incentives for Multi-Family Dwelling 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.	**Evaluated, not offered.** Effective 2018, California law requires installation of submeters in all new multi-family construction. The SFPUC administers this requirement locally and incentives do not apply because it is mandated. For existing buildings, the SFPUC continues to provide assistance with fixture and equipment replacement, maintenance and leak detection and report, as well as assistance with water use monitoring through existing tools that are easier and more economical for existing buildings to reduce water use.	M12, M13
Turf Removal Incentive	A per-square-foot rebate to replace turf with regionally appropriate plants.	**Evaluated, not offered as an independent measure.** Turf removal is provided through the SFPUC's Large Landscape Grant measure, which is open to multi-family customers with irrigated landscapes over 10,000 square feet. Additionally, the SFPUC continues to provide educational materials, trainings, incentives for irrigation controllers, and onsite assistance through water-wise evaluations.	M16

Measure	Description	Status	Model Reference No.
Irrigation Nozzle Distribution	Provide free irrigation nozzles to customers, such as homeowners associations and multi-family properties.	**Evaluated, not offered as an independent measure.** Nozzles are provided through the SFPUC's Large Landscape Grant measure, which is open to multi-family customers with irrigated landscapes over 10,000 square feet.	M18
Insurance for water lateral replacements	SFPUC had an agreement with American Water Resources (AWR) that enabled them to offer water (and sewer) lateral coverage that pays for the cost of replacing broken or damaged laterals in single family and small multi-family properties up to 4 dwelling units. Broken water laterals can be a source of extensive water loss and high bills.	**Program ran from 2019 to 2023.**	N/A
NON-RESIDENTIAL MEASURES			
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).	**Completed.** Offered until 2017. Ended due to Commercial Conservation Ordinance requirements for efficient fixtures. Before HET rebates, the SFPUC provided rebates to replace high-flow toilets with 1.6 gpf toilets. These earlier toilet incentives are not counted as active conservation measures in the SFPUC's conservation forecast models. The SFPUC started a new ultra high efficiency toilet rebate program in 2025, which is open to all customer sectors and incentivizes installation of fixtures more efficient than California code.	N10
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).	**Completed.** Offered until 2017. Ended due to Commercial Conservation Ordinance requirements. Before HET rebates, the SFPUC provided rebates to replace high-flow toilets with 1.6 gpf toilets. These earlier toilet incentives are not counted as active conservation measures in the SFPUC's conservation forecast models. The SFPUC started a new ultra high efficiency toilet rebate program in 2025, which is open to all customer sectors and incentivizes installation of fixtures more efficient than California code.	N11
HET Direct Install – CII	Free installation of HETs for non-residential customers. **Prerequisite:** Direct Install Audit (Measure N2).	**Completed.** SFPUC provided HET direct install programs from 2010 through 2016.	N12

Measure	Description	Status	Model Reference No.
HET Direct Install – School/Hotel	Free installation of HETs for schools or hotels in San Francisco. **Prerequisite**: Direct Install Audit (Measure N2).	**Completed.** SFPUC provided HET direct install programs that also included urinals (see N18) from 2010 through 2016	N13
HET Voucher – CII	A voucher for HET purchase.	**Completed.** Provided between 2010 and 2015.	N14
HET Voucher – School/Hotel	A voucher for HET purchase.	**Completed.** Provided between 2010 and 2015.	N15
HEU Rebates	Rebate up to $500 per urinal for eligible commercial businesses when high-flow urinals (≥ 1.5 gpf) are replaced with HEUs.	**Completed.** Offered until 2017. Will consider new rebate program after 2026.	N17
HEU Direct Install	A program for replacing 1.5-gpf HEUs with pint-flush urinals.	**Completed.** SFPUC provided urinal direct install programs from 2010 through 2016.	N18
Urinal Retrofit	A turnkey program for the replacement of the flush valve only. Free product and free installation of HEU flush valves.	**Completed.** SFPUC provided urinal retrofit program from 2015 to 2017.	N19
Coin-Op CEE Tier 2 (WF 4.5) Rebate	Rebates for commercial high-efficiency clothes washers with a WF of ≤ 4.5. Measure discontinued.	**Completed.** Measure replaced by rebate for Energy Star Most Efficient to continue to drive market for most efficient clothes washers.	N20
Custom Water Use Reports	Provides customers a monthly site-specific water use report to provide better understanding of water use patterns and trends.	**Evaluated, not offered.** The SFPUC instead 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 and leak alert notifications.	N6b
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.	**Evaluated, not offered.** Non-residential market already extensive served by SFPUC's long-running rebate and direct install programs. On-bill financing could potentially be considered if the remaining estimated quantity of inefficient fixtures warrants it.	N16

Measure	Description	Status	Model Reference No.
Dipper Well and Other Food Service Incentives	Dipper wells are small countertop sinks that use a constant flow of water to clean utensils like scoops and thermometers used in ice cream parlors, coffee shops, restaurants, cafeterias, etc.	**Evaluated.** Water utilities are studying potential replacement technologies that do not use continuous flow. More study needed to confirm compliance with health requirements and what, if any, permits might be required. In 2024 the SFPUC expanded terms of non-metered equipment potentially eligible for rebate through its commercial equipment program. Dipper well, defrosting and other water-saving technologies in food establishments could potentially be considered if eligibility requirements are met.	N25b

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7. WATER SAVINGS AND COST

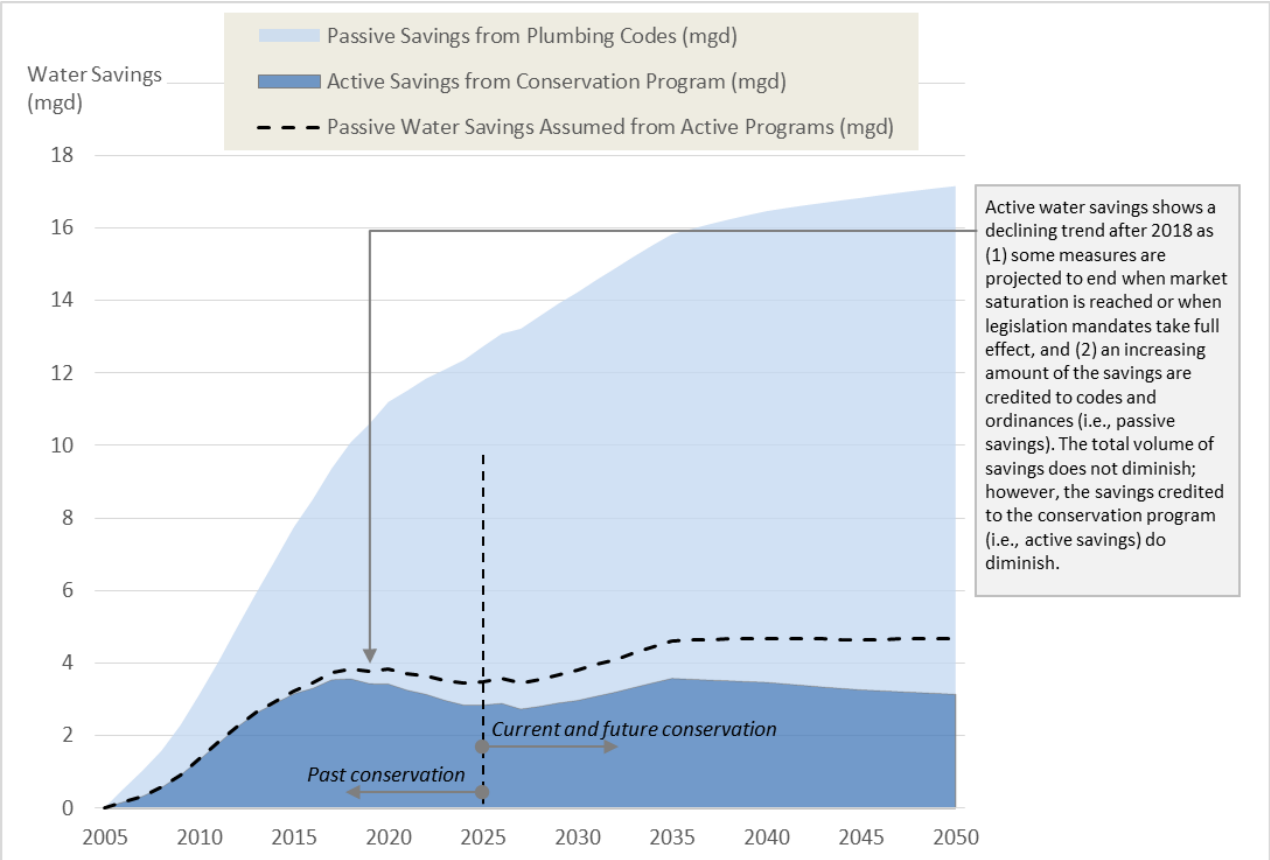
The SFPUC uses its Water Conservation Tracking Model (Conservation Model), a customization of the Alliance for Water Efficiency's (AWE's) Water Conservation Tracking Tool to estimate and project water Conservation Program activity, water savings, and the costs and benefits of conservation measures summarized in this *2025 Retail Water Conservation Plan*. As noted earlier in this document, the SFPUC only models water savings for measures with sufficient empirical data or industry-accepted engineering calculations for which there is a reasonable level of confidence. The SFPUC implements several measures that do not have modeled water savings and also implements other programs beyond conservation, including supply-side water loss and stormwater management programs that are estimated to reduce potable water use but whose savings are not included in the Conservation Model or reflected in the following savings estimates. Estimated 2025-2050 water savings for the Onsite Water Reuse Program are based on existing water budget applications and reported data from operating onsite water reuse projects. These estimates and data were determined outside of the Conservation Model, but are included in water savings and the effects on demand presented in this section and **Section 8**. They are likely conservative estimates of future savings, because they do not include savings from future unknown onsite reuse projects. More information about the onsite reuse water budget application and water use calculator tools can be found on the SFPUC's program website: www.sfpuc.gov/npo.

Modeled Water Savings

The Conservation Model contains the individual measures that have modeled water savings that the SFPUC has implemented in the past and is planning to implement as part of its overall current 2025 Conservation Program. The process to update the Conservation Plan includes consideration of potential future measures. 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. See **Appendix D** (SFPUC Conservation Tracking Model Water and Energy Savings Specifications for Conservation Measures) for the specific data sources and assumptions used to generate the water savings and plumbing code specifications for each measure. Some measures, such as school education programs, do not have well-defined water savings and are therefore not included in the model.

The most meaningful way to assess the overall impact of a Conservation Program is to consider both "active" water savings from conservation measures implemented by the utility and "passive" savings from plumbing codes. **Figure 7-1** shows the SFPUC's estimated active and passive water savings from modeled conservation measures since 2005 when we began to use a forecast model and through 2050. The key takeaway is that overall water savings continue to increase over time; active water savings show a declining trend after 2018 due to the SFPUC's conservative approach of not including water savings estimates for some measures anticipated to be offered over the next 25 years but are not yet defined enough to calculate reliable savings estimates and to the fact that more savings are attributed to code.

Figure 7-1: Conservation Water Savings Forecast



Note: "Active Savings" includes savings from Onsite Water Reuse Program.

Table 7-1 shows the estimated passive water savings by customer sector since 2005.

Table 7-1: Estimated Passive Savings (Cumulative Since 2005)

	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	2045	2050
					million gallons per day (MGD)					
Single Family	0.0	0.6	1.4	2.2	2.9	3.3	3.6	3.9	4.1	4.2
Multi-Family	0.0	1.0	2.5	4.2	5.4	6.0	6.5	6.9	7.1	7.3
Non-Residential	0.0	0.3	0.7	1.3	1.6	1.9	2.1	2.2	2.4	2.5
Total Passive Savings	**0.0**	**1.8**	**4.6**	**7.8**	**9.9**	**11.3**	**12.3**	**13.0**	**13.6**	**14.0**
					Acre-Feet per Year (AF/Yr)					
Single Family	0	627	1,520	2,509	3,256	3,739	4,088	4,347	4,544	4,698
Multi-Family	0	1,090	2,806	4,748	5,997	4,544	7,313	7,709	8,004	8,232
Non-Residential	0	292	820	1,458	1,822	8,004	2,326	2,505	2,652	2,775
Total Passive Savings	**0**	**2,010**	**5,146**	**8,715**	**10,908**	**2,652**	**13,574**	**14,414**	**15,059**	**15,704**

Note: "Total" row may not match exactly due to rounding.

The following tables **Table 7-2** through **Table 7-5** show the estimated active water savings in total and by customer sector for modeled conservation measures. For ease of presentation, some measures are grouped together in a single savings estimate. The tables depict 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 active 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.[8]

[8] 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.

Table 7-2: All Sectors Annual and Cumulative Water Savings Projection

Measure Category	Annual Water Savings in Selected Years (AF/yr) [4]										2005-2050 Cumulative Savings (AF)[4]
	Past Savings				*Future Savings*						
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	2045	2050	
ASSISTANCE SERVICES											
Surveys & Reports	5	338	505	332	220	367	367	367	367	367	**15,640**
INCENTIVES											
Toilets	0	449	1,379	1,451	1,330	1,172	1,008	867	747	643	**44,171**
Urinals	0	3	20	26	23	21	19	17	15	14	**762**
Clothes Washers	0	425	724	680	230	100	41	18	0	0	**11,143**
Showerheads	0	162	477	237	50	33	33	12	0	0	**4,914**
Devices	10	10	37	58	12	17	21	16	12	12	**1,005**
Rain Barrels and Cisterns	0	0	1	2	2	2	0	0	0	0	**34**
Efficient Irrigation Timers	0	0	0	0	9	52	86	43	0	0	**949**
Large Landscape Retrofits	14	14	24	28	18	18	8	4	0	0	**642**
Landscape Water Budgets	0	0	0	0	92	92	92	92	92	92	**2,405**
Commercial Large Equipment	0	0	10	329	330	13	5	5	5	5	**3,492**
WATER MANAGEMENT TOOLS											
Leak Alerts	0	0	71	174	235	235	235	235	235	235	**7,600**
MANDATES											
Onsite Water Reuse Program[3]	0	0	0	112	165	711	1,603	1,735	1,735	1,735	**35,287**
Retrofit on Resale (ROR)[1]	0	105	294	412	474	498	497	480	452	419	**17,259**
Total Annual Savings (AF/Yr) [2]	**29**	**1,505**	**3,541**	**3,840**	**3,191**	**3,331**	**4,014**	**3,891**	3,661	**3,522**	**145,303**
Total Annual Savings (MGD) [2]	**0.03**	**1.34**	**3.16**	**3.43**	**2.85**	**2.97**	**3.58**	**3.47**	**3.27**	**3.14**	

(1) Although ROR is related to local plumbing codes, it is included as an active conservation measure in the SFPUC's conservation forecast model. Other mandates and code related to toilets, urinals, showerheads, and clothes washers are counted into plumbing code savings and are not called out as active measures. Additional standards such as requirements for efficient residential hot water

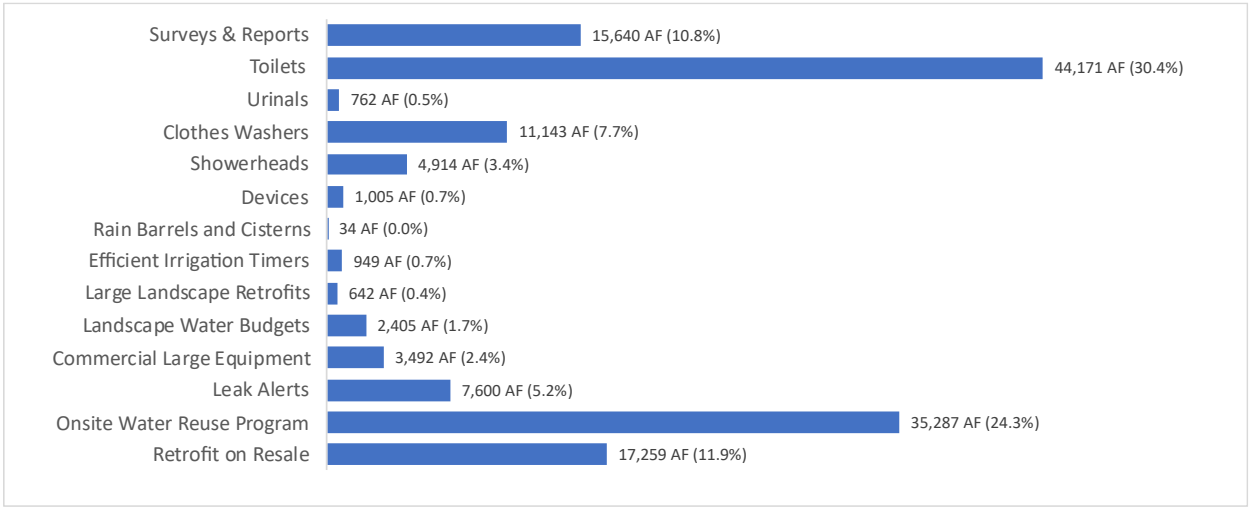
systems and submetering that may generate some water savings are not factored into active or passive plumbing code changes due to insufficient data or established methodology to estimate savings.

(2) 1 MGD equals approximately 1,121 AF/Yr. "Total" row may not match exactly due to rounding.

(3) Onsite Water Reuse Program estimated savings covers projects that are required to comply and projects that voluntarily comply, as well as voluntary projects that receive SFPUC grant bunding, but for ease of presentation is included under the Mandates category.

(4) The annual water savings listed for each year are the water savings for that specific year; the cumulative savings reflect all years, including the years between the five-year increments that are not shown.

Figure 7-2: All Sectors Conservation Measures Cumulative Water Savings Projection



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

Table 7-3: Single Family Annual and Cumulative Water Savings Projection

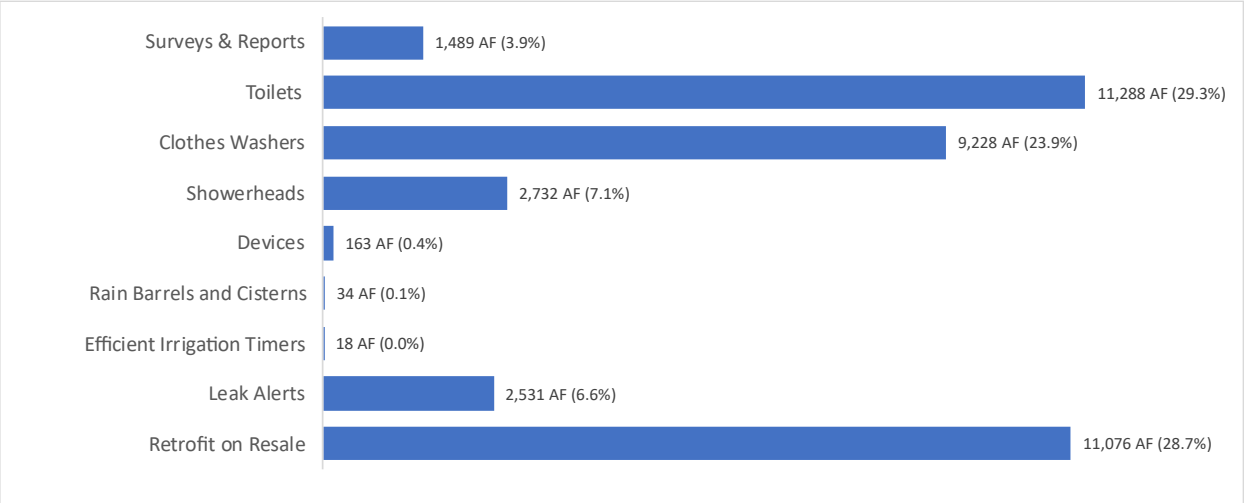
Measure Category	Annual Water Savings in Selected Years (AF/yr) [3]										2005-2050 Cumulative Savings (AF)[3]
	Past Savings				*Future Savings*						
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	2045	2050	
ASSISTANCE SERVICES											
Surveys & Reports	0	41	68	23	20	26	26	26	26	26	**1,489**
INCENTIVES											
Toilets	0	132	346	362	336	298	258	223	193	168	**11,288**
Clothes Washers	0	407	654	576	137	31	14	6	0	0	**9,228**
Showerheads	0	143	283	70	21	15	13	5	0	0	**2,732**
Devices	0	0	0	1	5	6	6	6	6	6	**163**
Rain Barrels and Cisterns	0	0	1	2	2	2	0	0	0	0	**34**
Efficient Irrigation Timers	0	0	0	0	0	1	2	1	0	0	**18**
WATER MANAGEMENT TOOLS											
Leak Alerts	0	0	71	70	70	70	70	70	70	70	**2,531**
MANDATES											
Retrofit on Resale (ROR)[1]	0	68	190	266	305	320	318	306	288	266	**11,076**
Total Annual Savings (AF/Yr) [2]	**0**	**791**	**1,613**	**1,373**	**897**	**769**	**707**	**643**	**584**	**536**	**38,559**
Total Annual Savings (MGD) [2]	**0.00**	**0.71**	**1.44**	**1.22**	**0.80**	**0.69**	**0.63**	**0.57**	**0.52**	**0.48**	

(1) Although ROR is related to local plumbing codes, it is included as an active conservation measure in the SFPUC's conservation forecast model. Other mandates and code related to toilets, urinals, showerheads, and clothes washers are counted into plumbing code savings and are not called out as active measures. Additional standards such as requirements for efficient residential hot water systems and submetering that may generate some water savings are not factored into active or passive plumbing code changes due to insufficient data or established methodology to estimate savings.

(2) 1 MGD equals approximately 1,121 AF/Yr. "Total" row may not match exactly due to rounding.

(3) The annual water savings listed for each year are the water savings for that specific year; the cumulative savings reflect all years, including the years between the five-year increments that are not shown.

Figure 7-3: Single Family Conservation Measures Cumulative Water Savings Projection



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

Table 7-4: Multi-Family Annual and Cumulative Water Savings Projection

Measure Category	Annual Water Savings in Selected Years (AF/yr) [4]										2005-2050 Cumulative Savings (AF)[4]
	Past Savings				*Future Savings*						
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	2045	2050	
ASSISTANCE SERVICES											
Surveys & Reports	0	7	147	71	25	16	16	16	16	16	**1,700**
INCENTIVES											
Toilets	0	153	549	603	575	503	432	371	318	273	**18,461**
Clothes Washers	0	2	42	77	73	48	15	8	0	0	**1,305**
Showerheads	0	18	194	167	27	16	17	6	0	0	**2,140**
Devices	0	0	0	1	5	6	6	6	6	6	**160**
Efficient Irrigation Timers	0	0	0	0	0	<1	<1	<1	0	0	**5**
WATER MANAGEMENT TOOLS											
Leak Alerts	0	0	0	48	49	49	49	49	49	49	**1,524**
MANDATES											
Retrofit on Resale (ROR)[1]	0	37	104	146	169	178	178	173	164	153	**6,183**
Onsite Water Reuse Program[3]	0	0	0	0	0	101	179	179	179	179	**3,730**
Total Annual Savings (AF/Yr) [2]	**0**	**217**	**1,035**	**1,113**	**923**	**917**	**892**	**808**	**733**	**676**	**35,207**
Total Annual Savings (MGD) [2]	**0.00**	**0.19**	**0.92**	**0.99**	**0.82**	**0.82**	**0.80**	**0.72**	**0.65**	**0.60**	

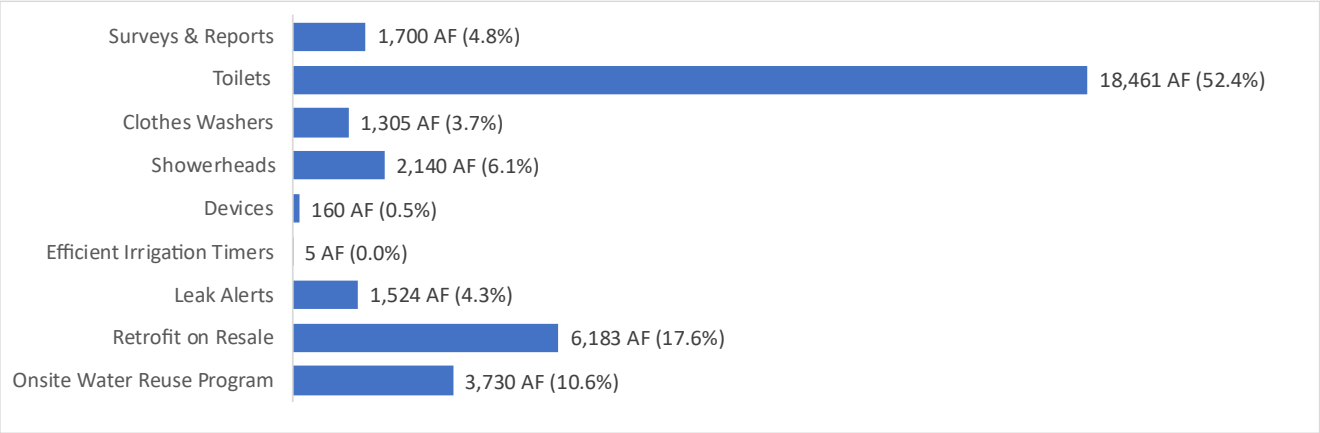
(1) Although ROR is related to local plumbing codes, it is included as an active conservation measure in the SFPUC's conservation forecast model. Other mandates and code related to toilets, urinals, showerheads, and clothes washers are counted into plumbing code savings and are not called out as active measures. Additional standards such as requirements for efficient residential hot water systems and submetering that may generate some water savings are not factored into active or passive plumbing code changes due to insufficient data or established methodology to estimate savings.

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

(3) Onsite Water Reuse Program estimated savings covers projects that are required to comply and projects that voluntarily comply, as well as voluntary projects that receive SFPUC grant bunding, but for ease of presentation, it is included under the Mandates category.

(4) The annual water savings listed for each year are the water savings for that specific year; the cumulative savings reflect all years, including the years between the five-year increments that are not shown.

Figure 7-4: Multi-Family Conservation Measures Cumulative Water Savings Projection



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

Table 7-5: Non-Residential Annual and Cumulative Water Savings Projection

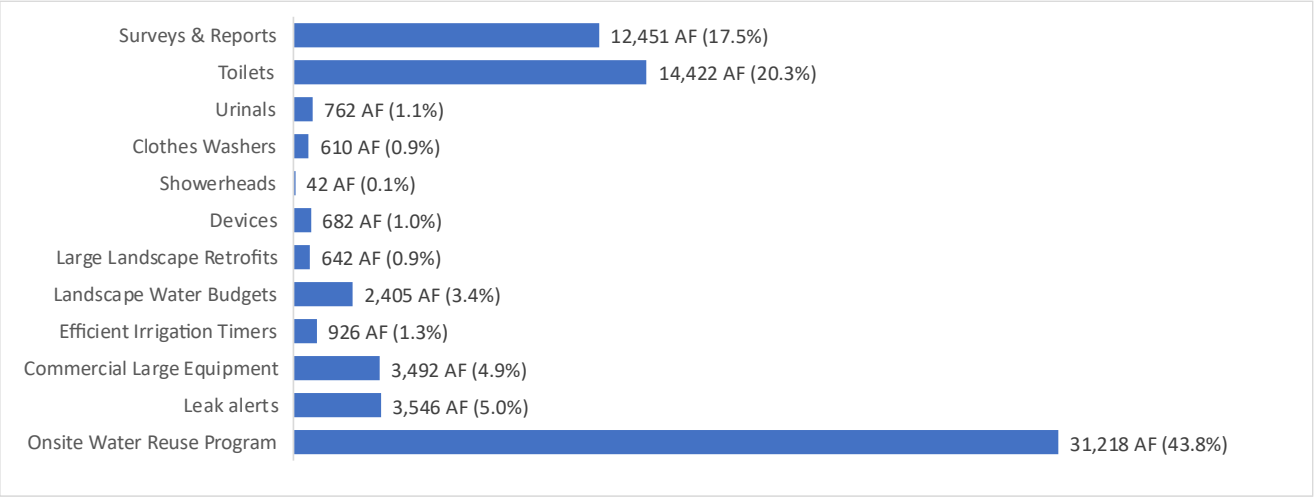
Measure Category	Annual Water Savings in Selected Years (AF/yr) [3]										2005-2050 Cumulative Savings (AF)[3]
	Past Savings				*Future Savings*						
	2005 (model start year)	2010	2015	2020	2025	2030	2035	2040	2045	2050	
ASSISTANCE SERVICES											
Surveys & Reports	5	291	289	237	175	325	325	325	325	325	**12,451**
INCENTIVES											
Toilets	0	164	484	486	419	371	319	274	235	202	**14,422**
Urinals	0	3	20	26	23	21	19	17	15	14	**762**
Clothes Washers	0	16	27	27	21	20	12	4	0	0	**610**
Showerheads	0	0	0	0	2	2	3	1	0	0	**42**
Devices	10	10	37	57	2	6	9	5	1	1	**682**
Large Landscape Retrofits	14	14	24	28	18	18	8	4	0	0	**642**
Landscape Water Budgets	0	0	0	0	92	92	92	92	92	92	**2,405**
Efficient Irrigation Timers	0	0	0	0	8	50	84	42	0	0	**926**
Commercial Large Equipment	0	0	10	329	330	13	5	5	5	5	**3,492**
WATER MANAGEMENT TOOLS											
Leak Alerts	0	0	0	54	49	115	115	115	115	115	**3,546**
MANDATES											
Onsite Water Reuse Program[2]	0	0	0	0	168	605	1,423	1,557	1,557	1,557	**31,218**
Total Annual Savings (AF/Yr) [1]	**29**	**497**	**893**	**1,242**	**1,374**	**1,640**	**2,413**	**2,442**	**2,346**	**2,311**	**71,199**
Total Annual Savings (MGD) [1]	**0.03**	**0.44**	**0.80**	**1.11**	**1.23**	**1.46**	**2.15**	**2.18**	**2.09**	**2.06**	

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

(2) Onsite Water Reuse Program covers projects that are required to comply and projects that voluntarily comply, but for ease of presentation, it is included under the Mandates category.

(3) The annual water savings listed for each year are the water savings for that specific year; the cumulative savings reflect all years, including the years between the five-year increments that are not shown.

Figure 7-5: Non-Residential Conservation Measures Cumulative Water Savings Projection



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

Unit Costs of Water Savings

Table 7-6 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). The table only includes measures implemented during 2025-2050 and does not include costs or ongoing water savings expected from programs implemented over 2005-2024. 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 the 2025-2050 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 **$834/AF**. The average unit cost is $1,273/AF for single family residential measures, $770/AF for multi-family residential measures, and $756/AF for non-residential measures. These estimates do not reflect the Onsite Water Reuse Program.

Table 7-6: 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			
ASSISTANCE SERVICES			
Surveys & Reports	$1,934	529	$3,655
INCENTIVES			
Toilets	$227	168	$1,349
Clothes Washers	$137	114	$1,205
Showerheads	$35	126	$279
Devices	$99	114	$865
Rain Barrels and Cisterns	$21	1	$20,608
Efficient Irrigation Timers	$124	15	$8,275
WATER MANAGEMENT TOOLS			
Leak Alerts	$628	1,449	$433
All Single Family Measures:	**$3,204**	2,516	**$1,273**
Multi-Family Residential			
ASSISTANCE SERVICES			
Surveys & Reports	$262	328	$800
INCENTIVES			
Toilets	$631	655	$963
Clothes Washers	$118	161	$733
Showerheads	$44	154	$285
Devices	$97	112	$869
Efficient Irrigation Timers	$35	5	$6,991
WATER MANAGEMENT TOOLS			
Leak Alerts	$685	1,016	$674
All Multi-Family Measures:	**$1,872**	2,431	**$770**
Non-Residential			
ASSISTANCE SERVICES			
Surveys & Reports	$3,518	6,453	$545
INCENTIVES			
Toilets	$227	233	$972
Clothes Washers	$236	102	$2,316
Showerheads	$9	26	$338
Devices	$46	95	$483
Large Landscape Retrofits	$3,791	71	$53,392
Landscape Water Budgets	$825	1,910	$432
Efficient Irrigation Timers	$179	774	$231
Commercial Large Equipment	$165	88	$1,878
WATER MANAGEMENT TOOLS			
Leak Alerts	$185	2,383	$78
All Non-Residential Measures:	**$9,181**	12,138	**$756**
All Measures:	**$14,257**	17,085	**$834**

A higher unit cost for a measure does not necessarily mean the SFPUC spends more on a yearly basis to implement that particular measure when compared to measures with lower unit costs. A higher unit cost does not necessarily mean the measure does not 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 measures have a higher unit cost due to limited data available on water savings. The SFPUC, however, issues a much lower volume of these types of incentives than toilet and washer incentives, which leads to lower annual costs administering these reuse incentives. The reuse measures also add value in aligning with the SFPUC's mission of diversifying the Conservation Program, encouraging the use of non-potable water for irrigation needs and helping with the collection of cost and water savings data for evaluating similar types of projects in the future.

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8. Conservation Effect on Retail Water Demand

The SFPUC used demand projections generated from its Retail Demand Model prepared for its 2025 UWMP for the demand numbers presented in this 2025 Plan. The retail water demand forecast shows the effect of 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 decline and remain low despite steady population and employment growth, which is due in large part to its water conservation efforts.

Table 8-1 presents the water demand projections for each of the three customer sectors and for the in-city retail service area. 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 SFPUC active conservation measures. This forecast is driven by population growth, employment growth, and various socioeconomic factors. Passive savings from plumbing codes and appliance standards are assumed to be included in this value (see detailed explanation below).

2. **SFPUC Program Adjustment:** This is the forecast of future water savings from SFPUC-initiated water Conservation Programs (i.e., active conservation savings). The adjustment is presented as a negative value, indicating a deduction from the Unadjusted Baseline Demand.

3. **Onsite Water Reuse Program Adjustment:** This is a forecast of future water savings from buildings with onsite water reuse systems. The adjustment, like the SFPUC Program 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 active water savings from adjustments for the SFPUC program and the Onsite Water Reuse Program.

The table below also includes distribution system losses, which represents the unallocated water in the distribution system. The SFPUC annually conducts water loss audits to estimate its distribution system losses, in accordance with the DWR guidelines. 2025 system water losses presented in the table were taken from the SFPUC's FY 24-25 water loss audit to DWR; projected water losses are based on the anticipation of leaks and breaks due to aging infrastructure and active management of losses.

The adjusted demand divided by the corresponding population projection is the gross per capita water use of the in-city retail system, or GPCD. It is used to assess the SFPUC's progress toward meeting its urban water efficiency targets that became effective in 2025.

The SFPUC also tracks its 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.

Earlier chapters of this 2025 Plan describe the effect of historical and future water savings from plumbing codes and appliance standards (i.e., passive conservation savings). The SFPUC's 2025 Retail Demand Model does not explicitly adjust for passive savings using outputs from the Conservation Model. Instead, the Retail Demand Model estimates the relationship between water use and various demand factors (primarily price, weather, and presence of drought) using a regression analysis with account-level fixed effects. In a regression analysis, changes in the explanatory variable—customer water use—are explained by the dependent variables, such as rates, climate, and macro-economic factors. While savings from active Conservation Programs and the Onsite Water Reuse Program are explicitly modeled, passive savings are assumed to be accounted for in the econometric analysis of changes in water demand in response to factors

like price and weather. There are always inherent challenges in adjusting for and projecting conservation effects on demands. Specifically, care needs to be taken not to double-count savings from Conservation Programs with consumers' responses to rates, drought, and climate. Whether passive savings are explicitly modeled or not, the potential for some level of over- or under-estimation of passive savings remains. To be conservative for water planning purposes, the Retail Demand Model estimation of passive savings is likely on the lower end (i.e., not over-projecting).

After adding active conservation and Onsite Water Reuse Program historical savings to historical demands, the 2025 Retail Demand Model arrives at an estimate of "pre-conservation" demand, which describes what demand would have been without SFPUC's Conservation Programs. The statistical demand model predicts future demand based on this "pre-conservation" data. In the last step of the Retail Demand Model, active conservation savings and Onsite Water Reuse Program savings are added back in to generate the final demand estimates. **Table 8-1** summarizes the outputs of the 2025 Retail Demand Model.

Table 8-1: SFPUC In-City Retail Water Demands for 2025-2050

	2025	2030	2035	2040	2045	2050
Single Family	million gallons per day (MGD)					
Unadjusted Baseline Demand	12.6	13.4	13.1	13.1	13.1	13.1
Adjustments:						
SFPUC Conservation Program	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
Adjusted Demand	12.6	13.3	13.0	13.0	13.0	13.0
Multi-Family						
Unadjusted Baseline Demand	22.2	26.3	27.3	29.0	30.6	32.4
Adjustments:						
SFPUC Conservation Program	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
Onsite Water Reuse Program[3]	0.0	-0.1	-0.2	-0.2	-0.2	-0.2
Adjusted Demand	22.2	26.2	27.1	28.7	30.4	32.2
Non-Residential						
Unadjusted Baseline Demand	12.6	12.9	12.4	12.9	13.3	14.0
Adjustments:						
SFPUC Conservation Program	0.0	-0.4	-0.5	-0.4	-0.4	-0.4
Onsite Water Reuse Program[3]	-0.2	-0.5	-1.3	-1.4	-1.4	-1.4
Adjusted Demand	12.4	11.9	10.7	11.1	11.5	12.2
Total Adjusted Demand	47.3	51.4	50.8	52.8	54.9	57.4
Municipal Demand[4]	2.2	2.2	2.2	2.2	2.2	2.2
Landscape Demand[4]	1.5	1.5	1.5	1.5	1.5	1.5
Water Loss	7.6	7.8	7.8	7.8	7.8	7.8
Total In-City Retail Demand	58.5	62.9	62.3	64.3	66.4	68.9
In-City Retail Population (1,000)	842	1,008	1,064	1,120	1,175	1,230
In-City Residential Population (1,000)	812	972	1,026	1,079	1,133	1,186
Gross Per Capita Use (GPCD)	70	62	59	57	56	56
Residential GPCD (R-GPCD)	43	41	39	39	38	38

Notes:

(1) 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.

(2) Sum of demands and adjustments may not match the totals due to rounding.

(3) While the Onsite Water Reuse Program is considered a measure in the SFPUC's overall Conservation Program for purposes of water savings, to highlight its size and focus on new development, it is separately highlighted in this table.

(4) "Landscape" includes all dedicated irrigation accounts across sectors. "Municipal" includes all standard, combination, fire, and otherwise non-irrigation accounts for municipal departments.

Table 8-2 summarizes the various water uses by in-city and suburban retail customers to provide another perspective on the breakdown of the retail demands. Historical water billing data and census data were used to estimate the suburban water use and population, respectively.

Table 8-2: Retail Water Demand Projections with Water Conservation

	2025	2030	2035	2040	2045	2050
Adjusted In-City Retail Demands	million gallons per day (MGD)					
Single Family Residential	12.6	13.3	13.0	13.0	13.0	13.0
Multi-Family Residential	22.2	26.2	27.1	28.7	30.4	32.2
Non-Residential	12.4	11.9	10.7	11.1	11.5	12.2
Municipal	2.2	2.2	2.2	2.2	2.2	2.2
Landscape	1.5	1.5	1.5	1.5	1.5	1.5
Water Loss (1)	7.6	7.8	7.8	7.8	7.8	7.8
In-City Retail Demand Subtotal (2)	**58.5**	**62.9**	**62.3**	**64.3**	**66.4**	**68.9**
Suburban Retail Demands(3)						
Single Family Residential	0.1	0.1	0.1	0.1	0.1	0.1
Non-Residential	3.6	3.6	3.6	3.6	3.6	3.6
Other	0.3	0.4	0.5	0.6	0.7	0.9
Suburban Retail Demand Subtotal (2)	**4.0**	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**
Total Retail Demand	**62.5**	**67.0**	**66.5**	**68.6**	**70.7**	**73.4**
Combined Retail Population (1,000) (3)	844	1,010	1,066	1,122	1,177	1,232
Combined Retail Residential Population (1,000) (3)	813	973	1,027	1,081	1,134	1,187
Gross Per Capita Use (GPCD)	74	66	62	61	60	60
Residential GPCD (R-GPCD)	43	41	39	39	38	38

Notes:

(1) Sum of demands may not match the totals due to rounding.

(2) Large facilities and residential houses outside of San Francisco that receive water from and are billed directly by the SFPUC.

(3) In-city population 2025 actuals based on DOF E-5 released May 2025; 2030-2050 projections for total in-city population provided by San Francisco Planning Department. In-city residential population was calculated by subtracting an assumed 3.6% group quarters population. Suburban retail actual and projected population are the same, and are based on the number of retail residential service connections in Redwood City, Daly City, Fremont, Millbrae, and Sunol; the number of homes in Castlewood CSA; inmate population of the San Francisco County Jail #3 in San Bruno (previously Jail #5); and 2018-2023 U.S. Census data. The estimated population in the suburban retail service area was developed by multiplying the area's respective housing unit occupancy data from the U.S. Census by recorded in sales data. Population for Groveland CSD is not included in the suburban retail service area population. The population estimates presented in this table only account for the residential connections within the suburban retail service area.

Figure 8-1 graphically illustrates the effect of the SFPUC's water Conservation Program on the overall retail water demand. Demand reflects projected water use and includes all retail customers within and outside of San Francisco. Projections show that water savings from conservation will not outpace anticipated population and job growth; thus, demand is forecasted to increase. In the absence of active water Conservation Program efforts, retail demand is projected to increase by 21 percent over the next 25 years, from 62.5 MGD in 2025 to 75.5 MGD in 2050. However, after accounting for the projected savings from water conservation, the retail demand would increase by approximately 18 percent, from 62.5 MGD in 2025, to 73.4 MGD in 2050.

Figure 8-1: Effect of Water Conservation on Retail Water Demand

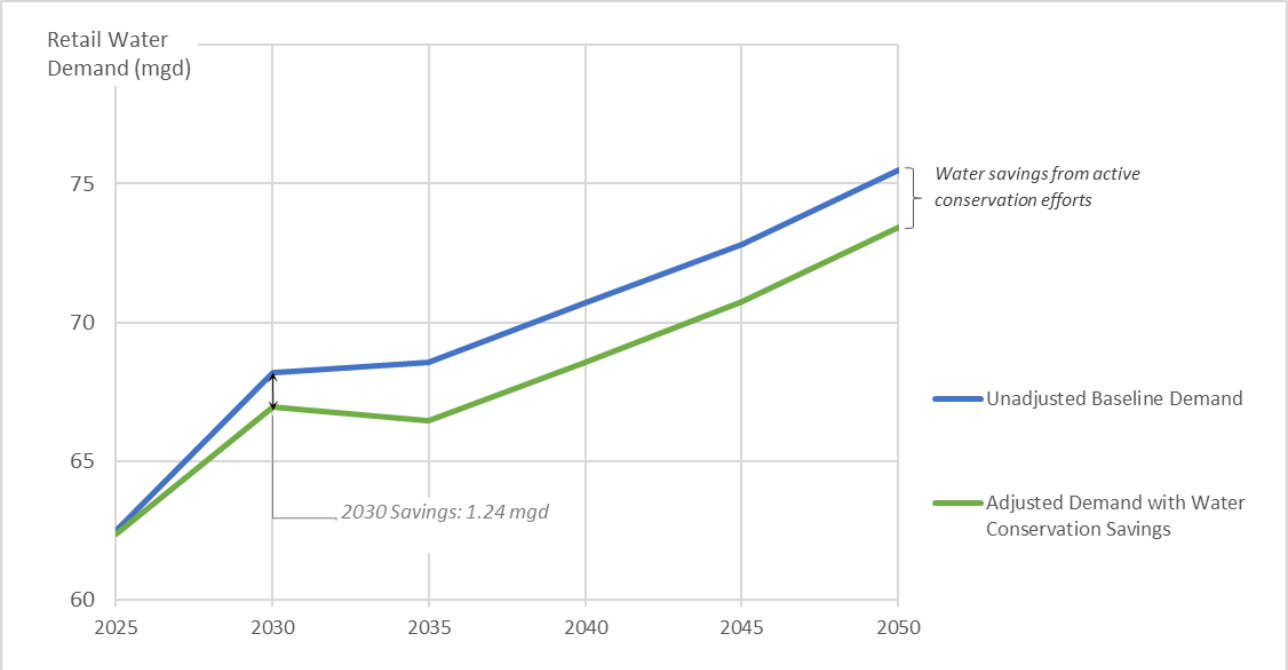
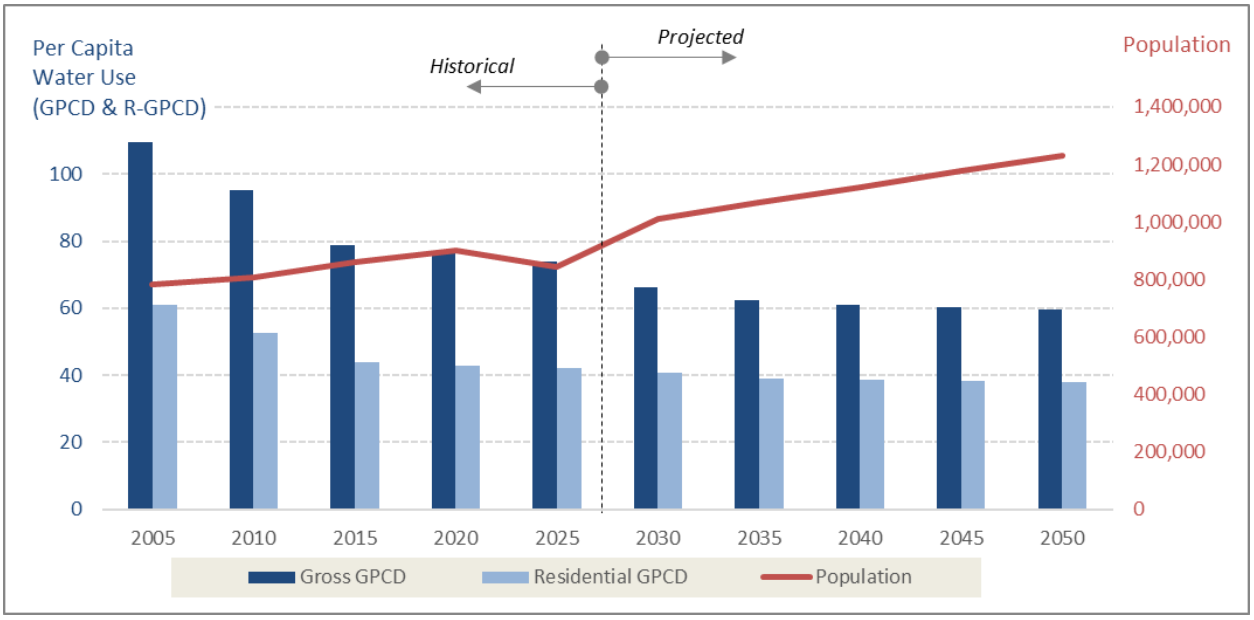


Figure 8-2 shows the effect of the SFPUC's water conservation effort in terms of per capita water use. This figure reflects actual water use and historical population estimates from 2005 to 2025 and projected water use and population for years after 2025.

Figure 8-2: Historical and Projected Population and Per Capita Water Use Trends



The SFPUC's retail service area population is expected to grow by 46 percent over the next 25 years (from 843,881 in 2025 to 1,231,654 in 2050) while the retail per capita water use is estimated to decrease and remain low. The SFPUC's retail residential per capita water use for FY 24-25 is 43 R-GPCD, which is one of the lowest in the state of California. Through continuous aggressive conservation efforts, the SFPUC expects to maintain low residential water usage.

9. Next Steps

The SFPUC plans to continue implementing a robust Conservation Program and keep meeting state urban water efficiency targets, other local and state water efficiency requirements, and the SFPUC's own level of service goals for efficient water use. The Conservation Program outlined in this 2025 Retail Water Conservation Plan includes an extensive mix of incentives, services, and tools that serves all 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 are expected to be regularly evaluated to determine end dates based on codes and market saturation rates.

The SFPUC will continue to 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 102.8 gallons per capita per day (GPCD) and residential per capita water use was 59.1 R-GPCD. In 2025, these levels dropped to 74 GPCD and 43 R-GPCD, respectively, due in large part to more efficient plumbing fixtures. These SFPUC per capita water use levels are expected to remain much lower than the statewide average. These figures indicate that the SFPUC is well positioned to continue to meet California's Making Conservation a Way of Life regulations that became effective in 2024.

Between now and the issuance of the 2030 Retail Water Conservation Plan, the SFPUC plans to continue reviewing its forecasted conservation savings against actual program activity on a quarterly and annual basis. The SFPUC has committed to updating its conservation savings model and conducting a major review of implemented and potential new conservation measures every five years, coinciding with the update of its UWMP. The SFPUC will use this 2025 Plan and the findings as a broad guidance document to inform the implementation of conservation measures over the next five years. 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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APPENDIX A

SFPUC Plumbing Fixture Population and Efficiency Saturation Estimates - 2025 Update

POLICY ANALYSIS FOR THE PUBLIC AND PRIVATE SECTORS
M.CUBED

5358 MILES AVENUE
OAKLAND, CA 94618
(510) 593-6913
MITCHELL@MCUBED-ECON.COM

Date: June 25, 2025

To: Julie Ortiz and Kevin Galvin, SFPUC
Fr: David Mitchell, M.Cubed
Cc: Chris Hewes, Woodard & Curran

Re: Review of Recent Evidence on Plumbing Fixture Ownership, Turnover, and Saturation

I. Introduction

This memorandum summarizes work completed under **Task 5 – Saturation Analysis Update**—as defined in our Scope of Work—and includes the following components:

ULFT vs. HET Saturation

To support SFPUC's recent program modification encouraging the replacement of 1.6 gallons-per-flush (gpf) toilets (ULFTs) with high-efficiency toilets (HETs) rated at 1.1 gpf or less, M.Cubed reviewed the published literature on residential fixture efficiency saturation. The goal was to identify any recent findings that could justify revising or updating existing saturation estimates for toilets.

Other Plumbing Fixture Saturation Research

In addition to the ULFT-HET analysis, M.Cubed conducted a broader review of studies on plumbing fixture turnover and efficiency saturation in both residential and non-residential settings. This review focused primarily on research published since 2019–2020, when the current fixture population and efficiency saturation forecast model was developed. Earlier studies were also considered when relevant.

Technical Memorandum Preparation

M.Cubed prepared this technical memorandum to summarize the results of the review and identify how the findings may be used to improve the fixture saturation and forecast model.

This memorandum constitutes the deliverable for Task 5.

II. Reviewed Research

Our review emphasized data and research published since 2019–2020, when SFPUC's conservation model was last updated. However, earlier studies were included when relevant to the analysis. The following sources were reviewed:

- **Flume Data Labs**

Flume Data Labs publishes the *Household Water Use Index* quarterly, which summarizes residential water use by single-family homes across the 15 largest U.S. Metropolitan Statistical Areas—including metrics for average toilet use. Additionally, Flume has released toilet water use estimates for the San Diego County Water Authority (SDCWA) and the Municipal Water District of Orange County (MWDOC).

These empirical estimates serve as useful benchmarks against the outputs of SFPUC's fixture saturation forecast model.

- **AWE/PMI 2017 Toilet Saturation Study**

Published by the Alliance for Water Efficiency (AWE) and the Plumbing Manufacturers Institute (PMI), this study estimated the remaining stock of non-efficient toilets—defined as those using more than 1.6 gpf—as of 2015 for five U.S. states, including California. These estimates help assess whether SFPUC's model outputs are in reasonable alignment with external saturation estimates.

- **2019 U.S. WaterSense Market Penetration Study**

Conducted by GMP Research for PMI, this study estimated the market penetration of WaterSense-labeled toilets and showerheads as a share of the installed stock. It provided both national and regional penetration rates, including estimates for California. Like the AWE/PMI study, it offers a point of comparison for evaluating the plausibility of SFPUC's current saturation forecasts.

- **Los Osos Water Offset Study (2023)**

This study estimated the saturation of high-efficiency toilets and showerheads in the Los Osos community of San Luis Obispo County. While less applicable due to substantial differences in housing stock size, composition, and age compared to SFPUC's service area, the study is included because it is the only source we identified that provides recent saturation estimates for fixture types of interest.

III. Concordance of Estimates vs. Empirical Verification

Of the studies reviewed, Flume Data Labs is the only source that provides empirical estimates of toilet water use and saturation based on observed household-level usage. All other studies rely on engineering estimates derived from assumptions about fixture stocks, replacement rates, and usage patterns—similar to the methodology underlying SFPUC's saturation model.

Because the Flume estimates are grounded in direct measurement, they provide the most robust basis for evaluating the empirical accuracy of SFPUC's forecast model. While engineering estimates from other studies can be compared for concordance, they do not offer an independent empirical check. Concordance among engineering estimates may suggest consensus or support for model assumptions, but it cannot confirm accuracy.

Accordingly, we place the greatest weight on the Flume Data Labs estimates in our assessment.

IV. Flume Data Labs Toilet Water Use Estimates

Table 1 compares average single-family toilet water use estimates reported by Flume Data Labs with those generated by SFPUC's fixture saturation model. For additional context, we also include benchmark values from the 1999 and 2016 Residential End Uses of Water Studies, as well as the 2011 California Residential End Uses of Water Study.

SFPUC's model estimates average flush volume as a weighted average, based on the forecast proportion of 3.5+ gpf toilets, ULFTs (1.6 gpf), and HETs (1.28 gpf) in the fixture stock. To reflect field observations, we assume:

- 4.0 gpf for 3.5+ gpf toilets,

- 1.8 gpf for ULFTs (instead of the nominal 1.6 gpf), and
- 1.28 gpf for HETs.

The ULFT flush volume is adjusted to 1.8 gpf to account for leakage and observed over-performance in field conditions, where many ULFTs flush above their rated volume. Similarly, a HET flush volume of 1.28 gpf is used even though HETs with flush volumes below this threshold are now commonly installed. Keeping the HET volume at its maximum rating helps account for leakage and over-performance. However, these adjustments have minimal effect on the estimated average flush volume when reported to the nearest tenth of a gallon.

Table 1. Single-Family Residential Average Toilet Water Use (gallons/flush)

Year	SFPUC Model	End Use Studies	Flume National	Flume MWDOC	Flume SDCWA
1997 1/	3.4	3.5			
2005 2/	2.8	2.8			
2013 3/	2.4	2.6			
2021	2.0		2.0		
2022	2.0			2.1	1.9
1/ 1999 Residential End Use Study, data logging mostly done in 1997. 2/ 2011 California Residential End Use Study, data logging mostly done in 2005. 3/ 2016 Residential End Use Study, data logging mostly done in 2013.					

The data in Table 1 show that SFPUC's model closely aligns with empirical estimates derived from household-level data logging. This concordance suggests that the model's forecasts of the distribution of 3.5+ gpf, ULFT, and HET toilets are reasonable and well-calibrated.

Accordingly, these findings do not indicate a need to revise the underlying model structure or assumptions used to estimate toilet saturation and water use.

V. AWE/PMI 2017 Toilet Saturation Estimates

The 2017 AWE/PMI Toilet Saturation Study estimated that, as of 2015, approximately 21% of residential toilets in California were non-efficient models rated at 3.5 gpf or higher. In comparison, SFPUC's fixture saturation model estimated that 26% of residential toilets in San Francisco were 3.5+ gpf units in the same year—a 5 percentage point difference**.**

This higher estimate from the SFPUC model is not unexpected**,** given San Francisco's older housing stock. In 2015, approximately 88% of San Francisco's housing units were built prior to 1990, compared to 76% statewide. Since homes constructed before 1990 were typically equipped with 3.5+ gpf toilets, San Francisco's older housing profile naturally results in a higher estimated share of non-efficient toilets.

This distinction in housing age and original fixture installation is likely sufficient to explain the discrepancy between the two saturation estimates.

VI. 2019 U.S. WaterSense Market Penetration Study Results

Saturation estimates for residential toilets and showerheads from the 2019 WaterSense Market Penetration Study are reviewed below.

Toilet Estimates

Using U.S. Census data on housing units and bathrooms, along with assumptions about fixture turnover and replacement, the study estimated the distribution of residential toilet fixture types in California circa 2019, as shown in Table 2. These estimates are compared to those produced by the SFPUC model.

As with the AWE/PMI study, the higher share of 3.5+ gpf toilets estimated by the SFPUC model is likely attributable to San Francisco's older housing stock relative to the state as a whole.

Differences in the ULFT and HET shares can be explained by divergent modeling assumptions. The WaterSense study includes only natural replacements and installations in new construction, while the SFPUC model also incorporates replacements from utility programs and San Francisco's retrofit-on-resale ordinance. These additional mechanisms are estimated to have resulted in the installation of approximately 49,000 HET toilets in San Francisco. Consequently, the SFPUC model is expected to report a higher share of HET toilets.

Table 2. Estimates of Toilet Efficiency Distribution, Circa 2019

Estimate Source	3.5+ gpf	ULFT (1.6 gpf)	HET (<= 1.28 gpf)
WaterSense Study	16.9%	62.1%	21.0%
SFPUC Model	19.4%	51.6%	28.9%

Showerhead Estimates

Using a similar approach, the WaterSense study estimated the distribution of showerhead efficiencies shown in Table 3. These estimates are not directly comparable to those from the SFPUC model because the two studies use different flow rate thresholds to classify efficient fixtures. The WaterSense study uses a 2.0 gallons per minute (gpm) cutoff, while the SFPUC model applies a 1.8 gpm cutoff consistent with the current California standard. As such, the comparison in Table 3 is approximate.

The SFPUC model estimates a higher share of efficient showerheads, which may be due to two key differences. First, as with toilets, the WaterSense study excludes replacements resulting from programs and retrofit-on-resale requirements. Second, the WaterSense study assumes a slower natural replacement rate, with an average showerhead lifespan of 12 years (equivalent to an annual turnover rate of 8.3 percent). In contrast, the SFPUC model adopts the AWE Tracking Tool's assumption of a 12 percent annual replacement rate, implying an average lifespan of 8.3 years.

Table 3. Estimates of Showerhead Efficiency Distribution, Circa 2019

	Non-WaterSense > 2.0 gpm	WaterSense Certified <= 2.0 gpm
WaterSense Study	41.0%	59.0%
	> 1.8 gpm	**<= 1.8 gpm**
SFPUC Model	36.0%	64.0%

Despite the methodological differences, the two sets of estimates are reasonably consistent—particularly when accounting for the fact that the SFPUC model includes the effects of local programs and policies that accelerate the adoption of efficient fixtures.

VII. Los Osos Saturation Study

The 2023 Los Osos study estimated the saturation of efficient plumbing fixtures in Los Osos and surrounding areas, relying on a combination of engineering assumptions and empirical data related to mandated retrofits. Toilet saturation estimates from the Los Osos study and the SFPUC model are summarized and compared in Table 4. Showerhead estimates are provided in Table 5.

Toilet Estimates

The Los Osos study and the SFPUC model show limited concordance in toilet saturation estimates. The Los Osos estimates indicate a notably lower proportion of 3.5+ gpf toilets and a significantly higher share of ULFT toilets compared to the SFPUC model. These differences likely stem from specific retrofit requirements implemented in Los Osos:

- **Retrofit-to-Build and Retrofit-on-Sale Requirements**

In 2008, San Luis Obispo County adopted regulations requiring properties in Los Osos to retrofit toilets exceeding 1.6 gpf and showerheads exceeding 2.0 gpm when sold or remodeled. As of June 2023, the County had issued approximately 2,223 retrofit-on-sale certificates on a base of about 5,600 parcels. Additionally, around 100 retrofit-to-build certificates were issued in the same period.

- **County Sewer Connection Retrofits**

Starting in 2012, the County required all properties connecting to the new sewer system and treatment plant to retrofit bathroom fixtures. Approximately 5,200 out of the roughly 5,600 parcels in the study area are within the sewer service area and subject to this retrofit mandate.

Together, these requirements have virtually eliminated 3.5+ gpf toilets in Los Osos, largely accounting for the differences from the SFPUC model estimates. Additionally, since California's 1.28 gpf toilet standard did not fully take effect until 2018, after most required retrofits in Los Osos were completed, a higher proportion of ULFTs relative to HETs is observed compared to the SFPUC estimates.

Given these distinct local retrofit dynamics, significant concordance between Los Osos and San Francisco toilet saturation estimates would not be anticipated.

Table 4. Estimates of Toilet Efficiency Distribution, Circa 2022

Single-Family	**3.5+ gpf**	**ULFT (1.6 gpf)**	**HET (<= 1.28 gpf)**
Los Osos Study	7%	69%	24%
SFPUC Model	17%	49%	34%
Multi-Family	**3.5+ gpf**	**ULFT (1.6 gpf)**	**HET (<= 1.28 gpf)**
Los Osos Study	0%	75%	25%
SFPUC Model	16%	44%	40%

Showerhead Estimates

As with the WaterSense study, showerhead estimates from Los Osos are not directly comparable to the SFPUC model due to differences in flow rate categories. The Los Osos study categorizes showerheads as

2.5+ gpm, 2.0 gpm, or 1.5 gpm, while the SFPUC model uses categories of greater than 2.5 gpm, between 1.8 and 2.5 gpm, and 1.8 gpm or less. Thus, the middle category in the Los Osos study overlaps the second and third categories of the SFPUC model.

Both sets of estimates indicate that nearly all showerheads have flow rates below 2.5 gpm. However, exact comparisons of efficiency distributions below this threshold are complicated by overlapping classifications.

Table 5. Estimates of Showerhead Efficiency Distribution, Circa 2022

Single-Family	**2.5+ gpm**	**2.0 gpm**	**1.5 gpm**	**< 2.5 gpm**
Los Osos Study	4%	73%	23%	96%
	2.5+ gpm	**> 1.8 and < 2.5 gpm**	**<= 1.8 gpm**	
SFPUC Model	1%	19%	80%	99%
Multi-Family	**2.5+ gpm**	**> 1.8 and < 2.5 gpm**	**<= 1.8 gpm**	
Los Osos Study	0%	80%	20%	100%
	2.5+ gpm	**> 1.8 and < 2.5 gpm**	**<= 1.8 gpm**	
SFPUC Model	1%	25%	74%	99%

VIII. Conclusions

This review of recent studies on plumbing fixture saturation and efficiency turnover included evaluations of empirical data from Flume Data Labs, as well as engineering-based estimates from the AWE/PMI 2017 Toilet Saturation Study, the 2019 U.S. WaterSense Market Penetration Study, and the 2023 Los Osos Water Offset Study. The primary findings are as follows:

1. Empirical data from Flume Data Labs provide strong validation for SFPUC's fixture saturation model. The close alignment of Flume's measured toilet usage with SFPUC's model estimates indicates the underlying assumptions and structure of the model accurately reflect real-world conditions.
2. Differences observed between the SFPUC model and engineering estimates from the AWE/PMI and WaterSense studies are largely explained by variations in housing stock characteristics and local retrofit policies specific to San Francisco compared to California at large.
3. The Los Osos study demonstrates significant differences in saturation due to unique local retrofit mandates and requirements, making direct comparisons with SFPUC estimates challenging and limited.

Overall, the reviewed evidence does not reveal compelling justification to alter the current structure or fundamental assumptions of the SFPUC fixture saturation forecast model. The current model remains well-supported by empirical benchmarks and reasonable modeling assumptions appropriate to San Francisco's unique context.

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APPENDIX B

SFPUC Plumbing Fixture Population and Efficiency Saturation Estimates - 2014 Base Study

POLICY ANALYSIS FOR THE PUBLIC AND PRIVATE SECTORS
M.CUBED

5358 MILES AVENUE
OAKLAND, CA 94618
PH: 510-547-4369
FX: 510-547-3002
MITCHELL@MCUBED-ECON.COM

TO: WINOLA CHEONG

FROM: DAVID MITCHELL

SUBJECT: SFPUC PLUMBING FIXTURE POPULATION AND EFFICIENCY SATURATION ESTIMATES

DATE: JANUARY 13, 2014

I. SUMMARY OF RESULTS

Estimates of fixture populations and percentage of remaining inefficient fixtures are summarized in Table 1. Population estimates in Table 1 have been rounded to the nearest thousand. The data and methods used to develop these estimates are presented in the remainder of this memorandum.

Table 1. Summary of Fixture Population and Percentage Inefficient

Fixture	Fixture Population* Circa 2012	Percentage Inefficient	Inefficient Population*
Toilets			
Single-Family	252,000	33%	83,000
Multi-Family	321,000	32%	103,000
CII	154,000	40%	62,000
Urinals	39,000	75%	29,000
Washers			
Single-Family	105,000	49%	52,000
Multi-Family In-Unit	95,000	54%	51,000
Multi-Family Common Laundry	15,000	No Estimate	
Coin-Op	1,000	No Estimate	
*Fixture population estimates rounded to nearest thousand.			

II. INTRODUCTION

Fixture population and efficiency saturation estimates are developed for the following categories of plumbing fixtures:

- Single Family Residential Toilets
- Multi Family Residential Toilets
- Single Family Residential Clothes Washers
- Multi Family Residential In-Unit Clothes Washers
- Multi Family Residential Common Laundry Clothes Washers
- CII Toilets

- CII Urinals
- CII Coin-Op Clothes Washers

The population estimates represent the estimated total number of devices within each fixture category as of 2012. The efficiency saturation estimates represent the fraction of the estimated population of devices estimated to be high-efficiency fixtures. High-efficiency fixtures within each fixture category are defined as follows:

- Toilets: flush rating of 1.6 gpf or less
- Urinals: flush rating of 0.5 gpf or less
- Clothes Washers: Energy Star designation

Where possible, the efficiency saturation estimates are benchmarked against estimates from other independent sources of information.

III. SINGLE-FAMILY RESIDENTIAL TOILETS

A. FIXTURE POPULATION

We estimate of the number of single family toilets as the product of the number of single family dwelling units for the City and County of San Francisco and the average number of toilets per single family dwelling unit.

The number of single family dwelling units in 2012 is taken from the American Community Survey (ACS) 1-Year Estimates for 2012. For the purposes of this analysis, single family dwelling units are taken to be 1-unit detached and 1-unit attached (e.g. condominiums) dwelling units. The estimated total number of such dwelling units in 2012 is 113,878.
The average number of toilets per single family dwelling unit is estimated using bathroom count data from the 2011 American Housing Survey (AHS) for the San Francisco, San Mateo, Redwood City survey region. The AHS estimates the percentage of dwelling units with 0, 1, 1.5, or 2 or more bathrooms. For purposes of this analysis, a bathroom is assumed to have one functioning toilet. For dwelling units with 2 or more toilets, it is necessary to estimate the average number of toilets, since this is left undefined by the survey. We assume most dwelling units in the city would have either 2 or 3 toilets and a much smaller percentage would have 4 or 5 toilets. We use the distribution in Table 2 to estimate the average. This yields an average of 2.75 toilets per dwelling unit for households with 2 or more toilets.

Table 2. Assumed Distribution of Toilets in Single-Family Dwelling Units with 2 or More Toilets

Number of Toilets in Dwelling Units with 2 or More	% of Dwelling Units
2	45%
3	40%
4	10%
5	5%

The distribution of dwelling units by number of bathrooms is then used to calculate the average number of toilets per dwelling unit for 1-unit detached and 1-unit attached dwelling units, as shown in Table 3.

Table 3. Average Toilets Per 1-Unit Detached and 1-Unit Attached Dwelling Units

		% of Dwelling Units	
# Bathrooms	# Toilets	1, detached	1, attached
0	0	0.0%	0.2%
1	1	20.1%	31.9%
1.5	2	9.9%	19.0%
2 or more	2.75	70.0%	49.0%
Total		100.0%	100.0%
Average # Toilets		2.32	2.04

Lastly, the weighted average number of toilets for single-family dwelling units is calculated using the proportion of 1-unit detached and 1-unit attached dwelling units from the 2012 ACS data, as shown in Table 4. This yields as estimate of 2.21 toilets per single-family dwelling unit.

Table 4. Average Toilets Per Single-Family Dwelling Unit

Dwelling Unit	Avg. Toilets Per Unit	% of Units	Weighted Toilets
1, detached	2.32	59.5%	1.383
1, attached	2.04	40.5%	0.827
Single-Family (rounded)			2.210

Table 5 shows the resulting population estimate of single-family toilets in 2012 and compares it to the estimated population currently in the Retail Demand Model. We estimate the current stock of single-family toilets in San Francisco is 251,720 toilets, or rounding, about 252,000 toilets. The estimate exceeds the Retail Demand Model estimate by about 38,000 toilets. There are two reasons for the difference.

- First, the Retail Demand Model currently uses an average of 2 toilets per single-family unit whereas the 2012 ACS and 2011 AHS data suggest the average is somewhat greater than this, at 2.21 toilets per unit.

- Second, the Retail Demand Model does not adjust the stock of single-family housing units over time. Rather it sets it to the estimated number of units in 2005 and holds it there. This is a legacy model issue and it is not clear why an assumption of a static housing stock was adopted by SFPUC when the model was first developed. According to the 2005 ACS there were approximately 110,494 occupied single-family housing units in 2005, whereas in 2012 there were 113,878, a difference of 3,384 units. The Retail Demand Model uses an estimate of 106,722 single-family dwelling units, which is lower than the 2005 ACS estimate.

Table 5. Estimated Population of Single-Family Toilets in 2012

Variable	Value
Single-Family Units in 2012	113,878
Avg. Toilets Per Unit (rounded)	2.21
Total Single-Family Toilets in 2012	251,720
Retail Demand Model Single-Family Toilet Estimate	213,444

B. PERCENTAGE OF EFFICIENT TOILETS

We use a model of toilet turnover to estimate the percentage of single-family toilets in 2012 that have a flush rating of 1.6 gpf or less. The model operates on an annual time-step and runs from 1990 to 2012. The model assumes that all toilets in 1990 were rated 3.5 gpf or more.[1] It then estimates the replacement of existing toilets and the addition of new toilets (due to growth in the housing stock) over the 1991-2012 period based on four factors, as follows:

- **Toilets in new housing**. Starting in 1991, the model assumes toilets installed in new housing have a flush rating of 1.6 gpf or less, consistent with plumbing code requirements that went into effect in California in 1991. The distribution of housing units by year built, as reported in the 2012 ACS, is used to estimate the stock of single-family housing units in 1990 as well as the addition of new housing units in years after 1990.

- **SFPUC toilet replacement programs**. The model uses data reported to the CUWCC to adjust the stock of 3.5+ toilets for toilet conversions by SFPUC toilet replacement programs. The CUWCC data show that 41,559 single-family toilets were replaced by SFPUC programs between 1995 and 2012.

- **Retrofit on resale ordinance**. Starting in 2009, the model adjusts the stock of 3.5+ gpf toilets in response to the City's adoption of its retrofit-on-resale ordinance. The model uses an average single-family resale rate of 2.4%. The resale rate is derived from estimates of the single-family housing stock for the years 2009-2012 and the number of existing single-family units sold annually over this period, as reported by The Real Estate Market Trends Report website. The model assumes that efficient and non-efficient toilets are equally likely to be involved in a property resale. The model estimates that the ordinance resulted in the conversion of 9,561 3.5+ toilets over the period 2009-2012.

- **Natural replacement.** The model assumes that in any given year the residual stock of 3.5+ toilets (i.e., 3.5+ toilets not converted by SFPUC toilet programs or the retrofit on resale ordinance) may convert to an efficient toilet for other reasons, such as bathroom remodeling, device failure, etc. The model assumes a rate of natural replacement of 3.0%. This rate is the average rate of replacement from two empirical estimates of toilet replacement rate in the Bay Area, one done for EBMUD and the other done for SCVWD. The model estimates that natural replacement converted 103,896 3.5+ toilets over the period 1991-2012.

[1] Low-flow toilets were in existence prior to 1990 and a small percentage of toilets had likely already been converted to low-flow in 1990. However, the vast majority of toilets had not yet converted and we adopt the zero conversion assumption for modeling convenience.

Model results are summarized in Table 6, which shows the estimated percentage of 3.5+, ULFT, and HET toilets in each year. As of 2012, the model estimates that 2 out of every 3 toilets in single-family dwelling units are efficient. One-third of existing toilets are estimated to be 3.5+ gpf. Thus, of the estimated 251,720 single-family toilets, we estimate 83,184 have flush ratings of 3.5 gpf or more.

Table 6. Percentage of Single-Family Toilets by Efficiency Level

Year	3.5+ gpf	ULFT	HET	Total
1990	100%	0%	0%	100%
1991	97%	3%	0%	100%
1992	93%	7%	0%	100%
1993	90%	10%	0%	100%
1994	87%	13%	0%	100%
1995	84%	16%	0%	100%
1996	79%	21%	0%	100%
1997	74%	26%	0%	100%
1998	70%	30%	0%	100%
1999	66%	34%	0%	100%
2000	63%	37%	0%	100%
2001	60%	40%	0%	100%
2002	58%	42%	0%	100%
2003	55%	45%	0%	100%
2004	53%	47%	0%	100%
2005	51%	49%	0%	100%
2006	49%	51%	0%	100%
2007	47%	53%	0%	100%
2008	45%	54%	0%	100%
2009	42%	57%	1%	100%
2010	39%	59%	2%	100%
2011	36%	61%	3%	100%
2012	33%	63%	4%	100%

The model estimates closely correspond to empirical saturation estimates for 1997 and 2005 developed by the Residential End Uses of Water (REUWS) studies. This is shown in Table 7. The 1997 REUWS estimate is the average saturation of efficient toilets for three California cities -- Las Virgenes, Lompoc, and San Diego -- included in the national REUWS study. The two 2005 estimates are for California and San Francisco. The correspondence between the model and the REUWS estimates provides strong evidence the model estimates are reasonably accurate.

Table 7. Comparison of Model Results to REUWS Estimates

	Percentage of Efficient Toilets[1]			
Year	Model	REUWS National Study[2]	REUWS California Study	REUWS San Fran. Study
1997	26%	28%		
2005	49%		46%	47%
1. Efficient toilets are toilets with a flush rating of 1.6 gpf or less. 2. Avg. saturation for cities of Lompoc, Las Virgenes, and San Diego.				

IV. MULTI-FAMILY RESIDENTIAL TOILETS

A. FIXTURE POPULATION

As with the single-family estimate, 2012 ACS and 2011 AHS data are used to estimate the number of multi-family toilets in 2012. For the purposes of this analysis, multi-family dwelling units are defined as dwelling units in buildings with 2 to 4, 5 to 9, 10 to 19, 20 to 49, or 50 or more dwelling units per structure (excluding condominiums). The ACS data show there were 232,004 dwelling units meeting these criteria in 2012, as shown in Table 8.

Table 8. Multi-Family Dwelling Units in 2012

Units in Structure	Number of Units
2 to 4	71,046
5 to 19	72,366
20 to 49	34,916
50 or more	53,676
Grand Total	232,004

Bathroom count data from the 2011 AHS are then used to estimate the average number of toilets, as shown in Table 9.

Table 9. Average Toilets per Dwelling Unit by Number of Units per Structure

		% of Dwelling Units by Number of Units Per Structure			
# Bathrooms	# Toilets	2 to 4	5 to 19	20 to 49	50 or more
0	0	1.9%	0.9%	4.7%	4.7%
1	1	63.3%	77.2%	73.9%	71.4%
1.5	2	11.2%	7.7%	3.6%	1.5%
2 or more	2.75	23.6%	14.3%	17.8%	22.4%
Total		100.0%	100.0%	100.0%	100.0%
Average Toilets		1.51	1.32	1.30	1.36

Lastly, the weighted average number of toilets for multi-family dwelling units is calculated using the distribution of dwelling units by number of units per structure from Table 8 and the toilet averages from Table 9. This calculation, shown in Table 10, yields an estimate of 1.38 toilets per multi-family dwelling unit.

Table 10. Average Toilets Per Single-Family Dwelling Unit

Dwelling Unit	Avg. Toilets Per Unit	% of Units	Weighted Toilets
2 to 4	1.51	30.62%	0.46
5 to 19	1.32	31.19%	0.41
20 to 49	1.30	15.05%	0.20
50 or more	1.36	23.14%	0.31
Multi-Family (rounded)			1.38

Table 11 shows the resulting population estimate of multi-family toilets in 2012 and compares it to the estimated population currently in the retail demand model. We estimate the current stock of multi-family toilets in San Francisco is 320,903 toilets, or rounding, about 321,000 toilets. The estimate exceeds the Retail Demand Model estimate by about 118,000 toilets. As with the single-family population estimate, there are two reasons for the difference.

- First, the Retail Demand Model currently uses an average of 1 toilet per multi-family unit whereas the 2012 ACS and 2011 AHS data suggest the average is significantly greater than this, at 1.38 toilets per unit.

- Second, the Retail Demand Model does not adjust the stock of multi-family housing units over time. Rather it sets it to the estimated number of units in 2005 and holds it there. As with the single-family model, this is a legacy issue and it is not clear why an assumption of a static housing stock was adopted by SFPUC when the model was first developed. According to the 2005 ACS there were approximately 211,611 occupied multi-family housing units in 2005, whereas in 2012 there were 232,004, a difference of 20,393 units. The Retail Demand Model uses an estimate of 202,898 multi-family dwelling units, which is lower than the 2005 ACS estimate.

Table 11. Estimated Population of Single-Family Toilets in 2012

Variable	Value
Multi-Family Units in 2012	232,004
Avg. Toilets Per Unit (rounded)	1.38
Total Multi-Family Toilets in 2012	320,903
Retail Demand Model Multi-Family Toilet Estimate	202,898

B. PERCENTAGE OF EFFICIENT TOILETS

We use the same approach for estimating the percentage of efficient toilets that we used for single-family dwelling units. In the case of multi-family units, the four drivers are as follows.

- **Toilets in new housing**. As for the single-family model, we assume that all units constructed after 1991 are fitted with toilets that have flush ratings of 1.6 gpf or less.

- **SFPUC toilet replacement programs**. The model uses data reported to the CUWCC to adjust the stock of 3.5+ toilets for toilet conversions by SFPUC toilet replacement programs. The CUWCC data show that 47,306 toilets were replaced by SFPUC programs between 1995 and 2012.

- **Retrofit on resale ordinance**. Starting in 2009, the model adjusts the stock of 3.5+ gpf toilets in response to the City's adoption of its retrofit-on-resale ordinance. We do not have data on multi-family property resale rates, so we use the assumption from the Retail Demand Model of 1.1%. The model estimates that the ordinance resulted in the conversion of 5,187 3.5+ toilets over the period 2009-2012.

- **Natural replacement.** As with the single-family model, we use a natural replacement rate of 3%.

Model results are summarized in Table 12, which shows the estimated percentage of 3.5+, ULFT, and HET toilets in each year. As of 2012, the model estimates that 68% of toilets in multi-family dwelling units are efficient. 32% of existing toilets are estimated to be 3.5+ gpf. Thus, of the estimated 320,903 multi-family toilets, we estimate 102,931 have flush ratings of 3.5 gpf or more.

The saturation estimate for ULFT/HET toilets corresponds very closely to the saturation estimate based on SFPUC inspections of 158 multi-family properties. The estimate from these inspections is 69%. While the inspected properties are all affordable housing units and therefore not necessarily representative of the overall population of multi-family housing in the City, it is reassuring that the two estimates correspond so closely.

Table 12. Percentage of Multi-Family Toilets by Efficiency Level

Year	3.5+ gpf	ULFT	HET	Total
1990	100%	0%	0%	100%
1991	96%	4%	0%	100%
1992	93%	7%	0%	100%
1993	90%	10%	0%	100%
1994	87%	13%	0%	100%
1995	83%	17%	0%	100%
1996	79%	21%	0%	100%
1997	74%	26%	0%	100%
1998	70%	30%	0%	100%
1999	65%	35%	0%	100%
2000	60%	40%	0%	100%
2001	57%	43%	0%	100%
2002	54%	46%	0%	100%
2003	51%	49%	0%	100%
2004	49%	51%	0%	100%

2005	47%	53%	0%	100%
2006	45%	55%	0%	100%
2007	43%	56%	0%	100%
2008	41%	58%	1%	100%
2009	39%	60%	1%	100%
2010	37%	62%	1%	100%
2011	35%	64%	2%	100%
2012	32%	65%	3%	100%

V. SINGLE-FAMILY CLOTHES WASHERS

A. FIXTURE POPULATION

The 2011 AHS for the San Francisco-San Mateo-Redwood City survey region found that 92.2% of owner-occupied housing units have clothes washing machines. This installation percentage is applied to the 2012 population of single-family dwelling units to estimate the population of single-family clothes washers, as shown in Table 13. Unlike for residential toilets, the estimate based on the 2011 AHS and 2012 ACS data is close to the estimate used in the Retail Demand Model, differing only by about 5%.

Table 13. Estimated Population of Single-Family Washers in 2012

Variable	Value
Single-Family Units in 2012	113,878
% of Owner-Occupied Units with Washers	92.189%
Total Single-Family Washers in 2012	104,983
Retail Demand Model Single-Family Toilet Estimate	111,299

B. PERCENTAGE OF HIGH EFFICIENCY WASHERS

The 2011 AHS reports that the percentage washers in owner-occupied and renter-occupied dwelling units that were Energy Star was 54.6% and 40.6%, respectively. Based on these penetration rates, we estimate that 50.9% of single-family washers are Energy Star, as shown in Table 14.

Table 14. Percentage of Energy Star Clothes Washers by Single-Family Residential Tenure

Tenure Status	Owner-Occupied	Renter-Occupied	Total
Dwelling Units	83,484	30,394	113,878
% with washers	92.2%	92.2%	
Clothes washers	76,963	28,020	104,983
% Energy Star	54.6%	40.6%	50.9%
Energy Star	42,046	11,372	53,418

The REUWS for San Francisco estimated that circa 2005, 32% of single-family washers were efficient.[2] This suggests there has been a significant increase in the share of efficient washers since the time of that analysis. We used a washer replacement model to test the plausibility of this increase in saturation. The model runs on an annual time-step from 2005 to 2012. The model assumes that 32% of washers in 2005 were efficient. In subsequent years, the model assumes the following:

- 91.4% of washers in new construction are rated Energy Star. This estimate comes directly from the 2011 AHS.[3]
- 60% of washer purchases (other than new construction) are rated Energy Star. This estimate comes from EPA.
- 8.3% of the existing washer inventory is replaced each year. This estimate is based on a 12-year average life for clothes washers.

Based on these assumptions, the model estimates that 52% of washers in 2012 would be efficient, which corresponds closely with the estimate of about 51% in Table 14 derived AHS and ACS data. Thus, we conclude the 2005 REUWS saturation estimate is consistent with the current estimated saturation rate.

VI. MULTI-FAMILY IN-UNIT CLOTHES WASHERS

A. FIXTURE POPULATION

As with single-family washers, the population estimate for in-unit clothes washers in multi-family dwelling units is derived from 2011 AHS and 2012 ACS data. Based on this data, we estimate as of 2012 there were 94,746 in-unit clothes washers in multi-family dwelling units, as shown in Table 15. It is not possible to compare this estimate to the Retail Demand Model since that model does not include in-unit multi-family clothes washers.

Table 15. Estimated Population of In-Unit Multi-Family Washers in 2012

Tenure Status	Owner-Occupied	Renter-Occupied	Total
Dwelling Units	40,817	191,187	232,004
% with washers	92.2%	29.9%	
Clothes washers	37,629	57,118	94,746
Retail demand model estimate for 2012			NA

B. PERCENTAGE OF HIGH EFFICIENCY WASHERS

Based on the AHS Energy Star penetration rates for owner- and renter-occupied dwelling units, we estimate that 46.2% of multi-family in-unit washers are Energy Star, as shown in Table 16.

[2] Based on water volume per load statistics.
[3] New construction for the 2011 AHS was defined as units constructed between 2007-11.

Table 16. Percentage of Energy Star Clothes Washers by Multi-Family Residential Tenure

Tenure Status	Owner-Occupied	Renter-Occupied	Total
Dwelling Units	40,817	191,187	232,004
% with washers	92.2%	29.9%	
Clothes washers	37,629	57,118	94,746
% Energy Star	54.6%	40.6%	46.2%
Energy Star	20,557	23,182	43,739

VII. MULTI-FAMILY COMMON LAUNDRY CLOTHES WASHERS

A. FIXTURE POPULATION

The population of common laundry area washers in multi-family units is based on laundry room equipment guidelines published by the Multi-Family Laundry Association. The guidelines recommend the number of washer/dryer pairs per unit based on the residential profile of the multi-family complex, as shown in Table 17.

Table 17. Recommended Washer/Dryer Pairs by Resident Profile

Resident Profile	Number of Dwelling Units per W/D Pair
Families	8-12
Young working adults	10-15
Older working adults	15-20
Students	25-40
Senior citizens	25-40

Using the mid-point of the dwelling unit ranges and assigning the weights shown in Table 18, we estimate, on average, there are 15.75 dwelling units per common laundry washer/dryer pair. The average number of washer/dryer pairs per dwelling unit is the reciprocal of this estimate – 0.0635 washer/dryer pairs per dwelling unit. Multiplying by the number of multi-family dwelling units yields an estimate of 14,730 common laundry clothes washers.

The Retail Demand Model uses an estimate of 17,410 common laundry washers for 2012, which is about 18% greater than the estimate in Table 18. There are two reasons for the difference.

- First, the Retail Demand Model assumes an average of 14 dwelling units per common area washer whereas the Table 18 estimate uses 15.75.

- Second, the Retail Demand Model estimate uses a larger dwelling unit estimate – about 244,000 versus 232,000.

Table 18. Multi-Family Common Laundry Washer Population Estimate

Resident Profile	Mid-Point Dwelling Units per W/D Pair	Assumed Distribution of Dwelling Units (Weight)
Families	10	50%
Young working adults	12.5	20%
Older working adults	17.5	10%
Students	32.5	10%
Senior citizens	32.5	10%
Weighted Avg. Dwelling Units Per W/D Pair		15.75
Estimated Washers per Dwelling Unit		0.0635
Number of Renter-Occupied Multi-Family Dwelling Units		232,004
Estimated Common Laundry Washers		14,730

B. PERCENTAGE OF HIGH EFFICIENCY WASHERS

Other than the 2011 AHS, we did not find any estimates of high-efficiency washer saturation for multi-family. The AHS applies to in-unit washers, not common laundry washers, and therefore is not directly applicable. Because common laundry washers are frequently leased from a vendor rather than owned by the facility, the penetration rate could differ from what the AHS estimated for in-unit washers.

VIII. CII TOILETS

A. FIXTURE POPULATION

We use the CUWCC's CII toilet count methodology to estimate the number of CII toilets from 1992 to 2012. The CUWCC methodology is described in the CUWCC's CII ULFT Savings Study (2001). Toilet populations are calculated separately for commercial and industrial buildings (other than hotels), hotels, schools, and government sector buildings.

For commercial and industrial buildings (other than hotels) the coefficients in Table 19 are used with County Business Patterns (CBP) data to estimate the number of toilets. The CBP data give the count of establishments within each CII sector by employment size category. These counts are multiplied by the coefficients in Table 19 to estimate the number of toilets for each CII sector.

In the case of hotels, the CUWCC method is based on the number of hotel rooms. The toilet count coefficient is 1.05 toilets/hotel room. Hotel room counts for 1985, 2009, and 2012 are from City planning department reports. For other years, hotel room counts are interpolated.

For schools, the CUWCC method is based on the number of K-8 and 9-12 students. The toilet count coefficients are 0.028571 toilets/student for K-8 and 0.036364 toilets/student for 9-12. Multiplying these coefficients by the number of students yields the toilet population estimate for the school sector. Student body counts for public and private schools are from the California Department of Education.

Table 19. CII Toilet Coefficients

CII Sector	Industry Classification System		Employment Size				
	NAICS	SIC	1 to 9	10 to 19	20 to 49	50 to 99	100+
Industrial	31-33	20-39	2.0	2.6	4.8	8.0	18.0
Retail/Wholesale	42,44,45	50-57,59,72,75,76	2.0	2.4	5.3	9.0	13.1
Eating/Drinking	722	58	2.0	2.5	4.3	7.7	11.6
Office	52-56, 81 (not 81311)	60-67,73,81,86 (not 866), 87-89	2.0	3.4	8.1	18.1	32.6
Health Care	62	80	2.2	6.3	15.0	32.4	65.2
Church	81311	866	3.1	9.1	21.6	21.6	21.6
Other		All other SIC codes	2.0	2.3	5.7	12.7	19.4

The toilet populations for commercial/industrial, hotels, and schools developed using the CUWCC method are shown in Table 20. A problem with the CUWCC method is the way in which the estimates fluctuate with the business cycle. This happens because the method assumes the relationships between number of employees (and students) and number of toilets are fixed, whereas in reality they fluctuate. This causes the method to undercount toilets during low employment periods -- e.g. 1992 -- and over count toilets during high employment period -- e.g. 2000. To address this problem, we smooth the estimates using linear regression. The smoothed estimates are shown in the last column of Table 20.

Table 20. CUWCC Method CII Toilet Population Estimates

Year	Comm./Ind.	Hotels	Schools	Total Unsmoothed	Total Smoothed
1992	103,547	29,917	2,913	136,377	144,120
1998	115,221	31,509	2,762	149,492	145,817
1999	115,010	31,782	2,756	149,548	146,100
2000	118,674	32,058	2,739	153,470	146,383
2001	118,216	32,336	2,733	153,285	146,666
2002	109,884	32,616	2,697	145,197	146,949
2003	108,431	32,900	2,651	143,981	147,232
2004	107,890	33,185	2,606	143,680	147,514
2005	108,871	33,473	2,589	144,932	147,797
2006	110,630	33,763	2,570	146,963	148,080
2007	112,306	34,056	2,562	148,924	148,363
2008	113,812	34,352	2,526	150,690	148,646
2009	110,927	34,650	2,493	148,070	148,929
2010	110,411	34,876	2,470	147,757	149,212
2011	111,385	35,104	2,447	148,935	149,494
Avg Growth	0.38%	0.85%	-0.91%	0.46%	0.19%

The CUWCC method for estimating toilets in the government sector could not be implemented because it requires data from Dunn and Bradstreet which would have to be purchased and could not be obtained in time for this study. To estimate the number of toilets in the government sector, we use a previous estimate of government sector toilets in San Francisco in 1992 prepared by the CUWCC and then escalate it using the average rate of growth for the other sectors. The estimated population of CII toilets, including the government sector, is shown in Table 21.

Table 21. Estimated Population of CII Toilets

Year	CII (excl. Gov't)	Gov't	Total
1992	144,120	4,000	140,377
1993	144,403	4,008	141,018
1994	144,686	4,015	141,663
1995	144,969	4,023	142,310
1996	145,252	4,031	142,960
1997	145,534	4,039	143,614
1998	145,817	4,046	144,270
1999	146,100	4,054	144,929
2000	146,383	4,062	145,592
2001	146,666	4,070	146,257
2002	146,949	4,078	146,926
2003	147,232	4,086	147,598
2004	147,514	4,093	148,272
2005	147,797	4,101	148,950
2006	148,080	4,109	149,631
2007	148,363	4,117	150,315
2008	148,646	4,125	151,003
2009	148,929	4,133	151,693
2010	149,212	4,141	152,387
2011	149,494	4,149	153,084
2012	149,777	4,157	153,784

The estimated population of CII toilets in 2012 is 153,784 toilets. The CII toilet population estimate in the Retail Demand Model is 81,174 toilets in 2005, which is about half the estimate based on the CUWCC method. The Retail Demand Model estimate is based on an average of 6 toilets per non-residential account and 13,529 non-residential accounts in 2005. Both of these are legacy assumptions from when the model was first developed by SFPUC.

B. PERCENTAGE OF EFFICIENT TOILETS

We use the same approach for estimating the percentage of efficient toilets that we used for single- and multi-family dwelling units. In the case of CII toilets, there are only three drivers as follows.

- **Toilets in new construction**. We assume new buildings after 1991 are fitted with toilets that have flush ratings of 1.6 gpf or less.

- **SFPUC toilet replacement programs**. The model uses the toilet program history in the Retail Demand Model and data reported to CUWCC on CII toilet replacement to adjust the stock of 3.5+ toilets for toilet conversions by SFPUC toilet replacement programs. These data show that 14,533 CII toilets were replaced by SFPUC programs between 1995 and 2012.

- **Natural replacement.** As with the single- and multi-family models, we use a natural replacement rate of 3%.

Model results are summarized in Table 22, which shows the estimated percentage of 3.5+, ULFT, and HET toilets in each year. As of 2012, the model estimates that 60% of CII toilets are efficient. 40% of existing toilets are estimated to be 3.5+ gpf. Thus, of the estimated 153,784 CII toilets, we estimate 61,500 have flush ratings of 3.5 gpf or more.

Table 22. Percentage of CII Toilets by Efficiency Level

Year	3.5+ gpf	ULFT	HET	Total
1992	97%	3%	0%	100%
1993	94%	6%	0%	100%
1994	90%	10%	0%	100%
1995	87%	13%	0%	100%
1996	84%	16%	0%	100%
1997	81%	19%	0%	100%
1998	77%	23%	0%	100%
1999	74%	26%	0%	100%
2000	72%	28%	0%	100%
2001	69%	31%	0%	100%
2002	67%	33%	0%	100%
2003	65%	35%	0%	100%
2004	62%	38%	0%	100%
2005	60%	40%	0%	100%
2006	58%	42%	0%	100%
2007	54%	45%	1%	100%
2008	52%	47%	2%	100%
2009	49%	48%	2%	100%
2010	46%	50%	4%	100%
2011	44%	52%	4%	100%
2012	40%	53%	7%	100%

IX. CII URINALS

A. FIXTURE POPULATION

Koeller (2006) estimated that there is one urinal for every four toilets in California.[4] Using this ratio with the CII toilet population estimate in Table 21 gives a urinal population estimate of 38,500 (rounded).

The Retail Demand Model currently uses a ratio of 3 urinals to every 20 toilets (15%), which gives a population estimate that is 40% smaller than the population estimate based on Koeller (2006). The urinal to toilet ratio used in the Retail Demand Model is a legacy assumption from when the model was first developed by SFPUC.

B. PERCENTAGE OF EFFICIENT URINALS

We did not identify data that would improve the Retail Demand Model's saturation estimates. Under current assumptions, the Retail Demand Model estimates that 25% of urinals have flush ratings of 0.5 gpf or less in 2012. Using the population estimate based on Koeller (2006), this implies that there remain 28,875 non-efficient urinals in use circa 2012.

X. COMMERCIAL COIN-OPERATED WASHERS

A. FIXTURE POPULATION

The population of commercial coin-operated washers is San Francisco is estimated using CBP data on the number of coin-operated establishments in the City and an average of 36 washers per establishment. The average number of washers per establishment is based on a sample of California coin-operated laundries reported in Sutter, Pope, and Walther (2006).[5] CBP reported 26 coin-operated laundries in San Francisco in 2011. This yields an estimated 936 coin-operated washers.

B. PERCENTAGE OF EFFICIENT WASHERS

We did not find any estimates of high-efficiency washer saturation for coin-operated laundries. However, the low number of coin-operated washers and the prevalence of equipment leasing does not make this sector an attractive target for washer rebate programs.

[4] Koeller, J. (2006). *A Report on Potential Best Management Practices: Year Two Annual Report.* Sacramento: California Urban Water Conservation Council.
[5] Sutter, M., T. Pope, and E. Walther, "Estimating Commercial Clothes Washer Use in California Coin Laundry Stores." ACEE Summer Study on Energy Efficiency in Buildings.

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APPENDIX C

Detailed Table of Fixture Populations and Saturation Rates 2025 - 2050

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Table C-1: Estimated Fixture Population and Percentage of Efficient and Inefficient Fixtures

	2025		2030		2035		2040		2045		2050	
	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures	Inefficient Fixtures	Efficient Fixtures
Toilets												
Single Family	35,409	215,598	26,791	224,216	20,270	230,737	15,336	235,670	11,603	239,403	8,779	242,227
	14.1%	85.9%	10.7%	89.3%	8.1%	91.9%	6.1%	93.9%	4.6%	95.4%	3.5%	96.5%
Multi Family	43,033	282,900	33,376	292,557	25,887	300,046	20,078	305,855	15,573	310,361	12,078	313,855
	13.2%	86.8%	10.2%	89.8%	7.9%	92.1%	6.2%	93.8%	4.8%	95.2%	3.7%	96.3%
Non-Residential	35,414	84,861	30,411	70,133	26,115	60,225	22,426	51,717	19,258	44,412	16,537	38,138
	29.4%	70.6%	30.2%	69.8%	30.2%	69.8%	30.2%	69.8%	30.2%	69.8%	30.2%	69.8%
Total	113,856	583,359	90,578	586,905	72,272	591,008	57,840	593,243	46,434	594,175	37,395	594,220
	16.3%	83.7%	13.4%	86.6%	10.9%	89.1%	8.9%	91.1%	7.2%	92.8%	5.9%	94.1%
Clothes Washers												
Single Family	22,511	83,432	13,477	92,466	8,317	97,626	5,190	100,753	3,239	102,704	2,021	103,922
	21.2%	78.8%	12.7%	87.3%	7.9%	92.1%	4.9%	95.1%	3.1%	96.9%	1.9%	98.1%
Multi-Family	28,828	77,230	17,914	88,144	11,166	94,891	6,968	99,090	4,348	101,709	2,713	103,344
	27.2%	72.8%	16.9%	83.1%	10.5%	89.5%	6.6%	93.4%	4.1%	95.9%	2.6%	97.4%
Non-Residential	1,740	4,128	1,086	4,782	678	5,190	423	5,445	264	5,604	165	5,703
	29.7%	70.3%	18.5%	81.5%	11.5%	88.5%	7.2%	92.8%	4.5%	95.5%	2.8%	97.2%
Total	53,079	164,790	32,477	185,392	20,160	197,708	12,581	205,288	7,851	210,018	4,899	212,969
	24.4%	75.6%	14.9%	85.1%	9.3%	90.7%	5.8%	94.2%	3.6%	96.4%	2.2%	97.8%
Urinals												
Total	6,172	19,636	5,300	20,508	4,551	21,257	3,908	21,900	3,356	22,452	2,882	22,926
	23.9%	76.1%	20.5%	79.5%	17.6%	82.4%	15.1%	84.9%	13.0%	87.0%	11.2%	88.8%
Showerheads												
Single Family	20,041	131,467	10,137	141,372	4,938	146,571	2,596	148,913	1,365	150,143	718	150,790
	13.2%	86.8%	6.7%	93.3%	3.3%	96.7%	1.7%	98.3%	0.9%	99.1%	0.5%	99.5%
Multi-Family	54,601	258,398	28,269	284,730	14,408	298,591	7,587	305,412	3,996	309,004	2,104	310,895
	17.4%	82.6%	9.0%	91.0%	4.6%	95.4%	2.4%	97.6%	1.3%	98.7%	0.7%	99.3%
Non-Residential	6,358	27,642	3,355	30,645	1,771	32,229	935	33,065	493	33,507	260	33,740
	18.7%	81.3%	9.9%	90.1%	5.2%	94.8%	2.7%	97.3%	1.5%	98.5%	0.8%	99.2%
Total	81,001	417,507	41,761	456,747	21,117	477,391	11,117	487,391	5,854	492,654	3,083	495,425
	16.2%	83.8%	8.4%	91.6%	4.2%	95.8%	2.2%	97.8%	1.2%	98.8%	0.6%	99.4%

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APPENDIX D

Updated SFPUC Water Conservation Tracking Model Overview and Water and Energy Savings Specifications for Conservation Program Measures (2025)

SFPUC Conservation Tracking Model

Water and Energy Savings Specifications for Conservation Program Measures

David Mitchell, M.Cubed

Last Updated: 02-03-2026

Overview

The SFPUC Conservation Tracking Model is a tool developed to track conservation program activity, water savings, and costs and benefits for SFPUC's retail service area conservation programs. The model is a customized version of the Alliance for Water Efficiency's (AWE) Water Conservation Tracking Tool, an Excel-based water conservation tracking model with more than four hundred registered water utility users throughout North America. In 2014, the SFPUC customized the AWE Conservation Tracking Tool for its retail service area and began using it to forecast water savings from conservation measures.

The purpose of this Water and Energy Savings Specifications for Conservation Program Measures Technical Memorandum is to document the assumptions and methodologies used to estimate water savings for every measure in the SFPUC's Conservation Tracking Model and key updates made over time. This document reflects all measures with modeled water savings included in the Conservation Tracking Model, including measures the SFPUC implements now or plans to in the next five years, implemented in the past, and ones SFPUC has evaluated and not implemented and may or may not do so in the future. It does not reflect conservation measures the SFPUC provides or provided in the past that don't have established or sufficient water-savings methodologies.

History of SFPUC Conservation Forecast Modelling

The SFPUC developed its first model in 2004 to forecast both in-City retail water demands and water savings from conservation measures. The SFPUC used estimated conservation water savings generated by this model to develop its 2004 and 2011 conservation plans. The SFPUC migrated from using this combined demand/forecast model in 2014, and started using a separate econometric demand model originally developed by The Brattle Group to estimate retail demands and to the SFPUC Conservation Tracking Model to estimate water savings from conservation measures. Most recently, in 2025, the SFPUC updated its econometric demand model for its retail service area for use in preparing its 2025 Urban Water Management Plan and for providing updated demand estimates for its 2025 Retail Conservation Plan.

Model Structure

The Conservation Tracking Model is an Excel-based model with an extensive Visual Basic backend. Using the model requires completing Model Setup, Program Specification, and Annual Activity data input tasks. Each data input task is contained on a separate worksheet in the model.

Model Setup consists of providing the model with the baseline forecast of water demand, as well as other basic system information the model uses to calculate the costs and benefits of conservation programs. The baseline water demand forecast comes from the econometric demand models. Setup also includes providing the latest estimates of actual population, housing, and employment which are used to update the estimates of passive water savings to date.

Program Specification consists of parameterizing the conservation programs in the model. The model can hold up to 200 separate programs. Program parameters are grouped into five categories: water saving parameters, utility cost parameters, participant cost parameters, participant non water benefits parameters, and plumbing code parameters. The latter are used to specify interaction effects with plumbing codes to avoid double counting water savings jointly produced by plumbing codes and conservation programs. In terms of forecasting conservation program water savings, the most important parameters are the water savings parameters and the plumbing code interaction parameters.

Annual Activity is simply the number of units of activity that have been done (in the case of historical years) or are expected to be done (in the case of future years). The user enters historical and projected annual activity for each conservation program that was specified during the Program Specification step. For toilets, urinals, and clothes washers, the model includes fixture inventory modules to keep track of how many fixtures have been converted to efficient fixtures due to plumbing codes and conservation programs to ensure the user does not specify levels of fixture replacement that are physically infeasible.

Once the three data input tasks have been completed the model results can be reviewed. Model results are summarized into three categories: (1) program water savings, (2) retail water demand, and (3) costs and benefits.

- Program water savings are the projected annual water savings from each specified conservation program through 2050. Results can be grouped by program category and customer class or shown individually.

- Retail demand results summarize the baseline annual demand forecast with plumbing code and conservation program adjustments through 2050. It is grouped by customer class and shown separately for the in-city and suburban parts of SFPUC's retail service area. Results can be shown in MGD or acre-feet. Gross per capita and residential per capita water use are also reported.
- Costs and benefits of conservation are reported for the utility and program participant perspectives. Unit costs, net present value, and benefit-cost ratios can be reported for the totality of all programs, for individual program categories (e.g. toilet replacement programs), or for individual programs. In addition to financial benefits and costs, the model calculates expected reductions in associated energy use and greenhouse gas emissions.

Model inputs can be saved as scenarios. This allows the model to simultaneously hold more than one set of data inputs. For example, a user could specify scenarios for alternative baseline population and demand forecasts or for alternative levels of conservation program investment. There is no practical limit to the number of scenarios the model can hold.

Summary of Key Updates since 2015

2015 Updates
The conservation program savings presented in SFPUC's 2011 Conservation Plan were developed with the SFPUC's original Retail Demand Model not the Conservation Tracking Model. While the Conservation Tracking Model can be calibrated to replicate the 2011 estimates, the final estimates developed for the 2015 Conservation Plan, which were developed with the Conservation Tracking Model, were generally lower after 2020 than was presented in the 2011 Plan for three main reasons:

- The SFPUC undertook a review of the water saving estimates and assumptions and made several adjustments, including to savings estimates for clothes washers and toilets, both of which were lowered to account for new efficiency standards affecting the long-term savings potential of these programs.
- The 2015 Plan updated the end dates for toilet and clothes washer incentives due to high fixture saturation levels.

- The 2015 Plan focused mainly on the next five years, reflecting that beyond that horizon, there is much less certainty regarding what conservation programs SFPUC will find most beneficial and cost-effective to implement.

2020 Updates
In 2020, the SFPUC made the following changes to the model:

- Revised future participation levels for several measures to better reflect current trends.
- Added several new conservation measures.
- Adjusted the water savings assumptions of several existing measures.
- Updated the water savings module for clothes washer efficiency standards to align it with the approach used in Version 4 of the Alliance for Water Efficiency's Water Conservation Tracking Tool.
- Incorporated the City of San Francisco Planning Department's current population and housing estimates.
- Removed the calculation of plumbing code water savings for new development (post 2020) because they are already embedded in SFPUC's updated retail demand projections.

These updates were based on analysis of historical program participation, updated fixture saturation rates, and new empirical and other water-savings studies and data available since 2015. This document reflects the assumptions and specifications used in the SFPUC's Conservation Tracking Model for purposes of estimating water savings for the SFPUC's 2020 Retail Conservation plan.

2025 Updates
In 2025, the following updates to the model were made:

- Revised the toilet fixture saturation module to account for replacement of 1.6 gpf toilets with 1.28 gpf or less toilets by SFPUC toilet replacement programs.
- Updated savings assumptions of AMI leak alert measures to align with savings estimates reported in the February 2, 2024, technical memorandum: *Water Savings Assessment of SFPUC Leak Alert Programs*.
- Updated savings assumptions for HET replacement programs to account for replacement of existing toilets with HET toilets with flush ratings < 1.28 gpf.
- Added new programs to the model, including direct install and rebate programs to replace 1.6 gpf toilets with ultra-high-efficiency toilets with flush ratings of <= 1.0 gpf; and multi-family and non-residential landscape irrigation timer rebate programs.
- Incorporated into the model updated implementation costs provided by SFPUC for 39 programs.
- Incorporated projected annual implementation levels through 2050 provided by SFPUC for 38 programs.
- Incorporated the estimates of 2025 population, housing, and employment; estimates for 2020 population were revised.

2025 Population and Housing Estimates

SFPUC expects new construction to be built at code and generate no additional passive savings. All future passive savings will come from existing stock. As such, population and housing

estimates for 2025 were updated, as described below, and then held constant for the remainder of the planning horizon.

Population Estimate Update

Updated 2025 population of 842,027 was input based on Department of Finance E-5 Housing and Population Estimates (dated January 2025). Residential population in 2025 was updated from the same source. Additionally, the 2020 total population estimate of 941,269 provided by SF Planning was retroactively revised to 873,965 based on the 2020 estimated value from Department of Finance E-5 Housing and Population Estimates (dated January 2025).

The conservation model's original and updated population projections are shown in Table 1. As shown in this table, the population stops growing after 2025 to reflect no additional passive savings to be generated from future growth.

Table 1: Population Projection Update

	Total Population			Residential Population		
Year	2020 Model	2025 Model	% Difference	2020 Model	2025 Model	% Difference
2005	780,187	780,187	0.0%	756,678	756,678	0.0%
2010	805,235	805,235	0.0%	780,971	780,971	0.0%
2015	857,508	857,508	0.0%	831,995	831,995	0.0%
2020	941,269	873,965	-7.2%	913,031	840,986	-7.9%
2025	941,269	842,027	-10.5%	913,031	811,717	-11.1%
2030	941,269	842,027	-10.5%	913,031	811,717	-11.1%
2035	941,269	842,027	-10.5%	913,031	811,717	-11.1%
2040	941,269	842,027	-10.5%	913,031	811,717	-11.1%
2045	941,269	842,027	-10.5%	913,031	811,717	-11.1%
2050	941,269	842,027	-10.5%	913,031	811,717	-11.1%

Source: 2020 total population from San Francisco Planning Department, adjusted to residential population based on 3% group quarters (DOF E-5 and P-4)

Household Projection Update

Total housing units were sourced from San Francisco Planning's 2024 Housing Inventory. This value is assumed to be an estimate of total constructed housing units as opposed to occupied housing units.

Occupied single-family housing units in 2025 were set equal to the number of single-family residential accounts in the SFPUC's billing system as of June 2025. This includes the number of accounts with the service agreement type residential single family (RES-SWTR), regardless of dwelling unit count, and the service agreement type of residential combination service (COMBO-R) with 1 dwelling unit. Occupied single-family housing units for 2030 and beyond were kept the same as 2025.

Total 2025 housing units from the Planning Department were adjusted to estimate occupied housing units using a vacancy rate of 11.25%, which is an average of the last two estimates provided by the ACS 1-year estimates for the City of San Francisco from 2023 (11.03%) and 2024 (11.48%). Total occupied multi-family housing units in 2025 were estimated by subtracting the number of occupied single-family housing units in 2025 from the total 2025 occupied housing units.

Calculation of Plumbing Code Water Savings

The Conservation Tracking Model calculates the water savings associated with plumbing codes and appliance efficiency standards using models of fixture inventory coupled with usage assumptions. These savings are commonly referred to as passive water savings because they occur regardless of actions taken by the utility. The Tracking Model includes passive savings models for residential toilets, showerheads, and clothes washers, and non-residential toilets, urinals, hotel showerheads, and coin-op clothes washers.

It is important to emphasize that the passive savings estimates do not actually impact the model's estimates of final water demand. This is because the econometric demand model's baseline demand forecasts used in the Tracking Model are net of passive water savings. However, the econometric forecast does not generate an explicit forecast of passive water savings because the adjustment for passive savings is enacted through the model's trend term. Because SFPUC desired explicit estimates of passive water savings, modules for estimating these savings were included in the Conservation Tracking Model. These estimates are added to the econometric demand model's baseline forecast before it is used in the Conservation Tracking Model so that they can be represented explicitly in the Conservation Tracking Model. It is the econometric demand model's baseline forecast adjusted for passive savings that is entered on the conservation Model Setup worksheet. The adjusted baseline forecast is:[1]

Adjusted Baseline Forecast = Econometric Model Baseline Forecast + Passive Water Savings

The final demand forecast generated by the Conservation Tracking Model is then:

Final Demand Forecast = Adjusted Baseline Forecast – Passive Water Savings – Program Water Savings

This is also equal to:

Final Demand Forecast = Econometric Model Baseline Forecast – Program Water Savings

This means the only determinants of the final demand forecast are the Econometric Model Baseline Forecast and the forecast of programmatic water savings from future implementation of SFPUC conservation programs. While the passive savings forecast is useful because it provides an estimate of how much demand reduction can be ascribed to plumbing codes and appliance standards, it does not actually affect the final estimate of future demand.

[1] The passive water savings adjustment also includes water savings expected to be realized after 2015 from the historical implementation of SFPUC conservation programs prior to the start of the Econometric Model's baseline forecast. This is done to prevent the model from double counting these water savings.

Following are descriptions of how passive savings are calculated for each fixture/appliance category. The SFPUC Plumbing Fixture Population and Efficiency Saturation Estimates Technical Memorandum issued on January 13, 2014 and included in Appendix A of the 2015 Retail Conservation Plan and the updated saturation estimates memo dated August 19, 2019, and included in appendices of the 2020 Retail Conservation Plan provide more details on fixture population and saturation estimates.

Residential Toilets

The population of residential toilets is based on available estimates of actual single and multi-family housing units. These estimates are multiplied by the average number of toilets per dwelling unit, which are estimated from recent American Housing Survey data. The model uses an average of 2.22 and 1.26 toilets per dwelling unit for single and multi-family housing, respectively. Toilets installed in new housing constructed between 1991 and 2013 are assumed to be ULFT (1.6 gpf). Toilets installed in new housing constructed after 2013 are assumed to be HET (1.28 gpf). Toilets in existing housing constructed before 1991 are assumed to have an average flush volume of 3.5 gpf. Toilets in existing housing are assumed to be replaced at an annual rate of 3.1% per year. This is the average rate of residential toilet replacement reported in studies done by EBMUD and SCVWD. Existing toilets replaced between 1991 and 2013 are assumed to be replaced by ULFTs. Existing toilets replaced after 2013 are assumed to be replaced by HETs. Using this information, the model calculates the average flush volume for the inventory of new and existing toilets for each year between 1990 and 2064. Water savings per flush is calculated relative to the average flush volume in 1990. Average savings per flush is equal to the average flush volume in 1990 less the average flush volume in each year after 1990. Average savings per flush is multiplied by the estimated number of flushes per year to estimate annual water savings. The estimated number of flushes per year is equal to the residential population multiplied by the average daily per capita flush rate multiplied by 365. The residential population is derived from SFPUC's service area population forecasts. The average daily per capita flush rate of 4.8 is taken from the results for San Francisco reported in the 2011 California Single Family Water Efficiency Study.

Non-Residential Toilets

The population of non-residential toilets for the period 1990-2012 is taken from the Fixture Saturation Task Memo. The population of non-residential toilets for the period 2013-2064 is a linear extrapolation based on the forecast of service area population. The same assumptions used for residential toilets regarding flush volume of new toilets and replacement rate of existing toilets are used for non-residential toilets. The average flush volume of the toilet inventory and the water savings per flush relative to 1990 are calculated the same way as for residential toilets. Average savings per flush is multiplied by the estimated number of flushes per year to estimate annual water savings. Vickers (2001) estimates annual flushes by multiplying daily flushes by a 260-day work year. Male workers are assumed to flush toilets (as opposed to urinals) an average of one time per day while female workers are assumed to flush toilets an average of three times per day. Male workers are assumed to comprise 54% of the labor force, per City of San Francisco (2009). Total employment is taken from SFPUC's employment forecast.

Non-Residential Urinals

Based on an analysis of DBI data, the ratio of urinals to toilets is estimated to be 0.15. This ratio is applied to the estimated stock of non-residential toilets to estimate the stock of urinals. Urinals installed before 1992 are assumed to have an average flush volume of 2 gpf. Urinals installed between 1992 and 2013 are assumed to have an average flush volume of 1 gpd. Urinals installed in 2014 are assumed to have a flush volume of 0.5 gpf. Urinals installed after 2014 are assumed to have a flush volume of 0.125 gpf. Urinals are assumed to have the same replacement rate as toilets. The average

flush volume of the urinal inventory and the water savings per flush relative to 1990 are calculated the same way as for residential and commercial toilets. Average savings per flush is multiplied by the estimated number of flushes per year to estimate annual water savings. To calculate total flushes per year, male workers are assumed to have a daily flush rate of 2, per Vickers (2001). Male workers are assumed to comprise 54% of the labor force, per City of San Francisco (2009). Total employment is taken from SFPUC's employment estimate.

Residential Showerheads

The population of residential showerheads is based on available estimates of actual single and multi-family housing units. These forecasts are multiplied by the average number of showerheads per dwelling unit, which are estimated from recent American Housing Survey data. The model uses an average of 1.34 and 1.21 showerheads per dwelling unit for single and multi-family housing, respectively. Showerheads installed in new housing constructed before 2005 are assumed to have an average flow rate of 2.3 gpm. Showerheads installed in new housing constructed between 2005 and 2017 are assumed to have an average flow rate of 2.0 gpm. Showerheads installed after 2017 are assumed to have an average flow rate of 1.8 gpm. Showerheads in existing housing are assumed to be replaced at an annual rate of 12% per year, per the Alliance for Water Efficiency. Using this information, the model calculates the average showerhead flow rate for the inventory of new and existing showerheads for each year between 2005 and 2064. Average savings per minute is equal to the average flow rate in 2005 less the average flow rate in each year after 2005. Annual water savings is calculated as the product of the average flow rate and the annual number of minutes for showering. The annual number of minutes for showering is equal to the average number of shower events per household per day multiplied by the average shower duration in minutes multiplied by the number of households multiplied by 365. An average of 2 shower events per day and an average duration of 9 minutes per shower event are taken from the results for San Francisco from the 2011 California Single Family Water Efficiency Study.[2] The number of residential housing units is taken from SFPUC's housing forecast.

Hotel Showerheads

The population of hotel showerheads is based on an estimate of the total number of hotel rooms in San Francisco. The model assumes one showerhead per room. Showerheads installed before 2005 are assumed to have an average flow rate of 2.5 gpm. Showerheads installed between 2005 and 2017 are assumed to have an average flow rate of 2.2 gpm. Showerheads installed after 2017 are assumed to have an average flow rate of 1.8 gpm. Showerheads are assumed to be replaced at an annual rate of 12% per year, per the Alliance for Water Efficiency. Using this information, the model calculates the average showerhead flow rate for the inventory of new and existing showerheads for each year between 2005 and 2064. Average savings per minute is equal to the average flow rate in 2005 less the average flow rate in each year after 2005. Annual water savings is calculated as the product of the average flow rate and the annual number of minutes for showering. The annual number of minutes for showering is equal to the average number of shower events per occupied room per day multiplied by the average shower duration in minutes multiplied by the number of occupied rooms multiplied by 365. An average of 1.34 shower events per day per occupied room and an average duration of 10 minutes per shower event are taken from the AWWARF Commercial End Uses of Water Study. The average hotel occupancy rate is based on a review of various estimates published on the internet of hotel occupancy in San Francisco.

[2] The estimate of average number of shower events per day for San Francisco from this study is used directly in the single-family residential calculation. For the multi-family calculation, it is scaled by the ratio of multi-family to single-family persons per household to consider the lower density in multi-family housing.

Residential Clothes Washers

The stock of residential clothes washers is based on SFPUC's housing forecast and the average number of washers per dwelling unit. The average number of washers per dwelling unit is 0.937 for single-family and 0.41 for multi-family. The multi-family estimate includes both in-unit and common room washers. Existing washers are replaced at an annual rate of 9%, which is equivalent to assuming washers have an average useful life of 11 years, which is consistent with industry estimates. When a washer is replaced, it is replaced with either a conventional or high-efficiency (Energy Star) washer according to a forecast of market shares informed by market analyses done to support the setting of federal efficiency standards for washers. Water factors for new conventional and high-efficiency washers change over time in the model. Water factors for conventional washers are based on federal energy standards while water factors for high-efficiency washers are based on EPA Energy Star specifications. The average water factor for the stock of residential washers adjusts over the course of the forecast based upon the rate at which existing washers are replaced and new washers are added to the inventory. The model's accuracy in predicting water use by clothes washers is checked against water use benchmarks for 1997, 2007, and 2012 taken from residential end use studies. Washer utilization in single-family households is drawn from the San Francisco End Use of Water Study. Washer utilization in multi-family households scales down the single-family estimate to account for smaller average household size. Water savings are calculated relative to 2005 and are equal to the difference in water use assuming average washer efficiency in 2005 versus average washer efficiency in the forecast year.

Coin-op Clothes Washers

Estimates of passive water savings for coin-op clothes washers use the same methodology used for residential clothes washers. The natural replacement rate for coin-op washers is the average of estimates developed by the Alliance for Water Efficiency (11.1%) and the Department of Energy (13.3%). The stock of coin-op clothes washers is based on an internet search of coin-op washer facilities in San Francisco. The average number of washers per coin-op facility is taken from the Fixture Saturation Task Memo. The average number of loads per day is taken from a PG&E study of coin-op washer water and energy consumption. The water factors for new and replaced washers are based on existing federal efficiency regulations for commercial clothes washers.

Calculation of Programmatic Water Savings

The Conservation Tracking Model calculates the water savings associated with a program as the product of the estimated water savings per unit of activity and the amount of activity completed. These savings are commonly referred to as active water savings because they result from the utility's direct investment in conservation programs intended to reduce demand. In other words, the savings result from the utility's active pursuit of demand reduction.

In the Tracking Model, the user specifies a starting unit water savings for each program. The behavior and duration of the unit savings overtime can then be adjusted with the useful life, annual decay, and plumbing code interaction parameters. When the annual decay and plumbing code interaction parameters are both set to 0, annual savings is equal to the product of the initial unit savings and the amount of activity. Annual savings accrue until the measure's useful life is reached, after which annual savings are assumed to be zero. Thus given initial unit savings S_0, measure useful life u, and activity of A_s in year s, water savings in any year t ≥ s are:

$$S_t = A_s S_0 \; if \; t - s + 1 \leq u, 0 \; otherwise$$

When the annual decay parameter takes a value d in the range (0, 1], annual water savings in any year t ≥ s are:

$$S_t = A_s S_0 (1-d)^{t-s} \; if \; t-s+1 \leq u, 0 \; otherwise$$

When the plumbing code interaction parameter takes a value p in the range (0, 1] and the plumbing code is in effect for any year t ≥ v, annual water savings in any year t ≥ s are:

$$S_t = \begin{cases} A_s S_0 \; if \; u \geq t-s+1 \; and \; t < v \\ A_s (1-p)^{t-s} S_0 \; if \; t-s+1 \leq u \; and \; t \geq v \\ 0 \; if \; t-s+1 > u \end{cases}$$

When the plumbing code interaction parameter takes a value p in the range (0, 1], the plumbing code is in effect for any year t ≥ v, and the annual decay parameter takes a value d in the range (0, 1], annual water savings in any year t ≥ s are:

$$S_t = \begin{cases} A_s S_0 (1-d)^{t-s} \; if \; t-s+1 \leq u \; and \; t < v \\ A_s (1-p)^{t-s} S_0 (1-d)^{t-s} \; if \; t-s+1 \leq u \; and \; t \geq v \\ 0 \; if \; \; t-s+1 > u \end{cases}$$

The specification of these parameters are based on current state and federal plumbing codes and appliance standards and findings from empirical evaluations of conservation program performance, as compiled by the California Water Efficiency Partnership (CalWEP) and Alliance for Water Efficiency (AWE). The specific data sources and assumptions used to create the water savings and plumbing code specifications for each program are provided in the remainder of this document.

The model's toilet fixture inventory modules for single- and multi-family toilets also estimate water savings from the City's toilet retrofit-on-resale ordinance that started in 2009. These estimates rest on two simplifying assumptions: (1) 3.5+ gpf toilets are uniformly distributed across the housing stock and (2) each housing unit is equally likely to be put on the market for sale each year. Given these two assumptions, ROR toilet replacements in any year t ≥ 2009 are calculated as:

(Stock of 3.5+ gpf toilets at beginning of year – SFPUC toilet replacements) x housing resale rate

The model assumes ROR toilets are replaced with ULFTs prior to 2014 and HETs thereafter.

Program Water Savings Specifications

The remainder of this document presents the water savings specifications for each conservation measure included in the Conservation Tracking Model. Program specifications are grouped first by customer class and second by programs type.

Confidence in Estimates

The program water savings specifications utilize the best available information on water savings. Only measures with a sufficient level of confidence in the approach to estimating water-savings are included in the Tracking Model. The SFPUC implements a number of measures that are not included in the model that are likely to generate some water savings but for which there are insufficient empirical studies or standard engineering estimates to generate estimates with a reasonable level of confidence. For the measures included in the model there is a range of reliability of savings estimates. While all measures in the tool meet a base level of confidence, for established and widely deployed measures – e.g. toilet replacements -- there is strong empirical evidence on water savings from multiple empirical program evaluations. In other cases, less data is available or the program is so new that empirical performance data is limited or nonexistent. In these cases, the water savings estimates may be based on results of a single evaluation done elsewhere or they may be built up from utilization and flow rate assumptions – commonly referred to as engineering estimates.

A confidence score of 1, 2 and 3 is assigned to each program specification to indicate the level of confidence in the water savings specification. The confidence scores are subjective in the sense that they rely on professional judgement as to the quality and applicability of the data underlying the water savings specification.

Confidence Score	**Criteria**
1	Savings are based on well-designed empirical evaluations of program performance. The program is widely deployed by other water suppliers and water savings have been evaluated in multiple locations and contexts. Savings estimates are directly applicable or can reasonably be re-scaled to be applicable to SFPUC's service area.
2	Savings are based on simple empirics of program performance (e.g. a simple difference in means or difference-in-differences analysis). The program may not be widely deployed by other water suppliers and may not have been evaluated in multiple locations and contexts.
3	Empirical estimates of program performance are not available or are limited in their applicability to SFPUC's service area. Savings are based on engineering estimates relying on general assumptions about water use with and without the program intervention

Measure Summary Tables

The following tables summarize the measures in the model at the time of this update (August 2020). The tables provides:

- A brief description of each measure

- The unit savings estimate for the measure
- The basis for the estimate
- The expected annual water savings at the planned level of activity
- The confidence score for the water savings estimate

Link to Detailed Specifications
The measure IDs in the summary tables are hyperlinked to the measure's detailed specification. Ctr-clicking the specification ID will take the reader to the measure's detailed specification. Ctr-clicking the ID the detailed specification will take the reader back to the summary table.

Basis for Savings Estimates
The basis for the savings estimate is either:

Empirical Program Evaluations – the savings estimate is based on results from one or more empirical evaluations of water savings for similar programs. The empirical estimate may be adjusted to account for differences between the location(s) where the empirical evaluation was completed and SFPUC's service area. Such adjustments are explained in the measure's detailed specification.

Engineering Estimate – the savings estimate is based on assumptions about fixture/device utilization and the water-using properties of the existing and new fixture/device. Engineering estimates are generally less reliable than estimates based on empirical program evaluations.

Annual Savings Estimates
The annual savings estimates show the expected water savings from one year of planned annual activity. These savings would be expected to persist over the useful life of the measure. Savings for most measures are assumed to be stationary, meaning the model does not assume the savings will change significantly over its useful life. However, this assumption is not adopted for every measure. For example, the model assumes savings from surveys are not constant, but rather decrease with time. The estimates in the summary tables do not reflect these adjustments. Therefore, the estimates should be viewed as upper-bounds for measures whose savings are expected to decrease over time.

Single-Family Measures

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
S1	Mandatory CAP Audit	Free site evaluation required for single-family residents to participate in the SFPUC's Community Assistance Program (CAP) for discounted water and sewer rates. Identify inefficient plumbing fixtures and leaks and suggest improvements.	17.5 gpd	Empirical Program Evaluations	Savings assumed to decay by 20% per year	2
S2	WaterWise Evaluation	Free indoor and outdoor site consultation: review consumption history, check plumbing fixtures and irrigation system components for leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for replacement through rebate programs, and provide standard repair parts for faulty toilets and free water-saving devices and materials. Customized report of findings sent to customer after visit.	17.5 gpd	Empirical Program Evaluations	Savings assumed to decay by 20% per year	2
S3a	Leak Alerts	SFPUC uses its AMI data to flag accounts that trigger continuous usage thresholds and alerts customers if a leak is suspected. SFPUC provides alerted customers with information on how to check for and repair common leaks	0.56 gpd	Empirical Program Evaluations	Unit savings is per active Single-Family account	1
S3b	Custom Water Use Report	Report with customers' water use information, comparison of water to similar properties, and customized information on ways to save.	8.4 gpd	Empirical Program Evaluations	Multiple empirical evaluations have found home water reports reduce water use by 5-6%. The model assumes 5.5%.	1
S4	1.5 GPM Showerhead Distribution	Up to two free showerheads (as part of measure S2 or in-person pickup from SFPUC) per household.	6.8 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed	2

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
					in 2018. Assumes 54% installation rate	
S5	1.5 GPM Showerhead Direct Install	Provides free installation of 1.5 gpm showerheads to single family residents. WaterWise Evaluation (S2) is a pre-requisite to this measure.	12.6 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018	1
S6	HET Rebate	Cash rebates of up to $125 to replace old toilets (3.5 gpf or more) with approved HETs (1.28 gpf or less).	20.9 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Direct install savings reduced by 25% to account for rebates used to replace ULF toilets and program free-riders. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	2
S7	CAP Direct Install thru SFPUC Funding	Free installation of HETs (1.28 gpf) for single-family residents who are also CAP participants. Only 3.5 gpf toilets replaced except a small number of old, poorly performing 1.6s. **Pre-requisite:** Mandatory CAP Audits (Measure S1).	27.8 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Program replaced existing toilets rated >= 1.6 gpf	1

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
					with toilets rated <= 1.0 gpf.	
S8	HET Direct Install (Non-CAP)	Same as measure S7 but is open to single-family residents who are not a CAP participant. Program did not start until 2016	27.8 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	1
S8b	HET Direct Install (Non-CAP, replacing 1.6 gpf toilets)	Same measure as S8 but targets replacement of 1.6 gpf toilets	6.7 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3
S9	HET Voucher	A voucher issued to eligible residents to replace their older toilets with HETs.	20.9 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Direct install savings reduced by 25% to account for rebates used to replace ULF toilets and program free-riders. Program replaced existing toilets rated >= 1.6 gpf	2

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
					with toilets rated <= 1.0 gpf.	
S11	CEE Tier 3 Washer Rebate (IWF 4.0)	Up to $100 rebate from SFPUC and $50 rebate from PG&E for a combined $150 rebate for a washer with 4 IWF or lower.	10.2 gpd	Engineering Estimate	Engineering estimate based on limited data on clothes washer market shares	3
S12	Energy Star Most Efficient Washer Rebate (IWF 3.5)	Up to $100 rebate from SFPUC and $50 rebate from PG&E for a combined $150 rebate for a washer with 3.5 IWF or lower.	11.6 gpd	Engineering Estimate	Engineering estimate based on limited data on clothes washer market shares	3
S16a	Rain Barrel Discount (replaced by S16c)	Subsidy program (through a vendor) that discounts the purchase cost of rain barrel and provides training.	0.8 gpd	Engineering Estimate	60 gal capacity. Estimated with AWE Rain Barrel Harvest & Application Model	3
S16b	Rain Cistern Discount (replaced by S16d)	Subsidy program (through a vendor) that discounts the purchase cost of cisterns and provides training.	2.4 gpd	Engineering Estimate	205 gal capacity. Estimated with AWE Rain Barrel Harvest & Application Model	3
S16c	Rain Barrel Rebate	In-house administered rebate program with required proof of install.	0.8 gpd	Engineering Estimate	60 gal capacity. Estimated with AWE Rain Barrel Harvest & Application Model	3
S16d	Cistern Rebate	In-house administered rebate program with required proof of install.	2.4 gpd	Engineering Estimate	205 gal capacity. Estimated with AWE Rain Barrel Harvest & Application Model	3

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
S18	Weather-Based Irrigation Controller Rebate	Financial rebate towards purchase and installation of a weather-based irrigation controller that uses site specific data and adjusts the irrigation time depending on the local weather.	3.7 gpd	Empirical Program Evaluations	Estimate is based on review of empirical evaluations of WBIC savings in Southern and Northern CA	2
S20	Device Distribution	Various water-efficient fixtures: bathroom aerators (0.5/1.0/1.5 gpm), kitchen/bathroom laminar (1.5 gpm), kitchen aerators (1.5/2.2 gpm), utility aerators (1.5/2.0/2.2), pre-rinse spray nozzles, garden spray hose nozzles, toilet flappers, toilet fill valves, and soil moisture meters.	3.3 gpd	Engineering Estimate	Based on review of end use studies and engineering estimates of savings potential of aerators and other devices	3
S21	ULFT to Ultra-High-Efficiency Toilet Direct Install	Same as S8 but targeting replacement of 1.6 gpf toilets.	6.7 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3
S22	ULFT to Ultra-High-Efficiency Toilet Rebate	Same as S6 but targeting replacement of 1.6 gpf toilets.	5.0 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3

Multi-Family Measures

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
M1	WaterWise Direct Installation Evaluation	Free, required site evaluation for multi-family residents to participate in the SFPUC's HET/Urinal Direct Install Program). Identify inefficient plumbing fixtures and leaks and suggest improvements.	10.6 gpd	Empirical Program Evaluations	Equal to indoor savings for S1 and S2. Savings assumed to decay by 20% per year	2
M2	WaterWise Evaluation	Free site consultation: review consumption history, check toilets for leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for replacement through rebate programs, provide standard repair parts for faulty toilets and free water-saving devices and materials.	10.6 gpd	Empirical Program Evaluations	Equal to indoor savings for S1 and S2. Savings assumed to decay by 20% per year	2
M3a	Small Multi-Family Leak Alert	SFPUC uses its AMI data to flag 2-5 dwelling unit multi-family accounts that trigger continuous usage thresholds and alerts customers if a leak is suspected. SFPUC provides alerted customers with information on how to check for and repair common leaks	1.6 gpd	Empirical Program Evaluations	Unit savings applies to all Multi-Family customers with 2-5 dwelling units	1
M3b	Large Multi-Family Leak Alert	Same as M3a but targeting multi-family accounts with more than 5 units	0.0 gpd	Empirical Program Evaluations	Savings not statistically different from 0 in program evaluation	1
M4	Showerhead Distribution	Buildings with 10 or less units are limited to one showerhead per unit. These buildings can pick up showerheads at the customer service counter. Also includes buildings that receive showerheads that are not installed during a Water Wise Evaluation. Buildings with over 10 units must schedule a WaterWise Evaluation (measure M2) in order to receive the free devices	6.8 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Assumes 54% installation rate	2
M5	Showerhead Direct Install	Free installation of showerheads. **Pre-requisite:** WaterWise Direct Install Evaluations (Measure M1)	12.6 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit	1

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
					programs completed in 2018	
M6a M6b	HET Rebate	Cash rebates of up to $125 per tank-style HET or up to $300 per flushometer valve HET to replace a high-flow toilet (3.5 gpf or more).	30 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Direct install savings reduced by 25% to account for rebates used to replace ULF toilets and program free-riders. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	2
M7a M7b	HET Direct Install	Free installation of tank-style (T) or flushometer valve (F) HETs. **Pre-requisite:** WaterWise Direct Install Evaluation (Measure M1)	38.6 gpd 38.6 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	1
M7c	HET Direct Install (replacing 1.6 gpf toilets)	Same as M7 but targeting replacement of 1.6 gpf toilets	9.3 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
M8	HET Voucher	A voucher issued to eligible residents to replace their older toilets with HETs	30 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Direct install savings reduced by 25% to account for rebates used to replace ULF toilets and program free-riders. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	2
M9	HET Install thru On-Bill Financing	Partner with third-party vendors to find customers with remaining savings opportunity, sell them the program, and conduct the installation. The customer pays for the program through savings received through their water bill.	38.6 gpd	Empirical Program Evaluations	Based on empirical evaluation of bathroom retrofit programs completed in 2018. Program replaced existing toilets rated >= 1.6 gpf with toilets rated <= 1.0 gpf.	1
M10	CEE Tier 3 Washer Rebate (IWF 4.0)	Rebate for coin-op, common area clothes washer with IWF of 4 or lower. (multi-family in-unit residential style washers are covered under SF measure)	126 gpd	Engineering Estimate	Engineering estimate based on limited data on clothes washer market shares	3

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
M17	Efficient Irrigation Timer Rebate	Financial rebate towards purchase and installation of a weather-based irrigation controller that uses site specific data and adjusts the irrigation time depending on the local weather.	3.7 gpd	Empirical Program Evaluations	Savings assumed to be same as single-family program (S18)	2
M20	Device Distribution	Various water-efficient fixtures: bathroom aerators (0.5/1.0/1.5 gpm), kitchen/bathroom laminar (1.5 gpm), kitchen aerators (1.5/2.2 gpm), utility aerators (1.5/2.0/2.2), pre-rinse spray nozzles, garden spray hose nozzles, toilet flappers, toilet fill valves, and soil moisture meters.	3.3 gpd	Engineering Estimate	Based on review of end use studies and engineering estimates of savings potential of aerators and other devices	3
M21	ULFT to Ultra-High-Efficiency Toilet Direct Install	Same as M7 but targeting replacement of 1.6 gpf toilets.	9.3 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3
M22	ULFT to Ultra-High-Efficiency Toilet Rebate	Same as M6 but targeting replacement of 1.6 gpf toilets.	6.9 gpd	Engineering Estimate	Estimate prepared by SFPUC Staff	3

Non-Residential Measures

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
N1	WaterWise Evaluations for Commercial Buildings	Free site consultation: review consumption history, check toilets for leaks, determine fixture flow rates, recommend improvements, identify fixtures eligible for replacement through incentive programs, provide standard repair parts for faulty toilets and free water-saving devices and materials. Customized report of findings sent after visit.	215 gpd	Empirical Program Evaluations	Based on empirical evaluations of CII surveys done in Southern California in the 1990s	3
N2	Commercial Direct Install Audits	Free site consultation similar to measure N1. Required for commercial buildings that applied for direct install programs.	215 gpd	Empirical Program Evaluations	Based on empirical evaluations of CII surveys done in Southern California in the 1990s	3
N3a N3b N3c	Surveys – Hospitals, Hotels, Schools	Free site consultation for hospitals, hotels, and schools	4643 gpd 993 gpd 256 gpd	Empirical Program Evaluations	Based on empirical evaluations of CII surveys done in Southern California in the 1990s	3
N4	Surveys – Large Landscape by Contractors	Free landscape survey provided to eligible customers (0.5 acres or more of irrigated landscapes) under the Landscape Technical Assistance Program. Survey will evaluate the water delivery system to check for inefficiencies that lead to water losses, Surveyors will also determine the site's water budget by cataloguing plant type and will create site-specific recommendations and a cost estimate for improving irrigation efficiency.	161 gpd	Engineering Estimate	Unit savings per acre surveyed. Assumes 10% reduction in average landscape site water use of 1.8 AF/Acre	3

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
N5	Surveys – CII Facilities by Contractors	Free site consultation for other types of non-residential customers provided by third-party consultant or other funding sources.	5120 gpd	Engineering Estimate	SFPUC staff estimate of water savings from consultant audits	2
N6	Landscape Leak Alert	SFPUC uses its AMI data to flag landscape accounts that trigger continuous usage thresholds and alerts customers if a leak is suspected. SFPUC provides alerted customers with information on how to check for and repair common leaks	28.2 gpd	Empirical Program Evaluations		1
N7	1.5 GPM Showerhead Giveaway	Provides free, high-efficiency 1.5 gpm showerheads for San Francisco businesses.	5.6 gpd	Engineering Estimate	Based on review of hotel end use studies and engineering estimates of hotel showerhead savings potential. Assumes 54% installation rate	3
N8	1.5 GPM Showerhead Direct Install	Free installation of high-efficiency 1.5 gpm showerheads for San Francisco businesses. **Pre-requisite:** Direct Install Audit (Measure N2)	10.4 gpd	Engineering Estimate	Based on review of hotel end use studies and engineering estimates of hotel showerhead savings potential.	3
N9	Device Distribution	Various water-efficient fixtures: bathroom aerators (0.5/1.0/1.5 gpm), kitchen/bathroom laminar (1.5 gpm), kitchen aerators (1.5/2.2 gpm), utility aerators (1.5/2.0/2.2), pre-rinse spray nozzles, garden spray hose nozzles, toilet flappers, toilet fill valves, and soil moisture meters.	3.3 gpd	Engineering Estimate	Based on review of end use studies and engineering estimates of savings potential of aerators and other devices	3
N10a N10b	HET Rebate	Cash rebates of up to $125 per tank style toilet and up to $300 per flushometer valve toilet for replacing	28.4 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up	2

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
		high-flow toilets (3.5 gpf or more) with approved HET models (1.28 gpf or less).			ULFT savings to account for improved efficiency of HET	
N11a N11b N11c N11d N11e N11f	HET Rebate – Schools, Hotels, Muni	Cash rebates of up to $125 per tank style toilet and up to $300 per flushometer valve toilet for replacing high-flow toilets (3.5 gpf or more) with approved HET models (1.28 gpf or less).	20.6 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2
N12a N12b	HET Direct Install	Free installation of High-Efficiency Toilets for businesses in SF **Pre-requisite:** Direct Install Audit (Measure N2)	29 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2
N13	HET Direct Install – Schools, Hotels	Free installation of HETs for schools or hotels in SF. **Pre-requisite:** Direct Install Audit (Measure N2)	19.6 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2
N14	HET Voucher	A voucher for HET purchase.	28.4 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
N15	HET Voucher – Schools, Hotels	Same as N14 but directed at schools and hotels	17.8 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2
N16	HET Install thru On-Bill Financing	Partner with third-party vendors to find customers with savings opportunity, sell them the program, and conduct the installation. The customer pays for the program through savings received through their water bill.	29 gpd	Empirical Program Evaluations	Based on CUWCC CII Toilet Savings Study. Estimate scales-up ULFT savings to account for improved efficiency of HET	2
N17a N17b	HEU Rebate	Cash rebates of up to $300 per urinal for eligible commercial businesses when high flow urinals (1.5 gpf or more) are replaced with High-Efficiency Urinal (HEU) models that are 0.125 gpf or less.	16.2 gpd	Empirical Program Evaluations	Based on CUWCC Urinal Savings Potential PBMP Study	3
N18	HEU Direct Install	A program for replacing 1.5 gallons per flush (gpf) high efficiency urinals with pint flush urinals.	16.2 gpd	Engineering Estimate	Based on CUWCC Urinal Savings Potential PBMP Study	3
N20	Energy Star Washer Rebate (IWF 4.5)	Measure has been discontinued. Cash rebates for commercial high-efficiency clothes washers with a water factor of 4.5 or below.	39 gpd	Engineering Estimate	Engineering estimate based on limited data on clothes washer market shares and coin-op washer utilization rates	3
N21	Energy Star Washer Rebate (IWF 4)	Cash rebates of up to $200 for commercial high-efficiency clothes washers with a water factor of 4.0 or below. For any business where 10 or more washers are being installed, a pre-purchase inspection must be scheduled.	45 gpd	Engineering Estimate	Engineering estimate based on limited data on clothes washer market shares and	3

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
					coin-op washer utilization rates	
N22a	Landscape Grants (pre 2020)	Under Landscape Grant Program, landscapes with over 0.5 acre of irrigated areas are eligible to receive funding to implement retrofits and install fixtures to facilitate water conservation.	179 gpd/acre	Empirical Program Evaluations	Based on SFPUC staff estimates of water savings for 11 large landscape grant projects	2
N22b	Landscape Grants (post 2020)	Under Landscape Grant Program, landscapes with 10,000 sf to 0.5 acre or more of irrigated areas are eligible to receive funding to implement retrofits and install fixtures to facilitate water conservation.	179 gpd/acre	Empirical Program Evaluations	Assumed same as N22a	2
N24	Equipment Retrofit Rebates - Unmetered/Estimated	Incentives to businesses to upgrade indoor equipment. Projects must achieve an annual water savings of 100 ccf or more to qualify. SFPUC will provide qualifying projects incentives of $0.50 per ccf over a 10-year lifespan up to 50% of the equipment costs. Program includes customized incentives as well as standard incentives for equipment with predictable water savings, such as water efficient ice machines, and connectionless food steamers.	2.0	Engineering Estimate	Annual activity entered in units of ccf/yr.	1
N25a	Custom Equipment Retrofit Rebates – Metered (Pre-2025)	Similar to Measure N24, but allows applicants to create customized project tailored toward their specific business needs and water use patterns.	2.0	Engineering Estimate	Annual activity entered in units of ccf/yr.	1
N25b	Custom Equipment Retrofit Rebates – Metered (2025+)	Same as N25a, but with larger incentive cost.	2.0	Engineering Estimate	Annual activity entered in units of ccf/yr.	1
N26	Non-Residential Leak Alert	SFPUC uses its AMI data to flag non-residential accounts that trigger continuous usage thresholds and alerts customers if a leak is suspected. SFPUC provides alerted customers with information on how to check for and repair common leaks	5.0 gpd	Empirical Program Evaluations		1

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Basis for Savings Estimate	Notes on Savings Estimate	Water Savings Estimate Confidence Score
N27	Kitchen Low Flow Spray Valves	Rebate or giveaway of high-efficiency kitchen spray valves used primarily by dishwashing stations	30 gpd	Empirical Program Evaluations	Based on multiple empirical evaluations of savings from kitchen spray-valve retrofits. Estimate assumes 50% installation/retention rate	1
N29	Efficient Irrigation Timer Rebate	Financial rebate towards purchase and installation of a weather-based irrigation controller that uses site specific data and adjusts the irrigation time depending on the local weather.	13.4 gpd	Empirical Program Evaluations	Lower-bound of 95% CI of average savings per station, per A&N Technical's 2011 WBIC savings evaluation. Lower-bound is used because of San Francisco's climate and lower landscape water use.	2
N30	ULFT to Ultra-High-Efficiency Toilet Rebate	Cash rebates to replace tank and flushometer style toilets and up to $300 per flushometer valve toilet. Similar to N10 but targets replacement of 1.6 gpf toilets	7.0 gpd	Engineering Estimate	Estimate prepared by SFPUC	3

Measures Applicable to All Customers

ID	Measure Name	Measure Description	Expected Unit Water Savings (GPD)	Notes on Savings Estimate	Water Savings Estimate Confidence Score
A3	Irrigation Customer Large Landscape Budget (Discontinued)	The SFPUC calculates how water use for irrigated landscape sites that received an irrigation or landscape grant or were required to comply with San Francisco's Water Efficient Irrigation Ordinance (WEIO) compares to the maximum allowable water use (MAWA) recommended for the plant types per state calculations. Staff are exploring how to potentially expand the program to all sites served by dedicated irrigation meters	357 gpd	Unit savings per acre surveyed. Assumes 10% reduction in average pre-grant water use of 4 AF/Acre for 9 large landscapes enrolled in SFPUC landscape grant program	3
A4a	Municipal Large Landscape Budget	This measure is for informational/educational monthly water budget reports sent to dedicated irrigation account customers. The monthly water budget report indicates how their water use for the previous month (and all prior months in the year) compares with the estimated amount allotted for their site based on the state MAWA calculation, divided by month and factoring in precipitation. Prior to 2025, the SFPUC provided these reports only to dedicated irrigation customers that had received an irrigation meter or landscape grant from the SFPUC.	48 gpd	Assumes 10% reduction in average pre-budget water use of 0.54 AF/Ac	3
A4b	Non-Municipal Large Landscape Budget	This measure is for informational/educational monthly water budget reports sent to dedicated irrigation account customers. The monthly water budget report indicates how their water use for the previous month (and all prior months in the year) compares with the estimated amount allotted for their site based on the state MAWA calculation, divided by month and factoring in precipitation. Prior to 2025, the SFPUC provided these reports only to dedicated irrigation customers that had received an irrigation meter or landscape grant from the SFPUC.	236	Assumes 10% reduction in average pre-budget water use of 2.64 AF/Ac	3

Measure Specifications

This section contains the water savings specification for each measure used in the conservation savings model. The specifications are grouped by customer class: (1) single-family, (2) multi-family, and (3) non-residential.

Single Family Measures

ID	Name	Class	Category
S1	Mandatory CAP Audit	Single Family	Audits & Reports

Water Savings: Average of savings from residential survey savings reported by Whitcomb (2000), A&N Technical Services (1994b), and Chesnutt, et al. (1995) is 33.9 gpd. Whitcomb (2000) reported 60% of savings are from outdoor uses and 40% are from indoor uses. Single family irrigation area in SFPUC retail service is approximately 34% of state average reported by DeOreo and Mayer (2010). Estimate based on combination of behavioral and fixture retrofits induced by survey recommendations. Savings from showerheads removed from indoor component to avoid double counting savings from S11 and S12. The 3 gpd estimate for showerheads assumes half the site visits get a direct install showerhead and half get a showerhead left for owner-installation, in which 50% are installed.

Water savings = (0.4 x 33.9 gpd – 3 gpd) + 0.6 x 0.34 x 33.9 gpd = 17.5 gpd (6,388 gpy)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: 20%. Lower-end of decay rate range reported in CUWCC (2005).

Useful Life: 5 yrs. Based on typical useful life of survey savings reported in CUWCC (2005).

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year, 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 0.42 x (0.4 x 33.9 gpd – 3 gpd) + 0.8 x 0.6 x 0.34 x 33.9 gpd)/17.5 = 57%

Unit Sewer Savings: Sewer savings = 0.4 x 33.9 gpd – 3 gpd = 10.6 gpd (3,869 gpy)
Wastewater to water savings ratio = 0.606

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that half of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 66% of total survey savings.

Gas savings = 0.0072 therms/gal x 0.67 x 0.5 x 0.66 = 0.0016 therms/gal

Confidence Score: 2

ID	Name	Class	Category
S2	WaterWise Evaluations	Single Family	Audits & Reports

All assumptions same as S1.

ID	Name	Class	Category
S3a	Leak Alerts	Single Family	Audits & Reports

Water Savings: Detailed empirical analysis of SFPUC's Single-Family Customer Leak Alert Program concluded:

- The Program reduced the mean duration of leak events lasting 72 or more hours by 32.6 hours, from 58 to 25.4 hours.
- The Program reduced the frequency of leak events lasting 72 or more hours from 0.194 to 0.113 leaks per meter-year.
- The Program reduced mean leakage volume from 437.1 to 233.7 gallons per meter-year, or by about 203 gallons per meter-year.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: We assume the same savings pattern as S1 and S2 – where outdoor savings comprise 34% of total savings and 80% of outdoor savings occur in the peak period.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 0.42 x 0.66 + 0.8 x 0.34 = 55%

Unit Sewer Savings: We do not have data on how leakage is distributed between indoor and outdoor water uses. We assume the same distribution as indoor and outdoor water use.
Sewer savings = 0.66 x 203 gpy per meter = 134 gpy per meter
Wastewater to water savings ratio = 0.66

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
S3b	Custom Water Use Report	Single Family	Audits & Reports

Water Savings: Average water savings are 5.5% of single family daily use, per Mitchell and Chesnutt (2014). Multiple other empirical estimates of water use report savings have measured average saving rates of 4-6% (https://www.watersmart.com/resources/). Median single family water use in SFPUC's retail service area (circa 2005) is 153 gpd, per DeOreo and Mayer (2010a).

Water savings = 0.055 x 153 gpd = 8.4 gpd (3,066 gpy)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: Evaluations of water use reports have not had sufficient data to detect seasonal effects (Mitchell and Chesnutt, 2014). For now we assume the same savings pattern as S1 and S2 – where outdoor savings comprise 34% of total savings and 80% of outdoor savings occur in the peak period.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = (0.42 x 0.66 x 8.4 gpd + 0.8 x 0.34 x 8.4 gpd) ÷ 8.4 = 55%

Unit Sewer Savings: Evaluations of water use reports have not had sufficient data to determine indoor and outdoor savings as a share of total (Mitchell and Chesnutt, 2014). For now we assume the same savings pattern as S1 and S2 – where indoor savings comprise 66% of total savings

Sewer savings = 0.606 x 8.4 gpd = 5.09 gpd (1,858 gpy)
Wastewater to water savings ratio = 0.606

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that half of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 66% of total savings.

Gas savings = 0.0072 therms/gal x 0.67 x 0.5 x 0.66 = 0.0016 therms/gal

Confidence Score: 1

ID	Name	Class	Category
S4	1.5 GPM Showerheads Distributions	Single Family	HESH

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Mean savings for showerheads installed in single-family households was 12.6 gpd. Field studies of retrofit kit distributions in Irvine (A&N Technical Services 1992d) and Los Angeles (A&N Technical Services 1991) have found initial installation probabilities that range from 49% to 59%. We assume a 54% installation probability.

Water savings = 0.54 x 12.6 gpd = 6.8 gpd (2482 gpy)

Plumbing Code Savings: Zero. SB 407 mandates showerheads have a maximum capacity of 2.5 gpm. Currently, the average flow rate of showerheads in SFPUC's retail service area is 1.95, per DeOreo and Mayer (2010a).

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 8 yrs, per Alliance for Water Efficiency (2014).

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 6.8 gpd (2482 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006) and that hot water comprises 67% of shower/faucet flow - average of DOE (2006) and Aquacraft (1999). Gas savings = 0.0072 therms/gal x 0.67 = 0.0048 therms/gal

Confidence Score: 2

ID	Name	Class	Category
S5	1.5 GPM Showerheads Direct Install	Single Family	HESH

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Mean savings for showerheads installed in single-family households was 12.6 gpd (4599 gpy).

Unit Sewer Savings: Sewer savings = 12.6 gpd (4599 gpy)
Wastewater to water savings ratio = 1.000

All other assumptions same as S4.

Confidence Score: 1

ID	Name	Class	Category
S6	HET Rebates (Tank)	Single Family	HET

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Installed HETs had flush rates of 1.1 gpf or less. Mean savings for HETs installed in single-family households was 27.8 gpd (10147 gpy). Direct installation programs can more effectively screen out the replacement of ULF toilets than can rebate programs. Nearly all the toilets replaced in the direct installation programs evaluated by M.Cubed and A&N Technical Services were older non-ULFT toilets. Rebate programs may inadvertently issue rebates for the replacement of ULF toilets. To account for this possibility, mean daily savings estimated for the direct installation programs is reduced by 25%.

Water savings = 27.8 gpd x 0.75 = 20.9 gpd (7629 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 25 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 20.9 gpd (7629 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
S7	CAP Direct Install thru SFPUC Funding	Single Family	HET

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Installed HETs had flush rates of 1.0 gpf or less. Mean savings for HETs installed in single-family households was 27.8 gpd (10147 gpy).

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 27.8 gpd (10147 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
S8	HET Direct Install (Non-Cap)	Single Family	HET

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Installed HETs had flush rates of 1.0 gpf or less. Mean savings for HETs installed in single-family households was 27.8 gpd (10147 gpy).

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 27.8 gpd (10147 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
S9	HET Vouchers	Single Family	HET

All assumptions same as S6.

ID	Name	Class	Category
S11	CEE Tier 3 Rebate (IWF 4.0)	Single Family	HEW

Water Savings: Assumes participant in market for washer. Without rebate, participant will purchase either top- or front-load washer. Current market share (circa 2012) of top-load washers is 52%, per DOE (2012). Current Energy Star market share (circa 2012) is 50%, per DOE (2012). Maximum allowed IWF for Energy Star washer after 2011 is 6. Maximum allowed IWF for non-Energy Star washer is 9.5, per National Appliance Standard. (National Appliance Standard changes in 2015 to 4.5 IWF for front-load and 8.0 IWF for top-load, and again in 2018 to 6.0 IWF for top-load). Average IWF of new washer is:

Avg IWF of New Washer Without Rebate = 0.5 x 6.0 + 0.5 x 9.5 = 7.75 (note this will overstate avg IWF after 2015 due to nat'l appl stdrd)

Average washer loads per day for single family households in SFPUC retail service area is 0.91, per DeOreo and Mayer (2010a). Average volume of new clothes washer is 3 cubic feet, per DOE (2012).

Water savings = (7.75 – 4.0) x 3 x 0.91 = 10.2 gpd (3,723 gpy)

Plumbing Code Savings: Effective Jan 1, 2015, appliance standard is 4.5 IWF for front-load and 8.0 IWF for top-load. Given current front- and top-load market shares and Energy Star market share, average IWF under appliance standard in 2015 is:

2015 Avg IWF under Nat'l Appl Std = 0.52 x (0.5 x 8.0 + 0.5 x 6.0) + 0.48 x 4.5 = 5.8

Effective Jan 1, 2018, appliance standard is 4.5 IWF for front-load and 6.0 for top-load. Average IWF under appliance standard in 2018 is:

2018 Avg IWF under Nat'l Appl Std = 0.52 x 6.0 + 0.48 x 4.5 = 5.3.

For modeling conservation program benefits, we use the average of these two water factors – 5.6 -- and start the standard in 2015. Plumbing code savings starting in 2015 are:

Plumbing code savings = (7.75 – 5.6) x 3 x 0.91 = 5.9 gpd (2,154)

Plumbing Code NRR: 7.1%. Based on average washer life of 14 years, per DOE (2012).

Annual Decay Rate: NA

Useful Life: 14 years, per DOE (2012)

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 10.2 gpd (3,723 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: 0.0036 KWh/gal. Based on high efficiency washer electricity savings reported in FEMP (2000).

Unit Gas Savings: 0.0035 therms/gal. Based on high efficiency washer gas savings reported in FEMP (2000).

Confidence Score: 3

ID	Name	Class	Category
S12	Energy Star Most Efficient (IWF 3.5) Washer Rebate	Single Family	HEW

Water Savings: See S11 for details.

Water savings = (7.75 – 3.5) x 3 x 0.91 = 11.6 gpd (4,234 gpy)

Unit Sewer Savings: Sewer savings = 11.6 gpd (4,234 gpy)
Wastewater to water savings ratio = 1.000

All other assumptions same as S11.

Confidence Score: 3

ID	Name	Class	Category
S16a, S16b S16c, S16d	Rain Barrels and Cisterns	Single Family, Multi Family, Non-Residential	Grants

Water Savings: Savings based on M.Cubed Rain Barrel Harvest & Application Model (rainbarrel_harvest_and_application_model.xlsx)

60 gal barrel = 302 gpy (assumes 100 sqft irr area)
205 gal cistern = 887 gpy (assumes 300 sqft irr area)

The rain barrel water savings model simulates rain barrel catchment, filling, and application of stored water using daily rainfall and ETO data for the period 2/5/2001 to 10/22/2014. Daily weather data are from the Union City CIMIS weather station. The 60 gallon barrel savings estimate assumes a catchment area of 1000 square feet, irrigation area of 100 square feet, and landscape crop water coefficient (KL) of 0.25. The 205 gallon cistern savings estimate assumes irrigation area is 300 square feet. The other model assumptions are the same. Daily application of stored water is equal to the lesser of daily irrigation requirement and stored water. Daily irrigation requirement in cubic feet is equal to irrigation area x KL x net ETO ÷ 12.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 15 years. Assumed

Peak Period Savings Percent: 24%. Calculated with M.Cubed Rain Barrel Harvest & Application Model for a 100 gal. barrel. Peak period savings % increases with barrel size, since more water can be stored for use in peak season.

Unit Sewer Savings: NA

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
S18	WBIC	Single Family	Grants

Water Savings: Several empirical program evaluations of WBIC performance have been completed since the early 2000s. A good summary of these studies can be found on the Cal WEP website. The following table summarizes findings from these studies.

Study	% Reduction in Outdoor Water Use	% Reduction in Total Household Water Use	Mean Reduction in Gal/Day	Sample Size
Orange County 2001	16-24%	7-10%	37-57	40 SF Homes
Orange County 2004	No estimate	10%	41	97 SF Homes
No & So Cal, 2009	7%	No estimate	58	1,987 SF Homes
Orange County 2010	10%	7%	37	899 SF Homes
Orange County 2011	No estimate	9%	49	70 SF Homes

The mean percentage reduction in outdoor water use estimated by these studies range from 7 to 24%. We are inclined to give more weight to the 2009 and 2010 studies that had large sample sizes. The mean percentage reduction in outdoor water use was 7-10%. We use the lower end of the range to be conservative.

Median single family water use in SFPUC's retail service area (circa 2005) is 153 gpd, per DeOreo and Mayer (2010a). On average, outdoor water use is assumed to be 34% of total water use. Expected WBIC savings are thus: 153 x 0.34 x 0.07 = 3.7 gpd or 1,351 gpy.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 10 years. Assumed

Peak Period Savings Percent: 100% of savings assumed to occur in peak season.

Unit Sewer Savings: NA

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
S20	Device Distribution	Single Family	Grants

Water Savings: Water savings are a quantity-weighted average of devices distributed by SFPUC. The devices, quantity weights, and annual savings are shown in the following table.

Devices	Annual Quantity	Savings (GPY)	
1.5 gpm bathroom aerator	8229	210	
1.0 gpm bathroom aerator	0	361	
0.5 gpm bathroom aerator	1537	511	
1.5 gpm kitchen laminar	0	210	
1.5 gpm bathroom laminar	0	210	
2.2 gpm kitchen aerator	265	0	
1.5 gpm kitchen aerator	4641	210	
1.5 utility aerator	54	210	
2.0 utility aerator	54	60	
2.2 utility aerator	16	0	
Garden spray hose nozzle	295	0	No reliable estimates
Toilet flapper	3603	1212	
Toilet fill valves	1819	1212	Assumed to be same as flapper savings
Soil moisture meter	7	0	No reliable estimates
Total	20520		
Weighted Avg Savings		491	

Annual savings for aerators are based on the following data and assumptions:

- Median SFR faucet use is 29 gpd (source: Aquacraft SFPUC End Use Study).
- An average of 4 faucets per household is assumed.
- Average use per faucet is 7.25 gpd. The calculation assumes uniform faucet usage, which while unlikely to be true is necessary given lack of data on faucet use.
- Aerators reduce free flowing faucet water consumption. It is assumed half of faucet use is for free flowing uses (e.g. brushing teeth or washing vegetables) and half is for fixed volume uses (e.g. filling pots or getting a drink of water). Free flowing faucet use is therefore 3.63 gpd.
- Average faucet flow is assumed to be 2.2 gpm. Therefore, faucets average 1.6 minutes of free flowing use per day.
- It is assumed half of distributed faucets are installed.

Given these assumptions, savings by aerator flow rate are:

Aerator flow rate (gpm)	Avg Use GPD	Potential Savings (GPD)	Install %	Actual Savings (GPD)	Actual Savings (GPY)
2.2	3.63	0.00	50%	0.00	0
2.0	3.30	0.33	50%	0.16	60
1.5	2.47	1.15	50%	0.58	210
1.0	1.65	1.98	50%	0.99	361
0.5	0.82	2.80	50%	1.40	511

Annual savings for flappers and fill valves are based on the following data and assumptions:

- Median SFR leakage rate is 8.3 gpd, per Aquacraft SFPUC End Use Study.
- According to 2004 CUWCC Toilet Flapper Study and 1999 Residential End Use Study most household water leaks can be attributed to toilets. It is assumed toilet leaks account for 80% of the median leakage rate, or 6.64 gpd.
- It is assumed replacing flapper or fill valves will eliminate toilet-related leakage.
- It is assumed half of distributed flappers and fill valves are installed.

Given these assumptions, water savings are 3.32 gpd, or 1212 gpy.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 5 years

Peak Period Savings Percent:

Unit Sewer Savings: Same as water savings

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
S21	ULFT to Ultra-High-Efficiency Toilet Direct Install	Single Family	HET

Water Savings: 6.7 gpd (2446 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 6.7 gpd (2466 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
S22	ULFT to Ultra-High-Efficiency Toilet Rebate	Single Family	HET

Water Savings: 5.0 gpd (1825 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 5.0 gpd (1825 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

Multi Family Measures

ID	Name	Class	Category
M1	WaterWise Direct Install Evaluations	Multi Family	Audits & Reports

Water Savings: Assumes same as indoor share of savings for S1 and S2

Water savings = 10.6 gpd (3,869 gpy)

Plumbing Code NRR: NA

Annual Decay Rate: 20%. Same as S1 and S2. Lower-end of decay rate range reported in CUWCC (2005).

Useful Life: 5 yrs. Same as S1 and S2. Based on typical useful life of survey savings reported in CUWCC (2005).

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 10.6 gpd (3,869 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that half of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 100% of total survey savings.

Gas savings = 0.0072 therms/gal x 0.67 x 0.5 x 1.00 = 0.0024 therms/gal

Confidence Score: 2

ID	Name	Class	Category
M2	WaterWise Evaluations	Multi Family	Audits & Reports

All assumptions same as M1.

ID	Name	Class	Category
M3a	Small Multi-Family Leak Alert	Multi Family	Audits & Reports

Water Savings: Detailed empirical analysis of SFPUC's Multi-Family Customer Leak Alert Program concluded:

- The Program reduced the mean duration of leak events lasting 72 or more hours from 235.7 to 137.0 hours.
- The Program reduced the frequency of leak events lasting 72 or more hours from 0.656 to 0.453 leaks per meter-year.
- The Program reduced the mean leak volume from 1519 to 925.5 gallons per meter-year, or 593.5 gallons per meter-year (1.6 gpd).

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: We assume leaks are more or less distributed uniformly across the year.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Unit Sewer Savings: We do not have data on how leakage is distributed between indoor and outdoor water uses. We assume multi-family water use is dominated by indoor water uses and so too are water savings from leak alerts.
Sewer savings = 0.9 x 593.5 gpy per meter = 534.2 gpy per meter
Wastewater to water savings ratio = 0.9

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
M3b	Large Multi-Family Leak Alert	Multi Family	Audits & Reports

Water Savings: A statistically significant reduction in mean leakage volume between the pre- program and program periods was not detected. Thus, we do not estimate any water savings for the large multi-family leak alert program.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: We assume leaks are more or less distributed uniformly across the year.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Unit Sewer Savings: We do not have data on how leakage is distributed between indoor and outdoor water uses. We assume multi-family water use is dominated by indoor water uses and so too are water savings from leak alerts.
Sewer savings = 0.9 x 0 gpy per meter = 0 gpy per meter
Wastewater to water savings ratio = 0.9

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
M4	Showerheads Distributions	Multi Family	HESH

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Mean savings for showerheads installed in multi-family households was 12.6 gpd. Field studies of retrofit kit distributions in Irvine (A&N Technical Services 1992d) and Los Angeles (A&N Technical Services 1991) have found initial installation probabilities that range from 49% to 59%. We assume a 54% installation probability.

Water savings = 0.54 x 12.6 gpd = 6.8 gpd (2482 gpy)

Plumbing Code Savings: Zero. SB 407 mandates showerheads have a maximum capacity of 2.5 gpm. Currently, the average flow rate of showerheads in SFPUC's retail service area is 1.95, per DeOreo and Mayer (2010a).

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 8 yrs, per Alliance for Water Efficiency (2014).

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 6.8 gpd (2482 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006) and that hot water comprises 67% of shower/faucet flow - average of DOE (2006) and Aquacraft (). Gas savings = 0.0072 therms/gal x 0.67 = 0.0048 therms/gal

Confidence Score: 2

ID	Name	Class	Category
M5	Showerheads Direct Install	Multi Family	HESH

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Mean savings for showerheads installed in multi-family households was 12.6 gpd (4599 gpy).

Unit Sewer Savings: Sewer savings = 12.6 gpd (4599 gpy)

All other assumptions same as M4.

Confidence Score: 1

ID	Name	Class	Category
M6a	HET Rebate (Tank)	Multi Family	HET

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Installed HETs had flush rates of 1.0 gpf or less. Mean savings for HETs installed in multi-family households was 38.6 gpd (14089 gpy). Direct installation programs can more effectively screen out the replacement of ULF toilets than can rebate programs. Nearly all the toilets replaced in the direct installation programs evaluated by M.Cubed and A&N Technical Services were older non-ULFT toilets. Rebate programs may inadvertently issue rebates for the replacement of ULF toilets. To account for this possibility, mean daily savings estimated for the direct installation programs is reduced by 25%.

Water savings = 38.6 gpd x 0.75 = 30.0 gpd (10950 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 30.0 gpd (10950 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
M6b	HET Rebate (Flushometer)	Multi Family	HET

All assumptions same as M6a.

ID	Name	Class	Category
M7a	HET Direct Install (Tank)	Multi Family	HET

Water Savings: M.Cubed and A&N Technical Services (2018a, 2018b) estimated toilet, showerhead, and aerator water savings from direct installation bathroom retrofit programs in Bakersfield, Torrance, and East Los Angeles targeting both single- and multi-family bathrooms. Installed HETs had flush rates of 1.0 gpf or less. Mean savings for HETs installed in multi-family households was 38.6 gpd (14089 gpy).

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 38.6 gpd (14089 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
M7b	HET Direct Install (Flushometer)	Multi Family	HET

All assumptions same as M7a.

ID	Name	Class	Category
M7c	ULFT to Ultra-High-Efficiency Toilet Direct Install	Multi Family	HET

Water Savings: 9.3 gpd (3395 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 9.3 gpd (3395 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
M8	HET Voucher	Multi Family	HET

All assumptions same as M6a.

ID	Name	Class	Category
M9	HET/Fixture Install thru On-Bill Financing	Multi Family	HET

All assumptions same as M7a.

ID	Name	Class	Category
M10	CEE Tier 3 Rebate (IWF 4.0)	Multi Family	HEW

Note that the model has separate measures for M10a and M10b that are distinguished only by differing rebate amounts provided through time.

Water Savings: Assumes rebates are for common area laundry rooms, not individual apartments. Without rebate, participant will purchase either top- or front-load washer. Current market share (circa 2012) of top-load washers is 52%, per DOE (2012). Current Energy Star market share (circa 2012) is 50%, per DOE (2012). Maximum allowed IWF for Energy Star washer after 2011 is 6. Maximum allowed IWF for non-Energy Star washer is 9.5, per National Appliance Standard. (National Appliance Standard changes in 2015 to 4.5 IWF for front-load and 8.0 IWF for top-load, and again in 2018 to 6.0 IWF for top-load). Average IWF of new washer is:

Avg IWF of New Washer Without Rebate = 0.5 x 6.0 + 0.5 x 9.5 = 7.75 (note this will overstate avg IWF after 2015 due to nat'l appl stdrd)

Average washer loads per day is 8.4, per M.Cubed (2014). Average volume of new clothes washer for common area use is assumed to be 4 cubic feet.

Water savings = (7.75 – 4.0) x 4 x 8.4 = 126 gpd (45,990 gpy) [Get energy star commercial list]

Plumbing Code Savings: Effective Jan 1, 2015, appliance standard is 4.5 IWF for front-load and 8.0 IWF for top-load. Given current front- and top-load market shares and Energy Star market share, average IWF under appliance standard in 2015 is:

2015 Avg IWF under Nat'l Appl Std = 0.52 x (0.5 x 8.0 + 0.5 x 6.0) + 0.48 x 4.5 = 5.8

Effective Jan 1, 2018, appliance standard is 4.5 IWF for front-load and 6.0 for top-load. Average IWF under appliance standard in 2018 is:

2018 Avg IWF under Nat'l Appl Std = 0.52 x 6.0 + 0.48 x 4.5 = 5.3.

For modeling conservation program benefits, we use the average of these two water factors – 5.6 -- and start the standard in 2015. Plumbing code savings starting in 2015 are:

Plumbing code savings = (7.75 – 5.6) x 4 x 8.4 = 72 gpd (26,280)

Plumbing Code NRR: 7.1%. Based on average washer life of 14 years, per DOE (2012).

Annual Decay Rate: NA

Useful Life: 14 years, per DOE (2012)

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 126 gpd (45,990 gpy)

Wastewater to water savings ratio = 1.000

Unit Electricity Savings: 0.0036 KWh/gal. Based on high efficiency washer electricity savings reported in FEMP (2000).

Unit Gas Savings: 0.0035 therms/gal. Based on high efficiency washer gas savings reported in FEMP (2000).

Confidence Score: 3

ID	Name	Class	Category
M17	Efficient Irrigation Timer Rebate	Multi Family	HET

All assumptions same as S18.

ID	Name	Class	Category
M20	Device Distribution	Multi Family	Grants

Water Savings: Water savings are a quantity-weighted average of devices distributed by SFPUC. The devices, quantity weights, and annual savings are shown in the following table.

Devices	Annual Quantity	Savings (GPY)	
1.5 gpm bathroom aerator	8229	210	
1.0 gpm bathroom aerator	0	361	
0.5 gpm bathroom aerator	1537	511	
1.5 gpm kitchen laminar	0	210	
1.5 gpm bathroom laminar	0	210	
2.2 gpm kitchen aerator	265	0	
1.5 gpm kitchen aerator	4641	210	
1.5 utility aerator	54	210	
2.0 utility aerator	54	60	
2.2 utility aerator	16	0	
Garden spray hose nozzle	295	0	No reliable estimates
Toilet flapper	3603	1212	
Toilet fill valves	1819	1212	Assumed to be same as flapper savings
Soil moisture meter	7	0	No reliable estimates
Total	20520		
Weighted Avg Savings		491	

Annual savings for aerators are based on the following data and assumptions:

- Median SFR faucet use is 29 gpd (source: Aquacraft SFPUC End Use Study).
- An average of 4 faucets per household is assumed.
- Average use per faucet is 7.25 gpd. The calculation assumes uniform faucet usage, which while unlikely to be true is necessary given lack of data on faucet use.
- Aerators reduce free flowing faucet water consumption. It is assumed half of faucet use is for free flowing uses (e.g. brushing teeth or washing vegetables) and half is for fixed volume uses (e.g. filling pots or getting a drink of water). Free flowing faucet use is therefore 3.63 gpd.
- Average faucet flow is assumed to be 2.2 gpm. Therefore, faucets average 1.6 minutes of free flowing use per day.
- It is assumed half of distributed faucets are installed.

Given these assumptions, savings by aerator flow rate are:

Aerator flow rate (gpm)	Avg Use GPD	Potential Savings (GPD)	Install %	Actual Savings (GPD)	Actual Savings (GPY)
2.2	3.63	0.00	50%	0.00	0
2.0	3.30	0.33	50%	0.16	60
1.5	2.47	1.15	50%	0.58	210
1.0	1.65	1.98	50%	0.99	361
0.5	0.82	2.80	50%	1.40	511

Annual savings for flappers and fill valves are based on the following data and assumptions:

- Median SFR leakage rate is 8.3 gpd, per Aquacraft SFPUC End Use Study.
- According to 2004 CUWCC Toilet Flapper Study and 1999 Residential End Use Study most household water leaks can be attributed to toilets. It is assumed toilet leaks account for 80% of the median leakage rate, or 6.64 gpd.
- It is assumed replacing flapper or fill valves will eliminate toilet-related leakage.
- It is assumed half of distributed flappers and fill valves are installed.

Given these assumptions, water savings are 3.32 gpd, or 1212 gpy.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 5 years

Peak Period Savings Percent:

Unit Sewer Savings: Same as water savings

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
M21	ULFT to Ultra-High-Efficiency Toilet Direct Install	Multi Family	HET

Water Savings: 9.3 gpd (3395 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 9.3 gpd (3395 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
M22	ULFT to Ultra-High-Efficiency Toilet Rebate	Multi Family	HET

Water Savings: 6.9 gpd (2519 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 6.9 gpd (2519 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

Non Residential Measures

ID	Name	Class	Category
N1	WaterWise Evaluations for Commercial Buildings	Non Residential	Audits & Reports

Water Savings: Assumes basic analyst or staff evaluations identify an average of 20% potential water savings per site, per CUWCC (2005). For calculating water savings, we assume 50% of potential savings are realized. Average realized water savings is therefore 10% of site use, which matches the assumption used by the SFPUC Retail Demand Model. Average water use per site (circa 2014) is 2,154 gpd, per SFPUC Retail Demand Model.

Water savings = 0.2 x 0.5 x 2,154 gpd = 215 gpd (78,475 gpy)

(NOTE: A higher estimate is warranted if SFPUC targets sites with higher than average use.)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA. No savings persistence data reported in CUWCC (2005).

Useful Life: No savings persistence data reported in CUWCC (2005). We assume same average life as S1 – 5 years.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year, 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days. Assumes 18% of savings are irrigation-related, per CUWCC (2005).

Peak % = (0.42 x 0.82 x 215 gpd + 0.8 x 0.18 x 215 gpd)/215 gpd = 49%

Unit Sewer Savings: Sewer savings = 0.82 x 215 gpd = 176 gpd (64,240 gpy)
Wastewater to water savings ratio = 0.820

Unit Electricity Savings: NA. No data on electricity savings

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that one-quarter of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 82% of total survey savings. Gas savings = 0.0072 therms/gal x 0.67 x 0.25 x 0.82 = 0.001 therms/gal

Confidence Score: 3

ID	Name	Class	Category
N2	Commercial Direct Install Audits	Non Residential	Audits & Reports

All assumptions same as N1.

ID	Name	Class	Category
N3a,N3b,N3c	Surveys – Hospitals, Hotels, Schools	Non Residential	Audits & Reports

Water Savings: Number of sites and average daily use per site (circa 2013) shown in table are taken from the SFPUC Retail Demand Model.

Category	Number of Sites	Average Daily Use (gpd)
Hospitals	28	46,429
Hotels	421	9,929
Schools	297	2,559
Wtd Avg		8,365

Assumes basic analyst or staff evaluations identify an average of 20% potential water savings per site, per CUWCC (2005). For calculating water savings, we assume 50% of potential savings are realized. Average realized water savings is therefore 10% of site use, which matches the assumption used by the SFPUC Retail Demand Model. Average water use per site is 8,365 gpd, per above table.

Water savings wtd average = 0.2 x 0.5 x 8,365 gpd = 837 gpd (305,505 gpy)
Hospitals = 0.2 x 0.5 x 46,429 gpd = 4643 gpd (1,694,695 gpy)
Hotels = 0.2 x 0.5 x 9,929 gpd = 993 gpd (362,445 gpy)
Schools = 0.2 x 0.5 x 2,559 gpd = 256 gpd (93,440 gpy)

(NOTE: A higher estimate is warranted if SFPUC targets sites with higher than average use.)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA. No savings persistence data reported in CUWCC (2005).

Useful Life: No savings persistence data reported in CUWCC (2005). We assume same average life as S1 – 5 years.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year, 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days. Assumes 18% of savings are irrigation-related, per CUWCC (2005).

Peak % = (0.42 x 0.82 x 837 gpd + 0.8 x 0.18 x 837 gpd)/837 gpd = 49%

Unit Sewer Savings: Sewer savings = 0.82 x 837 gpd = 686 gpd (250,390 gpy)
Hospitals = 3,807 gpd (1,389,555 gpy)
Hotels = 814 gpd (297,110 gpy)
Schools = 210 gpd (76,650 gpy)
Wastewater to water savings ratio = 0.820

Unit Electricity Savings: NA. No data on electricity savings

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that 50% of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 82% of total survey savings. Gas savings = 0.0072 therms/gal x 0.67 x 0.5 x 0.82 = 0.002 therms/gal

Confidence Score: 3

ID	Name	Class	Category
N4	Surveys – Large Landscape by Contractors	Non Residential	Audits & Reports

Water Savings: Per SFPUC Retail Demand Model, average use per site is 1.8 af/acre. Average water savings is 10%, also per SFPUC Retail Demand Model.

Water savings per acre = 0.1 x 1.8 x 325,851/365 = 161 gpd (58,765 gpy)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA. No savings persistence data reported in CUWCC (2005).

Useful Life: No savings persistence data reported in CUWCC (2005). We assume same average life as S1 – 5 years. Same assumption used in SFPUC Retail Demand Model.

Peak Period Savings Percent: Assumes 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 80%

Unit Sewer Savings: NA

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
N5	Surveys – CII Facilities by Contractors	Non Residential	Audits & Reports

Water Savings: SFPUC estimates consultant audits save from 2,450 to 7,790 gpd. Model assumes midpoint of range – 5,120 gpd.

Water savings = 0.5 x (2,450 gpd + 7,790 gpd) = 5,120 gpd (1,868,800 gpy)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA. No savings persistence data reported in CUWCC (2005).

Useful Life: No savings persistence data reported in CUWCC (2005). We assume same average life as S1 – 5 years. Same assumption used in SFPUC Retail Demand Model.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year, 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days. Assumes 23% of savings are irrigation-related, per CUWCC (2005).

Peak % = (0.42 x 0.77 x 5120 gpd + 0.8 x 0.23 x 5120 gpd)/5120 gpd = 51%

Unit Sewer Savings: Sewer savings = 0.77 x 5120 gpd = 3,942 gpd (1,438,830 gpy)

Unit Electricity Savings: NA. No data on electricity savings

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006), that hot water comprises 67% of shower/faucet flow - per DOE (2006) – that one-quarter of indoor water savings involve reductions in shower/faucet flow, and that indoor savings comprise 82% of total survey savings. Gas savings = 0.0072 therms/gal x 0.67 x 0.25 x 0.77 = 0.0009 therms/gal

Confidence Score: 2

ID	Name	Class	Category
N6	Landscape Leak Alerts	Non Residential	Audits & Reports

Water Savings: Detailed empirical analysis of SFPUC's Landscape Customer Leak Alert Program concluded:

- The Program reduced the mean duration of leak events lasting 72 or more hours from 598.2 to 434.1 hours.
- The Program reduced the frequency of leak events lasting 72 or more hours from 1.048 to 0.840 leaks per meter-year.
- The Program reduced the mean leak volume by 10311 gallons per meter-year (28.2 gpd).

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: We assume leaks are more or less distributed uniformly across the year.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Unit Sewer Savings: Outdoor water use only

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
N7	1.5 GPM Showerhead Giveaway	Non Residential	HESH

Water Savings: Water savings estimate assumes program targets lodging establishments where shower water use comprises a significant proportion of total facility water use. Hotel shower water use from data logging done for the 2000 AWWARF CII End Uses of Water Study are summarized in the following table.

Shower Water Use Estimates from AWWARF CII End Uses of Water Study, 2000

Hotel Location	Water Use gpy/showerhead	Implied Utilization Rate minutes/day	Retrofit Water Use gpy/showerhead	Savings gpy/showerhead	% Hot
Irvine	10,203	13	6,957	3,246	71%
Phoenix	13,724	17	9,357	4,367	28%
San Diego	12,446	15	8,486	3,960	
Santa Monica	11,182	14	7,624	3,558	
Average	11,889	15	8,106	3,783	50%

Mean flow rate (gpm)	2.2
Retrofit flow rate (gpm)	1.5

We assume installed showerheads will have a mean savings rate of 3,800 gpy. Field studies of retrofit kit giveaway programs in Irvine (A&N Technical Services 1992d) and Los Angeles (A&N Technical Services 1991) found initial installation probabilities that ranged from 49% to 59%. We assume a 54% installation probability.

Giveaway showerhead savings = 3,800 gpy/showerhead x 0.54 = 2,052 gpy/showerhead

Plumbing Code Savings: Zero. SB 407 mandates showerheads have a maximum capacity of 2.5 gpm. It is assumed the flow rating of replaced showerheads will be 2.5 gpm or less

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 8 yrs, per Alliance for Water Efficiency (2014).

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 2,052 gpy
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006) and that hot water comprises 50% of shower flow per above table. Gas savings = 0.0072 therms/gal x 0.5 = 0.0036therms/gal

Confidence Score: 3

ID	Name	Class	Category
N8	1.5 GPM Showerhead Direct Install	Non Residential	HESH

Water Savings: Water savings estimate assumes program targets lodging establishments where shower water use comprises a significant proportion of total facility water use. Hotel shower water use from data logging done for the 2000 AWWARF CII End Uses of Water Study are summarized in the following table.

Shower Water Use Estimates from AWWARF CII End Uses of Water Study, 2000

Hotel Location	Water Use gpy/showerhead	Implied Utilization Rate minutes/day	Retrofit Water Use gpy/showerhead	Savings gpy/showerhead	% Hot
Irvine	10,203	13	6,957	3,246	71%
Phoenix	13,724	17	9,357	4,367	28%
San Diego	12,446	15	8,486	3,960	
Santa Monica	11,182	14	7,624	3,558	
Average	11,889	15	8,106	3,783	50%

Assumed Mean flow rate (gpm)	2.2
Retrofit flow rate (gpm)	1.5

We assume installed showerheads will have a mean savings rate of 3,800 gpy/showerhead installed.

Plumbing Code Savings: Zero. SB 407 mandates showerheads have a maximum capacity of 2.5 gpm. It is assumed the flow rating of replaced showerheads will be 2.5 gpm or less

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 8 yrs, per Alliance for Water Efficiency (2014).

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 3,800 gpy
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: Assumes energy requirement of 0.0072 therms/gal for hot water heating, per DOE (2006) and that hot water comprises 50% of shower flow per above table. Gas savings = 0.0072 therms/gal x 0.5 = 0.0036therms/gal

Confidence Score: 3

ID	Name	Class	Category
N9	Device Distribution	Non Residential	Grants

Water Savings: Water savings are a quantity-weighted average of devices distributed by SFPUC. The devices, quantity weights, and annual savings are shown in the following table.

Devices	Annual Quantity	Savings (GPY)	
1.5 gpm bathroom aerator	8229	210	
1.0 gpm bathroom aerator	0	361	
0.5 gpm bathroom aerator	1537	511	
1.5 gpm kitchen laminar	0	210	
1.5 gpm bathroom laminar	0	210	
2.2 gpm kitchen aerator	265	0	
1.5 gpm kitchen aerator	4641	210	
1.5 utility aerator	54	210	
2.0 utility aerator	54	60	
2.2 utility aerator	16	0	
Garden spray hose nozzle	295	0	No reliable estimates
Toilet flapper	3603	1212	
Toilet fill valves	1819	1212	Assumed to be same as flapper savings
Soil moisture meter	7	0	No reliable estimates
Total	20520		
Weighted Avg Savings		491	

Annual savings for aerators are based on the following data and assumptions:

- Median SFR faucet use is 29 gpd (source: Aquacraft SFPUC End Use Study).
- An average of 4 faucets per household is assumed.
- Average use per faucet is 7.25 gpd. The calculation assumes uniform faucet usage, which while unlikely to be true is necessary given lack of data on faucet use.
- Aerators reduce free flowing faucet water consumption. It is assumed half of faucet use is for free flowing uses (e.g. brushing teeth or washing vegetables) and half is for fixed volume uses (e.g. filling pots or getting a drink of water). Free flowing faucet use is therefore 3.63 gpd.
- Average faucet flow is assumed to be 2.2 gpm. Therefore, faucets average 1.6 minutes of free flowing use per day.
- It is assumed half of distributed faucets are installed.

Given these assumptions, savings by aerator flow rate are:

Aerator flow rate (gpm)	Avg Use GPD	Potential Savings (GPD)	Install %	Actual Savings (GPD)	Actual Savings (GPY)
2.2	3.63	0.00	50%	0.00	0
2.0	3.30	0.33	50%	0.16	60
1.5	2.47	1.15	50%	0.58	210
1.0	1.65	1.98	50%	0.99	361

0.5	0.82	2.80	50%	1.40	511

Annual savings for flappers and fill valves are based on the following data and assumptions:

- Median SFR leakage rate is 8.3 gpd, per Aquacraft SFPUC End Use Study.
- According to 2004 CUWCC Toilet Flapper Study and 1999 Residential End Use Study most household water leaks can be attributed to toilets. It is assumed toilet leaks account for 80% of the median leakage rate, or 6.64 gpd.
- It is assumed replacing flapper or fill valves will eliminate toilet-related leakage.
- It is assumed half of distributed flappers and fill valves are installed.

Given these assumptions, water savings are 3.32 gpd, or 1212 gpy.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 5 years

Peak Period Savings Percent:

Unit Sewer Savings: Same as water savings

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
N10a	HET Rebates (Tank) - CII	Non Residential	HET

Water Savings: Savings based on CUWCC CII Toilet Savings Study (2001). Assume 10% of rebates replace ULFTs
Water savings = 0.9 x 1.15 x 25 gpd + 0.1 x 25 gpd = 28.4 gpd (10,366 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N10b	HET Rebates (Flushometer) - CII	Non Residential	HET

Water Savings: Savings based on CUWCC CII Toilet Savings Study (2001). Assume 10% of rebates replace ULFTs
Water savings = 0.9 x 1.15 x 25 gpd + 0.1 x 25 gpd = 28.4 gpd (10,366 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N11a,N11b,N11c	HET Rebates Schools, Hotels, Muni (Tank)	Non Residential	HET

Water Savings: Assumes program targets non-ULF toilets. CUWCC (2001) estimated replacing non-ULF toilets with ULF toilets in schools, hotels, and government facilities resulted in average daily savings shown in the table.

Category	Avg Savings Per ULF Toilet (gpd)	Imputed Flushes/Day
Schools	18	8.4
Hotels	16	7.4
Government	25	11.6
Avg Savings	20	9.3

Note: GPD savings from CUWCC (2001). Imputed flushes/day assumes avg of replaced toilet was 3.75 gpf

Assume 10% of rebates replace ULFTs
Schools: [0.1(1.6-1.28)+0.9(3.75-1.28)] x 8.4 = 18.9 gpd (6,914)
Hotels: [0.1(1.6-1.28)+0.9(3.75-1.28)] x 7.4 = 16.7 gpd (6,096)
Gov: [0.1(1.6-1.28)+0.9(3.75-1.28)] x 11.6 = 26.2 gpd (9,563)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N11d,N11e,N11f	HET Rebates Schools, Hotels, Muni (Flushometer)	Non Residential	HET

All assumptions same as N11a, N11b, N11c.

ID	Name	Class	Category
N12a	HET Direct Install (Tank) - CII	Non Residential	HET

Water Savings: Assumes program targets non-ULF toilets. CUWCC (2001) estimated replacing non-ULF toilets with ULF toilets resulted in average daily savings of 25 gpd. Assuming non-ULF toilets have an average flush volume of 3.75, the HE toilet would save approximately 15% more than a ULF toilet.

Water savings = 1.15 x 25 gpd = 29 gpd (10,585 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = 29 gpd (10,585 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N12b	HET Direct Install (Flushometer) - CII	Non Residential	HET

All assumptions same as N12a.

ID	Name	Class	Category
N13	HET Direct Install School/Hotel	Non Residential	HET

Water Savings: Assumes program targets non-ULF toilets. CUWCC (2001) estimated replacing non-ULF toilets with ULF toilets in schools and hotels resulted in average daily savings shown in the table.

Category	Avg Savings Per ULF Toilet (gpd)	Imputed Flushes/Day
Schools	18	8.4
Hotels	16	7.4
Avg Savings	17	7.9

Note: GPD savings from CUWCC (2001). Imputed flushes/day assumes avg of replaced toilet was 3.75 gpf

It is assumed direct install toilets would only replace non-ULF. Assuming non-ULF toilets have an average flush volume of 3.75, the HE toilet would save approximately 15% more than a ULF toilet.

Water savings = 1.15 x 17 gpd = 19.6 gpd (7,154 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N14	CII HET Voucher	Non Residential	HET

All assumptions same a N10

ID	Name	Class	Category
N15	HET Voucher School/Hotel	Non Residential	HET

Water Savings: Assumes 90% of vouchers go to non-ULF and 10% go to ULF toilets. CUWCC (2001) estimated replacing non-ULF toilets with ULF toilets in schools and hotels resulted in average daily savings shown in the table.

Category	Avg Savings Per ULF Toilet (gpd)	Imputed Flushes/Day
Schools	18	8.4
Hotels	16	7.4
Avg Savings	17	7.9

Note: GPD savings from CUWCC (2001). Imputed flushes/day assumes avg of replaced toilet was 3.75 gpf

Savings = [0.1 x (1.6 – 1.28) + 0.9 x (3.75 – 1.28)] x 7.9 = 17.8 gpd (6,497 gpy)

Comparison to Retail Demand Model (RDM) Estimate: this measure is not in the RDM.

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent:
Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days.

Peak % = 42%

Unit Sewer Savings: Sewer savings = same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N16	HET/Fixture Install thru On-Bill Financing	Non Residential	HET

All assumptions same as N12a

ID	Name	Class	Category
N17a, N17b	HEU Rebate - CII	Non Residential	HEU

Water Savings: From Koeller & Company (2005). Urinals in CA used an estimated 28,000 AFY in 2005. Average flush rate is 2 times per day per male employee. Total employment in 2005 is 16.8 million, 55% male. Average flush volume = 28000 x 325851/[2 x 16.8 x 10^6 x 0.55 x 365) = 1.35 gpf

25 x 10^6 gal/day / 1.35 gal/flush = 18.5 x 10^6 flushes/day

18.5 x 10^6 flushes/day / 1.4 x 10^6 urinals (circa 2005) = 13.2 flushes/urinal/day

0.5 gpf: (1.35-.5) x 13.2 flush/day = 11.2 gpd (4,088 gpy)
0.25 gpf: (1.35-.25) x 13.2 flush/day = 14.5 gpd (5,293 gpy)
0.125 gpf: (1.35-.125) x 13.2 flush/day = 16.2 gpd (5,913 gpy)

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
N18	HEU Direct Install - CII	Non Residential	HEU

All assumptions same as N17.

ID	Name	Class	Category
N20	Energy Star Washer Rebates (IWF 4.5)	Non Residential	HEW

Water Savings: Assumes rebates are for common area laundry rooms, not individual apartments. Without rebate, participant will purchase either top- or front-load washer. Current market share (circa 2012) of top-load washers is 52%, per DOE (2012). Current Energy Star market share (circa 2012) is 50%, per DOE (2012). Maximum allowed IWF for Energy Star washer after 2011 is 6. Maximum allowed IWF for non-Energy Star washer is 9.5, per National Appliance Standard. (National Appliance Standard changes in 2015 to 4.5 IWF for front-load and 8.0 IWF for top-load, and again in 2018 to 6.0 IWF for top-load). Average IWF of new washer is:

Avg IWF of New Washer Without Rebate = 0.5 x 6.0 + 0.5 x 9.5 = 7.75 (note this will overstate avg IWF after 2015 due to nat'l appl stdrd)

Average loads per day for machines with load capacity under 25 pounds is 3, per Sutter and Pope (2006). Average washer volume is assumed to be 4 cubic feet.

Water savings = (7.75 – 4.5) x 4 x 3 = 39 gpd (14,235 gpy)

Plumbing Code Savings: Effective Jan 1, 2015, appliance standard is 4.5 IWF for front-load and 8.0 IWF for top-load. Given current front- and top-load market shares and Energy Star market share, average IWF under appliance standard in 2015 is:

2015 Avg IWF under Nat'l Appl Std = 0.52 x (0.5 x 8.0 + 0.5 x 6.0) + 0.48 x 4.5 = 5.8

Effective Jan 1, 2018, appliance standard is 4.5 IWF for front-load and 6.0 for top-load. Average IWF under appliance standard in 2018 is:

2018 Avg IWF under Nat'l Appl Std = 0.52 x 6.0 + 0.48 x 4.5 = 5.3.

For modeling conservation program benefits, we use the average of these two water factors – 5.6 -- and start the standard in 2015. Plumbing code savings starting in 2015 are:

Plumbing code savings = (7.75 – 5.6) x 4 x 3 = 26 gpd (9,490)

Plumbing Code NRR: 12.2%, average of the turnover rates assumed by AWE (11.1%) and DOE (13.3%) for commercial washers.

Annual Decay Rate: NA

Useful Life: 14 years, per DOE (2012)

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 39 gpd (14,235 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: 0.0036 KWh/gal. Based on high efficiency washer electricity savings reported in FEMP (2000).

Unit Gas Savings: 0.0035 therms/gal. Based on high efficiency washer gas savings reported in FEMP (2000).

Confidence Score: 3

ID	Name	Class	Category
N21	Energy Star Washer Rebates (IWF 4)	Non Residential	HEW

Note that the model has separate measures for N21a and N21b that are distinguished only by differing rebate amounts provided through time.

Water Savings: Assumes rebates are for common area laundry rooms, not individual apartments. Without rebate, participant will purchase either top- or front-load washer. Current market share (circa 2012) of top-load washers is 52%, per DOE (2012). Current Energy Star market share (circa 2012) is 50%, per DOE (2012). Maximum allowed IWF for Energy Star washer after 2011 is 6. Maximum allowed IWF for non-Energy Star washer is 9.5, per National Appliance Standard. (National Appliance Standard changes in 2015 to 4.5 IWF for front-load and 8.0 IWF for top-load, and again in 2018 to 6.0 IWF for top-load). Average IWF of new washer is:

Avg IWF of New Washer Without Rebate = 0.5 x 6.0 + 0.5 x 9.5 = 7.75 (note this will overstate avg IWF after 2015 due to nat'l appl stdrd)

Average loads per day for machines with load capacity under 25 pounds is 3, per Sutter and Pope (2006). Average washer volume is assumed to be 4 cubic feet.

Water savings = (7.75 – 4.0) x 4 x 3 = 45 gpd (16,425 gpy)

Plumbing Code Savings: Effective Jan 1, 2015, appliance standard is 4.5 IWF for front-load and 8.0 IWF for top-load. Given current front- and top-load market shares and Energy Star market share, average IWF under appliance standard in 2015 is:

2015 Avg IWF under Nat'l Appl Std = 0.52 x (0.5 x 8.0 + 0.5 x 6.0) + 0.48 x 4.5 = 5.8

Effective Jan 1, 2018, appliance standard is 4.5 IWF for front-load and 6.0 for top-load. Average IWF under appliance standard in 2018 is:

2018 Avg IWF under Nat'l Appl Std = 0.52 x 6.0 + 0.48 x 4.5 = 5.3.

For modeling conservation program benefits, we use the average of these two water factors – 5.6 -- and start the standard in 2015. Plumbing code savings starting in 2015 are:

Plumbing code savings = (7.75 – 5.6) x 4 x 3 = 26 gpd (9,490)

Plumbing Code NRR: 12.2%, average of the turnover rates assumed by AWE (11.1%) and DOE (13.3%) for commercial washers.

Annual Decay Rate: NA

Useful Life: 14 years, per DOE (2012)

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 45 gpd (16,425 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: 0.0036 KWh/gal. Based on high efficiency washer electricity savings reported in FEMP (2000).

Unit Gas Savings: 0.0035 therms/gal. Based on high efficiency washer gas savings reported in FEMP (2000).

Confidence Score: 3

ID	Name	Class	Category
N22	Landscape Grants	Non Residential	Grants

Water Savings: Average savings for previous grant projects (implemented 2011-2019) is shown in the following table based on calculations performed by SFPUC. The pre-grant average water use per acre is 1.6 AFY/Acre and the average water savings per acre is 0.2 AFY/Acre (11%), or 65,170 gpy (179 gpd).

Project Name	Project Size (acres)	Pre-Grant Use (mgy)	Projected Savings (mgy)	Projected Savings (%)	Observed Savings (mgy)[1]	Observed Savings (%)[1]
Balboa Park Water Conservation Project	17.3	15.4	1.5	10%	-1.24	-8%
Fort Mason Water Conservation Irrigation Upgrades	12.3	25.8	4.6	18%	7.5	29%
Sunset Blvd. Landscape Irrigation Retrofit	3.5	16.7	13.8	83%	N/A	N/A
Jefferson Square Park Water Conservation Project	5.1	6.0	1.7	28%	0.52	9%
Alta Plaza Park Water Conservation Project	4.0	9.7	3.8	39%	-0.65	-7%
Laguna Honda Hospital Water Conservation Project	2.5	2.9	0.96	33%	N/A	N/A
Moscone Recreation Center	6.2	8.8	2.7	30%	-0.36	-4%
Alamo Square Park	9.4	8.8	1.4	16%	2.41	27%
Sunol Glen Elementary School	1.7	2.56	1.17	46%	0.03	1%
Washington Square Park	1.5	3.0	1.7	60%	X	X
Forest Hill Station	0.7	1.13	0.44	39%	0.0	0%

[1] Based on simple comparison of billed consumption before and after project installation, with no controls for factors like weather, price, or drought restrictions.

Program N22a (Landscape Grants Pre2020) in the Tracking Model reflects landscapes with over 0.5 acre of irrigated area that were installed before 2020.

Program N22b (Landscape Grants Post 2020) in the Tracking Model reflects landscapes of 10,000 sf to 0.5 ac or more of irrigated area. Only one project of 10,000 sq ft has been completed between 2020-2025 (Lombard Street in May 2023). The Filoli Center Irrigation System Update Project is 845,000 sq ft (19.4 ac) and begins construction in 2025. Water savings are assumed to be the same as those estimated for N22a projects until updated savings estimates can be calculated from newly installed projects.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA. No savings persistence data reported in CUWCC (2005).

Useful Life: SFPUC program assumption is 20 years.

Peak Period Savings Percent: Assumes 80% of outdoor savings occur in peak period. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 80%

Unit Sewer Savings: NA

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N24	Equipment Retrofit Rebates	Non Residential	Grants

Water Savings: Water savings are 1 CCF/Yr (748 gpy) because the savings are entered directly as CCF/Yr in the Annual Activity.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 10 years

Peak Period Savings Percent: 42%

Unit Sewer Savings: Same as water savings
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
N25	Custom Equipment Retrofit Rebates	Non Residential	Grants

All assumptions same as N24
N25a and N25b are only distinguished by the unit cost for each program.

ID	Name	Class	Category
N26	Non-Residential Leak Alerts	Non Residential	Audits & Reports

Water Savings: Detailed empirical analysis of SFPUC's Landscape Customer Leak Alert Program concluded:

- The Program reduced the mean duration of leak events lasting 72 or more hours from 495.6 to 438.4 hours.
- The Program did not reduce leak frequency.
- The Program reduced the mean leak volume by 1841.7 gallons per meter-year (5.0 gpd).

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year.

Peak Period Savings Percent: We assume leaks are more or less distributed uniformly across the year.

Peak period runs from May 1 to Sep 30, representing 42% of days.

Unit Sewer Savings: We do not have data on how leakage is distributed between indoor and outdoor water uses. We assume non-residential water use is dominated by indoor water uses and so too are water savings from leak alerts.
Sewer savings = 0.9 x 1841.7 gpy per meter = 1657.5 gpy per meter
Wastewater to water savings ratio = 0.9

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 1

ID	Name	Class	Category
N27	Kitchen Low Flow Spray Valves	Non Residential	Grants

All assumptions taken directly from the SFPUC Retail Demand Model. The SFPUC Retail Demand Model used a daily water savings estimate of 30 gpd (10,950 gpy) and fixture useful life of 10 years. The estimate is based on empirical estimates of daily savings (60 gpd) and a 50% installation and retention rate.

Confidence Score: 1

ID	Name	Class	Category
N29	Efficient Irrigation Timer Rebate	Non-Residential	Grants

Water Savings: 13.4 gpd or 4891 gpy. This is the lower-bound of 95% CI of average savings per station, per A&N Technical's 2011 WBIC savings evaluation. Lower-bound is used because of San Francisco's climate and lower landscape water use.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 10 years. Assumed

Peak Period Savings Percent: 100% of savings assumed to occur in peak season.

Unit Sewer Savings: NA

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 2

ID	Name	Class	Category
N30	ULFT to Ultra-High-Efficiency Toilet Rebate	Non-Residential	HET

Water Savings: 7.0 gpd (2540 gpy). Engineering estimate prepared by SFPUC staff.

Plumbing Code Savings: Effective Jan 1, 2014, same as water savings

Plumbing Code NRR: 3% per M.Cubed (2014)

Annual Decay Rate: NA. Leakage and double flushing assumed no worse than toilets replaced.

Useful Life: NA. Plumbing code ensures toilet cannot revert to lower efficiency. Period of savings attributed to program does not exceed useful life of toilet. On average savings are counted for 33 years, the average useful life of the toilet.

Peak Period Savings Percent: Assumes indoor savings evenly distributed through year. Peak period runs from May 1 to Sep 30, representing 42% of days. Peak % = 42%

Unit Sewer Savings: Sewer savings = 7.0 gpd (2540 gpy)
Wastewater to water savings ratio = 1.000

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
A3	Irrigation Customer Landscape Budgets	Non Residential	Audits & Reports

Water Savings: Many water suppliers have adopted water budgets for their large landscapes, which provides an effective way for both managing and evaluating large landscape programs. Landscape budgets are a form of customer education/information designed to help customers irrigate landscape efficiently. The effectiveness of this intervention can vary significantly depending on existing water use practices, types of landscapes subject to budgets, types of customers receiving budgets, cost of water, etc. There have been several empirical evaluations of landscape budget performance. Cal WEP provides a good summary of these studies.

The impact of landscape education on compliance with water budgets was evaluated in Orange County, California in a 2004 study. The education component was targeted at landscape contractors and property managers at home-owner associations (HOAs). The results were based on the experience of 47 HOAs that had participated in the program up to that point. The impact evaluation concluded that early participants in the program reduced their water demand by 9%, later participants by 20% (the difference between early and later participants was not explained).

Several studies are available that examine the impact of budget-based rates on large landscape water use. An early study, published in 1997 showed that tiered rates tied to landscape water budgets can reduce irrigation demand by about 20-25%.

Cal WEP compiled data from 12 Bay Area retailers on actual water use versus budget for a sample of large landscapes. On average, actual use exceeded budgeted use by 33%. Cal WEP also compared budget exceedence by type of customer. It found budget exceedence was greatest for HOAs and commercial properties (excluding gold courses) and lowest for parks and schools. The average exceedence for HOAs and commercial was 23% and 34%, respectively; for parks and schools it was 10% and 5%, respectively.

This measure assumes budgets would reduce large landscape water use by 10%, on average. This is at the lower-end of the savings range from empirical studies and significantly less than the average budget exceedence for the sample of 12 Bay Area water agencies. A conservative savings assumption is deemed appropriate because:

- Parks and schools, which tend to have lower budge exceedence, comprise most of the large landscape area in SFPUC's retail service area.
- SFPUC's high retail water rates already discourage wasteful irrigation and landscape water use.
- SFPUC's cool summer climate results in lower irrigation application rates relative to other parts of California with dryer, hotter summer climates.

The average pre-grant irrigation application rate at large landscape sites participating in SFPUC's large landscape grant program is 4 AF/acre (see N22).

Savings = 4 AF/acre x 0.1 = 0.4 AF/acre (130,340 gpy/acre)

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year

Peak Period Savings Percent: 100%

Unit Sewer Savings: 0

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
A4a	Municipal Large Landscape Budget	Non Residential	Audits & Reports

Water Savings: Assumes 10% reduction in average pre-budget water use of 0.54 AF/Ac. See further detail in Measure A3.
Savings = 0.54 AF/acre x 0.1 = 0.054 AF/acre (17,596 gpy/acre; 48 gpd/acre)

SFPUC analyzed 2020 satellite imagery for all parcels associated with dedicated irrigation meters and identified the area of irrigable, irrigated landscape cover served by each meter and parcel. Based on calendar year 2024 billed consumption, the average pre-budget water use for municipal irrigation accounts was 0.54 AF/ac, based on 867 acres of irrigable, irrigated municipal landscape served by dedicated irrigation meters that are slated to receive regular water budget reports starting in late 2025.

Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year

Peak Period Savings Percent: 100%

Unit Sewer Savings: 0

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

ID	Name	Class	Category
A4b	Non-Municipal Large Landscape Budget	Non Residential	Audits & Reports

Water Savings: Assumes 10% reduction in average pre-budget water use of 2.64 AF/Ac. See further detail in Measure A3.

Savings = 2.64 AF/acre x 0.1 = 0.264 AF/acre (86,025 gpy/acre; 236 gpd/acre)

SFPUC analyzed 2020 satellite imagery for all parcels associated with dedicated irrigation meters and identified the area of irrigable, irrigated landscape cover served by each meter and parcel. Based on calendar year 2024 billed consumption, the average pre-budget water use for non-municipal irrigation accounts was 2.64 AF/ac, based on 173 acres of irrigable, irrigated non-municipal landscape served by dedicated irrigation meters that are slated to receive regular water budget reports starting in late 2025.
Plumbing Code Savings: NA

Plumbing Code NRR: NA

Annual Decay Rate: NA

Useful Life: 1 year

Peak Period Savings Percent: 100%

Unit Sewer Savings: 0

Unit Electricity Savings: NA

Unit Gas Savings: NA

Confidence Score: 3

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