

Chapter 6 – Water Conservation

6.1 Introduction

This chapter describes Redwood City's water conservation programs, also known as water efficiency or water demand management programs. Redwood City is implementing all the relevant programs described in the Act, among others. These proactive, City-managed water conservation programs are referred to as "active" conservation programs.

Before addressing active conservation programs, it is necessary to quantify passive conservation associated with high-efficiency toilets and clothes washers. These two fixtures, that account for about half of total residential indoor water use, are somewhat unique in that California state and Federal laws have mandated that only high-efficiency toilets be sold as of 1992 and high-efficiency clothes washers be sold starting in 2007. Passive conservation will occur over time without any City action or expense. Because some of the active conservation programs are associated with toilets and clothes washers, it is necessary to first quantify passive water conservation from these uses so as to not double count water savings.

Redwood City has been and continues to be a strong promoter of water conservation programs that improve water supply reliability and environmental benefits to the community. Beyond the standard types of conservation programs defined by the Act, the City also has an innovative program that creates detailed water use information on water bills to help customers better understand and budget water use for their customized situation. As identified by the Redwood City Recycled Water Task Force, the City is also now or is planning to implement conservation programs related to the distribution of pre-rinse flow valves, installation of artificial turf to replace turfgrass, use of evapotranspiration controllers to improve irrigation, and use of hot-water recirculating systems. The expected water savings from both passive and active conservation are summarized in this chapter.

6.2 Passive Water Conservation

Passive conservation is defined as water savings from the adoption of State and Federal plumbing codes and legislation mandating the sale of high-efficiency toilets and clothes washers. These are the two largest end uses of indoor residential water use, making up about half of total indoor use.

In 1989, toilet manufacturers began producing ultra-low flush toilets or ULFTs (1.6 gallons per flush) in 1989. Toilets before this used 3.5 gallons or more per flush. In January 1992, a California Plumbing Code change required all new toilets to be ULFTs. Many older, less-efficient toilets were still being sold. A Federal plumbing code change effective January 1994 mandated use of ULFTs in all new construction as part of the Energy Policy Act of 1992. Older high-volume toilets were no longer manufactured on a national level after 1994 and ULFT market penetration has been increasing since.

Engineering changes have also improved the water and energy efficiency associated with clothes washers. In February 2004, the California Energy Commission adopted

water efficiency standards for clothes washers.¹ The standard states that by 2007 washers can use a maximum of 8.5 gallons per cubic foot of wash load. By 2010 the maximum will be 6.0 gallons per cubic foot.

As shown in Table 6-1, post-2000 passive water savings grow over time and will reach 1,038 af/yr by 2030.

Table 6-1 Passive Water Savings, Post-Year 2000 (in af/yr)							
Customer Type	2000	2005	2010	2015	2020	2025	2030
Single Family	0	145	293	401	481	540	584
Multiple Family	0	59	114	155	185	208	225
Commercial	0	66	117	156	187	210	229
Total	0	269	523	712	853	959	1,038

6.3 Active Conservation Program Descriptions

This section describes each of the 14 urban water conservation programs defined in the Act. Redwood City actively implements each of the relevant programs. Section 6.4 describes other active conservation programs being implemented.

6.3.1 Water Survey Programs for Single- and Multiple-Family Residential Customers

Since 1994, the City has offered free residential water use surveys. Surveys are conducted by City staff and include checking toilets, showers, and faucets for leaks and distributing free showerheads and faucet aerators as needed. The survey also provides advice on outdoor irrigation efficiency by measuring landscape areas, testing sprinkler systems for irrigation efficiency, teaching customers how to set the irrigation controller, developing a monthly irrigation schedule (based on soil type, evapotranspiration, and irrigation system characteristics), recommending sprinkler system repairs or improvements, and providing brochures on water efficient landscaping, design, and plants.

6.3.2 Residential Plumbing Retrofit

Since 2000, the City mails and distributes kits that include showerheads, aerators, and toilet tank leak detection tablets at community events, fairs, and during Water Awareness Month. At these events, the City also distributes water use surveys and conservation educational materials.

6.3.3 System Water Audits, Leak Detection, and Repair

The City’s unaccounted-for water rate of around four percent is significantly below the ten percent limit set forth by the California Urban Water Conservation Council (CUWCC) in its *Memorandum of Understanding Regarding Urban Water Conservation Best Management Practices* (MOU) in 1992. The City has always monitored its unaccounted-

¹ Federal approval will still be required, as the Federal Energy Policy Act of 1992 allows only the Federal Government to regulate residential clothes washers unless a state exemption is approved. California has already been instructed by the Legislature to apply for that exemption as part of AB 1561.

for water and repairs system leaks immediately when found. The City owns an electronic leak detector unit and City personnel have participated in leak detection trainings sponsored by the AWWA, surveying at least 15 miles of main and service lines per year on an ongoing basis.

6.3.4 Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections

Since the 1980s, the City meters water use for all of its customers and uses a conservation promoting multi-block rate structure. The City requires separate irrigation meters for customers with large landscaped areas, to distinguish outside water use from interior water use, and to facilitate potential recycled water conversions. Commercial/industrial/institutional customers are required to have fire sprinkler systems. Since 1999, the City has required residential fire sprinklers in all new single- and multi-family construction. Separate meters are required for fire sprinkler systems, with associated monthly service charges. The City will continue to install and read meters on all new services, and will continue to conduct its large meter testing, calibration and replacement program.

6.3.5 Large Landscape Conservation Programs and Incentives

In 2002, the City Council authorized participation in a regional program administered by BAWSCA, providing service to all of its dedicated irrigation meter customers. This service includes providing customers with customized water budgets each billing period based on weather conditions and site characteristics. The program also provides site surveys in which an irrigation expert visits selected sites to collect information and provide advice to improve irrigation efficiency and scheduling.

6.3.6 High-Efficiency Washing Machine Rebate Programs

The City has been participating in a regional program administered by BAWSCA since August 2001, providing \$150 rebates to customers who buy high-efficiency clothes washers for single-family residences. Redwood City leads all BAWSCA agencies in clothes washer rebates since the regional program began. The City also participates in a regional program with a private firm to distribute high-efficiency washers to multiple-family and commercial customers using \$250 rebates.

6.3.7 Public Information Programs

The City promotes water conservation through a variety of outreach efforts. Since May 2001, the City has produced a bimonthly newsletter distributed with the water bill that includes water conservation as a primary topic. The City also participates in several public fairs and events distributing water conservation brochures, water saving devices, and information regarding appropriate plantings, irrigation, and ways to conserve water. City water bills were redesigned in 1996 to show gallons used per day and water use for the previous 12 months. The City has developed customized water use budgets shown on the water bill for all single-family homes based on its Water Allocation Program. The City's award-winning website is available at any time and helps customers understand what conservation programs are available and how they can participate.

6.3.8 School Education Programs

Since 1994, the City has continued to work with public and private schools in Redwood City to promote water conservation at school facilities and to educate students about

water issues. The City provides educational materials for several grade levels including Hetch Hetchy water system maps, posters, activity books, teacher's guides, and videos. The City also sponsors an annual Water Conservation Poster Contest for grades in four categories (1-3, 4-6, 7-8, and high school) and awards prizes for the best three entries in each category. The best posters are submitted to the regional Bay Area Water Users Association annual poster contest. City staff has provided school presentations for all grades, including water conservation stories such as "Peter and the Water Story," "Water Fun" and "The California Water Story." The Peninsula Conservation Center Foundation awarded the City the 1995 Business Environmental Award for its Water Conservation and Education Program.

6.3.9 Conservation Programs for Commercial, Industrial, and Institutional Accounts

The City provides landscape irrigation conservation programs to the commercial, industrial, and institutional customer class per Section 6.3.5 above. The City also encourages its commercial customers to participate in its toilet replacement programs. In the future, the City plans to participate in a regional program to be administered by BAWSCA that will provide complex water surveys to commercial customers based on their specific water uses (e.g., cooling towers). It also plans to implement a low-flush urinal program.

6.3.10 Wholesale Agency Programs

The City does not provide wholesale potable water to any other retail agencies; thus, this program is not applicable to Redwood City.

6.3.11 Conservation Pricing

Since the 1980s, the City has an increasing block rate structure where the per unit price of water increases with increasing increments of water use. Regarding sewer service charges, the City uses a single price rate structure based on water use for non-residential customers; this price varies with customer sector depending on wastewater flow characteristics. For residential customers, the City uses a flat rate that is unrelated to an individual customer's water use.

6.3.12 Water Conservation Coordinator

Since 1992, the Water Public Works Superintendent serves as the City's Conservation Coordinator. Tasks include oversight and implementation of the conservation programs, program reporting, and communication of water conservation issues within the City organization and to the public.

6.3.13 Water Waste Prohibition

The City established a "No-Waste" ordinance that includes numerous water use restrictions and prohibitions, including prohibitions against use of defective irrigation equipment, flooding of gutters, streets or drainage systems, and use of water hoses without a shut-off valve. This ordinance took effect 1992. The City intends to update this in 2006.

6.3.14 Residential Ultra-Low Flush Toilet Replacement Programs

The City has designed a variety of high-efficiency toilet replacement programs. In September 2004, the City implemented a "Toilet Give-Away" event providing 1,000 free

high-efficiency dual-flush toilets and also 308 pressure-assist toilets in exchange for old toilets (the old toilets were recycled by the City). The City also approved two other programs to help replace old less-efficient toilets, including: 1) Free Direct Install Program – this program provides residential and commercial customers with free toilets, free installation, and hauling away the old toilets; and 2) Toilet Rebate Program – this program is offered for those people that would rather select and install their own qualifying high-efficiency toilet. The rebate amounts range from \$75 to \$175, depending on the type of toilet purchased.

The City boosts its water savings by installing toilets that use less than the standard 1.6 gallons per flush rating. Programs are also designed to minimize “free-riders” (e.g., program participants that would have replaced their toilets even without the program).

6.4 Additional Water Conservation Measures

In addition to the active conservation measures described above, the City has created an innovative program to help customers better understand and budget their water use. Also, the Redwood City Recycled Water Task Force recommended the implementation of additional water conservation programs as part of the Recycled Water Project Alternative TF (see Chapter 3). These additional programs are also described in this section.

6.4.1 Residential Water Allocation Program

Since 2001, the City has used its Water Allocation Program (WAP) to produce a water budget for each individual single-family customer each billing period. The water budget reflects what each household should use if common water efficient technologies and practices are employed. The water budget is printed on each customer’s water bill. The purpose of the water budget is to provide customers with relevant information to help them conserve water and lower their water bills. The water budget is based on number of occupants, landscape type and area, weather, and whether or not the property has a swimming pool. The WAP targets and serves a function much like the residential water surveys in informing and educating people how to conserve water. The program also provides customer service benefits.

In 2001, the City sent out surveys to all single-family homes to collect the basic information needed to calculate a water budget. The response rate to the survey was 50 percent. For those not replying to the survey, default assumptions on household characteristics were used. The data are continually being updated via contact with customers. Data collected by the residential water survey program for a home, for example, are utilized by the WAP to improve the relevance of the water budget.

6.4.2 Pre-Rinse Spray Nozzle Replacement Program

The statewide “Rinse and Save” program is co-founded by the California Public Utilities Commission (CPUC) and participating water agencies, and administered by the CUWCC. This program consists of the installation of water-efficient pre-rinse spray nozzles in dishwashing facilities of restaurants, cafeterias, and other food service providers. Redwood City provides funding in the amount of \$50 per installed valve and CPUC funding of \$131 per valve. The valves (1.6 gallons per minute) are installed at restaurants and other eating establishments to replace high-volume pre-rinse spray nozzles. The City had 77 and 139 valves installed in FY 2003-04 and 2004-05, respectively.

6.4.3 Artificial Turf Replacement Program

One of the recommendations of the Recycled Water Task Force was to reduce potable water demand by converting natural grass playing fields to synthetic turf at several parks and schools in Redwood City. Several playing fields (Sequoia High School, Hoover Park, Canada College) have been converted to synthetic turf beginning in 2002. In July 2005, the City initiated the design of three synthetic turf fields in the City-owned Red Morton Park complex. Turf replacement at Sandpiper Park, Marlin Park, and Hawes Park will be done in the next phase.

6.4.4 Evapotranspiration Controllers Program

This conservation program consists of the installation of evapotranspiration (ET) controllers on landscape irrigation systems for irrigation-only water customers. Although this recommendation has not yet been implemented, the City plans to implement a pilot program for residential sites in FY 2005/06. The City's approach to implementing the Large Landscape Irrigation Efficiency Program (see Section 6.3.5 above) is to first focus site owners and managers on seasonally adjusted irrigation scheduling, based on a monthly water budget unique to each site and its conditions. Equal emphasis is placed on basic system inspection and repair, so that water is not being wasted due to broken spray heads and/or leaking pipes. As part of the pilot program, ET controllers will be installed on five large residential landscape systems, which are anticipated to result in a total estimated potable water demand reduction of five af/yr. User evaluations and performance results will be tracked for future decision-making.

6.4.5 Hot Water Recirculation Pumps Program

This conservation program consists of promoting the installation of hot water recirculation pumps on residential water systems. The City is currently studying this program, and anticipates implementation of a pilot effort in FY 2006/07.

6.5 Water Conservation Program Implementation Plan

Redwood City is implementing all of the relevant conservation programs identified by the Act, as well as five other programs. The schedule, level of activity, costs, and water savings associated with each program are presented in Appendix F. This implementation plan will be updated over time with the refinement of assumptions and identification of new opportunities. Redwood City seeks to implement the most cost-effective programs, but also considers customer service and community benefits in the process.

Water savings for the active conservation programs are only calculated for a select group of programs; they include residential water surveys, residential plumbing retrofits, large landscape efficiency, clothes washers, commercial programs, toilet replacement, pre-rinse spray nozzles, artificial turf replacement, hot water recirculation, and ET controllers. For the other programs, water savings are difficult to quantify. This does not imply that water savings are not significant, but rather that they are difficult to quantify with a reasonable level of certainty. The City implements these programs on the premise that they are good business practices.

Table 6-2 and Figure 6-1 show the water savings associated with the programs where they are quantified. Water savings increase and decrease over time depending on conservation program activity and the limited lifetime associated with savings from some

programs (e.g., pre-rinse spray nozzles are assumed to have an effective life of five years). For toilets and clothes washers programs, only the incremental water savings over and above expected future water savings associated with passive (natural) replacement of these fixtures are included. Outdoor water savings of potable water supplies also diminish as irrigation customers convert from SFPUC water to recycled water.

**Table 6-2
Water Conservation Program Savings (af/yr)**

Program	\$/AF	2005	2010	2015	2020	2025	2030
Pre Rinse Spray Nozzles	\$57	38	26	0	0	0	0
Plumbing Retrofit	\$181	2	19	14	14	14	14
Landscape	\$247	186	104	98	98	98	98
ET Controller	\$403	2	12	0	0	0	0
Residential Toilets	\$553	27	281	217	168	130	101
Clothes Washers	\$639	18	19	12	8	6	4
Residential Surveys	\$1,167	6	56	56	56	56	56
Commercial Programs	\$1,207	0	43	25	4	4	4
Hot water Recirculation	\$1,633	0	6	0	0	0	0
Artificial Turf	\$3,113	15	65	65	65	65	65
Active Conservation							
Totals		294	632	488	413	373	341
Passive Conservation	\$0	269	523	712	853	959	1,038
Total Conservation		563	1,155	1,200	1,266	1,331	1,379

Also shown are the costs per af/yr of water saved from the water agency perspective. The City uses this cost metric in comparing alternative programs, knowing that other parties are impacted by additional benefits and costs. For example, the artificial turf program results in lower maintenance costs and fields that can be used in more intensive ways by the community.

The pre-rinse spray nozzles, residential retrofit, and landscape programs, including ET controllers, tend to be the most cost effective programs. The toilet and clothes washer programs are also relatively cost effective. The other programs are less cost-effective from the Water Utility's perspective, but each provides a unique set of additional benefits to the Utility and the community.

6.6 Evaluation of Programs not Implemented

With the exception of the wholesaler program that is not applicable, the City is implementing all of the conservation programs listed in the Act.

6.7 Regional Coordination on Demand Management

BAWSCA and its member agencies look for opportunities to work with other water agencies, including the SFPUC and SCVWD, and leverage available resources in implementing water use efficiency projects. For example, in 2005, the SFPUC and BAWSCA entered into a Memorandum of Understanding (MOU) regarding the administration of a Spray Valve Installation Program. Through this MOU, SFPUC and

BAWSCA will work cooperatively to offer and coordinate installation of water conserving spray valves to food service providers in BAWSCA member service areas. Recently the Bay Area Efficient Clothes Washer Rebate Program, a single rebate program offered by all major water agencies in the greater Bay Area including BAWSCA and the SFPUC, was recipient of \$1.5M in Proposition 50 grant funds for implementation as early as FY 2006/2007.

BAWSCA and its member agencies will continue to look to partner with other agencies to develop regional water conservation efforts that look beyond local issues of supply and cost-effectiveness to examine costs, benefits and other related issues on a system-wide level. The goal is to maximize the efficient use of water regionally by capitalizing on variations in local conditions and economies of scale.

Figure 6-1. Water Savings from Active Conservation Programs

