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Water Use Efficiency Master Plan

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Prepared for

City of Riverside
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K/J Project No. 0989056*00

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Executive Summary

In September 2000 the City of Riverside Public Utilities (RPU) became a signatory to the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) and became a member of the California Urban Water Conservation Council (CUWCC). As set forth in the MOU, RPU has since endeavored to implement and monitor Best Management Practices (BMPs) for urban water conservation. In November 2009, Senate Bill No. 7X-7 (SBX7-7) was passed, requiring specific reduction in potable water use. In accordance with the requirements of SBX7-7, RPU is seeking to achieve a water demand reduction goal of 20 percent by 2020. This Water Use Efficiency Master Plan (WUEMP) focuses on the development of water conservation programs and projects designed to realize sustainable water savings and, in combination with recycled water, help Riverside reach the goal of 20% potable water savings by 2020.

The plan consists of five sections and four appendices. The main report sections describe RPU's service area, current and historical water use trends, current conservation efforts, an in-depth analysis of potential water conservation measures, and recommendations for a water use efficiency strategy. The appendices include background information on RPU's current conservation programs, water conservation policies and legislation, incentives and funding opportunities, and assumptions for the water conservation measures analysis.

ES.1 Water Use in Service Area

RPU provides water through approximately 63,500 water service connections within a service area of 75 square miles. The City began as an agricultural community and has evolved from agricultural to urban use since the 1940s. Now, Riverside consists primarily of residential land uses. Water supply consists almost entirely of local groundwater from the Bunker Hill, Riverside North, and Riverside South basins. Between 1970 through 2008, RPU purchased between 1 to 5% of its water supply as imported water from Western Municipal Water District (WMWD) to meet peak demands.

Water use varies year to year based on weather and economic conditions, and has fluctuated between production of 72,500 acre-feet per year (AFY) and 83,600 AFY between 2003 and 2009, with average annual production of 78,300 AF. Due to water loss (unaccounted-for-water) of approximately 12%, total billing records (sales) fluctuated between 63,000 AFY and 73,600 AFY between 2003 and 2009, with average annual water use of approximately 69,500 AF.

Currently, residential water consumption makes up about three quarters of total potable water use with single family residential alone accounting for nearly 60 percent. Commercial and industrial uses account for approximately a quarter of total water use. Approximately half of total water use is for landscape and irrigation, however most of it is not measured directly, with dedicated irrigation accounts accounting for only 5 percent of total water use. Figures ES-1 and ES-2 show the breakdown of current water use by sector as well as indoor versus outdoor uses. These figures represent annual billing records for fiscal year 2007-2008 and not potable water production; as such they do not take into consideration unaccounted for water, which on average for RPU during this period was approximately 12 percent of total production.

Figure ES-1: Water Consumption by End User (FY 07-08)

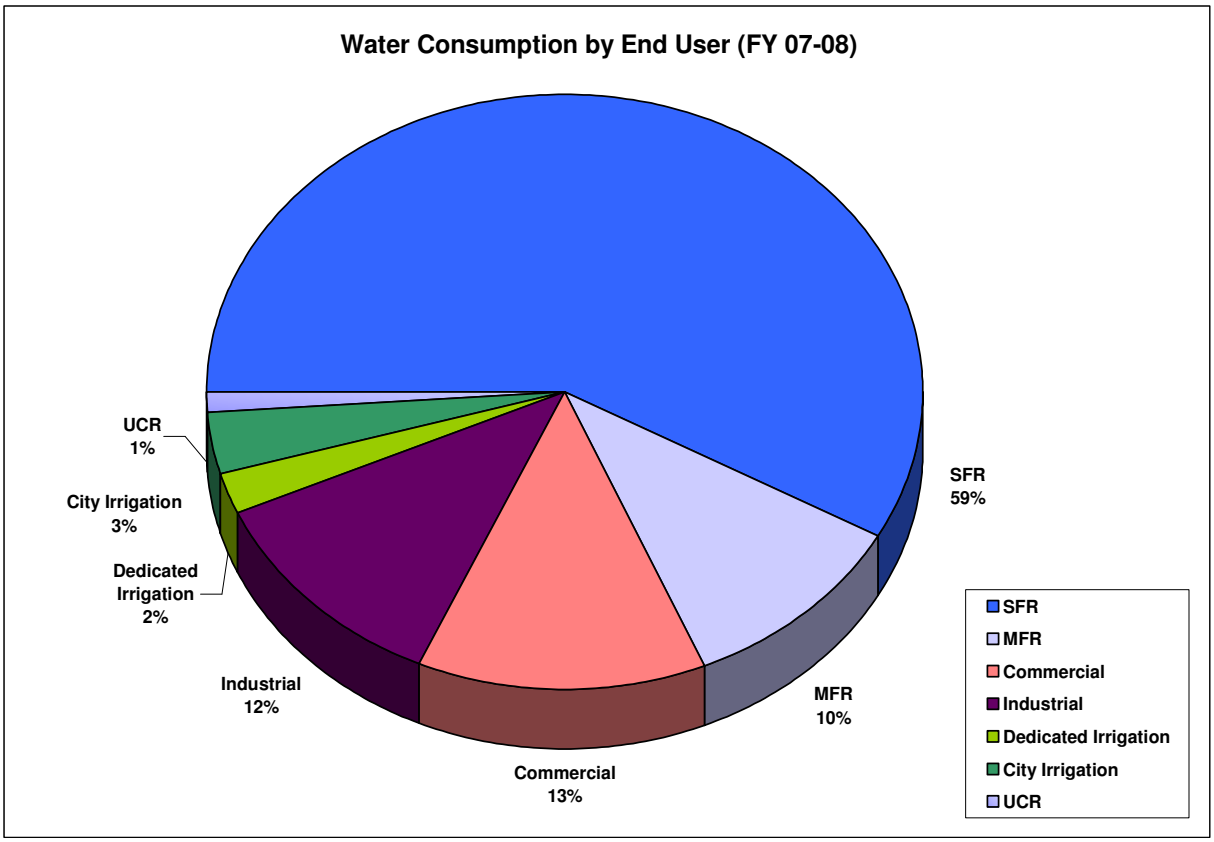
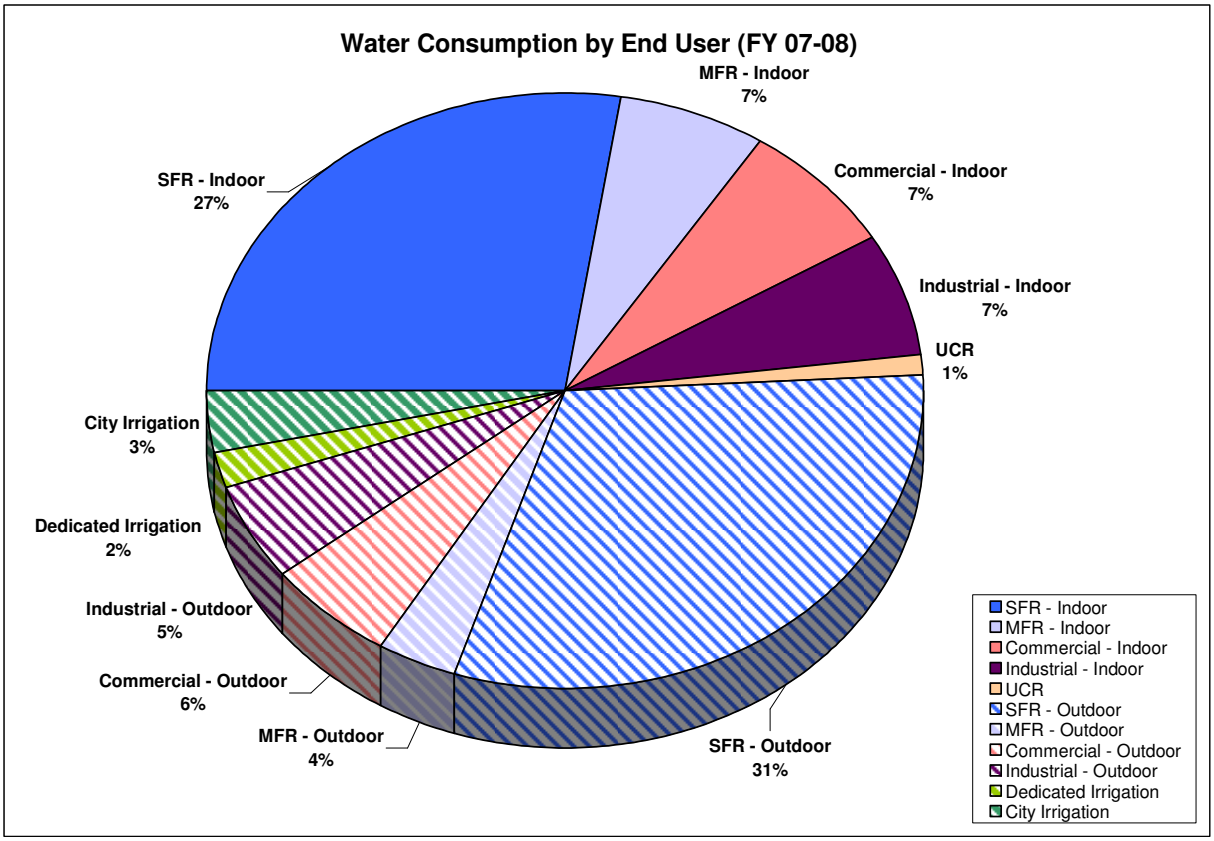


Figure ES-2: Indoor/Outdoor Uses (FY 07-08)



To meet SBX7-7's conservation requirements RPU needs to reduce potable consumption 16,200 AFY by 2020. RPU will need to meet this goal through conservation of 4,930 AFY by 2015 and 6,500 AFY by 2020 for an annual cost of about $2.3M. The balance will come from the development of recycled water—3,400 and 9,700 AFY by 2015 and 2020 respectively—as described in the 2009 Water Supply Plan (WSP). The projections for production, recycled water, and conservation are presented in the Table ES-1.

Table ES-1: Projections of Production, Recycled Water, and Conservation (AFY)

Description	2015	2020
Projected Production (incl. Home Gardens)	86,700	90,900
Projected Production – Water Service Area	86,300	90,500
Projected Recycled Water	3,400	9,700
Subtotal w/out Conservation	82,900	80,800
Urban Water Use Targets	77,970	74,300
Conservation Required	4,930	6,500

ES.2 Water Savings Measures Analysis

The scope of this WUEMP is to develop a water conservation strategy to achieve 10,000 AFY of savings by 2020. From an initial list of 77 conservation measures representing all reasonably known conservation devices, practices, and policies, 20 quantifiable measures were recommended within a 4-tier program. Each project tier, or Group, represents a specific degree of cost-effectiveness and difficulty of implementation. In addition to the conservation measures, savings expected to be gained from natural replacement of old and aging water-consuming devices was also analyzed.

The selection criteria for assigning projects into groups were based primarily upon the cost per AFY of water savings in 2020, as well as the other benefit-cost measures. The savings and costs of each project Group, as well as natural replacement savings, are summarized in Table ES-2. The table shows each Group's benefit/cost ratio, 2020 water savings, average annual costs, costs of water savings in 2020, and staffing requirements in full time equivalents (FTE). The cost of water savings in 2020 is the average annual operating cost of a project, relative to the annual water savings garnered by the project, in 2020. In contrast, the water utility benefit/cost ratio is a measure of the project's total benefits relative to its total costs for the whole period from 2010 to 2020.

Table ES-2: Summary of Quantifiable Water Savings

Conservation Option Tier	Water Utility Benefit/Cost	2020 Water Savings (AFY)	Average Annual Program Costs ($)	Cost of Water Savings in 2020 ($/AF)	Staffing Requirement (FTE's)[(a)]
Natural Replacement	-	1,500	-	-	-
Group 1	2.5	4,200	$1,320,000	$314	3.8
Cumulative		**5,700**	**$1,320,000**	**$232**	**3.8**
Group 2	1.3	1,300	$970,000	$723	2.3
Cumulative		**7,000**	**$2,290,000**	**$327**	**6.1**
Group 3	0.7	1,400	$1,523,000	$1,088	6.1
Cumulative		**8,400**	**$3,813,000**	**$454**	**12.2**
Group 4	0.3	500	$850,000	$1,823	2.8
All Groups	**1.3**	**8,900**	**$4,663,000**	**$524**	**15.0**

Note:
(a) Staff costs included in program costs

The scope of this WUEMP includes a water savings goal through conservation of up to 10,000 AFY. However, as described in this report, the total savings RPU needs through recycled water and conservation is projected to be 16,200 AFY and trade-offs will be made between the two programs. Since water conservation savings beyond Groups 1 and 2 (a total of 7,000 AFY including natural replacement) cost from $900 to $1,500 per AF (Group 3) additional conservation should be evaluated against recycled water.

Detailed assumptions for each project analysis are provided in Appendix D, including unit costs, savings, and implementation levels.

ES.3 Water Use Efficiency Strategies

The water use efficiency strategy recommendation for RPU is:

1. Pursue a "Flex-Track" approach to meeting MOU and Urban Water Management Plan (UWMP) requirements for all customers. Quantify the savings from the programmatic BMPs and use the programs identified in Groups 1 and 2 to meet the targets. Of the 16,200 AFY potable reduction required to meet SB7X-7, 7,000 AFY can be met through cost-effective conservation activities. While there are options to increase these savings they may be cost prohibitive at this time.

2. Continue implementation of the "Foundational BMPs," which are now required by the MOU as amended in 2008. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs).

3. Check for compliance with the Water Loss Control requirement and implement the AWWA water audit standard per the M36 manual.

4. Continue to consider the balance of conservation and recycled water in achieving both RPU and SB7X-7 goals.

5. Consider the value of "smart policies" to support incentive programs and provide a relatively low-cost approach to meeting reduction targets. Natural replacement accounts for about 20 percent of the 7,000 AFY that will be achieved through conservation by 2020. In addition to the natural replacement from fixture standards, new legislation such as SB 407, which sets requirements for fixture replacement for both Residential (2017) and Commercial (2019) and the new California Green Building Code (which goes into effect January 2011) and will set efficiency targets for all new development, will also reduce per capita use. These new standards were not quantified in the analysis.

6. Increase staffing by about 6 FTE to accommodate program expansion.

7. Develop a software tool that will allow for measurement of program activities and success towards meeting the goals.

The list of recommended programs includes eight programs in Group 1 and four programs in Group 2, with the differentiator being cost. Group 1 projects have an average annual cost per AF savings in 2020 of less than $500 per AF. Group 2 projects have an average annual cost per AF savings in 2020 of $500 to $900 per AF. In combination with natural replacements, the 12 programs are estimated to achieve a total water savings of 7,000 AFY by 2020 at an annual average cost of $2,290,000. Table ES-3 shows the recommended programs, associated costs, savings, and staffing requirements.

Table ES-3: Summary of Recommended Programs

Programs		Average Annual Costs ($)	2020 Savings (AFY)	Staffing Requirement (FTE's)[(a)]
Natural Replacement Savings				
3.5 gpf Toilets	$	-	550	-
2.5 gpm Showerheads	$	-	70	-
Washing Machine	$	-	860	-
Natural Replacement Total	$	-	**1,480**	-
Group 1 Programs				
Residential				
SFR Surveys - Top 5% of Customers	$	172,840	485	1.0
Precision Nozzles Distribution	$	266,000	1,006	0.9
Toilet Rebates	$	193,750	399	0.6
Large Landscape				
Dedicated Irrigation Surveys	$	334,900	772	0.0
CII Landscape Surveys - Top 5% CII WBICs Direct Install - Top 5%	$	162,835	868	0.6
CII Precision Nozzles	$	71,250	268	0.2
CII				
CII & MFR Clothes Washer Rebates	$	19,375	122	0.1
CII Toilet Installs	$	98,632	284	0.3
Group 1 Sub Total	**$**	**1,320,000**	**4,210**	**3.8**
Group 2 Programs				
Residential				
SFR Surveys - Top 5-10% of Customers	$	172,840	274	1.0
SFR Clothes Washer Rebates	$	116,250	202	0.4
Large Landscape				
CII Landscape Surveys - Top 5-10% CII WBICs Direct Install - Top 5-10%	$	161,651	201	0.6
CII				
CII Surveys - Top 5% CII Performance-Based Program - Top 5%	$	519,374	664	0.3
Group 2 Sub Total	**$**	**970,000**	**1,340**	**2.3**
Recommended Programs Total	**$**	**2,290,000**	**7,000**	**6.1**

Note:
(a) Staff costs included in program costs

Section 1: Introduction and Background Information

This section provides and introduction to the need for additional water conservation by 2020, as well as background on the Water Service Area climate, size, customer demographics, and current water supply.

1.1 Introduction

Senate Bill No. 7X-7, approved by the Governor November 10, 2009, requires a 20 percent reduction in urban per capita water use in California by December 31, 2020 with an interim target of at least 10 percent by December 31, 2015. The bill requires each urban retail water supplier to develop an "urban water use target" and an "interim urban water use target". Based on the "base daily per capita water use" of 261.9 gallons per capita per day (gpcd) for the City of Riverside Public Utilities (RPU) Water Service Area for the 10-year period ending December 31, 2008, RPU must reduce its water use by 20 percent to 209.5 gpcd by 2020. Based on the service area population projected for 2020, the reduction in water production is 16,200 acre-feet per year (AFY) to meet the "urban water use target" of 74,300 AFY as oppose to the Master Plan projection for 2020 (without additional conservation and/or recycled water) of 90,500 acre-feet per year. This reduction in water use needs to be met through a combination of water conservation and recycled water. An initial target set in the 2009 Water Supply Study for recycled water use that directly offsets potable water use is 9,700 AFY by 2020. This would leave a balance of 6,500 AFY of water use reduction required from water conservation. The actual trade-off between recycled water and conservation should depend on the life cycle costs and other non-economic factors of the alternatives once the Water Use Efficiency Master Plan and the Recycled Water Facilities Plan are completed.

1.2 Climate

RPU's service area is located in the southwest arid area of the United States. The climate typically exhibits hot, dry summers and mild, wet winters. Annual precipitation totals vary substantially from year to year. Most rainfall occurs during the months of November through April. Onshore airflow occurs during most of the year producing southwesterly winds. "Santa Ana" conditions occur occasionally producing warm, dry northeast winds that can reach high velocities. Table 1-1 provides monthly climatic data for the City of Riverside. Table 1-2 shows annual rainfall for the previous five years.

Table 1-1: Monthly Weather Statistics in RPU Service Area

	Jan	Feb	Mar	Apr	May	Jun	
Monthly Average ETo	2.5	2.9	4.2	5.3	5.9	6.6	
Average Temperature (F)	54	56	57	61	66	71	
Average Rainfall (In)	2.2	2.2	1.7	0.8	0.2	0.1	
	Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Monthly Average ETo	7.2	6.9	5.4	4.1	2.9	2.6	56.4
Average Temperature (F)	77	78	74	67	59	54	65
Average Rainfall (In)	0.0	0.1	0.3	0.3	0.9	1.2	10.1

Source: ETo: CIMIS data for Station 44, UC Riverside.
Temperature: Riverside Citrus Experimental Station; http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?carvrc; 1948-2005
Precipitation: Riverside Citrus Experimental Station; http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?carvrc; 1948-2005

Table 1-2: Annual Rainfall in RPU Service Area

Year	FY 03-04	FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09
Rainfall (in)	6.8	17.7	7.3	2.0	3.5	3.3

Source: CIMIS data for Station 44, UC Riverside.

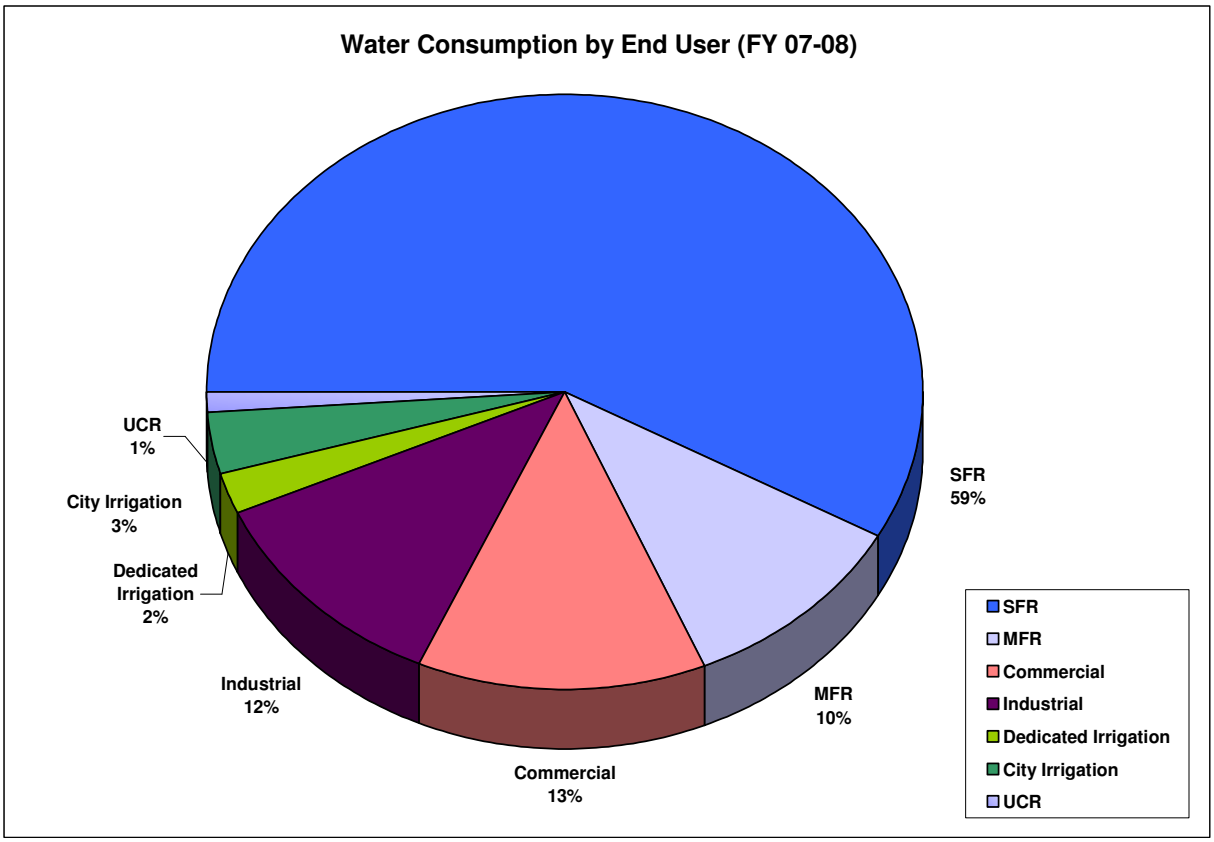
1.3 Service Area

RPU provides water through approximately 63,500 water service connections within a service area of 75 square miles, of which approximately 70 square miles are within Riverside's City Limits and approximately 5 square miles are outside the City Limits. Approximately 9 square miles within the City Limits are served by Western Municipal Water District (WMWD) and 1 square mile within the Riverside's limits are served by Easter Municipal Water District (EMWD). A small area (1/4 square mile) in northeast Riverside is served by Riverside Highland Water Company (RHWC).

1.4 Customer Demographics

The City began as an agricultural community and has evolved from agricultural to urban use since the 1940s. Now, Riverside consists primarily of residential land uses. Promoting the shift in land uses are high-income jobs migrating inland from coastal areas, which has resulted in high population growth, as documented by the 2005 Urban Water Management Plan (UWMP). Figure 1-1 identifies current water use in Riverside by sector.

Figure 1-1: Riverside Water Customer Accounts



1.5 Water Supply Sources

As of 2009, RPU became water independent and met its entire potable water demand using local groundwater with no purchased imported water. The groundwater is supplied for local groundwater basins: Bunker Hill, Riverside North, and Riverside South basins. RPU also has wells in the Arlington and Colton-Rialto basins but does not currently produce potable water from these basins. For the late 1970s through 2008, RPU purchased from less than 1 to 5 percent of its annual potable supply as treated imported water from WMWD to meet peak water demands within the higher elevations of the City's service area during hot summer months or emergencies. RPU has a contractual agreement with WMWD for up to 60 cubic feet per second (cfs) of imported water available through three separate connections. Tertiary treated recycled water currently provides less than 0.1 percent of the annual water supply and is provided through the Riverside Regional Water Quality Control Plant.

Section 2: End User Profile

2.1 Current and Projected Demands

RPU's 2009 Water Supply Plan (WSP) presents the 2008 normalized production as 80,000 AFY and the projections, without reductions due to recycled water and conservation, to be 86,700 for 2015 and 90,900 for 2020. The WSP assumes the development of 3,400 AFY of recycled water to offset potable demand by 2015 and 9,700 AFY by 2020. The WSP also assumes (without the benefit of the 2015 and 2020 Urban Water Use Targets) that conservation would need to reduce demand by approximately 5,000 AFY by 2015 and 10,000 AFY by 2020. Using the Southern California Association of Governments (SCAG) population projections for the City of Riverside for 2015 and 2020, the Water Service Area population can be estimated and the corresponding allowable production (gross water use) projected for each time frame. SCAG estimates the City of Riverside population will increase to 312,924 by 2015 and 335,468 by 2020. Assuming the Water Service Area population continues to be the same ratio of the City's population (94.366 percent), then the Water Service Area population in 2015 and 2020 should be 295,294 and 316,568, respectively. With targets of 235.7 and 209.5 gpcd, the production levels that will allow achievement of the reduction targets will be 25,405 million gallons (MG) (77,970 acre-feet) and 24,209 MG (74,300 acre-feet) for 2015 and 2020, respectively.

Using the allowable production (gross water use) described above, the targets for water conservation can be refined. The production projections from the WSP without reductions due to recycled water and conservation for RPU's Water Service Area are 86,700 and 90,900 AFY for 2015 and 2020, respectively. However, these estimates include RPU's wholesale deliver to the Home Gardens Community Services District of approximately 400 AFY. With deliver to Home Gardens removed, the production projections are 86,300 AFY for 2015 and 90,500 AFY for 2020. Assuming 3,400 AFY of recycled water deliveries by 2015 and 9,700 AFY by 2020, the remaining demand without additional conservation would be 82,900 AFY in 2015 and 80,800 AFY in 2020. Since the allowable production (gross water use) is 77,970 AFY for 2015 and 74,300 by 2020, then the amount of conservation savings required to meet the SBX7-7 targets is 4,930 AFY by 2015 and 6,500 AFY by 2020. The projections for production, recycled water, and conservation are presented in Table 2-1.

Table 2-1: Projections of Production, Recycled Water, and Conservation (AFY)

Description	2015	2020
Projected Production (incl. Home Gardens)	86,700	90,900
Projected Production – Water Service Area	86,300	90,500
Projected Recycled Water	3,400	9,700
Subtotal w/out Conservation	82,900	80,800
Urban Water Use Targets	77,970	74,300
Conservation Required	4,930	6,500

2.2 Meter Data Analysis

The meter data analysis included an in-depth characterization of water use by customer types in order to determine trends within user classes and identify opportunities to target conservation programs towards particular user classes. Meter data records for fiscal years 2003 to 2004 through 2007 to 2008 were analyzed. Customer types were classified into customer categories, or 'sectors', based on water billing rate codes, as shown in Table 2-2.

Table 2-2: Customer Types by Sector

Rate Code Description	Rate Code	Customer Category
STATE OF CALIFORNIA WATER	W601	Commercial
WA-1 ALT RESIDENTIAL WATER INSIDE	ALW1	Residential
WA-1 ALT RESIDENTIAL WATER OUTSIDE	ALW2	Residential
WA-1 RESIDENTIAL WATER INSIDE	W100	Residential
WA-1 RESIDENTIAL WATER OUTSIDE	W110	Residential
WA-10 RECYCLED IRRG WATER	W901	Irrigation
WA-3 IRRG NORESI THRU 3" INSIDE	W320	Irrigation
WA-3 IRRG W/RESI THRU 3" INSIDE	W300	Irrigation
WA-3 IRRG W/RESI THRU 3" OUTSIDE	W310	Irrigation
WA-3A Nurseries NO/RESI INSIDE TRAN/WA6	W220	Irrigation
WA-3A Nurseries W/RESI INSIDE TRAN/WA6	W222	Irrigation
WA-3B GROVE W/RESI INSIDE TRAN/WA9	W822	Irrigation
WA-3B GROVE W/RESI OUTSIDE TRAN/WA9	W823	Irrigation
WA-4 ALT RIV WTR IRR INSIDE	ALW9	Riverside Water Co. - Irrigation
WA-4 ALT WA4 WTR IRRG OUTSIDE	ALW8	Riverside Water Co. - Irrigation
WA-4 RIV WTR CO IRR OUTSIDE	W412	Riverside Water Co. - Irrigation
WA-4 RIV WTR CO IRRIGATORS INSIDE	W411	Riverside Water Co. - Irrigation
WA-6.1 ALT COM'L WATER INSIDE	ALW4	Commercial
WA-6.1 ALT COM'L WATER OUTSIDE	ALW3	Commercial
WA-6.1 COM'L WATER INSIDE	W200	Commercial
WA-6.1 COM'L WATER OUTSIDE	W210	Commercial
WA-6.2 ALT INDUSTRIAL WATER INSIDE	ALW5	Industrial
WA-6.2 ALT INDUSTRIAL WATER OUTSIDE	ALW6	Industrial
WA-6.2 INDUSTRIAL WATER INSIDE	W204	Industrial
WA-6.2 INDUSTRIAL WATER OUTSIDE	W214	Industrial
WA-6.2 UCR ALT POTABLE WTR AGREEMENT	ALWU	UCR
WA-6.2 UCR WTR CREDIT PER POTABLE AGRMNT	W892	UCR
WA-7 PARK & REC WATER	W600	City Irrigation
WA-7 PW FRONTAGE/MED LNDSCP MAINT	W610	City Irrigation
WA-7 SPECIAL METERED WATER	W700	City Irrigation

Rate Code Description	Rate Code	Customer Category
WA-8 GREENBELT IRRG PER ACRE	W883	Irrigation
WA-9 GROVE PRES RESI W/NOM LANDSCAP	W886	Irrigation
WA-9 GROVE PRES RESI W/NOM LANDSCAP OUTSIDE	W888	Irrigation
WA-9 GROVE-QUALIFY GROVE W/WO RESI	W887	Irrigation

Source: RPU Finance Department

The water rate codes used by RPU distinguish between single family residential, commercial, industrial, dedicated irrigation customers, and the University of California, Riverside. However, multi-family residential accounts are not distinguished by a separate rate code, but are instead identified as multiple-metered accounts, and may be categorized by many different rate codes. The majority of these multiple-metered accounts are classified by residential and commercial rate codes. While the number of multi-family residential accounts could be determined using the multiple-metered account designation, the total number of development units (DU's), or households, associated with these accounts could not be determined. Thus, for the purposes of estimating water conservation savings from the multi-family sector, the number of multi-family residential accounts was estimated using the service area population, residential population density in persons per household (pphh), and number of single family residential accounts.

2.3 Water Use by Sector

The following section examines water use and population trends and relationships. It is important to note that the amount of information is limited to eight years which makes any conclusions challenging. In addition, the rainfall and economic fluctuations during this period have been fairly dramatic, exacerbating the difficulty of establishing relationships. These issues are discussed further in the sections below.

Figure 2-1 shows the total number of accounts in RPU's service area since 2000. Data from 2003-2008 were obtained from billing records and data for the year 2000 was from the RPU 2005 UWMP. The figure shows steady growth in the number of accounts of approximately 1 percent per year (8 percent total growth).

Figure 2-1: Total Number of Accounts

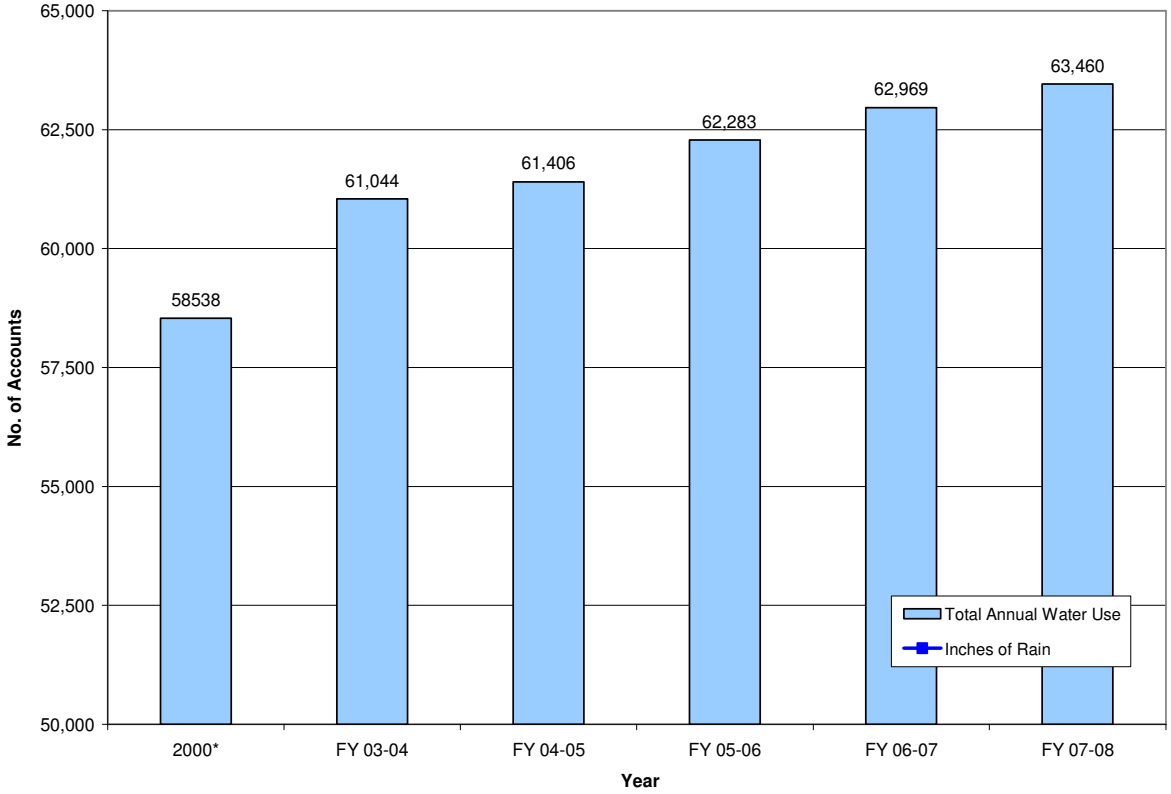


Figure 2-2 shows total water use between fiscal years 2003 and 2008. Compared with population patterns, it is more challenging to identify a trend in water use because of the large fluctuations in rainfall as well as the economic impacts of the last few years that have immediate and potentially only short term impacts on consumption. The average annual water use (measured through billing records and not as production) between 2003 and 2008 was approximately 69,500 AF and the 2005 UWMP indicates that water use in the year 2000 was 67,000 AF, so it seems that use has stayed fairly constant but that may be misleading given the fluctuations. For example, between FY05 and FY07 use rose by 14 percent and between FY07 and FY09 it dropped by about the same amount. The region also experienced record precipitation in 2005, which resulted in a decrease of nearly 7 percent in the annual average compared to the average for the six-year period. In the period being examined, water usage appears to have been largely influenced by factors other than population growth.

Figure 2-2: Total Yearly Water Use

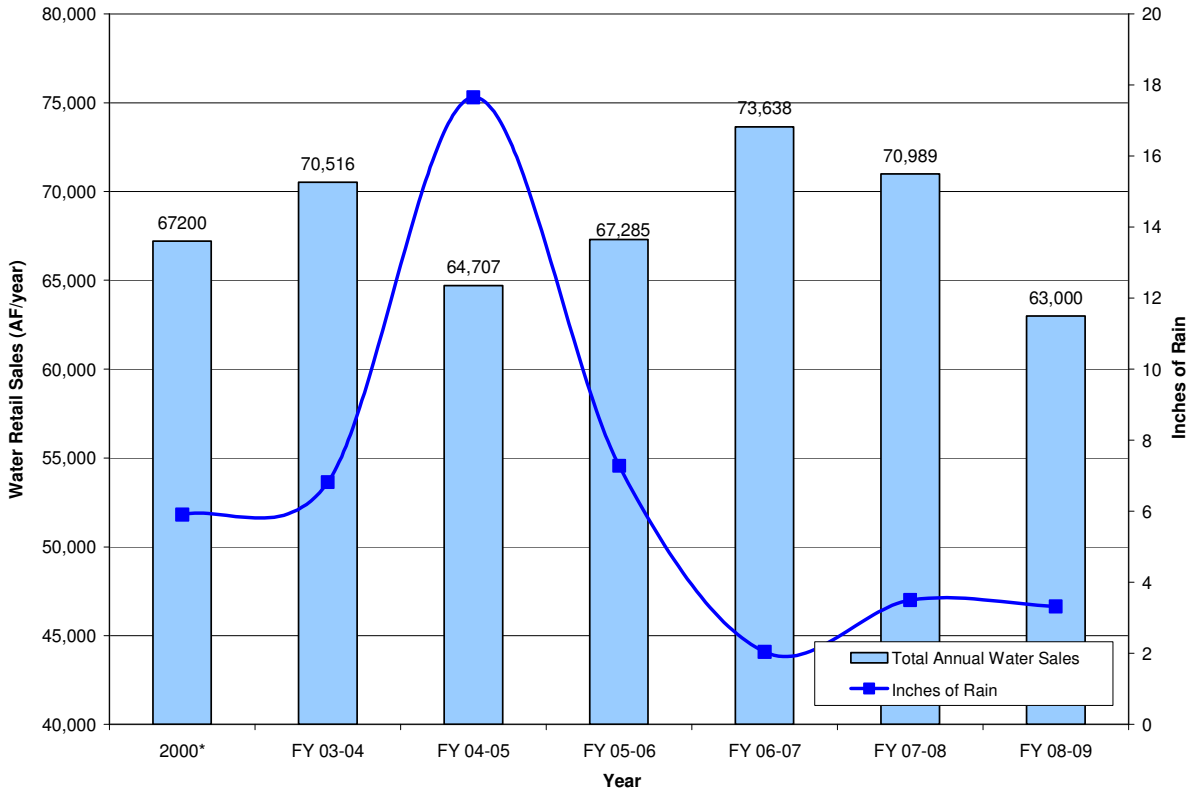
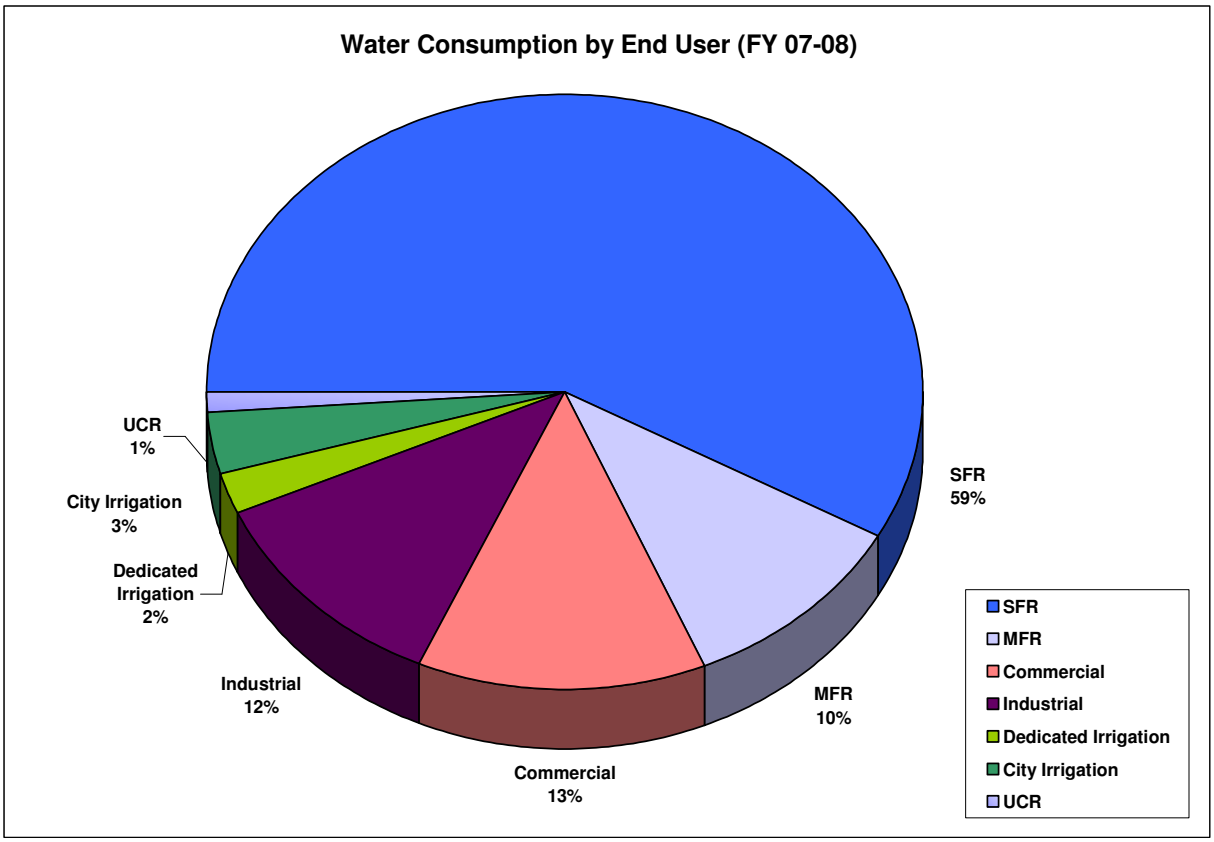


Figure 2-3 shows the breakdown of water use by sector. The figure shows that residential water consumption makes up about three quarters of total potable water use with single family residential alone accounting for nearly 60 percent and multi-family residential accounting for 10 percent. Commercial and industrial uses account for approximately one quarter of total water use, with each sector comprising 12 to 13 percent. While about half of total water use is for landscape and irrigation, most of it is not measured directly with dedicated irrigation accounts accounting for only 5 percent of total water use. The University of California, Riverside (UCR) accounts for approximately 1 percent of total water use.

It is important to note that the figures in this section represent annual billing records and not potable water production; as such they do not take into consideration unaccounted for water (UFW), which on average for RPU during this period was approximately 12 percent of total use.

Figure 2-3: Water Consumption by End User (FY 07-08)

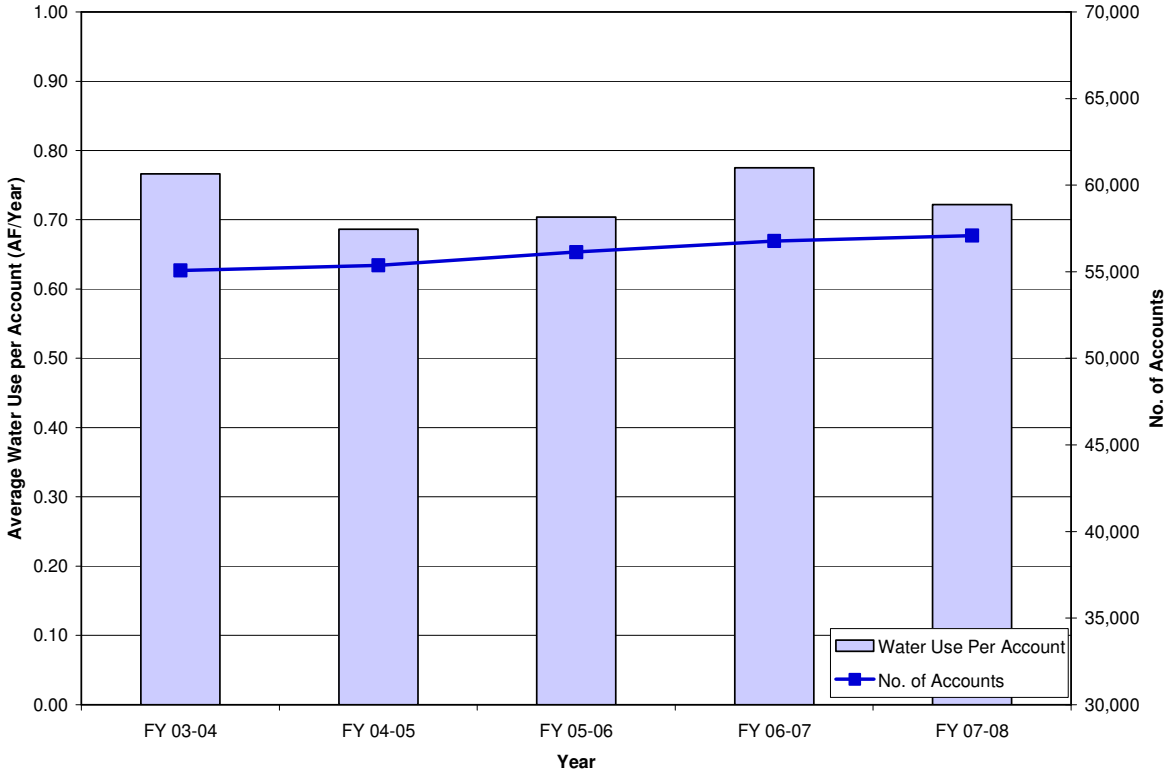


2.4 Residential

Single family residential water use is nearly 60 percent of the City's total water use. Figure 2-4 shows the water usage per account between 2003 and 2008. In this period, the region experienced slight growth in the number of residential accounts, on the order of roughly 4 percent. Due to the local dry climate, water usage per account is significantly higher than normal, with an overall average of 0.73 AFY, or 211 gpcd based on the City's average density over the period of 3.085 persons per account. Annual water use per account varied between 0.69 and 0.78 acre-feet, with the lowest value attributed to the abnormally wet year in 2005. In comparison, the 2008 WMWD Water Use Efficiency Master Plan estimates the average single-family residential per capita water use in the service area as 200 gpcd. In that analysis RPU's per capita water use was one of the highest for the region.

In general, residential per capita water use should exhibit a downward trend over time due to improvements in fixture efficiencies, natural replacement, and the greater efficiencies of newer developments versus older developments. However, climatic and economic conditions between 2003 and 2008 have caused fluctuations in water use, masking any discernable trend.

Figure 2-4: Average Water Use Per Account (SFR)

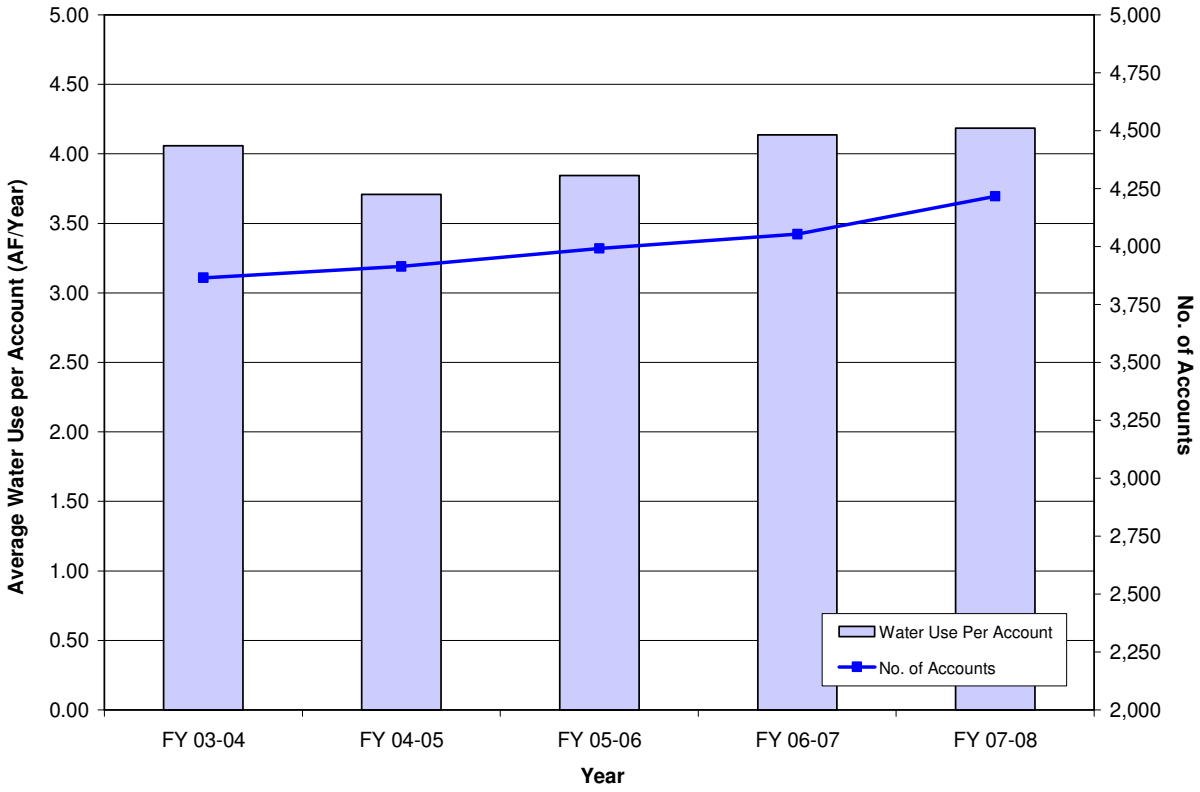


2.5 Commercial, Industrial and Institutional (CII) Sector

The CII sector is more challenging to characterize and develop conservation programs for due to the wide range of customers and uses that fall into this category. This sector can include small water users, such as churches, as well as large water users such as industrial food processing facilities. RPU does not utilize detailed subclasses within the water billing system to categorize these customers. Institutional accounts are also classified as commercial accounts in the billing system. Additionally, multi-family residential accounts are classified within CII as well as within residential categories, adding to the challenge.

CII customers account for approximately 25 percent of water use within the RPU service area. As shown in the figure below, water usage per account in the CII sector did not vary considerably between 2003 and 2008, with an average use per account of 4 AFY. Commercial use does seem to be on a slight rise, increasing from 15,700 AF in 2004 to 17,600 AF in 2008. This growth in the commercial sector water use is not uncommon in California and is possibly related to the historic focus on reducing residential sector water use rather than commercial.

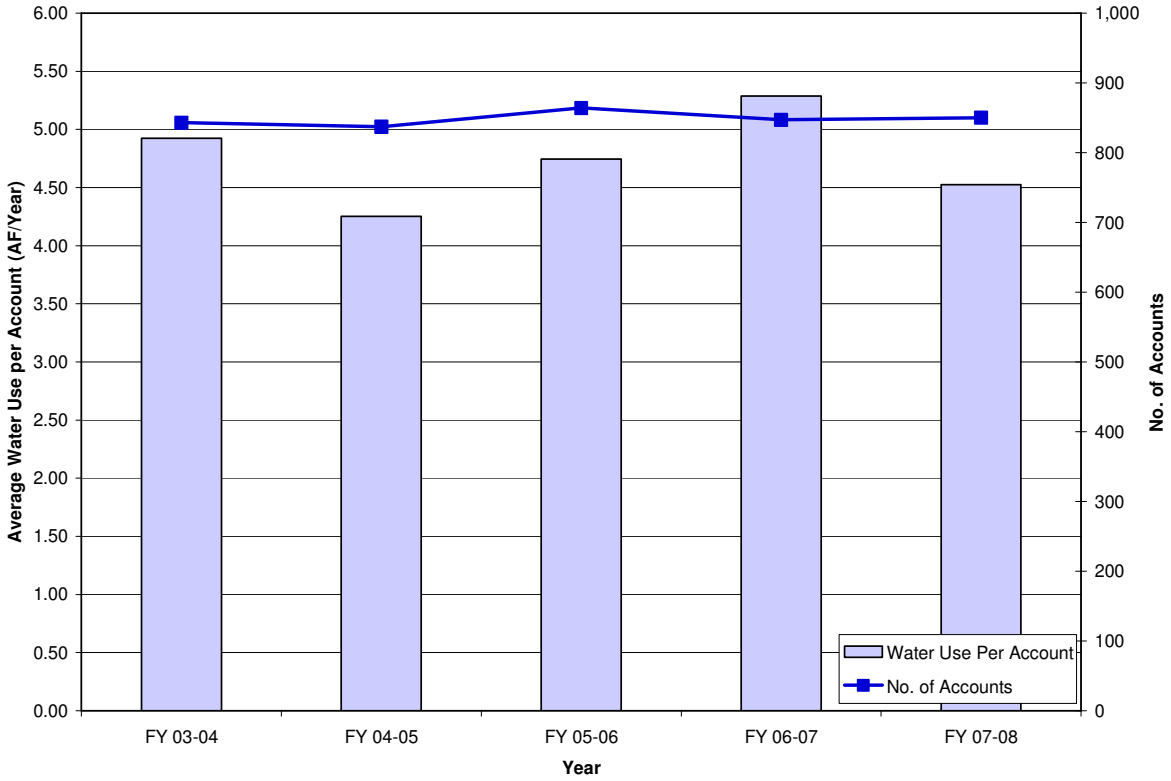
Figure 2-5: Average Water Use Per Account Over Time (Commercial and Industrial)



2.6 Large Landscape

The large landscape sector consists of dedicated irrigation accounts, or accounts that are billed by irrigation rates. These include city-owned or maintained facilities such as parks, groves, and medians, as well as residences and businesses with large landscaped areas. City-owned or maintained facilities comprise three percent of the total water use, and private accounts comprise two percent. The water usage of these accounts can include some indoor residential uses because there are large residential accounts with a single meter that are billed with irrigation rates. These customers are typically former agricultural accounts, or residences with large acreages of land to justify categorization as an agricultural customer. While only about five percent of the water use in RPU's service area is used by dedicated irrigation customers, they are high users, using more per account than CII customers. Large landscape use per account was 4.75 AFY between 2003 and 2008. During the 2005 wet year, water use was 4.25 AFY per account, roughly 10 percent less than the average.

Figure 2-6: Average Water Use Per Account Over Time (Large Landscape)



2.7 Outdoor vs. Indoor Water Use

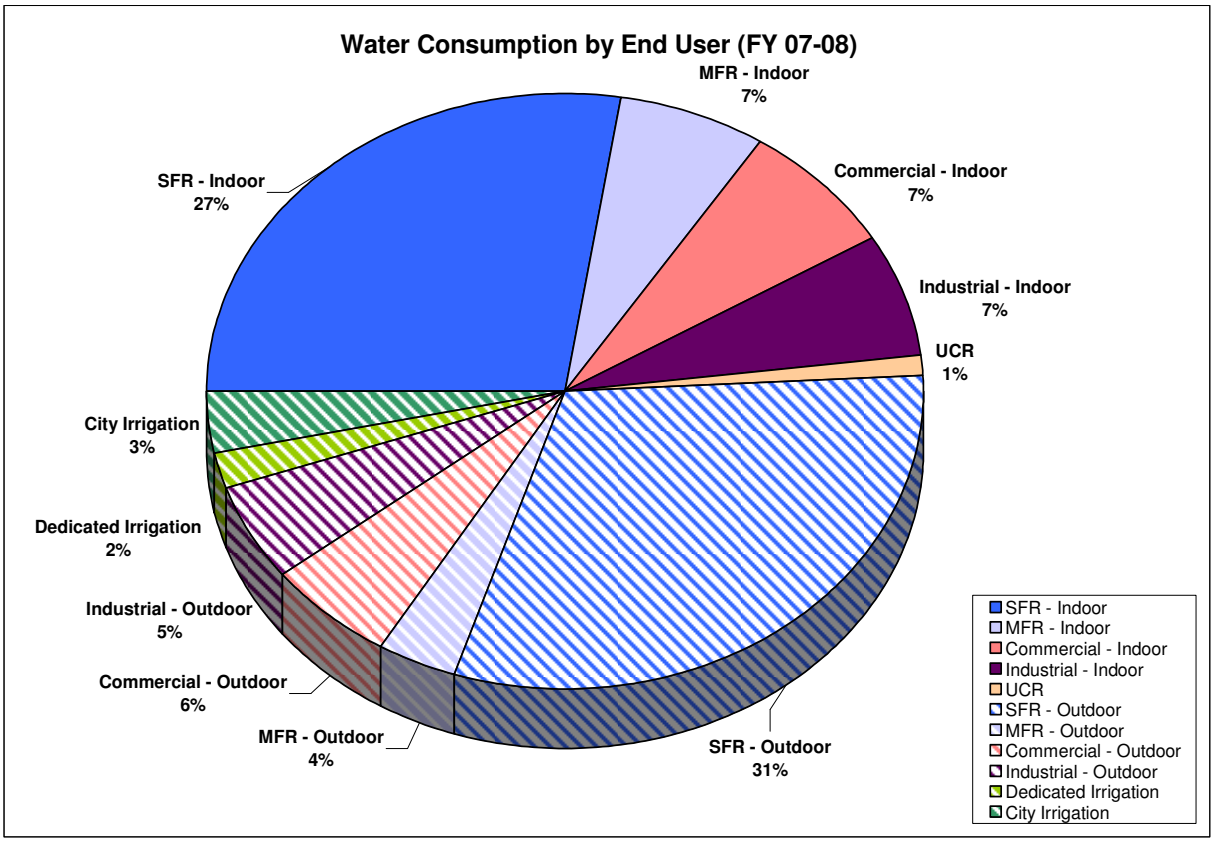
Outdoor water use was estimated through a minimum month analysis of meter data. Since most customers are served by a single mixed use water meter, determining the volume of water used for landscape irrigation requires separating indoor and outdoor water uses analytically. A common way of doing this is the minimum month method which assumes that during winter or wet months, irrigation use is minimal and therefore total water use during these months consists entirely of indoor water use. Indoor water use is generally not climate dependant and is therefore relatively constant throughout the year. For this analysis, the lowest water-use month between 2003 and 2008 was February 2005.

Indoor water use is likely to be overestimated using this method in a climate such as Southern California's, where some irrigation will occur even in the coldest and wettest months. If this is the case, the estimates of potential irrigation savings would err on the conservative side.

Figure 2-7 shows indoor and outdoor water use by customer type. Outdoor water use is slightly more than 50 percent of RPU's total water usage and most dominant in the single-family residential category. Overall, outdoor water use is estimated to be 53 percent of total water use in the single-family sector, 36 percent of total water use in the multi-family sector, and 44

percent of the CII sector. This large outdoor use is not atypical of the region and reflects the common challenge of managing landscape uses in the state.

Figure 2-7: Indoor/Outdoor Uses (FY 07-08)



2.8 Calculation of Service Area Water Use in Gallons per Capita per Day (gpcd)

Calculation of the urban "base daily per capita water use" was conducted per the requirements of Senate Bill No. 7X-7. The bill requires urban retail water suppliers to establish a baseline per-capita water use and develop water use targets for the years 2015 and 2020. Using the calculation approach defined in SBX7-7, RPU's "base daily per capita water use" was determined to be 261.9 gpcd for the 10-year period ending December 31, 2008. This value is a different measure than that the 211 gpcd discussed in Section 2.4 about residential water use for two reasons. First, the "base daily per capita water use" includes the total water used within RPU's service area, whereas the value discussed regarding residential per capita water use accounts for only the residential sector, and second, the "base daily per capita water use" is "gross water use" or "production," whereas the value discussed regarding residential per capita water use is based on billing records; it does not include unaccounted-for-water.

2.9 Planned Future Development

The RPU Water Service Area is approximately 80 percent built out and contains about 15 percent vacant land available for development. The 2005 Water Master Plan describes three categories of growth in water demand for ultimate build out: (1) development within the remaining vacant land, (2) increased density within areas already developed as defined in the City's General Plan, such as the Downtown and Magnolia corridors, and (3) water demand associated with growth and expansion of UCR.

2.10 Sectors to Target

The analysis presented in this section revealed that the region is dominated by SFR as a single group with consumption, accounting for approximately 60 percent of total water demand. Further, over half of the water used in this sector is for landscape irrigation. High irrigation water use is not uncommon in the Inland Empire and is largely the reason that water use per capita is very high in the region. This suggests that the SFR sector should be a key target for RPU's water use efficiency strategy, both in and out door.

Water in the CII sectors is also significant at about 25 percent of consumption. Additionally, water use per account is high in the CII sector and typically usage is highly weighted towards a few top customers, which makes it programmatically very appealing – a small number of customers with a high use RPU's billing data supports the trend, with the top five percent of CII customers using over 50 percent of the sector's usage. In other words, less than 0.5 percent of the total customers represent nearly 15 percent of the total water usage. Targeting high users in the CII sector addresses large uses with few customers or projects. The challenge with CII use is that it usually requires a greater effort due to the variety of devices and processes represented, but the return on that investment can be significant.

With regard to targeting customers for participation, conservation activities should focus primarily on portions of the service area which are not included in the recycled water plan. Due to the need for increased water supply reliability, recycled water as well as conservation will comprise most of RPU's new water sources. By targeting conservation activities to areas that will not be served by recycled water, RPU can optimize its potable water offsets and avoid redundancy in the two programs.

Section 3: Current Conservation Programs

RPU is a signatory to the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU), which requires the implementation of 14 Best Management Practices (BMPs) for water conservation. The Urban MOU was first adopted in December 1991 by the California Urban Water Conservation Council (CUWCC) and last amended in 2008. Agencies that are signatories to the Urban MOU are required to report regularly on their implementation efforts with regard to each of the 14 BMPs. These reports are archived in an online BMP Reporting Database at the CUWCC website and are publicly available.

The MOU and BMPs were revised by the CUWCC in 2008. The revised BMPs now contain a category of "Foundational BMPs" that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). The remaining "Programmatic" BMPs have been placed into three categories: Residential, Large Landscape, and Commercial, Industrial, and Institutional Programs. The intent of the revision was to provide water utilities with flexibility on achieving reduction targets and now provide options including a flex track and per-capita use approach to compliance. These revisions will be reflected in the reporting database starting with reporting year 2009. RPU's CUWCC reports including the Base Year file, the most recent BMP annual reports, and RPU's BMP records were analyzed to determine compliance levels with the 2008 MOU. Water use efficiency program data being collected for the 2008-2009 reporting period was also reviewed.

A summary and description of RPU's status in implementing the 14 BMP's is provided in Appendix A.

Section 4: Measures Identification, Selection and Analysis

In order to reduce future water demands and comply with SBX7-7, RPU needs to reduce demand by 16,200 AFY by 2020 through a combination of recycled water and conservation. Since the target value through each program is dependent of the cost-effectiveness, the scope of this WUEMP is to determine the feasibility and associated costs for 10,000 AFY of savings by 2020. The process of choosing and analyzing conservation measures and combining them into a 10 year plan consists of the following steps:

1. Calculating expected demand reductions from natural replacement

2. Developing an initial set of 77 conservation measures that represent all reasonably known conservation devices, practices and policies.

3. Gathering data for each conservation measure including saturation levels, customer base, decay factors and cost as well as implementation considerations. Professional judgment and staff input about previous experiences and the nature of the customer base also played an important role in this assessment.

4. Narrowing down the list of measures to those that were the most reasonable based on the results of step No. 2, to be further evaluated for their cost-effectiveness, potential for water savings and their feasibility. Programs were also combined where it made most sense, for example bundling a giveaway program with a residential survey program. The final list of programs consists of 16 quantifiable measures, and several non-quantifiable programs as discussed in Appendix D, Water Conservation Strategy.

5. Determining costs and benefits of implementing each conservation measure using the CUWCC cost-effectiveness model. For each measure, the costs of saved water as well as the financial and staffing resources to implement the program were determined.

6. Combining the measures into a conservation program that will meet the 2020 reduction goals (combined with the demand reduction estimates). The programs are tiered in a way that reflects the cost and ease of implementation. The results represent a reasonable range of conservation potential for long-range planning purposes.

4.1 Water Use Efficiency Program Rankings: Conservation Measures Identification, Evaluation and Prioritization

The initial list of potential water conservation measures identified essentially all possible options, based on professional experience and a familiarity with conservation programs across the state. The list covered activities, fixtures and policies and included projects currently being implemented or planned to be implemented by RPU. The list of potential projects was organized by sector — Residential; Large Landscape; and, Commercial, Industrial, and Institutional (CII) — due to their distinct programmatic needs. In addition to the quantifiable programs (those that have reliable information on unit water savings and cost), the analysis also addresses several non-quantifiable programs, which include policy initiatives and utility operations related activities. While not possible to reasonably attach costs and savings to these

programs, they are considered essential to the implementation of the quantifiable programs by providing the regulatory conditions, proper information, or market environment to support conservation.

Tables 4-1, 4-2, and 4-3 show the full list of potential Residential, Large Landscape, and CII programs.

Table 4-1: Residential Programs

Program	Description
Monitoring, Information & Technical Support	
Residential Assistance (Surveys)	Offer indoor and outdoor water surveys to single-family residential customers with high water use – program targets the top tiers of users based on billing data. Surveys should include leak detection, assessment of all water using fixtures and appliances including toilets, faucets, showers, washing machines and dishwashers. The Program provides small devices such as aerators, showerheads, toilet flappers as well as assistance to repair minor leaks. Program could consider targeting low income users in order to service a traditionally underrepresented community and one that tends to be more sensitive to bills, have older fixtures and have limited ability to implement water conservation measures on their own.
WBICs Direct Install	Offer direct installation of weather-based irrigation controllers (WBICs) to single-family residential customers with high water use and large landscaped areas (similar to current program with WMWD). The direct install program will provide the device, free installation, and 3 years of signal fees and can be implemented in conjunction with SFR Survey Program. Direct install programs are more expensive than rebates but they ensure proper installation and improved participation.
Automatic Meter Reading	AMR reads to identify leaks or other anomalies. Costs are significant - meters must be retrofit and a way of disseminating the information to the customer needs to be developed. Program can have multiple benefits with all the information that becomes available and trackable. Program could be considered in larger discussion regarding meter replacement, operations needs, staffing, etc. Provides valuable customer and system information but may be cost prohibitive as conservation tool alone.
Replace Old Water Meters	Many water meters in RPU's service area may be old and under report water use, resulting in lost revenue. Some meters may under report by 15%. Replacing old meters will help reduce unaccounted water and encourage conservation as customers will be billed correctly for their use.
In-Home Meter Monitors	In-home meters that assist customers in tracking how water is used in the home. No conclusive industry savings/results available. Water savings are likely to be low.
Incentives	
Precision Sprinkler Nozzles Distribution	RPU will begin a pilot program to distribute Torro Nozzles at a highly subsidized cost, in conjunction with WMWD in summer of 2010. The advantage to these sprinkler nozzles is their relative ease of implementation—they are easy to install and don't require the adjustment of traditional rotators— which may improve savings reliability The results of this pilot will provide more information.

Program	Description
Low-Flow Showerheads Distribution	Current plumbing code requirements will phase out older showerhead models with 2.5 gpm models, which are nearing saturation through natural replacement. Newer showerheads flow at 1.5 gpm and distribution of these (even to replace 2.5 gpm models) can offer significant and relatively inexpensive savings. Showerhead distribution should be implemented in conjunction with the Residential Survey Program.
High Efficiency Washing Machine Rebate Programs	Offer rebates for the purchase of HECW's. A New CA law will require all washing machines sold in CA to use no more than 6 gallons per cubic foot washing capacity (http://energy.ca.gov/releases/2009_releases/2009-10-29_clotheswashers.html) beginning in 2010. The rebate program should focus on those models that exceed regulatory requirements.
HET Rebates	Offer rebates for the purchase of high-efficiency toilets (HET's) (1.3 gpf). Although AB 715 phases in an HET requirement on all models sold in CA by 2014, there is value in accelerating that savings and, ideally, capturing those older models that would not otherwise be replaced.
WBICs Rebates	Offer rebates for WBIC's. Currently, RPU offers a $200 rebate per device, significantly less than the cost of a direct install (cost to the customer). In order to be more cost-effective for the customer, the rebate value could be increased and the program target only high-use customers who have the savings potential to justify the cost of a WBIC's installation.
Residential High Efficiency Dishwashers	High efficiency dishwashers are both water and energy efficient and also clean better than older models. Savings are not high - projected at only 3-6 gpd - but incremental cost is also low.
Residential Hose Nozzles	Nozzle attaches to hose with on/off control. Savings and costs are both not high. Device could be distributed as part of Residential Surveys Program.
High Performance Faucets	Kitchen or bathroom faucets or aerators that use less than the U.S. maximum of 2.2 gpm. Savings and costs are both not high; device has a very high decay factor. Device could be distributed as part of Residential Surveys Program.
Residential Hot Water Demand Systems	An electronically, demand-controlled system that sends cold water back to the water heater until hot water arrives at the fixture where it is needed. System is a controversial product in regards to its savings potential.
Residential Low Precipitation Irrigation Systems	Drip, micro, low volume precipitation irrigation is the slow application of water to a plant's root zone. This delivery reduces evaporation and eliminates overspray. Plants thrive on the optimum balance of oxygen and moisture around their roots. Incentives may be available through the Measured Savings program which offers customized incentive for industrial process and irrigation system water reduction.
Policy	
Dual water mains	Mandate that new subdivisions include dual water mains in the streetscape to allow for future conversion to recycled water. Could be considered as part of New Construction ordinance.
Dual Plumbing	Mandate that new developments include dual plumbing to allow for future conversion to recycled water. Could be considered as part of New Construction ordinance. Cost born by developer. Agency needs to have capacity to provide supply. Moves towards providing the appropriate quality water for appropriate use.
Pond and Water Feature Recycling	Water reuse for these outside features. Could be considered as part of New Construction ordinance. Recycled water ordinance does not address this topic.

Program	Description
Submetering	Installing submeter at sites with master meters. Could provide landlord with billing by volume of use capability or provide end use customer with information on their use. Could be considered as part of New Construction ordinance. Studies have shown reduced use. Submetering at existing sites can be expensive. Consider as WSS for New development.
Green Building Code	Savings accruing by encouraging enforcement of "Green" buildings codes that apply LEEDS/WaterSense Specifications (WSS) requirements to new construction. Could be considered as part of New Construction ordinance. Goes beyond WSS requirements to include design practices and more. Can specify % reduction, as in LEED. Generally for new construction only.
Low Impact Development Policies	Guidelines for new (and existing) development that incorporates water use efficiency, runoff, pollution prevention, etc. Could be considered as part of New Construction ordinance. Comprehensive approach to development
Builder Offset Programs	Mandate that all new construction requires demand offset. Could be considered as part of New Construction ordinance.
Alternative Water Sources	Non-potable water sources for cooling condensate, foundation drain water, gray water, storm water, rain water, etc. RPU has existing Recycled Water Ordinance for new and existing construction. 15 year plan includes 30% reuse goal. Ordinance and implementation plan can be reviewed further.
Toilet retrofit on resale	Replacement of toilets flushing at 3.5 gpf+ upon transfer of title. Program has low cost, but monitoring is an issue.
Gray Water Treatment Systems	Use of gray water from showers, bathroom lavatory sinks, and clothes washers for water reuse applications, such as toilet flushing or irrigation. Can be customer made systems or off-the-shelf bathroom systems. May have public health considerations.
Water Sense Specification for New Development	Incentives for residential construction to meet WSS standards. Incentives can take the form of rebates, recognition, ordinances, reduced construction fees, etc. Implementation challenge is setting up tracking mechanisms. Program can be tied to Green Builder program or Energy Efficiency New Construction Program.
Other Conservation Programs with Limited Applicability to RPU	
Residential Dual Metering	Same as dedicated irrigation for large commercial landscape. Requires smaller meter. Most cost effective for new construction. Cost prohibitive; new construction only. Can be included in WSS specifications.
Water Budgets	A water use budget is an upper bound estimate of water needed at a site given its landscape area, local weather conditions and other factors (i.e. plant type). Each billing period customers receives notices comparing their actual use to their budget. Many agencies implementing water budgets have achieved reductions of 20%.
Soil Moisture Sensors and Probes	Monitor soil moisture to determine irrigation requirements and adjust the irrigation schedule based upon the moisture content. MWD did not approve this device for incentives.
Shower Stall Head Limit	Limit the number of showerheads to one showerhead per 2500 square inches of shower space. A low cost program, but is challenging to monitor, and needs to be coordinated with building inspection/permit agency.
Rain Barrels	Retention of precipitation and runoff; ideally captured for later landscape use (80 gal barrels). Water can be stored for limited time may have limited utility from demand perspective.

Table 4-2: Large Landscape Programs

Program	Description
Monitoring, Information & Technical Support	
Dedicated Irrigation Accounts Surveys	Offer landscape surveys to dedicated irrigation accounts. A large landscape survey is a valve by valve assessment of the irrigation system. The evaluation would generate a site specific baseline watering schedule as well as recommendations for repairs and improvements. The survey could be combined with financial incentives to promote irrigation upgrades such as turf replacement, irrigation timers, or WBIC's.
CII Landscape Surveys	Offer landscape surveys to CII accounts with large landscaped areas. This is similar to the Dedicated Irrigation Accounts Surveys program above, but targets accounts which do not have separate meters for irrigation consumption.
CII WBICs Direct Install	Offer direct installation of WBICs to CII customers with high water use and large landscaped areas (similar to current program with WMWD) as well as 3 years of signal fees. The program can be combined with the CII Landscape Survey Program. A pilot program can be implemented in schools.
Dedicated Irrigation Meters for Large Landscape	Install separate meters for irrigation water use. This offers the customer more information about their specific landscape use. A pilot program can be conducted through school accounts. Could implement a joint program where RPU fronts the meter fee, and installs WBICs or other type of measure at the same time. This type of program can support overall conservation by improving measurement and tracking.
Customer Assistance	Provide management, design and other customer information
Outreach	Sponsor, support technical educational events
Incentives	
CII WBICs Rebates	Offer rebates for WBIC's. Currently, RPU offers a $200 rebate per device, significantly less than the cost of a direct install (cost to the customer). In order to be more cost-effective for the customer, the rebate value could be increased and the program target only high-use customers who have the savings potential to justify the cost of a WBIC's installation.
CII Precision Sprinkler Nozzles Distribution	RPU will begin a pilot program to distribute Torro Nozzles at a highly subsidized cost, in conjunction with WMWD in summer of 2010. The advantage to these sprinkler nozzles is their relative ease of implementation—they are easy to install and don't require the adjustment of traditional rotators— which may improve savings reliability. The results of this pilot will provide more information.
Synthetic Turf Rebates	Offer rebates for installation of synthetic turf to replace grass. The current RPU program offers $1/sq. ft., but participation has been low which is why MWD has recently stopped funding the program. Cost of $1/sq. ft. was determined to be insufficient to drive customer demand. School districts have participated in RPU's program in the past and a project with a community field yielded a cost recovery twice as fast as expected. Some social and aesthetic concerns require consideration.
High Efficiency Nozzles for Large Rotary Sprinklers	High efficiency nozzles for large rotary sprinklers replace standard plastic nozzles with durable metal nozzles. These replacement nozzles are resistant to wear and provide high distribution uniformity. Mostly used on golf courses and other open landscape for long range and close-in watering.

Program	Description
Low Precipitation Irrigation Systems	Drip, micro, low volume precipitation irrigation is the slow application of water to a plant's root zone. This delivery reduces evaporation and eliminates overspray. Plants thrive on the optimum balance of oxygen and moisture around their roots. Incentives may be available through the MWD Measured Savings program which offers customized incentive for industrial process and irrigation system water reduction.
Soil Moisture Sensors and Probes	Monitor soil moisture to determine irrigation requirements and adjust the irrigation schedule based upon the moisture content.
Policy	
Regional Landscaping	Conceptual design landscaping that utilizes regional plant palettes with an emphasis on low water using plants
Pond and Water Feature Recycling	Water reuse for these outside features
Green Building Code	Savings accruing by encouraging enforcement of "Green" buildings codes that apply LEEDS/WaterSense requirements to new construction. Could be considered as part of New Construction ordinance. Goes beyond WSS requirements to include design practices and more. Can specify % reduction, as in LEED. Generally for new construction only.
Time of Day irrigation restrictions	Restrict watering practices to between evenings and early morning to reduce evaporation losses.
Alternative Water Sources	Cooling condensate, foundation drain water, gray water, storm water, rain water, and any other feasible alternative for landscaping.
Local/Regional planning	Development of requirements for new development/compliance with AB 1881. Community Outreach efforts: outreach to all customers - residential, community-based organizations, developers, etc.
Other Conservation Programs with Limited Applicability to RPU	
Water Budgets (Measure landscape, develop budgets, provide information and reports and scheduling information).	A water use budget is an upper bound estimate of water needed at a site given its landscape area, local weather conditions and other factors (i.e. plant type). Each billing period customers receives notices comparing their actual use to their budget. Many agencies implementing water budgets have achieved reductions of 20%.

Table 4-3: CII Programs

Program	Description
Monitoring, Information & Technical Support	
CII Indoor Surveys	Offer indoor water use surveys to high-use customers. Surveys will evaluate and analyze water usage based upon the specifics of a given site. This can include both fixtures and processes, ranging from providing an inventory of sanitary equipment to evaluating opportunities for recycling water used in an industrial process. The survey would provide recommendations along with a cost/benefit analysis. The program can be combined with financial incentives to assist customers in implementing the recommendations.
Automatic Meter Reading	AMR reads to identify leaks or other anomalies. Costs are significant - meters must be retrofit and a way of disseminating the information to the customer needs to be developed. Program can have multiple benefits with all the information that becomes available and trackable. Program could be considered in larger discussion regarding meter replacement, operations needs, staffing, etc. Provides valuable customer and system information but may be cost prohibitive as conservation tool alone.
Replace Old Water Meters	Many water meters in RPU's service area may be old and under report water use, resulting in lost revenue. Some meters may under report by 15%. Replacing old meters will help reduce unaccounted water and encourage conservation as customers will be billed correctly for their use.
Incentives	
CII Performance-Based Program	Offer financial incentives to CII customers to save water through fixture or process changes. Various financing options are possible including loans, direct incentives, or pay back through customer bills. The program can be geared towards process-type uses captured through fixture incentive or plumbing code. This program is similar to MWD's Save a Buck Program which has been widely utilized.
CII High Efficiency Toilets	Offer direct installations of HET's (1.3 gpf). RPU is currently operating this program through WMWD and has targeted hotels and multi-family residential accounts. Although AB 715 phases in an HET requirement on all models sold in CA by 2014, there is value in accelerating that savings and, ideally, capturing those older models that would not otherwise be replaced.
High Efficiency Urinals	The current U.S. standard mandates ultra low flow urinals which use 1.0 gpf. Offer incentives for new models which use from 0 to 0.5 gpm.
CII and MFR High Efficiency Washing Machine Rebate Programs	Offer rebates for the purchase of HECW's. A New CA law will require all washing machines sold in CA to use no more than 6 gallons per cubic foot washing capacity (http://energy.ca.gov/releases/2009_releases/2009-10-29_clotheswashers.html) beginning in 2010. The rebate program should focus on those models that exceed regulatory requirements.

Program	Description
Commercial High Efficiency Dishwashers	Commercial dishwashers are available in a variety of designs, ranging from the under counter type, to the flight type used in the highest volume establishments. Costs also range dramatically with many machines costing from $12k - over $50k. Efficient machines can use water at a rate of 1.0 gallons per rack compared to 2.5 gallons per rack of the less than efficient models. Can combine as a food-service program if market is there. Would be more effective than stand-alone incentives as would provide a targeted way of reaching customers. Program would also include non-food specific incentives like toilets, water brooms, etc. Can be modeled like the 1-stop program.
High Performance Faucets	Kitchen or bathroom faucets or aerators that use less than the U.S. maximum of 2.2 gpm. Relatively inexpensive. Can be combined with any audit program or customer contact. Can combine as a food-service program
Connectionless Food Steamers	Incentives for the installation and use of boilerless food steamers. Saves 30 gallons per hour. Applicability may be limited. Market research must be conducted.
High Efficiency Pre-Rinse Spray Valves	Pre-rinse spray valves are used in restaurants to pre-rinse dishes prior to putting them in the dishwashers. The current national standard is 1.6 gpm. New models being sold are at 1.2 gpm or less. Previous direct-install pre-rinse spray valve programs have been successful. Provides energy savings as well.
Ice machines	Water-cooled ice machines are more energy efficient and energy-cooled machines are more water efficient. Eliminating water-cooled machines is one option. Ice machines that have earned the ENERGY STAR label are on average 15 percent more energy-efficient and 10 percent more water-efficient than standard models.
Waterless Wok	Wok used in Chinese restaurants that uses no water. Current woks run water the entire time restaurant is open. Applicability may be limited.
Pressurized Water brooms	Uses a combination of air and water pressure to clean and remove dirt and food spills with up to 75 percent less water needed. Replaces using a hose, nozzle or high pressure water broom (power washer) that typically uses 8 - 18 gpm with a low flow model that uses 2.0 gpm or less.
Cooling Tower Conductivity Controllers	Cooling towers are part of the air conditioning system of large buildings. These towers are used to expel heat from the system through evaporation. In order to keep salts and other impurities from corroding the towers it is necessary to bleed water out of the towers. Installing a conductivity controller gives customers the ability to only bleed out water after a certain conductivity is met aka increasing the cycles of concentration. Limited rebate availability through MWD.
Cooling Tower pH controllers	pH controllers are a sophisticated version of a conductivity controller which by monitoring pH and adding a different set of chemicals can reduce the bleed even more increasing the cycles of concentration up to 5-7 cycles. Limited rebate availability through MWD.
Dry Vacuum Pumps	Water-ring pumps are commonly used in smaller dental offices, but are infrequently used in larger operations due to high water consumption and increased power requirements. With a dry pump, a liquids separator is placed between the wet piping and the pump eliminating the need to flush the system with water.

Program	Description
Steam Sterilizers	Steam sterilization is the use of pressurized steam to kill infectious agents on medical equipment. New sterilizers can only operate while the water trap is open and some recycle a portion of the water.
Wet Cleaning	Retrofits at a dry cleaners moving to wet cleaning technologies which eliminates cooling tower requirement thereby reducing water use
Policy	
Dual water mains	Mandate that new subdivisions include dual water mains in the streetscape to allow for future conversion to recycled water. Could be considered as part of New Construction ordinance.
Alternative Water Sources	Non-potable water sources for cooling condensate, foundation drain water, gray water, storm water, rain water, etc. RPU has existing Recycled Water Ordinance for new and existing construction. 15 year plan includes 30% reuse goal. Ordinance and implementation plan can be reviewed further.
WSS Specifications for new construction	RPU has an Energy Efficiency New Construction Program in existence that pre-dates the Green Building Program (LEEDS/WSS). This program requires that non-residential new construction projects must have an energy efficiency that exceeds Title 24. Customers provide quantifiable data of annual savings; the incentive is linked to the amount saved. RPU has not tracked any kind of water efficiency measures. RPU needs and wants want to track water elements moving forward. There have been discussions about capturing the information on current projects but it hasn't moved forward yet. Incentives can take the form of rebates, recognition, ordinances, reduced construction fees, etc. Implementation challenge is setting up tracking mechanisms. Program can be tied to Green Builder program or Energy Efficiency New Construction Program.
Other Conservation Programs with Limited Applicability to RPU	
Commercial Laundry Retrofits	On-site commercial laundry retrofits includes ozone and other treatments. Market does not exist.
X-ray Film Processing Recycling System	Standard x-ray or film processors use a constant flow of water to cool the machines and rinse the film. Recycling systems capture the water and reuse it. Many medical facilities are moving to digital technology which eliminates all water use. Technology has shifted to digital.
Submetering	Installing submeters at sites with master meters. Could provide landlord with billing by volume of use capability or provide end use customer with information on their use. Low priority for RPU. New developments install submeters and administer their own billing.
Car Wash Reclamation Systems	Recycle water at a car wash. Already required.

4.2 Screening/Ranking Criteria and Process Description

The initial list of potential conservation projects, as described above, was compared using a number of cost-effectiveness parameters. These parameters include:

- **Water Utility Benefit/Cost Ratio**: The water utility benefit/cost ratio is a measure of the project's benefits relative to its costs for the period from 2010 to 2020. The project benefit is the present value of the total volume of water conserved within the period 2010-2020, with an avoided-cost value of $975 per acre-foot (AF). This avoided-cost value is based on the 2009 Water Supply Plan Priority C projects and does not include externalities such as savings to the customer, reduced wastewater treatment costs, or benefits to the environment. The Priority C water supply project that would be the most viable and cost-effective for implementation in the absence of conservation (or recycled water) is "Construct New Wells and a Potential new Groundwater Treatment Plant in the North Riverside Basin", with a capacity of 5,000 AFY. This project consists of three new groundwater wells in the vicinity of the Palm Well, interconnection piping from the wells to the Waterman Transmission Pipeline as well as to the Riverside Canal, and construction of a GAC treatment plant. The base cost of the project is estimated to be $384 per AF in 2008 dollars and $467 per AF by 2017. However, since all of the available water rights in the Riverside Basin as well as the basin safe yield are being utilized by existing or planned future projects, this new supply requires an equal amount of recharge. The WSP estimates the recharge cost to be $561 per AF in 2008 and $627 per AF by 2017. Therefore, the total cost per AF for this project is estimated to be $945 per AF in 2008 and $1,095 per AF by 2017. Given that the capital portion of the total annual costs for the project described above are fixed and the O&M costs are escalating at 3 percent per year, the cost per AF for 2010 is $975.

  The project cost is equal to the present value of the total program costs for the period 2010-2020, including materials, labor, administration, and overhead costs. Benefit/cost ratios of less than 1 will not be cost beneficial to RPU.

- **Annual Water Savings by 2020**: This is the annual volume of water conservation expected to be generated by the project by 2020. As a project is implemented, it will generate additional water savings each year as more customers are reached. However, savings will also decay over time as hardware deteriorates or customers change residences. The annual water savings by 2020 accounts for the expected decay in water savings over time.

- **Average Annual Program Costs**: This is the average annual expenditure for the project between 2010-2020 and includes:

  - Materials: Cost of rebate, devices, etc.

  - Labor: Cost of audits and consultants.

  - Administration: Refers to staffing costs, for example rebate processing, or customer interactions and more. Administration costs were calculated as a percentage of the material and labor costs.

  The average annual program cost does not include inflation.

- **Cumulative Net Present Value Cost/Cumulative AF Savings**: This value is the sum of the net present value annual costs of each project from 2010-2020, divided by the total volume of water savings expected to be generated by the project from 2010-2020.

- **Average Annual Cost per AF of Water Savings in 2020**: This value is a measure of the average annual cost of a project relative to the annual water savings garnered by the project, in 2020. Unlike the costs value used in the benefit/cost ratio, the cost per AFY of water savings in 2020 is a measure of the average annual cost over the period 2010 - 2020. The annual water savings is the water savings generated by the project in AFY in 2020. The savings value includes decayed water savings generated by the project in 2020, from previous year's activities (i.e., A water saving toilet installed in 2015 continues to produce water savings in 2020).

- **2020 Program Saturation**: The intent of this analysis is to develop a feasible program and therefore saturation estimates have been chosen to reflect an achievable goal. Achievable goal was estimated through industry standards and experience as well as discussion with RPU staff.

4.3 Screening Matrices

Table 4-4 shows the evaluated projects and the results of the project evaluation. Programs which were not chosen for implementation are shown with zero values for costs and savings. However, the benefit/cost ratio, cumulative net present value cost/cumulative AF savings, and average annual cost per AF of water savings in 2020 are shown in order to provide a relative comparison of each projects' cost-effectiveness. The evaluation assumptions, including the level of implementation for each program, are discussed in Appendix D. Detailed descriptions of these projects are provided previously in Tables 4-1 through 4-3.

Table 4-4: Summary of Conservation Programs

Programs	Avg. Annual Costs ($)	2015 Savings (AFY)	2020 Savings (AFY)	2020 Saturation	Benefit/Cost	Cum NPV$/Cum AF	Avg $/2020 AF	# FTEs	Avg. Annual Admin Costs $
Residential									
SFR Surveys									
Top 5% of Customers	$172,840	305	485	100%	1.7	$481	**$356**	0.43	$43,210
Top 5-10% of Customers	$172,840	172	274	99%	0.9	$851	**$630**	0.43	$43,210
Top 10-20% of Customers	$345,680	225	357	99%	0.6	$1,306	**$968**	0.85	$86,420
SFR WBICs Direct Install									
Top 5% of Customers	$849,750	519	825	99%	0.6	$1,390	**$1,030**		$212,438
Top 5-10% of Customers	$849,750	293	466	98%	0.3	$2,461	**$1,823**		$212,438
Top 10-20% of Customers	$0	0	0	0%	0.2	$3,778	**$2,799**		$0
SFR WBICs Rebates									
Top 5% of Customers	$0	0	0	0%	3.0	$270	**$200**		$0
Top 5-10% of Customers	$0	0	0	0%	1.7	$478	**$354**		$0
Top 10-20% of Customers	$0	0	0	0%	1.1	$734	**$544**		$0
Residential Precision Nozzles Distribution	$266,000	771	1,006	31%	2.6	$315	**$264**		$66,500
Residential Low Flow Showerhead Distribution	$12,673	84	98	12%	5.9	$140	**$130**		$3,168
Residential HECW Rebates	$116,250	108	202	92%	0.9	$911	**$575**		$29,063
Residential HET Rebates	$193,750	206	399	29%	1.0	$760	**$485**		$48,438
Large Landscape									
Dedicated Irrigation Surveys	$334,900	551	772	100%	1.5	$537	**$434**		$0
Synthetic Turf Rebates	$0	0	0	0%	0.9	$849	**$545**		$0
CII Landscape Surveys									
Top 5% of Customers	$89,123	619	868	98%	6.4	$127	**$103**	0.09	$22,281
Top 5-10% of Customers	$88,650	143	201	98%	1.5	$547	**$442**	0.09	$22,163
Top 10-20% of Customers	$177,300	155	218	97%	0.8	$1,007	**$814**	0.17	$44,325
CII WBICs Direct Install									
Top 5% of Customers	$73,712	706	878	99%	8.4	$97	**$84**		$18,428
Top 5-10% of Customers	$73,001	163	203	99%	1.9	$418	**$359**		$18,250
Top 10-20% of Customers	$147,741	177	223	100%	1.1	$771	**$661**		$36,935
CII WBICs Rebates									
Top 5% of Customers	$0	0	0	0%	39.6	$20	**$15**		$0
Top 5-10% of Customers	$0	0	0	0%	9.2	$88	**$65**		$0
Top 10-20% of Customers	$0	0	0	0%	5.0	$161	**$120**		$0
CII Precision Nozzles Distribution	$71,250	204	268	21%	2.6	$316	**$265**		$17,813
CII									
CII (& MFR) HECW Rebates	$19,375	64	122	19%	3.2	$249	**$158**		$4,844
CII Indoor Surveys									
Top 5% of Customers	$420,000	417	664	98%	0.9	$854	**$633**	0.00	$0
Top 5-10% of Customers	$0	0	0	0%	0.2	$3,672	**$2,721**	0.00	$0
Top 10-20% of Customers	$0	0	0	0%	0.1	$6,765	**$5,013**	0.00	$0

Programs		Avg. Annual Costs ($)	2015 Savings (AFY)	2020 Savings (AFY)	2020 Saturation	Benefit/Cost	Cum NPV$/Cum AF	Avg $/2020 AF	# FTEs	Avg. Annual Admin Costs $
CII Performance-Based Program										
	Top 5% of Customers	$99,374	417	664	-	3.2	$253	**$150**		$24,843
	Top 5-10% of Customers	$0	0	0	-	3.2	$253	**$150**		$0
	Top 10-20% of Customers	$0	0	0	-	3.2	$253	**$150**		$0
CII HET/Urinal Installs		$98,632	142	284	-	1.5	$541	**$347**		$24,658

4.4 Quantifiable Water Savings Analysis

Using the screening criteria described in Section 4.2, four groups of conservation projects were developed, with each group representing a specific degree of cost-effectiveness and difficulty of implementation. The selection criteria for assigning projects into groups was based primarily upon the cost per AFY of water savings in 2020, as well as the other benefit-cost measures described above. Additionally, whether or not the program was already being implemented by RPU was also considered. Projects were also grouped together if they are complimentary to each other, and the savings from each program individually would not be cumulative. For example, a financial incentives program to promote conservation in the commercial sector is complimentary to a commercial survey program, and the savings generated by each program individually would not be cumulative because both programs would produce similar customer responses.

The savings and costs of each project Group, as well as additional savings expected to be generated through natural replacement of old and aging water-consuming devices, are summarized in Table 4-5, and discussed further below. Detailed assumptions for each project analysis are provided in Appendix D, including unit costs, savings, and implementation levels.

Table 4-5: Summary of Quantifiable Water Savings

Conservation Option Tier	Water Utility Benefit/Cost	2020 Water Savings (AFY)	Average Annual Program Costs ($)	Cost of Water Savings in 2020 ($/AF)	Staffing Requirement (FTE's)[(a)]
Natural Replacement	-	1,500	-	-	-
Group 1	2.5	4,200	$1,320,000	$314	3.8
Cumulative		**5,700**	**$1,320,000**	**$232**	**3.8**
Group 2	1.3	1,300	$970,000	$723	2.3
Cumulative		**7,000**	**$2,290,000**	**$327**	**6.1**
Group 3	0.7	1,400	$1,523,000	$1,088	6.1
Cumulative		**8,400**	**$3,813,000**	**$454**	**12.2**
Group 4	0.3	500	$850,000	$1,823	2.8
All Groups	**1.3**	**8,900**	**$4,663,000**	**$524**	**15.0**

Note: (a) Staff costs included in program costs

4.4.1 Natural Replacement

Natural replacement of water-consuming devices in residential households occurs due to failure, aging, or remodeling. When these devices are replaced, they are replaced with a more efficient fixture required under plumbing codes. The scope of this WUEMP includes a water savings goal through conservation of up to 10,000 AFY. However, as described in this report, the total savings RPU needs through recycled water and conservation is projected to be 16,200 AFY and trade-offs will be made between the two programs. Since water conservation savings beyond Groups 1 and 2 (a total of 5,500 AFY) become more expensive than the WSP Priority C water supply projects, it is important to note that Groups 1 and 2 do not account for reductions in water use of current customers through natural replacement.

A forecast of water use reductions through natural replacement of residential devices is provided below in Table 4-6. It is estimated that by 2020, 1,500 AFY of water use reductions will be achieved through natural replacement of existing water fixtures. Additional savings would occur through natural replacement in the CII sector as well; however, a reliable estimate of CII natural replacement savings would require a detailed audit of the CII sector.

Table 4-6: Natural Replacement Rates Of Residential Fixtures

Fixture	Life Expectancy (Years)	Corresponding Natural Replacement Rate	Estimated Savings Through Natural Replacement by 2020 (AFY)
3.5 gpf Toilets	25	4%	550
2.5 gpm Showerheads	7	14%	70
Washing Machine	16	6.25%	860
Total			**1,480**

Source: CUWCC

As a result of natural replacements projected to occur by 2020, the water conservation savings by implementing Groups 1 and 2 would actually generate approximately 7,000 AFY of cost-effective water savings (not just 5,500 AFY from the funded programs). Note that natural replacement that will be accrued from SB 407 is not included in this estimate.

4.4.2 Group 1 Projects

Group 1 projects are the highest priority projects that provide significant savings for the least cost. These projects generally have an average annual cost per AF savings in 2020 of less than $500 per AF. Group 1 has a combined benefit/cost ratio of 2.5, and can generate 4,200 AFY in water savings by 2020 for an average annual cost of $1,320,000. Combined with savings generated through natural replacement, Group 1 projects can generate 5,700 AFY of savings by 2020. These projects are shown in Table 4-7.

Table 4-7: Group 1 Projects

Group1 Avg. Annual $/2020 Savings <$500	Average Annual Costs ($)	2020 Savings (AFY)	Average $/AF in 2020
Residential			$ -
SFR Surveys - Top 5% of Customers	$ 172,840	485	$ 356
Precision Nozzles Distribution	$ 266,000	1,006	$ 264
Toilet Rebates	$ 193,750	399	$ 485
Large Landscape			
Dedicated Irrigation Surveys	$ 334,900	772	$ 434
CII Landscape Surveys - Top 5%	$ 162,835	868	$ 187
CII WBICs Direct Install - Top 5%			
CII Precision Nozzles	$ 71,250	268	$ 265
CII			
CII & MFR Clothes Washer Rebates	$ 19,375	122	$ 158
CII Toilet Installs	$ 98,632	284	$ 347

Group1 Avg. Annual $/2020 Savings <$500	Average Annual Costs ($)	2020 Savings (AFY)	Average $/AF in 2020
Total	**$ 1,319,582**	**4,206**	**$ 314**

4.4.3 Group 2 Projects

Group 2 projects are additional conservation activities that expand upon the projects in Group 1. Additionally, Group 2 expands upon the customer base of Group 1 to include outreach to the top 5 percent of CII customers through surveys and financial conservation incentives, programs that are cost-effective but too expensive to be in Group 1. Group 2 projects generally have an average annual cost per AF savings in 2020 of between $500 per AF and $900 per AF. These projects have a combined benefit/cost ratio of 1.3, and can generate 1,300 AFY in water savings by 2020 for an average annual cost of $970,000. Combined with the savings of Group 1 and natural replacement, Group 2 can generate 7,000 AFY of water savings by 2020. These projects are shown in Table 4-8.

Table 4-8: Group 2 Projects

Group2 Avg. Annual $/2020 Savings $500 - $900	Average Annual Costs ($)	2020 Savings	Average $/AF in 2020
Residential			
SFR Surveys - Top 5-10% of Customers	$ 172,840	274	$ 630
SFR Clothes Washer Rebates	$ 116,250	202	$ 575
Large Landscape			
CII Landscape Surveys - Top 5-10%	$ 161,651	201	$ 801
CII WBICs Direct Install - Top 5-10%			
CII			
CII Surveys - Top 5%			
CII Performance-Based Program - Top 5%	$ 519,374	664	$ 782
Total	**$ 970,115**	**1,341**	**$ 723**

4.4.4 Group 3 Projects

Group 3 projects are not cost-effective, but can generate additional conservation savings if needed in combination with recycled water to meet 20x2020 water savings goals. Group 3 expands upon the projects of Group 1 and 2, and also includes a Weather Based Irrigation Controller (WBIC's) direct installation program for the top 5 percent of single family residential customers. Projects in Group 3 generally have an average annual cost per AF savings in 2020 of between $900 per AF and $1,500 per AF. These projects have a combined benefit/cost ratio of 0.7, and can generate 1,400 AFY in water savings by 2020 for an average annual cost of $1,523,000. Combined with the savings of Groups 1 and 2, and natural replacement, Group 3 can generate 8,400 AFY of water savings by 2020. These projects are shown in Table 4-9.

Table 4-9: Group 3 Projects

Group3 Avg. Annual $/2020 Savings $900 - $1,500	Average Annual Costs ($)	2020 Savings	Average $/AF in 2020
Residential			
SFR Surveys - Top 10-20% of Customers	$ 345,680	357	$ 968
SFR WBICs Direct Install - Top 5%	$ 849,750	825	$ 1,030
Large Landscape			
CII Landscape Surveys - Top 10-20%	$ 325,041	218	$ 1,475
CII WBICs Direct Install - Top 10-20%			
Total	**$ 1,522,788**	**1,400**	**$ 1,088**

4.4.5 Group 4 Projects

Like Group 3, Group 4 projects are also not cost-effective but can generate additional conservation savings at a much greater cost than the other Groups. Group 4 only includes a WBIC's direct installation program for the top 5 to 10 percent of single family customers. This project has a benefit/cost ratio of 0.3, and can generate 500 AFY in water savings by 2020 for an average annual cost of $850,000. Combined with natural replacement and the other Groups, Group 4 can generate 8,900 AFY of water savings by 2020. These projects are shown in Table 4-10.

Table 4-10: Group 4 Projects

Group4 Avg Annual $/2020 Savings $1,500 - $2,500	Average Annual Costs ($)	2020 Savings	Average $/AF in 2020
Residential			
SFR WBICs Direct Install - Top 5-10%	$ 849,750	466	$ 1,823
Total	**$ 849,750**	**466**	**$ 1,823**

Section 5: Water Use Efficiency Strategy

Water use efficiency programs in California need to comply with the 20 x 2020 water savings requirements of Senate Bill SX7-7, which sets a target reduction of 20 percent per capita usage of potable water by the year 2020. The estimated SBX7-7 target for RPU is a reduction in use of 16,200 AFY by 2020.

For RPU, the strategy recommended below involves a combination of conservation programs and recycled water that offset potable use. The overall strategy is presented followed by a list of the 12 conservation programs with the lowest unit implementation costs (Group 1 and 2 projects), and a summary of the projected staffing requirements. This is followed by a brief discussion of tracking methods.

5.1 Water Use Efficiency Strategies

The water use efficiency strategy recommendation for RPU is:

1. Pursue a "Flex-Track" approach to meeting MOU and Urban Water Management plan (UWMP) requirements for all customers. Quantify the savings from the programmatic BMPs and use the programs identified in Groups 1 and 2 to meet the targets. Of the 16,200 AFY potable reduction required to meet SB7X-7, 7,000 can be met through cost-effective conservation activities. While there are options to increase these savings they may be cost prohibitive at this time.

2. Continue implementation of the "Foundational BMPs" which are now required by the MOU as amended in 2008. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs).

3. Check for compliance with the Water Loss Control requirement and implement the AWWA water audit standard per the M36 manual.

4. Continue to consider the balance of conservation and recycled water in achieving both RPU and SB7X-7 goals.

5. Consider the value of smart policies to support incentive programs and provide a relatively low-cost approach to meeting reduction targets. Natural replacement accounts for about 20 percent of the 7,000 AFY that will be achieved through conservation by 2020. In addition to the natural replacement from fixture standards, new legislation such as SB 407 which sets requirements for fixture replacement for both Residential (2017) and Commercial (2019) and the new California Green Building Code (which goes into effect January 2011 and will set efficiency targets for all new development) will also reduce per capita use. These new standards were not quantified in the analysis.

6. Increase staffing by about 6 FTE to accommodate program expansion.

7. Develop a software tool that will allow for measurement of program activities and success towards meeting the goals.

5.2 Water Use Efficiency Programs

As described in Section 4, Group 1 consists of eight recommended programs with an average annual cost per AF savings in 2020 of less than $500 per AF. Group 2 consists of four recommended programs with an average annual cost per AF savings in 2020 of $500 to $900 per AF. In combination with natural replacements, the 12 programs are estimated to achieve a total water savings of about 7,000 AFY by 2020 at an annual average cost of $2.3 M. Table 5-1 shows the recommended programs and associated costs, savings, and staffing requirements.

Table 5-1: Summary of Recommended Programs

Programs	Average Annual Costs ($)	2020 Savings (AFY)	Staffing Requirement (FTE's)[(a)]
Natural Replacement Savings			
3.5 gpf Toilets	$ -	550	-
2.5 gpm Showerheads	$ -	70	-
Washing Machine	$ -	860	-
Natural Replacement Total	$ -	**1,480**	-
Group 1 Programs			
Residential			
SFR Surveys - Top 5% of Customers	$ 172,840	485	1.0
Precision Nozzles Distribution	$ 266,000	1,006	0.9
Toilet Rebates	$ 193,750	399	0.6
Large Landscape			
Dedicated Irrigation Surveys	$ 334,900	772	0.0
CII Landscape Surveys - Top 5% / CII WBICs Direct Install - Top 5%	$ 162,835	868	0.6
CII Precision Nozzles	$ 71,250	268	0.2
CII			
CII & MFR Clothes Washer Rebates	$ 19,375	122	0.1
CII Toilet Installs	$ 98,632	284	0.3
Group 1 Sub Total	**$ 1,320,000**	**4,210**	**3.8**
Group 2 Programs			
Residential			
SFR Surveys - Top 5-10% of Customers	$ 172,840	274	1.0
SFR Clothes Washer Rebates	$ 116,250	202	0.4
Large Landscape			
CII Landscape Surveys - Top 5-10% / CII WBICs Direct Install - Top 5-10%	$ 161,651	201	0.6
CII			

CII Surveys - Top 5%				
CII Performance-Based Program - Top 5%	$	519,374	664	0.3
Group 2 Sub Total	**$**	**970,000**	**1,340**	**2.3**
Recommended Programs Total	**$**	**2,290,000**	**7,000**	**6.1**

Note:
(a) Staff costs included in program costs

5.3 Staffing

The staffing levels required to implement each of the water use efficiency programs were presented in Section 4 based on the assumptions in Appendix D. For the 12 recommended programs, the total staffing requirement is estimated to be 6.1 full-time equivalents (FTEs). While RPU may opt to outsource some of the staffing, the current staffing of about 1.0 FTE needs to be increased at least sufficiently in order to administer and coordinate program expansion. Staffing costs are included in the program cost estimates.

5.4 Tracking Methods

Tracking the effectiveness and efficiency of the various programs (rebates, audits, etc) is an important component of the proposed water use efficiency strategy and is required for annual reporting purposes. A well-designed tracking tool will allow RPU to better understand saturation levels, participation rates, actual savings, costs and more. This information can make the program more dynamic and allow RPU to adjust programs as necessary to meet its goals.

The tracking system should identify each customer account that participates in the program through a survey, rebate, and/or incentive or some other way and participation details so that usage can be compared before and after participation. The complexity of the system will depend on RPU's requirements and resources, ranging from the simplest system that tracks participation to a more complex one that incorporates billing and GIS elements and automates certain program activities. Since tracking will likely involve customer billing data, a special meeting will be arranged with the appropriate parties within RPU, and a separate Technical Memorandum prepared as an addendum to this report.

Appendix A: Current Conservation Programs

A.1 Current Conservation Programs

The following is a summary and description of RPU's status in implementing the 14 BMP's required by the MOU.

Table A-1: Summary of Current Conservation Programs

	Foundational	
BMP 3	Unaccounted Water	CI
BMP 4	Metering	✓
BMP 7	Public Information	✓
BMP 8	School Education	✓
BMP 10	Wholesale Agency Programs	NA
BMP 11	Rate Structure	✓
BMP 12	Conservation Coordinator	✓
BMP 13	Water Waste Prohibition	CI
Programmatic: Residential		
BMP 1	Residential Water Surveys	CI
BMP 2	Residential Plumbing Retrofits	✓
BMP 6	HECW	✓
BMP 14	Residential ULFT	CI
Programmatic: Large Landscape		
BMP 5	Large Landscape Surveys	CI
Programmatic: CII		
BMP 9	CII Programs	CI
✓ = In compliance; CI = Currently implementing		

Table A-2: Description of Current Conservation Programs

Conservation Program	Description
Foundational	
BMP 3: Unaccounted Water	RPU is not currently in compliance with the revision to BMP 3 which requires implementation of AWWA's water audit standard per the M36 manual. RPU has recently identified inaccuracies in its operations data which have resulted in overestimations of system water loss. Effort has been underway in the last several years to reduce inaccuracies in system production data.
BMP 4: Metering	All RPU accounts are currently metered and billed by volume of use. Meters are required for all new service connections. RPU meets all the requirements for compliance with BMP 4. However, the CUWCC Coverage Report indicates that RPU is currently not in compliance due to incompleteness of forms submitted prior to 2007. The CUWCC reporting form changed for BMP 4 in 2007. Prior to 2007, the percent of accounts metered was required as input, which were incorrectly indicated as 0. These forms should be revised to show that 100% of accounts are metered in order for the Coverage Report to correctly determine compliance.
BMP 7: Public Information	RPU has been in compliance with BMP 7 since BMP reporting began in 1999. The public information program is implemented in coordination with RPU's wholesale agency, WMWD. Regional ad and media programs are implemented with WMWD and also Eastern Municipal Water District. RPU conducts its own program as well through public events, demonstration gardens, school programs, media advertising, and bill stuffers.
BMP 8: School Education	RPU has been in compliance with BMP 8 since BMP reporting began in 1999 and has been implementing a school education program since 1989. The school education program is implemented in coordination with RPU's wholesale agency, WMWD. Educational handout materials and class presentations are provided to students in grades K through 6.
BMP 10: Wholesale Agency Programs	BMP 10 is not applicable to RPU.
BMP 11: Rate Structure	RPU is in compliance with BMP 11. 100% of service connections are metered and billed on an increasing block rate structure with seasonal rates to promote conservation.

Conservation Program	Description
BMP 12: Conservation Coordinator	RPU has been in compliance with BMP 12 since BMP reporting began in 1999. Clay Monroe is currently the conservation coordinator.
BMP 13: Water Waste Prohibition	RPU is not in compliance with BMP 13. BMP 13 requires that agencies enact and enforce measures that prohibit specific landscape and irrigation inefficiencies, commercial or industrial inefficiencies, and other misuses of water. While RPU has had a water waste prohibition ordinance since BMP reporting began, the ordinance does not cover commercial car wash, laundry, and landscape activities which are required by the BMP.
Programmatic: Residential	
BMP 1: Residential Water Surveys	RPU is currently not in compliance with BMP 1. RPU has been providing indoor and outdoor water surveys to single-family residential and multi-family residential accounts since 1989. The CUWCC Coverage Report for BMP 1 indicates that RPU is currently in compliance with this BMP. However, review of past BMP reports show inconsistencies between data reported prior to and after fiscal year 2003-04. The reported number of surveys completed prior to 2004 appears to be overstated, and inconsistent with RPU's current understanding of its residential water survey program. RPU is currently not in compliance with BMP 1 and is not implementing residential water surveys at a level sufficient to be on track towards compliance.
BMP 2: Residential Plumbing Retrofits	RPU is in compliance with BMP 2. RPU has been installing low-flow showerheads since 1981as part of a "Weatherization" program targeted to low income residents, senior citizens and the disabled. Kennedy/Jenks estimates that at least 90% of pre-1992 residences are outfitted with low-flow showerheads, based on an estimated device life of 3 to 7 years. This meets the saturation requirement of 75% for outfitting pre-1992 with low-flow showerheads.
BMP 6: HECW	RPU is in compliance with BMP 6 by offering high-efficiency clothes washing machine rebates.
BMP 14: Residential ULFT	RPU is currently not in compliance with BMP 14. While RPU has been offering rebates and a direct install program for ULFT's and HET's, the level of replacements has not been at least equal to that which would be achieved through a Retrofit-on-resale (ROR) ordinance as required for compliance.

Conservation Program	Description
Programmatic: Landscape	
BMP 5: Large Landscape Surveys	RPU is currently not in compliance with BMP 5. BMP 5 has three conditions for compliance. Condition 1 requires that the agency develop ETo-based water budgets for 90% of its dedicated landscape meter accounts at an average rate of 9% per year for 10 years. RPU has not begun implementing this criterion. Condition 2 requires that the agency offer landscape surveys to at least 20% of its CII accounts with mixed use meters each report cycle and be on track to survey at least 15% of its CII accounts with mixed use meters within 10 years of the date implementation is to start. RPU was required to begin implementing this BMP in 1991-1992 and complete by 2002. Currently, RPU has provided surveys for a total of 5% of its current CII accounts and is not surveying at least 1.5% of CII accounts annually. Condition 3 requires that the agency provide financial incentives to customers to support Conditions 1 and 2. Currently, RPU provides incentives in the form of rebates for turf replacement, weather-based irrigation controllers, and will be implementing a program to provide efficient sprinkler nozzles.
Programmatic: CII	
BMP 9: CII Programs	RPU is currently in compliance with BMP 9. Through toilet rebates, other CII rebates, and surveys, RPU is on track to reduce CII water use by an amount equal to 10% of baseline use by end of 2009, 10 years after implementation started.

A.2 Wholesaler Implemented Conservation Programs

Many of the conservation activities that have been implemented in RPU's service area were conducted through both WMWD and Metropolitan Water District of Southern California (MWD). These wholesale agencies provide financial, technical, and program management support of conservation programs within their service areas through the requirements of BMP 10, Wholesale Agency Assistance Programs. The conservation activities being implemented through wholesaler programs is described below.

A.2.1 Metropolitan Water District

RPU's CII sector incentives are provided nearly entirely through MWD's rebates and the Save a Buck program for CII customers. MWD provides rebates for commercial and industrial customers within its member agencies' service areas for devices such as cooling towers, pH controllers, irrigation controllers, and toilets. Additionally, MWD has worked with WMWD and RPU to install high efficiency toilets in hotels, motels, and multi-family complexes in RPU's service area.

A.2.2 Western Municipal Water District

WMWD implements public outreach programs within its service area. RPU's public information (BMP 7) and school education (BMP 8) programs are conducted in coordination with WMWD's

program. RPU has also utilized WMWD's Smart Landscape Retrofit Program to provide its customers with free direct installations of weather-based irrigation controllers.

A.3 BMP Saturation

The following section evaluates RPU's implementation levels for the 14 BMPs. Key variables that were used in the calculations are described below. It is important to note that assumptions change. They can change when better information becomes available, when program goals or resources change or for a number of other reasons. To address that variability, the model developed allows for all of the assumptions described below to be adjusted as needed.

- Decay Factors: Water savings will decay over time due to equipment breakdown or degradation, lack of maintenance, or for reasons related to customer behavior (these tend to be the most dramatic decays). The analysis refers to decay factors developed by the CUWCC and documented in the Research and Evaluation Report (8/13/2009) and 2005 Cost & Savings Study.

- Natural Replacement Rates: Natural replacement of older model fixtures with more efficient versions is largely driven by standards and/or improvements in fixture efficiency. The most important legislative action to date has been the 1994 Federal National Energy Policy Act which specified toilet, showerhead and aerator standards. As homeowners remodel older homes or replace aging plumbing fixtures, older homes and fixtures are forced into compliance with new plumbing code requirements. Many inefficient fixtures are replaced this way in addition to agency-sponsored installations and rebates. It is therefore not uncommon for utilities to allocate their resources to those fixtures or processes not mandated in order to capture savings that would not otherwise happen.

- Unit water savings: estimates were taken from accepted industry standards and CUWCC protocols whenever possible. The data were then corrected for RPU-defined customer and service area characteristics based on information provided by RPU staff.

- Cost effectiveness: Typically, a cost-effectiveness analysis is performed using the CUWCC Avoided Cost Model along with the CUWCC Cost-Effectiveness Model. In this case, Kennedy/Jenks developed its own model using the same principles as the CUWCC models in order to best address RPU needs. The Kennedy/Jenks model develops the analysis to 2020, which reflects RPU's planning horizon. Additionally, the CUWCC model is limited to the 14 BMPs and has strict input requirements, limiting the number of variables that can be considered. This Kennedy/Jenks model can analyze a much larger number of options and provides flexibility, reflecting RPU's needs for options and flexibility.

- Landscape savings: assumption for audit estimates can vary significantly given the size of the site and/or whether they are higher users vs. average users.

Table A-3 summarizes the estimated saturation levels of the 14 BMPs. The results show that while a few BMPs have reached high levels of saturations, there is still significant savings potential. BMPs 2 (low-flow showerheads) and 14 (ULFT) have the highest saturation levels but even these programs still offer potential given improvements in fixture efficiencies. For example, while the market may be saturated with 2.5 gpm model showerheads, the newer

models flowing at 1.5 gpm can still offer significant and relatively low-cost savings. Similarly, while ULFT saturation ranges between 50 and 63 percent, HET saturation is still relatively low. The other BMPs, particularly indoor surveys and landscape BMPs, also demonstrate significant potential for additional conservation savings.

Table A-3: Summary Of Bmp Saturation

BMP	Program	Saturation Percentage
BMP 1	Residential Water Surveys (SFR)	0.3%
BMP 1	Residential Water Surveys (MR)	0%
BMP 2	Low Flow Showerheads - 2.5 gpm models (SFR)	93%
BMP 2	Low Flow Showerheads - 2.5 gpm models (MFR)	95%
BMP 3	Unaccounted Water	Saturation estimates are not appropriate for BMP 3.
BMP 4	Dedicated Irrigation Meters for CII Accounts	Saturation estimates are not appropriate for BMP 4.
BMP 5	Large Landscape Water Budgets	0%
BMP5	Large Landscape Water Surveys Completed	0%
BMP 6	High-Efficiency Clothes Washers (HECWs)	17%
BMP 7	Public Information	Saturation estimates are not appropriate for BMP 7.
BMP 8	School Education	Saturation estimates are not appropriate for BMP 8.
BMP 9	CII Water Use Surveys Completed	1%
BMP 10	Wholesale Agency Programs	Not applicable to retailers.
BMP 11	Water and Sewer Rate Structures	Saturation estimates are not appropriate for BMP 11.
BMP 12	Conservation Coordinator	Saturation estimates are not appropriate for BMP 12.
BMP 13	Conservation Pricing	Saturation estimates are not appropriate for BMP 13.
BMP 14	Residential ULFTs (SFR)	50%
BMP 14	Residential ULFTs (MFR)	63%
BMP 14	Residential HETs (SFR)	8%
BMP 14	Residential HETs (MFR)	3%

A.4 Evaluation of Current Conservation Programs

The tables below represent the current and past water conservation programs implemented by the various water suppliers adjacent to the City of Riverside. This initial survey of the entities' websites and information posted to the CUWCC website produced a list of the various programs that have been implemented. Even though some of the information on the CUWCC website was not current and represented past programs, most of the current information could be found on the individual suppliers' websites. Not all entities are MOU signatories and not all entities had websites related to water conservation information or programs. Table A-4 shows the

various BMPs (past and present classifications), the entity implementing the BMP, whether the entity is an MOU signatory, and a record of implemented BMPs.

Programmatic BMPs have minimum requirements and each water supplier can opt for developing programs based on the listed requirements or may develop a flex track program. A flex track program allows the water supplier to tailor the conservation measures that achieve water savings goals. As a result, the water conservation program of each entity will vary in composition, approach and extent of service. Most agencies in the Table A-5 have implemented residential and landscape surveys, provided residential low-flow fixtures and toilet rebates, and organized public outreach and school education programs. Some expanded their programs to achieve water savings goals and implemented the foundational BMPs and the programmatic BMPs extensively. However, some entities have not performed or do not continuously support any water conservation services.

Table A-4: Water Suppliers Current and Past Bmp Implementation

Agency	MOU Signatory	Conservation Website	BMP 1 Residential Water Surveys	BMP 2 Low Flow Fixtures	BMP 3 Unaccounted Water	BMP 4 Metering	BMP 5 Large Landscape Surveys	BMP 6 HECW	BMP 7 Public Information	BMP 8 School Education	BMP 9 CII Water Use Surveys	BMP 10 Wholesale Agency Programs	BMP 11 Rate Structure	BMP 12 Conservation Coordinator	BMP 13 Conservation Pricing	BMP 14 Residential ULFT
BMP- current classification			P/R	P/R	F/UO	F/UO	P/L	P/R	F/E	F/E	P/C,CII	F/UO	F/UO	F/UO	F/UO	P/R
Riverside PU	X	X	X	X	X	X	X	X	X	X	X	NA	X	X	X	X
WMWD	X	X	X	X	X	??	X	X	X	X	X		X	X		X
EMWD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
City of Corona	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
Jurupa CSD	X	X					X	X	X	X			X		X	X
Rubidoux CSD	X	None		X			X	X	X	X	X		X			X
City of San Bernardino Municipal Water Department	No	X		X			X				X					X
Inland Empire Utilities Agency	X	X							X	X		X		X		
City of Norco	No	None														
City of Colton	No	None														

P=Programmatic; F=Foundational; R=Residential; UO= Utility Operations; C= Commercial; CII= Commercial, Industrial and Institutional; L=Landscape; E=Educational

Table A-5: Municipalities and Cities Current and Past Water Conservation Programs

Agency	Western MWD	Eastern MWD	City of Corona	Inland Empire Utilities Agency	Jurupa CSD	Rubidoux CSD	City of San Bernardino Municipal Water Department	City of Norco	City of Colton
MOU Signatory	X	X	X	X	X	X			
Conservation Website	X	X	X	X	X		X		
Programs	-Residential Surveys -Low flow fixtures -Unaccounted water audit - Landscape contest -Irrigation hours and days -Landscape information -Turf replacement -HEWC -Public information -HET -WBIC -HECW -Rotating sprinkler nozzles -Synthetic turf -Rate structure -Coordinator -ULFT -Ordinance 374	-Residential Surveys -Low flow fixtures -Unaccounted water audit -Metering -Audits -Demonstration gardens -Landscape information -HEWC rebates -Advertising -Newsletter -Bill insert -Special event -Demonstration garden -Speaker's bureau -"Win gift card" water survey -Conservation packet -Compliant -School education -CII HET -HE/UL/ZW urinals -Irrigation controllers -Rotating spray nozzle -HE nozzle -Food steamers -Air-cooled ice machines -Waterbrooms -Cooling tower conductivity controllers -pH conductivity controllers -Steam sterilizer retrofits -Dry-vacuum pumps -Residential retrofits -Turf irrigation -Rate and pricing -Coordinator Prohibit: -gutter flooding -excessive irrigation and runoff - single-pass cooling system, -single pass fountains Past coverage -car wash and laundry -CII waste -water letter and penalty program -waste water notice letter program residential Ordinances 72.24; Ordinance 117.2 -Reuse program	-Residential Surveys -Low flow fixtures -Unaccounted water audit -CII irrigation meter retrofit -Dedicated irrigation meter accounts -Training -Surveys -Irrigation supplies discount -Water nozzles -WBIC -Landscape plants -Residential and parkways landscape -HECW -Advertising -Public service announcement -Bill insert -Newsletter -Demonstration garden -Special event -Speakers bureau -K-high school -ZW urinals -Dual flush toilets -WBIC -HET -HECW -WBIC -Rotating nozzles -Synthetic turf -Rate structure -Coordinator Prohibit -gutter flooding -single pass cooling -carwash -laundry -fountains - watering hard surface - runoff ordinance for watering hours -require leak repairs -ULFT	-Water budget calculation and information -Landscape newsletters -Technical workshops -Landscape audits -Ordinance meetings -WBIC controllers -Rotating spray nozzles -Synthetic turf -HEWC rebate program -Advertising -Bill inserts -Newsletter -Demonstration garden -Special event -Speaker bureau -Website information and tips -K-high school gardens - Rebates: -Toilets -Urinals -Food steamers -Dry vacuum pumps -Pressurized water brooms -Cooling tower -Conductivity controllers -Air-cooled ice machines -Steam sterilizer retrofits - Turf irrigation incentives -Coordinator	-Landscape/ water conservation class 2008 -Flyer on website -HECW -School outreach 2005-2008 - Rebates through SoCal Water Smart -Prohibit single pass cooling -Coordinator -Rate Structure	-Landscape surveys 2003-2006 -Public and school outreach 2003-2006 -Coordinator	-Household Conservation Kit - Water-smart landscaping class-2008 - WBIC rebate -ULFT rebates	None	None

Appendix B: Emerging Technologies, Policies and Legislation

B.1 Emerging Indoor Technologies

An indoor hardware retrofit program that brings all residential and non-residential structures constructed before 1992 up to current practice with respect to water use efficiency requires a consortium of activities and rebates to ensure maximum water savings can be achieved. The following is a series of measures that could help Riverside Public Utilities (RPU) implement an effective indoor water use efficiency program throughout its service area.

B.1.1 Residential Sector Conservation Measures

B.1.1.1 Residential High-Efficiency Toilets (HETs)

High-efficiency toilets (HETs) are defined as a fixture that flushes at 20 percent below the 1.6 gallons per flush (gpf) U.S. maximum or less, equating to a maximum of 1.28 gpf. This 20 percent reduction threshold serves as a metric for water authorities and municipalities designing more aggressive toilet replacement programs and, in some cases, establishing an additional performance tier for their financial incentives (e.g., rebate and voucher programs). It is also a part of the water efficiency element of many green building programs in the U.S. The newer HET models improve upon the water savings potential previously seen with ULFTs, which form the basis of BMP 14.

The use of residential HETs requires the replacement of existing toilet fixtures with models that use even less water than the previous 1.6 gpf ULFTs. There are over 200 different HET models available, from 23 different manufacturers, of which 142 are United States Environmental Protection Agency (USEPA) WaterSense certified. HETs may consist of: (a) dual-flush; (b) 1 gallon single-flush, pressure assisted; (c) 1.28 gallon single-flush, gravity-fed; or (d) 1.28 gallon flushometer valve toilets for commercial uses.

Current California legislation (AB 715, chaptered in 2007) mandates that after January 1, 2014, only HETs be sold or installed after in the state. With over eight years of sales and installations in California so far, HETs have exhibited a solid performance history and exceptional customer satisfaction overall.

B.1.1.2 High Performance Showerheads

Another area of recent and significant attention by water efficiency advocates is the residential shower system and showerheads. A current trend of ever-increasing shower flow rates and water use within new homes includes multiple showerheads, “rain” type shower systems, and shower spas and “gyms.” Installation of high-performing showerheads with flow rates that range from 1.5 to 2.0 gpm could achieve notable water savings in both new and remodeled homes. In order to increase the savings potential, however, limitations on the multiple-head shower system installations may be necessary through regulatory or other controls. The high-performance showerhead has a potential for water savings greater than the low flow showerheads included in the Residential Assistance Program.

B.1.1.3 Low-Flow Lavatory Faucet Aerators

Faucets have not been a primary focus of water efficiency advocates, given that the Energy Policy Act (EPAct) of 1992 and subsequent EPAct legislation have limited faucet flows to 2.2 gpm (at 60 psi). It is only now that serious attention (by the USEPA's WaterSense product labeling program) is again being given to residential lavatory faucets and possible new opportunities for further efficiencies. Installation of low-flow, 1.5 gpm faucet aerators in residential bathrooms may achieve measurable savings, although any reduction of residential bathroom faucet flows below the 2.2 gpm maximum will likely cause wait times for hot water to increase. As an example, with an assumed wait time of 30 seconds for hot water arriving through a 2.2 gpm faucet, the replacement of the aerator in that faucet with one flowing at 1.1 gpm will generally double the wait time for hot water to 1 minute. Therefore, any reductions proposed in the bathroom faucet flow rate must be accompanied by an evaluation of the effect upon the end-user and their attitudes towards the delivery of hot water when they want or expect it. The newer low-flow lavatory faucet aerators improve upon the water savings potential of those faucet aerators currently included in the Residential Assistance program.

B.1.1.4 Hot Water Demand Systems

A hot water demand system is an electronically, demand-controlled pumping system that sends cold water back to the water heater until hot water arrives at the sink, shower, or other fixture where it is needed. In the current average residence, there are twice as many water fixtures and appliances (e.g., showers, toilets, dishwashers, clothes washers, etc.) as there were in homes built pre-1970, and with increased home size, the distance to the farthest fixture has also more than doubled. Consequently, the time it takes hot water to reach the farthest fixture has significantly increased, resulting in inefficient and wasteful use of water during this "wait" period. Where determined to represent a potential water savings, installation of hot-water demand systems in the largest dwellings would be a feasible means for addressing efficiency in this sector.

B.1.1.5 High-Efficiency Clothes Washers (HECW)

High-efficiency clothes washers (HECWs) utilize technological advances to deliver high quality wash performance while saving both water and energy. Resource efficient models use 35 to 50 percent less water. Over 100 models of residential and commercial high-efficiency washers are offered. Incentives are currently available for the replacement of older clothes washers with these new water-efficient models as part of BMP 6.

B.1.1.6 New Home Construction Measures

For new home construction, the requirement for "structured plumbing" and the installation of water-efficient clothes washers and dishwashers (5.8 Water Factor (WF) or less) would be feasible. This would be similar to Metropolitan's "California Friendly Homes" program for new developments, in which efficient technologies are built-in to the new residences during construction.

B.1.2 Commercial, Industrial, Institutional (CII) Sector Conservation Measures

B.1.2.1 Commercial HETs and High Efficiency Urinals (HEUs)

To achieve maximum water savings, commercial facilities may consider toilet replacement with HETs, urinal replacement with high-efficiency urinals (HEUs) (which use 0.5 gallons or less), and low-flow faucet aerator (0.5 gpm) retrofit installations in restrooms, as needed. Where feasible in new construction, non-water urinals could also be installed, provided that the owner understands the long-term physical and financial impacts of the product. While non-water urinals offer the complete elimination of flush valves and water use, other more customer acceptable high-efficiency technologies are now making their appearance. The current national standard for urinals mandates a maximum flush volume of 1.0 gallon. California's recent HET fixture legislation (AB 715) also mandates that all urinals sold or installed in the state shall be HEUs as of January 1, 2014. Urinals flushing at significantly less than 0.5 gpf have existed in the marketplace for at least 15 years and have proven that much less water is required in today's new construction. Today's new 1 pint ($1/8^{th}$ gallon) flushing urinals are gaining broad market acceptance, provide excellent performance, and avoid some of the negative issues associated with non-water urinals.

B.1.2.2 Package Graywater Treatment Systems

Graywater is generally defined as wash water originating from showers, bathtubs, clothes washers, lavatory sinks, and similar uses. Graywater is distinctly different from "black water" which originates from toilets, and water derived from dishwashers and garbage disposals. Package graywater treatment systems are one of the most significant, emerging water-saving building equipment technologies in the market. These systems use graywater from showers, bathroom lavatory sinks, and clothes washers for water reuse applications. Following treatment, the water could then be used for toilet flushing and potentially for drip irrigation.

The capture, treatment, and reuse of graywater not only yields usable water that would otherwise be directed to the sewer, its use on landscape and for car washing is generally not subject to the typical watering restrictions that are sometimes imposed by local jurisdictions. While the costs of graywater treatment systems vary significantly depending upon the application and the underlying technology of the system, it is frequently not cost-effective to install such a system as a retrofit for the purpose of reusing water inside the building. Instead, these systems are more ideally suited to new construction applications.

B.1.2.3 Pre-Rinse Spray Valves and Boilerless Food Steamers

Commercial food service represents one of the larger water using sectors in the CII sector. For food service operations (restaurants, cafeterias, commercial kitchens, etc.), the replacement of existing non-efficient pre-rinse spray valves (where not already replaced) and incentives for the installation and use of boilerless food steamers are the dominant and easily achieved water use reduction actions. Boilerless food steamers only use 14 gallons of water per day (per compartment), versus the standard boiler-based models that use up to 400 gallons per day (gpd). In addition, the replacement of water-cooled ice makers with water-efficient air-cooled models can be considered.

B.1.2.4 Water Recycling Technologies for Medical Equipment

For medical facilities, consideration must be given to eliminating once-through water use in vacuum systems, X-ray film processing, and steam sterilizers. The use of existing water recycling technologies for these items of equipment can reduce water use significantly (upwards of 98 percent annually).

B.1.2.5 Waterbrooms

When using a hose and nozzle to clean sidewalks, approximately 8 to 18 gpm of water can be wasted. With a pressurized Waterbroom, cleaning is more water efficient, using as little as 2.8 gpm. The Waterbroom nozzle jets use a combination of air and water pressure to clean and remove dirt and food spills from concrete, asphalt or any other composite surface. Studies have shown that the Waterbroom requires 75 percent less labor to operate than a garden hose or broom. Accordingly, for those facilities with wash-down requirements, incentives for the use of pressurized Waterbrooms could be provided.

B.2 Emerging Outdoor Technologies

Water conservation programs should integrate the available technologies with planning and infrastructure. New technology, equipment, leak reduction, dedicated meters, recycled water, appropriate landscape design, and rainwater collection reduces the use of potable sources. Part of planning an efficient, well monitored outdoor water conservation program is to obtain information about all existing and proposed new development large landscapes in an agency's service area. This includes large footprint residences as well as all Commercial and Institutional sites. Comprehensive site audits should incorporate indoor water use data and outdoor data, type and irrigation efficiency of irrigation equipment and plant types.

B.2.1 Dual Metering

Dual metering refers to the installation of separate meters to record indoor and outdoor water use. This provides an efficient way of tracking landscape water use.

In existing areas, a retrofit is needed to replace a mixed-use meter with dual meters. To complete this on a large scale can be a significant investment for a water agency. Therefore, all new construction should be encouraged (incentives) or required (ordinances) to install dedicated landscape meters. Agencies could offer a dual-metering program to all properties with large landscapes (about 5,000+ square feet.) in the service area. Properties with a dedicated irrigation meter could be provided with an on-line landscape performance report every month. If recycled water becomes available in the future, the dedicated landscape meter could be hooked up to the recycled water system.

Also, water agencies are required to condition the installation of dedicated landscape meters for new retail service connections as of January 1, 2008. With landscape water use in the residential sector being such a significant source of water consumption, conditioning dual meters on new residential accounts in addition to CII accounts could have a substantial impact on overall water consumption. Dual metering is required for water budgeting of outdoor use.

B.2.2 Landscape Measures

B.2.2.1 Precision Irrigation

The State Legislature (based on recommendations of the AB 2717 Landscape Task Force) approved AB 1881 in 2006 regarding performance standards for irrigation equipment. In accordance with AB 1881, local planning agencies are required to adopt a model landscape ordinance that includes installation of water efficient devices and technology including moisture sensor, weather based irrigation controllers (smart-timers), and irrigation delivery devices such as rotator spray heads and drip systems on all Municipal and Industrial sites within its service area by January 1, 2025. In addition, water agencies are required to condition the installation of dedicated landscape meters for new retail service connections on all lots with more than 5,000 square feet of irrigated landscape, as of January 1, 2008.

- Drip or Low Precipitation Irrigation. RPU could develop a list of approved irrigation devices such as drip irrigation. Drip irrigation uses 75 percent less water than standard irrigation practices. This technology reduces runoff (unaccounted water loss) and soil erosion. Application of the water is precisely directed and the flow rate can be adjusted to the local conditions.

  Metropolitan offers up to $3 per nozzle when installing high efficiency rotating spray nozzles. The water savings are realized through reduced precipitation rates, uniformity in watering, and greater radius. This technology allows landscape to use 20 percent less water. Another technology, pressure regulating devices, for sprinkler heads reduces water use through regulating the pressure. The device is designed not to exceed the manufacturer's water pressure standard.

- Weather Based Irrigation Controllers. Weather based irrigation controllers (WBICs) currently available on the market use remote sensing or controlling options to determine whether irrigation is necessary. Water savings is realized by watering only when necessary based on the local evapotranspiration (ETo) rate, solar index detected, or temperature based on the type of controller. For example, if a high ETo rate or high solar index is detected by the controller, the irrigation system will be turned on. Water savings of 0.05 AF per station annually can be obtained. Savings is estimated at more than 14,600 gallons per household per year.

- Nozzles. Auto shut off hose nozzles increase water savings through greater efficiency when watering. The best application of water efficient hose nozzles is through residential and commercial sites where gardeners or residents water their gardens or lawns manually. Nurseries or home improvement stores that regularly water their plants could save water through use of these nozzles. Auto shut off hose nozzles can save up to 7,500 gallons per year. Some districts offer free hose nozzles as part of their water conservation program.

- Soil Moisture Sensors and Probes. Soil moisture sensors and probes can be used to determine when watering is necessary. Tensiometers, electrical resistance devices, and moisture content or root zones are all technologies currently available for use. One application of this technology is watering of commercial/industrial areas where the irrigation system is controlled manually or small areas where large amounts of equipment may not be cost effective.

B.2.2.2 Landscape Design

Landscape design is a planning approach that would integrate several factors that will reduce water use. Landscaping for water conservation can include one or several of the following aspects for water savings to be realized: plant type, minimizing narrow paths or steep areas that produce inefficient irrigation, plant groups with similar irrigation requirements, regular maintenance of irrigation equipment, fertilizer, aeration, mulch, and reduced irrigation areas in new developments. Water budgets for the types of landscaping could be determined and monitored by the District.

- Appropriate Landscaping. "Water-wise" landscaping is a conceptual design emphasizing water conservation. The design includes a plan, soil analysis, plant selection, turf areas, efficient irrigation technology, mulch, and maintenance. The design incorporates low water use plants. Agencies could offer lists of low water use plants that grow in the region and local nurseries or websites that could provide them. Agencies could develop examples of ideal designs of water-wise landscaping for various land areas or site types such Commercial or Residential. Landscapers or the public would utilize this information and optimize it for their own sites. A subset of water-wise landscaping is "natural" landscaping which utilizes only regional plants for a site plan. Low to no maintenance is necessary since the plants are adapted to the local climate and only rainfall will be necessary to maintain the area once plants are established. Water districts provide information on native plants on their websites and in many cases local nurseries that sell these plants. Water agencies can encourage builders, Homeowners Associations (HOAs), and developers to use these plants in their model homes either through incentives or ordinances. New developments can incorporate these plant palettes into the design for water efficient landscaping.

- Education and Outreach. Landscape design programs should include training and certification programs. Several California cities and water agencies offer year-round bilingual training programs for their customers and their local landscapers. Many of these programs are offered in Spanish. One example is the "Protector Del Agua" program run by Metropolitan.

  A landscape contractor certification program could be considered. Sites that are performing close to the weather-based water budget could then be placed on a "certified" list. This program could also be applied to developers of new residential and commercial properties.

B.2.2.3 Turf

- Turf Removal. "Cash-for-grass" program: An example of this type of program that could be instituted in an agency's service area offers a financial incentive per square foot of removed grass from a property. Customers must remove all irrigation systems dedicated for that grass and replace them with drip or low-water use irrigation devices. Customers then submit a landscape plan that incorporates low-water use and native plants. A check is mailed to the customer once the landscape plan has been implemented and inspected by agency staff (or a contractor).

  This program could be expanded to incorporate the installation of smart controllers, soil evaluation and amendment incentives and new water-efficient irrigation equipment

retrofits. HOAs could be targeted with public outreach to encourage the use of water-appropriate plant palettes instead of grass, with an eye toward amending CC&R restrictions that require turf grass in residential landscapes and common areas. This program could also be expanded to the Commercial sector, and could also be adapted to serve as the basis for landscaping requirements for new construction. However, homeowners are not required to keep the landscape and therefore may revert back to turf at some point, such as resale of the residence.

- Synthetic Turf. Synthetic turf is an alternative landscaping approach to reduce the water needs of an area. Synthetic turf can have an annual water savings of 6 AF per acre. Over the life of the product (which is approximately 10 years), the total water savings is 60 AF for every acre replaced. Athletic fields or schools may be an area where synthetic turf can replace turf yet not lose the recreational benefits of the site. However, financial incentives have remained low for these programs.

B.2.2.4 Swimming Pool Covers

From 2003 to 2006, Metropolitan established a rebate program for swimming pool covers that would cover 1 percent of the pools in its service area. The pool covers would require a minimum 12 millimeter (mm) in thickness but could be either bubbles, vinyl, or insulated vinyl covers. Swimming pool covers could result in 30 percent reduction in water losses, which would be equivalent to approximately 7,000 gallons per year per swimming pool.

B.2.2.5 Water Budgets

RPU could encourage and assist owners of large landscapes to develop a water efficient landscape using water budgets. The program could specify the types of irrigation equipment installed at each site, the irrigated area, and plant types present. The information could be entered into a web-based program so comparisons are made between the water budget of an area and weather-based water budgets. This comparison identifies any changes or upgrades to the current design for improved water savings. As recommended by the Landscape Task Force, user friendly materials and/or web-based software could be developed to determine water budgets for the irrigated areas for use by the district or individuals. Additionally, water audits could be required for any property that consistently exceeds 20 percent over the water budget that was determined by the software. RPU could also use GIS/remote sensing data to determine the amount of landscaped area in a particular sector of the service area.

B.2.2.6 Research

AB 2717 required a stakeholder workgroup to evaluate and recommend proposals for improving the efficiency of water use in new and existing urban irrigated landscapes in the state. Research in the areas of landscape and water conservation specifically identified program evaluation that could benefit from research, including how much water is conserved when precision irrigation programs are implemented in a service area. These types of post-implementation evaluations will help agencies determine whether to continue a program, shift strategies, or determine problems if a program is not effective.

B.3 Conservation-Related Legislation/policy

Legislation is being enacted to encourage reduced dependence on potable water. Policies are being set at various levels of government as described in detail below.

B.3.1 Federal Legislation

Most legislation at the Federal level involves direction from Congress to fund various water and energy conservation programs under Federal agencies. Two of these include; H.R. 146 - The Omnibus Public Land Management Act of 2009, and H.R. 1 - The American Recovery and Reinvestment Act of 2009.

B.3.1.1 U.S. Department of the Interior Water Smart Program

The objective of this new program is to "secure and stretch water supplies for use by existing and future generations." It encourages States, Indian Tribes, irrigation districts, water districts and other organizations with water or power delivery authority to leverage their money and resources by cost sharing with the US Bureau of Reclamation (USBR) on projects that conserve and use water more efficiently, increase the use of renewable energy in the management or delivery of water, protect endangered and threatened species, facilitate water markets, or carry out other activities to address climate-related impacts on water or prevent any water-related crisis or conflict. Applicants must provide a cost share of 50 percent or more of the total project cost. This program now incorporates the USBR Challenge Grant program under the Water Conservation Field Services Program, "Water 2025" and Water Conservation Initiative.

B.3.1.2 Environmental Protection Agency (EPA) WaterSense Program

Launched in 2006, WaterSense is an EPA-sponsored partnership program that seeks to protect the future of the nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs, and practices. WaterSense brings together local water utilities and governments, product manufacturers, retailers, consumers, and other stakeholders to:

- Decrease indoor and outdoor (non-agricultural) water use through the adoption of more efficient products and practices.
- Help consumers make water-efficient choices, including differentiating between products and services in the marketplace and adopting simple daily activities that reduce water use.
- Encourage innovation in manufacturing
- Establish and standardize rigorous certification criteria that ensure product efficiency, performance, and quality.

WaterSense helps consumers identify water-efficient products and programs that meet WaterSense water efficiency and performance criteria. Products carrying the WaterSense label perform well, help save money, and encourage innovation in manufacturing. WaterSense partners with manufacturers, retailers and distributors, and utilities to bring WaterSense-labeled products to the marketplace and make it easy to purchase high-performing, water-efficient

products. It also partners with irrigation professionals and irrigation certification programs to promote water-efficient landscape irrigation practices. Utilities such as RPU can access WaterSense materials and utilize them in marketing their own local water conservation programs and available products. They can also support local implementation of certification programs.

B.3.1.3 U.S. Department of Agriculture Agricultural Water Enhancement Program

The Agricultural Water Enhancement Program (AWEP) is administered by the USDA Natural Resources Conservation Service (NRCS). Through this program, USDA enters into contracts with owners and operators of agricultural lands to plan and implement groundwater and surface water conservation measures on those lands. All USDA funds go to the owners and operators of the lands.

State and local government entities are eligible to apply for the grants if they have a program in place where they have teamed with ag owners and operators.

The program requires description of the lands, participating owners/operators, and agreements or arrangement of the program for which funding is being sought.

RPU and the various agricultural owners/operators within the City's agricultural easement areas could access funds to implement conservation measures under this program by executing agreements for this purpose.

B.3.2 State Legislation

Various bills related to water conservation have been enacted over the last few years, as the State Legislature focuses on water issues, in particular the environmental and water supply constraints in the Sacramento-San Joaquin Bay-Delta. Water conservation and demand management are seen as key to solving water supply reliability problems statewide.

AB 1420 (Laird): Chaptered; Chapter No. 628, Statutes of 2007

Sets new requirements, based on specific content in UWMPs for urban water suppliers to be able to access State grant or loan funding.

Beginning January 1, 2009, the terms of, and eligibility for, a water management grant or loan made to an urban water supplier and awarded or administered by DWR, the SWRCB or the California Bay-Delta Authority (or its successor agency) shall be conditioned on the implementation of the water demand management measures described in Section 10631 of the Urban Water Management Planning Act (UWMP Act), and as potentially modified and determined by the department.

"Water management grants and loans" include funding for programs and projects for:

- *Surface water or groundwater storage*
- *Recycling*
- *Desalination*
- *Water conservation*

- *Water supply reliability*
- *Water supply augmentation*

This funding includes, but is not limited to, funds made available pursuant to Section 75026 of the Public Resources Code (Proposition 84)

Section 10631 of the UWMP Act requires detailed reporting on the implementation of an urban water supplier's water conservation activities. If various conservation measures are not being implemented, that must also be reported.

The department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, ***if the urban water supplier has submitted to DWR the following for approval:***

- Implementation Schedule
  - Financing plan
  - Budget

These materials must be included in the grant or loan agreement, for implementation of the water demand management measures. The supplier may request grant or loan funds to implement the water demand management measures to the extent the request is consistent with the eligibility requirements applicable to the water management funds.

In addition, the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, ***if an urban water supplier submits to the department the following for approval:***

- Documentation demonstrating that a water demand management measure is not locally cost effective.
- If DWR determines that the documentation submitted by the urban water supplier fails to demonstrate that a water demand management measure is not locally cost effective, it shall notify the urban water supplier and the agency administering the grant or loan program within 120 days that the documentation does not satisfy the requirements for an exemption, and include in that notification a detailed statement to support the determination. ("Not locally cost effective" means that the present value of the local benefits of implementing a water demand management measure is less than the present value of the local costs of implementing that measure.)
- The legislation also tasks DWR with the development of eligibility requirements to implement the requirement for qualifying for grant or loan funding for both of the following:
- The conservation measures described in the Memorandum of Understanding Regarding Urban Water Conservation in California, and

- Alternative conservation approaches that provide equal or greater water savings; and recognize the different legal, technical, fiscal, and practical roles and responsibilities of wholesale water suppliers and retail water suppliers.

The department shall determine whether an urban water supplier is implementing all of the water demand management measures described in Section 10631 based on either, or a combination, of the following:

(i) Compliance on an individual basis.

(ii) Compliance on a regional basis. Regional compliance shall require participation in a regional conservation program consisting of two or more urban water suppliers that achieves the level of conservation or water efficiency savings equivalent to the amount of conservation or savings achieved if each of the participating urban water suppliers implemented the water demand management measures. The urban water supplier administering the regional program shall provide participating urban water suppliers and the department with data to demonstrate that the regional program is consistent with this clause. The department shall review the data to determine whether the urban water suppliers in the regional program are meeting the eligibility requirements.

In addition, the bill adds a requirement that, in addition to the list of state and local planning agencies with which an agency must file its plan (and any amendments or changes), it must also file with any local agency formation commission (LAFCO) within which county the urban water supplier provides water supplies.

SBX7 (Steinberg), Chapter No. 4, November 10, 2009

The main focus of SBX7 is achievement of a 20 percent reduction in statewide urban water use in gallons per capita per day (gpcd) by 2020. It also contains new requirements for agricultural water suppliers. It adds several new sections to the water code.

The urban sector requirements of the bill apply mainly to retail urban water suppliers. Retail suppliers must determine their "base daily per capita water use" and report it in their 2010 Urban Water Management Plans (UWMPs) by July 1, 2011. They must utilize one of three methods identified in the bill:

- Average gross water use over a continuous 10-year period ending no earlier than December 31, 2004 and no later than December 31, 2010 (definition of gross water use is included in the bill).

- For retailers with at least 10 percent of 2008 demand served by recycled water (either retail or wholesale provided) this calculation may be extended to include an additional five years ending no earlier than December 31, 2004 and no later than December 31, 2010.

- For those retailers that are already close to their gpcd reduction targets (no less than 5 percent reduction), the estimate of average gross water use reported in gpcd and calculated over a continuous five-year period ending no earlier than December 31, 2007 and no later than December 31, 2010.

Retail suppliers must also identify their demand reduction targets by utilizing one of four methods identified in the bill:

- 80 percent of baseline gpcd water use (i.e., a 20 percent reduction).
- The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (70 percent of ETo); plus 10 percent reduction in baseline commercial, industrial institutional use by 2020.
- 95 percent of the applicable state hydrologic region target as set in the Draft 20x2020 Water Conservation Plan (April 03, 2009); see attached table.
- A method to be identified and developed by DWR through a public process and reported to the Legislature by December 31, 2010, to achieve a cumulative statewide 20 percent reduction. An agency is not bound to use this new method if it results in a target that is higher than 20 percent.

Retailers must meet interim gpcd reduction targets by December 31, 2015 and final targets by December 31, 2020.

Wholesalers are obligated to a subset of SBX7's requirements: they must provide in their UWMPs "an assessment of…present and proposed future measures, programs and policies to help achieve the water use reductions required…"

> Interactions between a wholesaler and its retailers, between wholesalers and retailers in a regional water management group, in an Integrated Regional Water Management Plan (IRWMP) funding area, a hydrologic region, or some other geographic scale "may" allow a retailer to meet its water use target, contingent upon "mutual agreement." *This is a key clause, because a wholesaler may choose to assist its retailers in achieving their targets within one of the geographic categories, but it is not required to do so* (Sections 10608.28 and 10608.36).

Should a wholesaler and its retailers decide to cooperate on a service area, regional, or other level, all data and reports must provide information *for both the regional water management group and separately for each "consenting" retailer and wholesaler* (section 10608.36)

The requirements of AB 1420 to provide water use efficiency program information in Section 10631 of UWMPs remain in effect until 2016. Agencies not in compliance with AB 1420 and SBX7 will be ineligible for state loan and grant funding.

AB 1465 (Hill): Chaptered; Chapter No. 534, Statutes of 2009

This bill was signed on October 11, 2009 and takes effect Jan 1, 2010. It allows agencies that have signed the Urban MOU to continue to utilize their California Urban Water Conservation Council (CUWCC) Best Management Practices (BMP) reports as a means to fulfill the Demand Management Measures section of the UWMP Act (section 10631). The BMPs were revised in 2008 and this bill incorporates those revisions as well as any that may take place in the future.

A key subtlety to this bill: section 10631(j) now states that agencies will be in compliance with the UWMP Act "…*by complying with all the provisions of the urban MOU…and by submitting the annual reports required by…that MOU*." For agencies that have been simply submitting biennial reports but not fulfilling all the terms of the MOU, this means that their BMP reports must be much more complete and all ancillary materials provide to the CUWCC (such as cost-effectiveness, budgetary, or legal exemptions, and other materials).

AB 975 (Fong) Chapter 495, Statutes of 2009

This bill updates the requirements for water meters on all connections in California. It allows water purveyors to recover the costs of meter installation and institutes requirements for charging customers by volume of use once meters are installed.

SB 407 (Padilla), chaptered: Chapter 587, Statutes of 2009

At last, California has passed a "universal retrofit" bill. This has been a desire of both water agencies and environmental groups for many years, and had been successfully stymied by the real estate lobby while such retrofits were tied to resale of real property. This bill, which was signed on October 11, 2009, sets three due dates:

- On and after January 1, 2014, all building alterations or improvements to single-family residential, and defined multifamily and commercial property, must replace noncompliant plumbing fixtures.
- On and before January 1, 2017, all noncompliant single-family residential plumbing fixtures must be replaced by the property owner.
- On or after January 1, 2019, all noncompliant plumbing fixtures in multifamily residential and commercial property must be replaced by a property owner.

In addition, on or after January 1, 2017, upon a real estate transaction for any single family, multifamily or commercial property, the requirements for compliance of plumbing fixtures must be disclosed as part of the disclosure process, as well as whether the property includes noncompliant plumbing. "Fixtures" include toilets, urinals, showerheads and faucets.

Water suppliers, as part of their water conservation programs, may include a retrofit on resale ordinance in their service areas; this is encouraged by the urban MOU. SB 407 includes a provision for such local ordinances (and/or other measures) to promote compliance with the bill or to achieve greater water savings. Such an ordinance could serve to accelerate the progress envisioned by SB 407 and could assist an agency in achieving its 20x2020 targets. Agencies that already had such ordinances in place prior to 2009 are deemed to already be in compliance with SB 407.

AB 811 (Levine) Chapter 159, Statues of 2008

This bill allows a public agency to finance energy efficiency improvements through various parcel charge assessment methods and allows those water use efficiency programs that contain embedded energy improvements to be financed as well.

AB 2882 (Wolk) Chapter 610, Statues of 2008

Allocation-based conservation water pricing is defined and agencies are allowed to utilize it as a pricing structure, and to recover costs of funding conservation programs through allocation-based pricing.

AB 1881 (Laird) Chapter 559, Statutes of 2006

State model landscape ordinance (Water Conservation in Landscaping Act): local planning agencies must institute a landscape ordinance as least as effective as the State Model Ordinance defined by his bill, and adopt it by December 31, 2009.

AB 2572 (Kehoe) Chapter 884, Statutes of 2004

All urban water suppliers must have water meters installed on all municipal and industrial service connections on or before January 1, 2025, and must bill by actual volume of use after meters are installed.

California Green Building Standards Code, 2010

The Code sets mandatory green building measures, including a 20 percent reduction in indoor water use, as well as dedicated meter requirements and regulations addressing landscape irrigation and design. Local jurisdictions, at a minimum, must adopt the mandatory measures; the Code also identifies voluntary measures that set a higher standard of efficiency, which can also be adopted. The new standards go into effect January 2011

B.3.3 Local Ordinances

RPU's existing water waste ordinance (Water Rule 15) is somewhat minimal and does not fulfill the terms of the MOU (see Recommended Updates to Ordinances below). The ordinance refers to waste "as defined" and "running water upon the streets." It does not differentiate between new and existing users, nor to the various water user sectors.

RPU also has its water shortage contingency plan described in the 2005 UWMP (as Water Rule No. 9), and that could be updated and submitted to CUWCC. This would be timely since RPU will be reviewing and including it as part of the 2010 UWMP.

RPU/City Landscape Ordinance per AB 1881

Based on review of the City's landscape ordinance, it appears to comply with the State Model Landscape ordinance. The ordinance calls for purveyor water conservation program linkages for existing landscapes, and follows the State's guidance for landscaping requirements in new development.

B.3.4 Recommended Updates to Ordinances

As RPU is an MOU signatory, it is obligated to implement its requirements though a BMP, Flex Track or GPCD approach as defined in the MOU. One of the Foundational BMPs, which must be implemented, is Water Waste prevention. This BMP which is intended to guide signatory ordinance development, as follows:

Water waste prevention (formerly BMP 13)

Although RPU is technically in compliance with the BMP, the ordinance could be improved by addressing specific users uses such as single-pass cooling systems; conveyer and in-bay vehicle wash and commercial laundry systems which do not reuse water; non-recirculating decorative water fountains which are all identified in the MOU.

Metering

RPU Water Rules 11 and 12, which refer to metering and master metering, could be upgraded to reflect compliance with the Utility Operations BMP regarding metering, which requires:

Identifying intra- and inter-agency disincentives or barriers to retrofitting mixed use commercial accounts with dedicated landscape meters, and conducting a feasibility study(s) to assess the merits of a program to provide incentives to switch mixed use accounts to dedicated landscape meters.

RPU could also consider requiring submetering and consumption billing for all new multi-family accounts.

Appendix C: Incentives and Funding

C.1 Financial Incentive (Rebate) Programs

Agencies offer incentives for water conservation via rebates toward residential, landscape, and industrial process and equipment modifications. Metropolitan Water District (MWD) and Western Municipal Water District (WMWD) have rebate programs as shown in Tables C-1 and C-2. Additional rebates are offered by electric and gas utilities for energy efficient products, such as from Southern California Edison and Southern California Gas Company, which may also translate into water savings depending on the product installed (see Table C-3).

C.1.1 Metropolitan Water District

MWD provides funding for a variety of rebate-based conservation incentive programs that are applicable within the WMWD service area, and that come from its Conservation Credits Funding Program. Some of the funding for established incentive programs and grants programs are provided for these incentives. For example, MWD will pay a flat incentive for each approved measure installed within its service area. Devices covered include HETs, urinals, HECWs, WBICs, rotating nozzles for sprinklers, cooling tower conductivity controllers, and several others.

C.1.1.1 MWD "Save A Buck"

"Save A Buck" is a rebate program tailored specifically for the CII sector. Rebates and incentives are available to business, industry and institutional water customers for installation or retrofit with qualifying water-saving devices. The program re-launched in June of 2010 and as of July 5, 2010, there is still over 90% of funds available. Due to the overwhelming popularity of the program, funding for the rebate program is limited and requires reservations.

C.1.1.2 MWD Public Sector Program

The Public Sector Water Efficiency Program addresses public agencies' water and energy savings needs by offering four services: water audits, enhanced device incentives, "pay for performance" cash back, and assistance to connect to recycled water supply. All public sector customers within MWD's service area are eligible. A public sector customer is defined as a city, county, state or federal facility funded through public funding. Non-profit organizations are not eligible under this program.

C.1.2 Western Municipal Water District

WMWD assists its retailers with obtaining incentives for water saving devices. WMWD processes incentive payment for all rebates offered by MWD and rebate reporting to MWD. Further, Western participates in MWD's Accelerated Public Sector Program. Within the City of Riverside boundaries, customers served by WMWD's retail system are eligible for rebates as shown in Table C-2.

C.1.3 Energy Utilities

Southern California Edison and Southern California Gas Company provide mail-in and instant rebates to replace or upgrade older residential, commercial and industrial appliances with new, ENERGY STAR qualified appliances, including high-efficiency clothes washers (with a water factor of 8.0 or less), dishwashers, water heaters, and other water efficient devices.

C.2 Funding Opportunities

A variety of opportunities for grant funding are available. Many of these grant opportunities require the applicant to provide matching funds ("local match") as well as funds for operations and maintenance once a project or program is implemented. The source of local match and funds for operations and maintenance may include: water and wastewater general funds; capital improvement funds; and general funds from local cities, County departments, private organizations, member dues, etc. Local taxpayers may also fund these projects through rate increases, bond measures, and tax increases.

This section identifies various funding sources and their associated requirements and guidelines, to assist with implementation of the recommended conservation programs. Sections C.2.1 through C.2.2 present information on federal and State funding sources. Table C-4 provides a summary of these funding opportunities and provides contact information for each program.

C.2.1 Federal

This section includes a discussion of funds available through various federal programs and specifies eligibility requirements.

C.2.1.1 U.S. Bureau of Reclamation WaterSMART Grant Program

Previously called the Challenge Grant Program, this grant program is intended to fund collaborative local projects that improve water conservation and management through advanced technology and conservation markets. Through this program, federal funding is provided to irrigation and water districts for up to 50 percent of the cost of projects involving conservation, efficiency and water marketing. Eligible applicants include irrigation and water districts and state governmental entities with water management authority. Applicants must be located in the western US (California is an eligible area). Applicants do not have to be part of a Reclamation project but proposals with a connection to Reclamation will receive more weight in the evaluation process.

C.2.1.2 U.S. Bureau of Reclamation Water Conservation Field Services Program

This program was initiated in 1996 to encourage water conservation, assist water agencies to develop and to implement effective water management and conservation plans, coordinate with state and other local conservation program efforts, and generally foster improved water management on a regional, statewide and watershed basis. Eligible applicants include agricultural and municipal and industrial water user entities, states, local governments, universities, and non-profit organizations that have a connection to or with a Reclamation Project, and tribes. Implementation of conservation measures is supported through local

programs on a cost-sharing basis, generally 50/50, through cooperative agreements or grants of up to $100,000 per eligible proposal.

C.2.2 State

Potential funding for Plan implementation may be available through various State programs, including those provided by Propositions 50, 84 and 13, as described below.

C.2.2.1 Proposition 50 – Water Use Efficiency Grants

The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, Water Code §79500, et seq., was passed by California voters in the November 2002 general election. Proposition 50 authorized $3,440,000,000 in general obligation bonds, to be repaid from the State's General Fund, to fund a variety of water projects. Many of the grant programs funded by Proposition 50 have concluded, although the water use efficiency program continues to accept applications.

This particular grant program is intended to fund agricultural and urban water use efficiency projects. The program focuses on funding projects that are not locally cost effective, and that provide water savings or in-stream flows that are beneficial to the Bay-Delta or the rest of the State. Consideration is also given to projects that address water quality and energy efficiency. Specific types of projects that can be funded include: water use efficiency implementation projects providing benefits to the State; research and development projects; feasibility studies, pilot or demonstration projects; training, education or public outreach programs; and technical assistance programs related to water use efficiency. Cities, counties, joint power authorities, public water districts, tribes, non-profit organizations (including watershed management groups), other political subdivisions of the State, regulated investor-owned utilities, incorporated mutual water companies, universities and colleges, and State and Federal agencies are eligible applicants. Grants to urban water suppliers are conditioned on implementation of the DMMs described in CWC §10631. This program is administered by DWR.

C.2.2.2 Proposition 84

The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006 (Public Resources Code § 75001, et seq.), was passed by California voters in the November 2006 general election. The funding for Proposition 84 is tied to participation in a qualified IRWMP. Proposition 84 will be implemented by the Department of Public Health (DPH), DWR, and the SWRCB. Proposition 84 programs will primarily fund projects that are not "locally cost effective," and that provide water savings, or in-stream flows that are beneficial to the Bay-Delta or the rest of the state. Consideration is also provided for projects that emphasize water quality and energy efficiency benefits.

DWR will offer grants for projects that assist local public agencies to meet the long-term water needs of the State including the delivery of safe drinking water and the protection of water quality and the environment. Eligible projects must be part of integrated regional water management plans. Projects eligible for integrated regional water management plan funding include programs for water supply reliability, water conservation, and water use efficiency.

C.2.2.3 Proposition 13 – Agricultural Water Conservation Program

The Agricultural Water Conservation program under Proposition 13 is for voluntary, cost effective projects or programs intended to improve agricultural water use efficiency, and feasibility studies for such projects. The types of projects funded under this program include canal or ditch piping or lining projects; tail water recovery projects; and replacement of leaking distribution system components. Up to $5,000,000 per eligible project may be awarded, and local public agencies and incorporated mutual water companies are eligible for funding. This program is administered by DWR.

Table C-1: Water Conservation Incentives Offered By Metropolitan Water District

Type	Incentive Program	Rebates
Residential	Weather-based Irrigation Controller - under 1 acre	$80
	Weather-based Irrigation Controller - 1 acre or larger	$25 per station
	Rotating Nozzles for pop-up spray head retrofits	$3
	High Efficiency Clothes Washer - Single and Multi-family (Water Factor < 4.0)	$85, $135 with grant
Commercial	Weather-based or Central Computer Irrigation Controller	$25 per station
	Large Rotary Nozzles	$7 per set
	Rotating Nozzles for pop-up spray head retrofits	$3 (minimum 25 per application)
	Commercial High Efficiency Toilet (tank or flushometer)	$50
	Commercial High Efficiency Toilet – New Construction Upgrade	$30
	Urinals – Zero Water Use and Ultra Low Water Use (0 – 0.25 gal/flush)	$200
	Urinals – Zero Water Use and Ultra Low Water Use – New Construction Upgrade (0 – 0.25 gal/flush)	$60
	pH Cooling Tower Controller	$1,750
	Dry Vacuum Pump	$125 per 0.5 hp
	Connectionless Food Steamer	$485 per compartment
	Cooling Tower Conductivity Controller	$625
	Ice Making Machine (Tier III)	$300
	Water Broom	$110
Other Incentives Eligible in MWD-Funded/Member Agency Administered Program	Irrigation Evaluation (without irrigation timer)	$8
	Irrigation Evaluation (with irrigation timer)	$18
	Commercial Landscape Survey	$200 per acre (a)
	Water Use Accountability	$3.50 per acre (b)
	Residential High Efficiency Toilet – Single and Multi-family	$50
	Residential High Efficiency Toilet – New Construction Upgrade	$30
	Single-family Indoor Survey	$12.50
	Customized Projects	$195 per AF, up to 50% of eligible costs

Type	Incentive Program	Rebates
Agricultural	Agricultural Projects	$195 per AF, up to 50% of eligible costs

Notes:

(a) Up to full cost of survey with no wait for device incentives.

(b) Limited to one-half of project cost.

Table C-2: Water Conservation Incentives Offered By Western Municipal Water District

Incentive Program	Rebates
Efficiency Evaluation Program	Free
High Efficiency Clothes Washers	$65
Smart Irrigation Controllers: (< 1 acre of landscaped area)	$120
Water Efficient Landscape Program	$0.40/sf, up to $2,400
High Efficiency Sprinkler Nozzles (freesprinklernozzles.com)	25 free nozzles for residential 100 free nozzles for commercial
Smart Yard Program	Program for WMWD retail customers. 50% instant rebate, customer pays balance over 5 years. www.westernsmartyard.com

Table C-3: Rebates for Energy Efficient Technologies Related To Water Conservation

Type	Technology	Rebate	Rebate Provider
SFR	Tankless Water Heater	$150-200 per unit	SoCal Gas
	Clothes Washer	$35 per unit	SoCal Gas
	Energy Star dishwasher	$30 per unit	SoCal Gas
	Hot Water Boiler	30% of cost tax credit	IRS
	Utility Loan Program (Water Heaters)	$$2,000-20,0000	SoCal Gas
	Clothes Washers	$100/unit	ARRA State of California
	Gas or electric storage water heaters	$30 per unit	SDGE/SCE
MFR	High Efficiency Dishwasher	$30-50 per unit	SoCal Gas
	Clothes Washers	$75-150/ unit	SDG&E
	Central System Gas Water Heaters	$500 per unit	SoCal Gas/SDG&E
	Natural Gas Boilers	up to $1500 per unit	SoCal Gas/SDG&E
Commercial	Boiler	$0.25-0.50/MBtuh	SoCal Gas
	High Efficiency Clothes Washer	$75 per unit	SoCal Gas
	Steamer	$2000 per unit	SoCal Gas
	Utility Loan Program	$5,000 minimum	SoCal Gas/SDG&E
	Tankless Water heater	$0.50-2.00 per mBtuh	SoCal Gas
Commercial/Industrial	Process Boiler Direct Contact Water Heater	$2.00 per mBtuh	SoCal Gas
	Storage Water Heater	$2.00 per MBtuh	SoCal Gas
	Boiler	$0.25-$0.50/MBtuh	SoCal Gas
	Steam Trap Replacement	$100-200 per unit	SoCal Gas
Manufacturers	Dishwasher/cloth washer	$45-75/unit tax credit	IRS
	Clothes Washer	$75-250/ unit tax credit	IRS

Notes:
(a) Most rebates and tax credits refer to purchases made between January 1, 2010 through December 31, 2010 or until the funds are expended.
TBD-Water savings to be determined
SCE- Southern California Edison
USDOE- United States Department of Energy
CPUC- California Public Utilities Commission
SoCalGas- Southern California Gas Company
IRS- Internal Revenue Service
PG&E-Pacific Gas and Electric

Table C-4: Possible Funding Opportunities

Funding Objective	Program Sponsor	Brief Description	Key Points	Eligibility	Submit Grant Application	Contact
FEDERAL						
Water Conservation	United States Bureau of Reclamation (USBR)	WaterSMART Program: Through the WaterSMART Grant Program, Reclamation provides 50/50 cost share funding to irrigation and water districts and states for projects focused on water conservation, efficiency, and water marketing. Projects are selected through a competitive process, based on their ability to meet the goals identified in Water 2025: Preventing Crises and Conflict in the West. The focus is on projects that can be completed within 24 months that will help to prevent crises over water.	Funding for Water 2025 Challenge Grant projects is awarded on a competitive basis through a merit-based review process performed by a Technical Proposal Evaluation Committee. Matching funds are required. Applicants must provide a minimum 50 percent of project costs in non-Federal cash or in-kind resources. Priority is given to projects that will be completed within 24 months from the date of the award, and that will decrease the likelihood of conflict over water.	Eligible applicants include irrigation and water districts, state governmental entities with water management authority. Projects must be located in Western US.	Funding opportunity for 2010 is now closed. http://www.usbr.gov/WaterSMART/grants.html	Miguel Rocha, Water 2025 Program Coordinator (303) 445-2841
Water Conservation	USBR	Water Conservation Field Services Program: This program is intended to: assist in developing effective water management and conservation plans; encourage and promote implementation of water efficiency measures; demonstrate conservation technologies; and promote and support water education and training. Through this program, Reclamation provides 50/50 cost share funding.	Funding is awarded on a competitive basis through a merit-based review process. Matching funds are required at a minimum 50 percent of total project costs, with up to $100,000 per eligible project/activity awarded.	Eligible applicants include agricultural and municipal and industrial water use entities, state governmental entities, universities, tribes, and non-profit organizations that have a connection with a Reclamation Project. Projects must be located in the Southern California Area Office (SCAO) service area.	Funding opportunity for 2010 is now closed. http://www.usbr.gov/WaterSMART/grants.html	Debra Whitney, SCAO Water Conservation Coordinator (951) 695-5319
STATE						
Proposition 50						
Conservation/ Water Use Efficiency (WUE)	Proposition 50- Chapter 7(g) DWR WUE Grant Program	Program primarily funds urban and agricultural projects not locally cost effective, and that provide water savings, or in-stream flows that are beneficial to the Bay-Delta or the rest of the state. Consideration also for water quality and energy efficiency.	Two step on-line process application process: first step is concept proposal and second step is detailed on-line submittal. Project Funding: $3 million, cost-share expected	Cities, counties, districts, tribes, non-profits; also utilities and mutual water companies for Section A, also universities, colleges, state and federal for section B.	http://www.grantsloans.water.ca.gov/grants/efficiency.cfm	Baryohay Davidoff, DWR (916) 651-9666
Proposition 84 (by chapter)						
Multiple Topics	Proposition 84 Water supply/flood protection, etc.	In general, this bond law would provide funding for flood control, integrated regional projects, water quality, etc.	$5.388 Billion major grants for local entities through IRWMPs	IRWMP is a primary tool of Proposition 84	Guidelines and PSP released July 27, 2010. http://www.water.ca.gov/irwm/integregio_implementation.cfm	Anna Aljabiry (916) 651-9262 aljabiry@water.ca.gov
Chapter 4 Planning	DWR	Plan and Feasibility studies/ climate change evaluation for impacts on flood and water systems, integration of flood and water systems, modeling, reservoir operations	$65 million budget	Interregional	Guidelines and PSP released July 27, 2010. http://www.water.ca.gov/irwm/integregio_implementation.cfm	Anna Aljabiry (916) 651-9262 aljabiry@water.ca.gov
Chapter 9 Sustainable Communities	TBD by Legislation	Urban greening projects that reduce energy, conserve water, and improves air/water quality, including not less than $20M for urban forestry projects	$90 million budget	Interregional	TBD	Anna Aljabiry (916) 651-9262 aljabiry@water.ca.gov
Chapter 9 Sustainable Communities	TBD by Legislation	Plan grants and incentives for regional and local land use plans designed to promote water conservation, reduce auto use/fuel	$90 million budget	Interregional	TBD	Anna Aljabiry (916) 651-9262 aljabiry@water.ca.gov

Funding Objective	Program Sponsor	Brief Description	Key Points	Eligibility	Submit Grant Application	Contact
		consumption, encourage greater infill/compact development, protect natural resources/ag lands, revitalize urban/commercial centers				
Proposition 13						
Water Conservation	DWR	Agricultural Water Conservation: voluntary, cost effective projects or programs to improve agricultural water use efficiency, and feasibility studies for such projects	Canal or ditch piping or lining projects; tail water recovery projects; and replacement of leaking distribution system components; $5 million per eligible project	Local public agencies and incorporated mutual water companies	Continuous filing; http://www.grantsloans.water.ca.gov/loans/conservation.cfm	Baryohay Davidoff (916) 651-9666

Appendix D: Water Conservation Measures Analysis Assumptions

D.1 Base Assumptions (Common to All Programs)

Category	Variable	Value Used	Data Sources and Assumptions
Agency Benefits	Unit cost of avoided water supply	$975 per AF	Based on marginal cost of new water supply (2009 Water Supply Plan Priority C projects).
Agency Costs	Full Time Employee (FTE) Equivalent	$75,000	Estimated typical value based on Kennedy/Jenks experience.
Discounting Information	Agency discount rate	2.9% per year	Real discount rate based on assumed nominal bond rate of 5% less 2.1% inflation (difference between nominal and real discount rates recommended by 2008 Office of Management and Budget Circular No. A-94, see http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html).

D.2 Single Family Residential Surveys – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Survey cost	$315 per survey	Cost of survey targeted indoor/outdoor survey and indoor handouts including showerheads, aerators and toilet flappers was reported to be $200 and $16, respectively, in 1995 dollars (CUWCC, 2005, page 2-50 to 2-51). Cost projected to be approximately $315 per survey in 2010 dollars.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
	Maximum number of surveys conducted per staff member	Up to 4 surveys per day, for 260 days per year	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	40 gpd (6.2%)	Savings for residential assistance program was reported to be 40 gpd for SFR (CUWCC Research and Evaluation Committee Report to Steering Committee, 8/13/2009), which is 6.2% of the average SFR account water use. This proportion was used as the savings factor for high water use accounts. However, greater savings is likely because there are additional water savings opportunities for larger users, particularly in the Riverside area where water use is greater than the statewide average.
	Savings decay	10% per year	While survey savings tend to decay over time by as much as 25% per year (CUWCC Research and

Category	Variable	Value Used	Data Sources and Assumptions
			Evaluation Committee Report to Steering Committee, 8/13/2009), high water users typically have leaks which contribute to excessive water use. Identifying and fixing these problems would result in greater sustained savings than surveys offered to typical customers without leaks.
Implementation Level	Top 5%	440 surveys per year	To reach saturation of 2,900 customers by 2020. Because savings decay over time, the cumulative equivalent number of surveys completed by 2020 is not equal to the total number of surveys completed by 2020.
	Top 5-10%	440 surveys per year	To reach saturation of 2,900 customers by 2020.
	Top 10-20%	880 surveys per year	To reach saturation of 5,800 customers by 2020.

D.3 Single Family Residential WBICs Direct Install – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Installation cost	$1030 per installation, 1.5 installations per site.	Average cost of installation in RPU's direct installation program in March to July 2009. Includes, product, installation, and 3 years signal fee costs.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20% of outdoor use	Outdoor savings typically in the 20% range for high use customers. CUWCC 2005 Cost & Savings Study (pg 2-3).
	Savings decay	10% per year	Expected life 10-15 years. CUWCC 2005 Cost & Savings Study (pg 2-4)
Implementation Level	Top 5%	440 installations per year	To reach saturation of 2,900 customers by 2020. Because savings decay over time, the cumulative equivalent number of surveys completed by 2020 is not equal to the total number of surveys completed by 2020.
	Top 5-10%	440 installations per year	To reach saturation of 2,900 customers by 2020.
	Top 10-20%		Program was not recommended

D.4 Single Family Residential WBICs Rebates – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Rebate cost	$200 per installation, 1.5 installations per site.	Current value of RPU WBICs rebate
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20% of outdoor use	Outdoor savings typically in the 20% range for high use customers. CUWCC 2005 Cost & Savings Study (pg 2-3).
	Savings decay	10% per year	Expected life 10-15 years. CUWCC 2005 Cost & Savings Study (pg 2-4)
Implementation Level			Program was not recommended

D.5 Synthetic Turf Rebates

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Rebate cost	$1/square foot	Current value of RPU turf replacement rebate.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	10 cubic feet per year per square foot replacement	Irrigation use in is approximately 10 cubic feet per square foot per year (CUWCC 2005 BMP Cost & Savings Study, pg 2-105).
	Savings decay	0% per year	Assumed sustained savings.
Implementation Level			Program was not recommended

D.6 Residential Precision Sprinkler Nozzles Distribution

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Nozzle cost	$1.90 per nozzle	Provided by RPU.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
	Nozzles distributed to each account (SFR)	25 nozzles	Provided by RPU
	Nozzles distributed to each account (MFR)	150 nozzles	Provided by RPU
Water Savings	Reduction in average use	0.002 AFY per nozzle	Provided by RPU

Category	Variable	Value Used	Data Sources and Assumptions
	Savings decay	20% per year	Provided by RPU. Life of nozzles is 5 years.
Implementation Level	Number of accounts to target per year	4,000 SFR accounts, 80 MFR accounts	Accounts needed per year to reach saturation of approximately 30% by 2020.

D.7 Residential Low-Flow Showerheads Distribution and Natural Replacement Savings

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Showerhead cost	$2.90 per nozzle	Cost of $2 in 1995, CUWCC 20050 BMP Costs & Savings Study (pg 2-44).
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in use (natural replacement savings, 2.5 gpm model)	5.5 gpd for SFR, 5.2 gpd for MFR	CUWCC 20050 BMP Costs & Savings Study (pg 2-44)
	Reduction in use (program savings, 1.5 gpm model)	7.7 gpd for SFR, 7.3 gpd for MFR	Assume 40% additional savings than 2.5 gpm models.
	Savings decay (2.5 gpm model)	0% per year	2.5 gpm showerheads are required by plumbing code and therefore have no decay rate
	Savings decay (1.5 gpm model)	30% per year	CUWCC 20050 BMP Costs & Savings Study (pg 2-44)
	Natural replacement rate	15%	Life of 7 years, CUWCC 20050 BMP Costs & Savings Study (pg 2-44)
Implementation Level	Number of accounts to target per year		3,500 showerheads per year, equal to 2 showerheads per SFR account targeted in SFR Survey Program.

D.8 Residential High Efficiency Washing Machine Rebate Programs and Natural Replacement Savings

Category	Variable	Value Used	Data Sources and Assumptions
Annual Costs	HEWC rebate cost	$155	RPU provides $80 for water rebate and $75 for energy rebate.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Average annual savings	10,220 gallons per year per machine	CUWCC Research and Evaluation Committee Report to Steering Committee, 8/13/2009
	Washing machine natural rate of replacement	16 years	CUWCC Research and Evaluation Committee Report to Steering Committee, 8/13/2009
	HECW marketshare	12% pre-2010, 100% post-2010	Based on K/J estimate from prior projects. After 2010, all washing machines sold in CA will use no more than 6 gallons per CF washing capacity. http://energy.ca.gov/releases/2009_releases/2009-10-29_clotheswashers.html

Category	Variable	Value Used	Data Sources and Assumptions
Implementation Level	Number of accounts to target per year	600	Assumed level of implementation.

D.9 Residential HET Rebates and Natural Replacement Savings

Category	Variable	Value Used	Data Sources and Assumptions
Annual Costs	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
	HET rebate cost	$100 per year	RPU provides $100 rebates for ULFT's and HET's.
Water Savings	Average persons per household	2.5 persons SFR and 1.5 persons MFR	RPU's CUWCC Base Year report.
	Average savings per HET	21.1 gpd for SFR and 26.6 gpd for MFR	CUWCC Research and Evaluation Committee Report to Steering Committee, 8/13/2009
	Average savings per ULFT	16.9 gpd for SFR and 21.3 gpd for MFR	ULFT savings scaled from HET savings based on ratio of 1.3 gallons per flush (gpf) vs. 1.6 gpf for ULFTs.
	Toilet natural replacement rate	4%	Based on CUWCC (2005, Exhibit 6).
	Decay factor	0%	AB 715 toilet standard requires 1/2 of all toilets sold to be HET in 2010 and all will be HET in 2014. Decayed units will be replaced with HET's.
Implementation Level	Number of accounts to target per year	1,200 SFR and 350 MFR	Assumed level of implementation

D.10 Dedicated Irrigation Accounts Surveys

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Survey cost	$1,970 per survey	CUWCC BMP C&S Study cited cost of survey in 1999 at $500 to $1500. Use cost of $1,500 with 2.5% inflation. Includes cost for inventory of accounts, targeting, marketing, implementation, monitoring and tracking
	Maximum number of surveys conducted per staff member	Up to 2 surveys per day, for 260 days per year	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20%	CUWCC, 2005. pg 2-103
	Savings decay	17% per year	Research and Evaluation Report (8/13/2009) suggests landscape surveys have life of 6 years.
Implementation Level	Number of surveys conducted per year	170 surveys	To reach saturation of 850 customers by 2020. Because savings decay over time, the cumulative equivalent number of surveys completed by 2020 is not equal to the total number of surveys completed by 2020.

D.11 CII Landscape Surveys

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Survey cost	$1,970 per survey	CUWCC BMP C&S Study cited cost of survey in 1999 at $500 to $1500. Use cost of $1,500 with 2.5% inflation. Includes cost for inventory of accounts, targeting, marketing, implementation, monitoring and tracking
	Maximum number of surveys conducted per staff member	Up to 2 surveys per day, for 260 days per year	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20%	CUWCC, 2005. pg 2-103
	Savings decay	17% per year	Research and Evaluation Report (8/13/2009) suggests landscape surveys have life of 6 years.
Implementation Level	Top 5%	45 surveys per year	To reach saturation of 230 customers by 2020. Because savings decay over time, the cumulative equivalent number of surveys completed by 2020 is not equal to the total number of surveys completed by 2020.
	Top 5-10%	45 surveys per year	To reach saturation of 230 customers by 2020.
	Top 10-20%	90 surveys per year	To reach saturation of 465 customers by 2020.

D.12 CII WBICs Direct Install – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Direct install cost	$1,030 per installation, 1.5 devices per site.	Average cost of installation in RPU's direct installation program in March to July 2009. Includes, product, installation, and 3 years signal fee costs.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20% of outdoor use	Outdoor savings typically in the 20% range for high use customers. CUWCC 2005 Cost & Savings Study (pg 2-3).
	Savings decay	10% per year	Expected life 10-15 years. CUWCC 2005 Cost & Savings Study (pg 2-4)
Implementation Level	Top 5%	45 installations per year	To reach saturation of 230 customers by 2020. Because savings decay over time, the cumulative equivalent number of installations completed by 2020 is not equal to the total number of installations completed by 2020.
	Top 5-10%	45 installations per year	To reach saturation of 230 customers by 2020.
	Top 10-20%	90 installations per year	To reach saturation of 465 customers by 2020.

D.13 CII WBICs Rebates – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Rebate cost	$200 per installation, 1.5 installations per site.	Current value of RPU WBICs rebate
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	20% of outdoor use	Outdoor savings typically in the 20% range for high use customers. CUWCC 2005 Cost & Savings Study (pg 2-3).
	Savings decay	10% per year	Expected life 10-15 years. CUWCC 2005 Cost & Savings Study (pg 2-4)
Implementation Level	Top 5%		Program was not recommended
	Top 5-10%		Program was not recommended
	Top 10-20%		Program was not recommended

D.14 CII Precision Sprinkler Nozzles Distribution

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Nozzle cost	$1.90 per nozzle	Provided by RPU.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
	Nozzles distributed to each account	150 nozzles	Provided by RPU
Water Savings	Reduction in average use	0.002 AFY per nozzle	Provided by RPU
	Savings decay	20% per year	Provided by RPU. Life of nozzles is 5 years.
Implementation Level	Number of accounts to target per year	200 accounts	Accounts needed per year to reach saturation of approximately 20% by 2020.

D.15 CII and MFR High Efficiency Washing Machine Rebate Programs

Category	Variable	Value Used	Data Sources and Assumptions
Annual Costs	HEWC rebate cost	$155	RPU provides $80 for water rebate and $75 for energy rebate.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Average annual savings	0.12 AFY per machine	CUWCC 2008 MOU, pg 46
	Decay factor	0%	No decay was used. After 2010, all washing machines sold in CA will use no more than 6 gallons per CF washing capacity. http://energy.ca.gov/releases/2009_releases/2009-10-29_clotheswashers.html

Category	Variable	Value Used	Data Sources and Assumptions
Implementation Level	Number of accounts to target per year	100	Assumed level of implementation.

D.16 CII Indoor Surveys – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Survey cost	$12,000 per survey	Kennedy/Jenks experience with prior CII indoor water survey project showed that consultant surveys for large CII water users can be between $12,000-$15,000 per survey
	Admin cost	0%	Assume that administration costs will be covered under the CII Conservation Incentives program that is paired with CII Indoor Surveys.
Water Savings	Reduction in average use	12%	Based on 11% for consultant surveys (CUWCC, 2005. pg 2-66) and 12-15% (CUWCC MOU, 2007).
	Savings decay	10% per year	While survey savings tend to decay over time by as much as 25% per year, high water users typically have leaks or other system inefficiencies which contribute to excessive water use. Identifying and fixing these problems for high users would result in greater sustained savings than surveys offered to the average customers.
Implementation Level	Top 5%	35 surveys per year	To reach saturation of 230 customers by 2020. Because savings decay over time, the cumulative equivalent number of surveys completed by 2020 is not equal to the total number of surveys completed by 2020.
	Top 5-10%		Program not recommended
	Top 10-20%		Program not recommended

D.17 CII Conservation Incentives – Top 5%, 5-10% and 10-20% of Customers

Category	Variable	Value Used	Data Sources and Assumptions
Agency Cost	Incentive cost	$975/AFY saved	Incentive equal to the avoided cost of water.
	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
Water Savings	Reduction in average use	1 AFY for every $975 spent	Incentive equal to the avoided cost of water.
	Savings decay	10% per year	While survey savings tend to decay over time by as much as 25% per year, high water users typically have leaks or other system inefficiencies which contribute to excessive water use. Identifying and fixing these problems for high users would result in greater sustained savings than surveys offered to the average customers.

Category	Variable	Value Used	Data Sources and Assumptions
Implementation Level	Top 5%	$99,400 per year	The CII Conservation Incentives program is designed to reimburse customers for water survey recommendations. Incentive equal to water savings expected to occur through CII survey program.
	Top 5-10%		Program not recommended
	Top 10-20%		Program not recommended

D.18 CII HET and Urinal Installs

Category	Variable	Value Used	Data Sources and Assumptions
Agency Costs	Admin cost	25%	Estimated typical value based on Kennedy/Jenks experience.
	HET Install cost	$82.50 for toilet, $82.50 for installation	RPU HET install program FY 08-09
	HE Urinal Install Cost	$87 for urinal $82.50 for installation	CUWCC estimated costs of product in 1995 were: Costs to replace full flush valve with low flow valve: $60-$80. Costs of non-water consuming urinal: $100-$400 (CUWCC, 2005. pg 2-97). Install costs taken as same value from RPU HET install program FY 08-09
	ULF Urinal Install Cost	$145 for urinal $82.50 for installation	
	Zero Flow Urinal Install Cost	$145 for urinal $82.50 for installation	
Water Savings	Average savings per HET	38 gpd	RPU HET install program FY 08-09
	Average savings per HE urinal	62 gpd	
	Average savings per ULV urinal	72 gpd	
	Average savings per zero flow urinal	82 gpd	CUWCC MOU, 2008
	Decay factor	0%	AB 715 toilet standard requires 1/2 of all toilets sold to be HET in 2010 and all will be HET in 2014. Decayed units will be replaced with HET's. Assume same for urinals.
Implementation Level	Number of devices to distribute per year	100 HET, 100 HE urinals, 100 ULV urinals, 100 zero flow urinals	Assumed level of implementation

Appendix E: Technical Memorandum #1 GPCD Calculations

Appendix F: Technical Memorandum #2 Avoided Cost of Water

Appendix G: Tracking Methods

To be provided at a later date.