

City of Sacramento Interim Water Conservation Plan

Department of Utilities
Field Services Division
Water Conservation Office

October 2009 (Revised January 2010)

Prepared by:
Mark Roberson
Sacramento Area Water Forum

and
Julie Friedman, Water Conservation Coordinator
City of Sacramento

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
SECTION 1. INTRODUCTION.....	9
1.1. Background.....	10
1.2. Document Scope and Organization	11
SECTION 2. DEMOGRAPHICS.....	13
2.1. Customer Class, and Premise Type	13
2.2. Water Use by Customer Class.....	14
2.3. Growth of Water User Connections	17
2.4. Other Demographics.....	18
SECTION 3. PAST PERFORMANCE	19
3.1. Targets and Actual Implementation	19
3.2. Performance	19
SECTION 4. WATER CONSERVATION TARGETS.....	21
4.1. MOU Coverage Requirement.....	21
4.2. Foundational > Utility Operations Programs	24
4.3. Foundational > Educational Programs	26
4.4. Programmatic > Residential.....	26
4.5. Programmatic > Commercial, Industrial and Institutional (CII)	28
4.6. Programmatic > Landscape	28
SECTION 5. PROGRAM COST.....	30
5.1. Cost Assumptions	30
SECTION 6. BENEFITS	33
6.1. Cost of Water and Conservation	33
6.2. Water Conservation Benefit	34
SECTION 7. COST EFFECTIVENESS ANALYSIS	38
SECTION 8. IMPLEMENTATION PLAN	38
SECTION 9. REPORTING.....	38
SECTION 10. REFERENCES	38
SECTION 11. APPENDICIES.....	39
APPENDIX A. PAST PERFORMANCE	39
APPENDIX B. TARGETS by BMP	39
APPENDIX C. COST AND BENEFIT ASSUMPTIONS.....	39

List of Figures

Figure 1.1. Simplified schematic showing water conservation’s connection to the river.9

Figure 2.1. Monthly use by all metered single-family accounts in 2008. February had the lowest water use in 2008. 16

Figure 3.1. Target and actual yearly water conservation for the Water Forum BMPs from 2001 to 2008.20

List of Tables

Table 1. Foundational best management practices.....6

Table 2. Programmatic best management practices.7

Table 1.1. Council BMPs and brief description of their implementation actions. All information is based on the amended 2008 MOU. 12

Table 2.1. Customer classes, premise type and applicable BMPs..... 13

Table 2.2. Connections, meters and accounts billed by meter by customer class as of 2008..... 14

Table 2.3. Metered water use for 2008..... 15

Table 2.4. Unmetered water use by customer class for 2008. 15

Table 2.5. Total and per connection water use and by customer class. 15

Table 2.6. Average indoor and outdoor water use by customer class for 2008 water production data for accounts with meters. Total use for metered accounts is given in Table 2.3. 16

Table 2.7. Connections by customer class and year through 2030. Data is scaled based on actual 2008 accounts..... 17

Table 2.8. Other City demographics..... 18

Table 3.1. Summary of Council BMPs targets and actual implementation counts from 2001-2008. 19

Table 4.1. MOU BMPs and a summary of their coverage requirements.21

Table 4.2. Coverage requirements for 2009 for Residential Assistance Program.22

Table 4.3. Ten year summary of BMPs targets under the Council MOU.....23

Table 4.4. Average monthly and total reference evapotranspiration (ETo), in inches, for the Fair Oaks CIMIS (station.....28

Table 5.1. Summary of program costs using WFA targets.31

Table 6.1. Summary of the unit water production costs for 2008 and which components are affected by conservation.33

Table 6.2. Benefit cost components for MOU and WFA.....34

Table 6.3. Summary of water conservation benefit assumptions, by BMP.....35

Table 7.1. Costs and benefits of water conservation – to the City, adapted from the Council’s 1999 MOU.....38

List of Acronyms

ac-ft/yr	acre-feet per year
BMP(s)	Best Management Practice(s)
CII	Commercial, Industrial, and Institutional
CUWCC	California Urban Water Conservation Council (Council)
DOU	City of Sacramento Department of Utilities
ETo	Reference evapotranspiration
gpf	gallons per flush
gpm	gallons per minute
HET	high-efficiency toilet
HEW	high-efficiency clothes washing machine
MOU	CUWCC Memorandum of Understanding
RWA	Regional Water Authority
SMUD	Sacramento Municipal Utilities District
SRCS	Sacramento Regional County Sanitation District
ULFT	Ultra low flow toilet
USBR	United States Bureau of Reclamation
RAC	Department of Utilities Rate Advisory Commission
Water Forum	Sacramento Area Water Forum
WEP	Water Efficiency Program

EXECUTIVE SUMMARY

Water conservation in the City of Sacramento (City) has multiple benefits – it can make more water available to improve American River flow conditions, it can improve the water quality in the American and Sacramento Rivers and the Delta, it can improve the long-term reliability of the region's water supply, and it can lower the cost of water service to the City's customers. This water conservation plan (Plan) is intended to be a living document that communicates the City's approach to implementing water conservation thereby fulfilling the commitments the City has made to its customers, the Water Forum Agreement (WFA) and the California Urban Water Conservation Council (Council).

This Plan is based on the outcome of an evaluation of each best management practice (BMP) listed in the California Urban Water Conservation Council Memorandum of Understanding (Council & MOU) that are currently being implemented or scheduled for implementation by the City. This Plan quantifies the number of conservation targets the City needs to implement, the cost of implementing the targets and the expected savings. The City supplied demographic information and other input data. Savings assumptions were taken from Council studies and City staff experience.

This Plan is considered interim because future infrastructure cost information, that is required to determine the monetary benefits of conservation, is unavailable. However, this information is being developed through the City's water master planning effort. When the required cost information is available, staff intends to conduct a cost-effectiveness analysis and finalize the Plan. In addition, this Plan will be updated on a periodic basis to reflect changes that arise from legal requirements, economics and program efforts.

Under both the MOU and the Water Forum Agreement (WFA) the City is committed to implement the Foundational BMPs (Table 1) at a cost of \$613,035. In addition, the City is required to implement up to eight programmatic BMPs (Table 2) if they are locally cost-effective¹. However, as discussed above a cost-effective analysis has not yet been conducted therefore all programmatic BMPs will be implemented. Although the cost-effective analysis was not completed, the cost per acre-foot of savings could be used to prioritize program efforts. This approach would suggest that the City focus on outdoor water savings first followed by CII and then rebates for WaterSense toilets and High-efficiency clothes washers. Costs for the Programmatic BMPs are \$1,679,995, and the total costs for Foundational and Programmatic BMPs in 2009 are \$2,293,030.

¹ Locally cost-effective means that the benefits of the BMP are greater than the costs.

Savings resulting from implementation efforts in 2009 are expected to be 1,869 acre-feet. Although the life-time of an individual conservation measure varies, the cumulative, life-time savings from program costs in 2009 are expected to result in up to 28,528 acre-feet with the majority of that amount coming from metering.

Other sections of this Plan include an analysis of past performance, a description of future reporting and an implementation Plan.

Table 1. Foundational best management practices.

Foundational Best Management Practice	Council Based Program ¹		Cost and Conservation ²				
			Cost		Savings in 2009	Life-Time Savings	Unit Cost
	Annual Targets & Unit	Capital \$	\$/yr	AF/yr	AF	\$/AF	
<i>1. Utility Operations Programs</i>							
Coordinator	1	Personnel	n/a	111,280	Savings are not quantifiable		
Water Waste Prevention	1	Program	n/a	tbd			
Wholesale Assistance	1	Program	n/a	tbd			
System Audits	1	Program	n/a	Assumed to be 10%			
Meter Retrofit (Single Family) ³	5,736	Meters installed	6,252,513	404,879	482	7,716	840
Meter Retrofit (Multi Family) ³	481		524,222	33,946	395	6,315	86
Meter Retrofit (CII) ³	183		199,674	12,930	143	2,281	91
Retail Conservation Pricing	Volumetric pricing implemented Jan-2010 ⁴					3,704	
<i>2. Educational Programs</i>							
Public Info	1	Program	n/a	25,000	Savings are not quantifiable		
School Education	1	Program	n/a	25,000			
Total All Foundational			6,976,409	613,035	1,019	20,016	

¹Target development details are in Section 2 of the document.

²Cost and conservation details are in Section 3 of the document.

³Meter retrofits assume are the annual number required to complete metering by 2024.

⁴Savings are estimated based on the use of volumetric pricing when meters are used for billing. Costs included with retrofits.

Table 2. Programmatic best management practices.

Programmatic Best Management Practice	Council Based Program ¹		Cost and Conservation ²				
			Cost		Savings in 2009	Life-Time Savings	Unit Cost
	Annual Targets & Unit		Capital \$	\$/yr	AF/yr	AF	\$/AF
<i>3. Residential</i>							
Res. Assistance Program	2,594	House calls	n/a	112,175	73	476	236
Res. Landscape Surveys	2,064	Surveys	n/a	127,530	338	2,215	58
High Eff. Clothes Washers	1,136	Rebates	n/a	92,966	18	220	423
Water Sense Toilet	5,624	Rebates	n/a	1,009,396	199	3,176	318
Water Sense Specifications	Rebates & Info.		n/a		Data unavailable		
<i>4. Commercial, Industrial and Institutional</i>							
CII Program	performance based		n/a	281,309	95	1,248	225
<i>5. Landscape</i>							
Dedicated Meter ³	120	Water Budgets	n/a	23,492	100	1,004	23
Mixed Use CII	244	Survey & Incentives	n/a	33,127	27	174	190
Total All Programmatic				1,679,995	850	8,512	197

¹Target development details are in Section 2 of the document.

²Cost and conservation details are in Section 3 of the document.

Findings and Recommendations

In addition to the outcomes of the analysis the following are findings and recommendations for improving the program.

- Cost-effectiveness analysis – An analysis of the cost-effectiveness of the programmatic BMPs has not yet been conducted for this Plan. When the avoided cost analysis for future infrastructure needs has been completed (currently under way through the water master plan update) it is recommended that a cost-effectiveness analysis be conducted on the programmatic BMPs.
- Data access – Data of high quality is collected by the City however, it is difficult to access. It is recommended that procedures should be put in place that allow ready access and standardization of data queries.

- Metering and water use information – Because the City has a limited number of metered residential connections, there is limited information on residential use. As metering is implemented this accuracy will improve; however, it should be understood that the residential use estimates may contain errors.
- Public information – It is recommended that the City communicate this Plan with its customers and stakeholders.
- Future updates – As the City improves its understanding of future demands and conservation potential, they should be reflected in this Plan.
- Society perspective – This plan was analyzed from the City’s point of view and does not capture all of the costs and benefits to the City’s customers. An analysis that includes societal costs and benefits would be informative and could potentially save the ratepayers more money. Among other information, this would require input from the Sacramento Regional Sanitation District.

The City will continue to support its responsibility as a good steward of water resources and of the American and Sacramento rivers. As the City continues implementation of BMPs, water conservation planning is crucial to improving the City’s efforts.

SECTION 1. INTRODUCTION

Why does the City of Sacramento have a water conservation program?

When standing on a bridge in Sacramento looking at the American or the Sacramento River it is hard to imagine the need to conserve water. However, improving the in-stream conditions in these rivers is a primary reason for conserving water. Water conservation improves river habitat by making more water supply available to flow down the river and it preserves a supply of cold water for use at strategic times to improve aquatic habitat (Fig.1.1). Also important is that by diverting less water out of the river, there is less return flow. This is important because the temperature of the return flow is higher and typically contains pollutants such as nitrogen. Elevated water temperatures and pollutants are both potentially detrimental to aquatic habitat. These benefits are articulated in the Water Forum Agreement (WFA) that the City of Sacramento (City) signed in 2000.

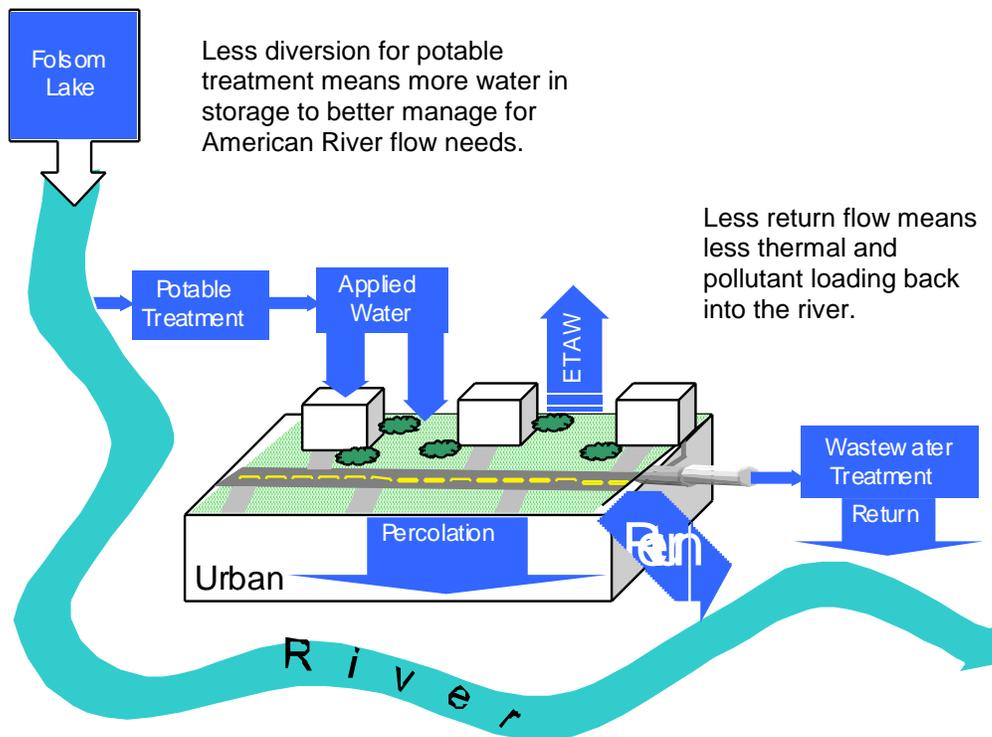


Figure 1.1. Simplified schematic showing water conservation’s connection to the river.

In addition to improving conditions in the river, water conservation makes sense from an economic point of view. In the short-term, conserving water means that the City needs to spend less money on energy to pump and distribute water and

less money for chemicals to treat the water. In the long-term, the City can potentially avoid capital infrastructure costs by reducing the number of groundwater wells that need to be constructed and avoid or reduce the need for new river diversions and other infrastructure. The balance between costs and benefits to the City are examined through a cost-effectiveness analysis.

A concern that is often voiced about water conservation is that if the City is not using water the City may jeopardize its water rights, as using less may be seen as needing less. However, the State of California considers water conservation a beneficial use of water and therefore a reduction in its use cannot be seen as the City “giving up” its rights to divert, use, and consume water.

The City has a goal of being the water conservation capitol. To jumpstart this goal the City recently updated its water conservation ordinance. This ordinance established outdoor water use requirements to help customers increase water conservation. This ordinance is designed to be an effective, responsible, and reliable approach to assist customers in achieving an increase in water use efficiency.

This plan is intended to help the City meet its commitments to its customers, the WFA and the Council. Portions of this plan will be updated on a periodic basis to reflect changes that arise from legal requirements, economics and program efforts.

1.1. Background

The City joined the California Urban Water conservation Council (Council) in 1995 (REF) as both a retail water purveyor and as a supplier of wholesale water within the American River place of use. The Council, governed by a memorandum of understanding (MOU), was created to increase efficient water use through partnerships among urban water agencies, public interest organizations, and private entities. When the City joined the Council it pledged to implement the BMPs that are articulated in the MOU. The Council’s goal is to integrate BMPs into the planning and management of California’s water resources. The MOU is available at www.cuwcc.org.

The Council amended its MOU in December 2008. The Council’s initial 14 best management practices (BMPs) are now organized into five categories as listed in Table 1.1. Because they are considered essential water conservation activities, two categories, utility operations and education, are designated as foundational BMPs. These categories were adopted for implementation by all signatories to the MOU as ongoing practices. The remaining BMPs are programmatic and are organized into residential; commercial, industrial, and institutional (CII), and landscape.

As a member of the Water Forum, the City has agreed to implement the Water Forum Agreement's water conservation element. The water conservation element was updated in 2009. The update calls for the signatories to replace old Water Forum BMPs with the Council MOU. One exception is that for any BMP found to be not-cost effective there is a negotiated process for deferring the BMP and substituting an alternative program. Another exception is that the number of Residential Assistance Surveys is dependent on the number of metered connections. Finally, a benefit of \$75 per acre-foot to the purveyors was included as an environmental benefit that is to be included as an agency benefit when analyzing the cost-effectiveness of a BMP.

1.2. Document Scope and Organization

The scope of this document is to convey the City's water conservation plan to its customers and interested stakeholders. The Plan is divided into nine sections;

1. Introduction – Background information on the City and its water conservation efforts.
2. Demographics – Data on accounts and water use information.
3. Past Performance – Data on historic water conservation efforts.
4. Water Conservation Targets – An analysis of targets based on the Council's MOU.
5. Program Cost – Information on the costs of implementing the water conservation program.
6. Benefits – Information on the benefits of implementing the water conservation program. This section only includes the savings component, cost savings cannot be determined at this time. When information on future infrastructure is available it will be used to estimate cost savings.
7. Cost-effectiveness Analysis – An analysis that compares the cost to the benefits of water conservation. Note this section has been delayed until additional information on future infrastructure is available.
8. Implementation Plan – The City's plan for meeting the targets of the plan.
9. Reporting – Reports on the City's progress in implementing the Plan and on the water savings performance.

Table 1.1. Council BMPs and brief description of their implementation actions. All information is based on the amended 2008 MOU.

Management Practice	Description of Action
Foundational	
<i>1. Utility Operations Programs</i>	
Coordinator	Provide single personnel to design and administer conservation program.
Water Waste Prevention	Develop, enact, and enforce ordinances that prohibit wasting of water.
Wholesale Assistance	Provide financial and technical assistance to wholesale customers.
System Audits	Audit delivery system to ensure no more than 10% system-wide losses. Requires meters.
Meter Retrofit	Based on meeting State Law – straight-line of existing unmetered connections by 2024.
Retail Conservation Pricing	Included with meter retrofit.
<i>2. Educational Programs</i>	
Public Information	Provide info. to public regarding program includes media campaigns, mailers, website etc.
School Education	Provide information for school education.
Programmatic	
<i>3. Residential</i>	
Residential Assistance Program	Conservation personnel survey interior of residences to assess water savings potential. Provide appropriate information and hardware (shower heads, aerators etc).
Residential Landscape Surveys	Conservation personnel survey exterior of residences to assess water savings potential Provide appropriate information and hardware.
High Efficiency Clothes Washers	Provide rebates or other incentives to replace inefficient clothes washers.
WaterSense Toilet	Provide rebates or other incentives to replace 3.5 gpf toilets.
WaterSense Specifications for new construction	Provide information and incentives for water conserving appliances and landscape for new construction.
<i>4. CII</i>	
CII Savings	Program to reduce CII water use by 10% below 2008 water use.
<i>5. Landscape</i>	
Dedicated Landscape Meters	Prepare water budgets with max applied water to be no greater than 70% of evapotranspiration.
Mixed Use CII with Landscape	Conservation personnel survey exterior of CII to assess water savings potential. Provide appropriate information and hardware.

SECTION 2. DEMOGRAPHICS

This section covers City data and information on connections, metering, customer class, water use, and other demographic information. This information is used in subsequent sections to develop implementation targets and to estimate costs and benefits.

2.1. Customer Class, and Premise Type

Accurate and timely information is essential to effective planning, management, and evaluation of the City’s water conservation program. The City’s computer information system (CIS) is a key tool to providing this information. City staff use custom queries to extract the following data from the CIS:

Customer class and premise type – water users are divided into end user types (Table 2.1) based on water use characteristics. This information is used to establish which BMPs to apply to a customer class.

Number of connections and metered connections (Table 2.2) – provides information on the number of users in any given customer class. This information is used to establish the number of BMP targets for a customer class.

Water use by customer class - for connections with meters (Table 2.3) an analysis can be performed to determine water use per metered account and to estimate indoor to outdoor use. This information is then used to estimate the benefit of a BMP.

Table 2.1. Customer classes, premise type and applicable BMPs.

Customer Classes and Premise Type	Applicable Council BMP
Single Family 1 Single Family Dwelling Multi Family 2 Apts 3 Duplex 4 Triplex 5 Fourplex 6 Mobil Home Park 7 Condo	<i>Foundational > Utility Operations Programs</i> Meter Retrofit Retail Conservation Pricing <i>Programmatic > Residential</i> Res. Assistance Res. Landscape Surveys High Eff. Clothes Washers Water Sense Toilet Water Sense Specifications
Commercial 8 Office 9 Retail 10 Warehouse	<i>Foundational > Utility Operations Programs</i> Meter Retrofit Retail Conservation Pricing <i>Programmatic > Commercial, Institutional and Industrial</i>

11 Hotel/Motel Mixed Use - Residential & 12 Commercial 13 Cemetary/Mortuary Institutional 14 Church 15 Public School 16 Private School 17 Hospital Boarding/Shelter/Convent/Group 18 Home 19 Fire Station 20 Parking Lot Industrial Accounts can only be identified with premise notes and note sub-types. This is done manually in the CIS.	CII <i>Programmatic > Landscape</i> Dedicated Landscape Meters Mixed Use CII with Landscape
Landscape Irrigation 21 Median 22 Irrigation 23 Park 24 Golf Course	<i>Programmatic > Landscape</i> Dedicated Landscape Meters Mixed Use CII with Landscape
Other Premise Types 25 Drain Inlets 26 Ficticious Premise 27 Hydrant Permit 28 Other 29 Truck Permit 30 Undetermined Premise Type 31 Vacant Lot	these premise types will be assigned to one of the customer classes

Table 2.2. Connections, meters and accounts billed by meter by customer class as of 2008.

Customer Class	Connections	Connections w/ Meters	Accounts Billed By Meters	Unmetered Connections
Commercial & Industrial	7,838	5,798	5,787	2,040
Institutional	901	563	559	338
Landscape	1,311	1,247	1,247	64
Multi Family	8,988	1,293	436	7,695
Other	85	56	53	29
Single Family	116,740	24,960	132	91,780

2.2. Water Use by Customer Class

Water use information, by customer class, is required to estimate the potential savings that can be achieved through water conservation. To arrive at an average use for all metered and unmetered connections an estimate was developed, based on total water production and use per metered connection. Metered water use accounted for 49,080 acre-feet in 2008 (Table 2.3). Total production, except wholesale, was 143,910 acre-feet therefore, 94,830 acre-feet (Table 2.4) were not metered.

Table 2.3. Metered water use for 2008.

Customer Class	Use	Average Use per Meter
	acre-feet	
Commercial & Industrial	17,125	2.95
Institutional	4,807	8.54
Landscape Irrigation	6,637	5.32
Multi Family	5,306	4.10
Other premise type	1,992	35.6
Single Family	13,214	0.53
Total	49,080	

Water use for unmetered connections, was determined using the average use per meter (Table 2.3) times the number of unmetered connections (Table 2.2). This approach was applied to all customer classes except single-family residential. Unmetered, single-family residential use was assumed to be the residual (38,579 AF) of all other metered and unmetered uses. Using this approach, the total single-family use is 51,793 AF for 116,740 connections (Table 2.5) or just under 0.45 AF/connection.

Table 2.4. Unmetered water use by customer class for 2008.

Water Use Category	Use	Note
acre-feet		
Conveyance loss	14,391	Assume 10% of total
Commercial	6,025	= metered rate x number of unmetered connections by customer class
Institutional	2,886	
Landscape Irrigation	341	
Multi Family	31,577	
Other premise type	1,031	
Single Family	38,579	= total production – metered – other unmetered
Total	94,830	

Table 2.5. Total and per connection water use and by customer class.

Water Use Category	Use	Average Use per Connection
		acre-feet
Conveyance loss	14,391	
Commercial & Industrial	23,150	2.95
Institutional	7,692	8.54
Landscape Irrigation	6,977	5.32
Multi Family	36,883	4.10
Other premise type	3,023	35.57
Single Family	51,793	0.45
Total	143,910	

The split between indoor and outdoor use was determined by assuming that the minimum water use month, February (Fig 2.1) was for indoor purposes. The split between indoor and outdoor is used to estimate savings from outdoor water conservation. A split of indoor to outdoor was developed for each customer class from the metered water use (Table 2.6). For analysis purposes the indoor, single-family use was assumed to be the metered rate (0.12 AF/connection) and using the per connection use from the metered plus unmetered accounts the outdoor was assumed to be 0.33 AF/connection.

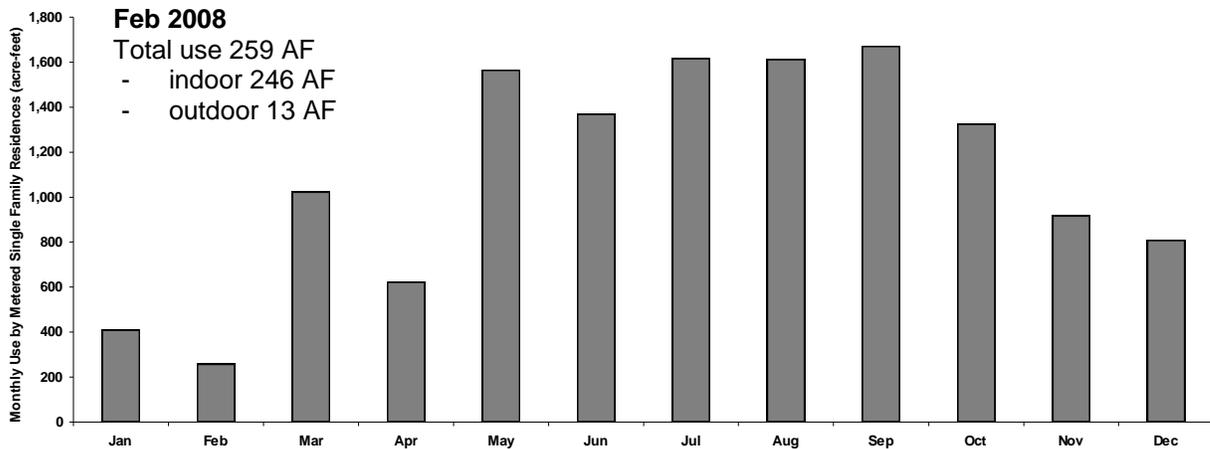


Figure 2.1. Monthly use by all metered single-family accounts in 2008. February had the lowest water use in 2008.

Table 2.6. Average indoor and outdoor water use by customer class for 2008 water production data for accounts with meters. Total use for metered accounts is given in Table 2.3.

Customer Class	Average Use per Metered Account	
	Outdoor	Indoor
	acre-feet	
Commercial	1.54	1.41
Institutional	6.05	2.49
Landscape Irrigation	4.73	0.59
Multi Family	3.03	1.08
Single Family	0.40	0.12

Indoor use for landscape accounts is potentially due to water use in park bathrooms, drinking fountains, and other buildings. Currently the City is inventorying and updating these accounts to separate landscape use from other park uses.

2.3. Growth of Water User Connections

Planning for water conservation activities and budgets requires an estimate of the growth in customers and their water needs. The source for determining growth in the number of end-user connections is the City’s 2005 Urban Water Management Plan (Ref). Table 6.10 in the Plan lists connections on five-year increments through 2030. For this effort the accounts were linearly interpolated between these time periods and then scaled based on the 2008 account information. Projected accounts are given in Table 2.7 for the residential, CII and landscape customer classes.

Table 2.7. Connections by customer class and year through 2030. Data is scaled based on actual 2008 accounts.

Year	Single Family	Multi Family	Commercial, Industrial & Institutional	Landscape
2005	108,299	8,561	10,228	1,257
2006	111,112	8,703	10,554	1,275
2007	113,926	8,846	10,880	1,293
2008	116,740	8,988	11,206	1,311
2009	119,554	9,130	11,532	1,329
2010	122,368	9,273	11,858	1,347
2011	124,810	9,402	12,201	1,362
2012	127,253	9,531	12,544	1,377
2013	129,695	9,661	12,888	1,393
2014	132,138	9,790	13,231	1,408
2015	134,581	9,920	13,574	1,424
2016	137,224	10,036	13,935	1,437
2017	139,867	10,153	14,296	1,449

2018	142,510	10,270	14,657	1,462
2019	145,154	10,386	15,019	1,475
2020	147,797	10,503	15,380	1,488
2021	150,450	10,607	15,758	1,498
2022	153,104	10,711	16,137	1,509
2023	155,757	10,814	16,516	1,519
2024	158,411	10,918	16,895	1,529
2025	161,064	11,022	17,273	1,539
2026	163,828	11,120	17,681	1,548
2027	166,592	11,217	18,088	1,557
2028	169,356	11,315	18,495	1,565
2029	172,120	11,412	18,902	1,574
2030	174,885	11,510	19,309	1,583

2.4. Other Demographics

Other demographics for the City are listed in Table 2.8. This information is used to develop targets for some of the BMPs. The City covers 62,208 acres (2008, General Plan)

Table 2.8. Other City demographics.

Demographic	Single Family	Multi Family
1992 housing stock (units)	96,055	55,625
Units with 3.5+ gpf Toilets in 2008	50,154	29,044
Average resale rate	4.91%	10.40%
Average persons per unit	2.90	2.00
Percent of 1992 housing stock with pre 1980 toilets	50%	50%
Housing demolition (% of remaining stock)	0.50%	0.50%
Average units per connection	1	6

SECTION 3. PAST PERFORMANCE

3.1. Targets and Actual Implementation

The City joined the Council in 1995 and signed the WFA in 2000. Since this time the City has maintained a water conservation program. This section of the document accounts for the City's previous efforts. The primary source of data for the counts of actions, such as the number of ultra low flow toilet rebates provided, is the annual report that the City submits to the Water Forum. To generate the amount of water saved, the savings assumptions provided in Section 6 of this document were used. Also, only the quantifiable BMPs are included in this section. A summary of the targets and actual actions implemented for the City is shown in Table 3.1.

Table 3.1. Summary of Council BMPs targets and actual implementation counts from 2001-2008.

CUWCC BMP (Water Forum name)	2001-2008	
	Targets	Actual
Meter Retrofit (Residential Meter Retrofit)	0	2,618
Meter Retrofit (Non-Residential Meter Retrofit)	4,952	464
Residential Assistance Program (Single Family Water Audits)	19,775	3,081
Residential Assistance Program (Multi Family Water Audits)	6,826	320
Residential Assistance Program (Plumbing Retrofits)	60,668	13,537
WaterSense Clothes Washers (Washing Machines)	voluntary	238
WaterSense Toilets (ULF Residential)	voluntary	3,110
CII (Commercial and Industrial Conservation Audits)	1,391	645
CII (Institutional Water Audits)	0	116
CII (ULF Commercial)	32,284	1,410
CII (ULF Institutional)	0	10
Mixed Use CII with Landscape (Large Landscape Audits)	984	155

3.2. Performance

The estimate of the yearly conservation for the targets and actual number of actions is shown in Figure 3.1. The yearly data represents the amount of conservation that is expected to occur during the year of implementation.

Worksheets for each BMP are in Appendix A (to be completed). For each BMP, information is provided on, the benefits of each target implemented, the life and

decay of each and City demographic data that is used in the analysis. The savings estimates are provided for each year of implementation along with the incremental and annual rollup of the targets.

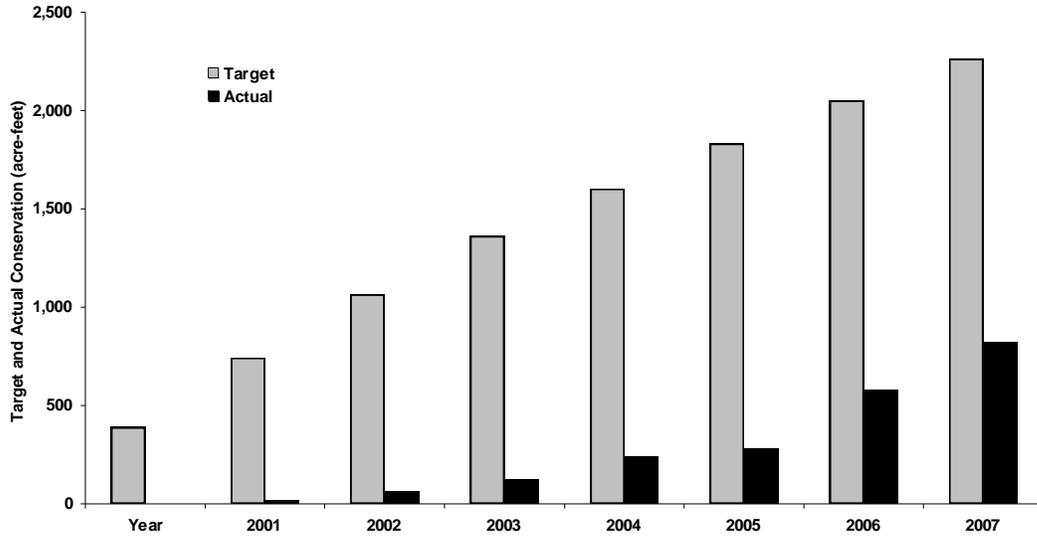


Figure 3.1. Target and actual yearly water conservation for the Water Forum BMPs from 2001 to 2008.

SECTION 4. WATER CONSERVATION TARGETS

The previous section of this document presented City demographics this section discuss how customer class information is translated into water conservation targets. A target is an action such as replacing an existing toilet with one that uses less water. Several of the BMPs do not have numerical targets rather their coverage requirement is to provide a certain type of service such as a water conservation coordinator.

This section provides information on how each BMP applies to the City. For each BMP with a numerical target a table is provided, in Appendix B, that has the annual and cumulative targets over the applicable time period. Figure B.1 illustrates the worksheets that are used to present the targets associated with quantitative BMPs. For some BMPs there is a requirement to include past efforts when determining targets. A discussion on historical conservation efforts and savings is provided in Section 3 of this document.

4.1. MOU Coverage Requirement

The MOU coverage requirements along with a brief summary of each BMP is given in Table 4.1. For quantifiable BMPs the coverage requirements dictate the number of targets that must be done or the rate of water conservation that must be achieved over a given time period. Depending on the BMP, the coverage requirement is applied to the number of connections or units. In addition, the coverage requirements for some BMPs decrease after a prescribed number have been implemented.

Table 4.1. MOU BMPs and a summary of their coverage requirements.

Management Practice	Summary of Coverage Requirements
<i>Foundational</i>	
<i>1. Utility Operations Programs</i>	
Coordinator	City will annually provide a dedicated person to serve as the coordinator
Water Waste Prevention	City will enact and enforce ordinances and regulations that prohibit the waste of water.
Wholesale Assistance	City will provide technical, financial support as well as a shortage contingency plan.
System Audits	City will maintain an active distribution system auditing program.
Meter Retrofit	Meter all connections by 2025.
Retail Conservation Pricing	Follows metering by 1 year.

<i>2. Educational Programs</i>	
Public Info	City will maintain an active public information program to educate customers.
School Education	City will maintain an active public information program to educate students..
Programmatic	
<i>3. Residential</i>	
Res. Assistance	Provide surveys to 15% of current single-family accounts and multi-family units by year 10, then decrease to 0.75%.
Res. Landscape Surveys	Provide surveys to 15% of current single-family accounts by year 10, then decrease to 0.75%.
Water Sense Clothes Washers	Provide incentives to 1% of current single-family accounts.
WaterSense Toilet	Provide incentives to replace 3.5 gpf or greater toilets until market saturation is 75% or greater.
WaterSense Specifications –new construction	Provide incentive to all new residential development to adopt WaterSense specification appliances etc.
<i>4. CII</i>	
CII Savings	10% reduction in 2008 CII use. Up to 50% credit given for savings prior to 2008.
<i>5. Landscape</i>	
Dedicated Landscape Meters	Establish water budgets for 90% of accounts.
Mixed Use CII with Landscape	Complete surveys for not less than 15% of CII accounts.

An example of how the coverage requirement is applied for the Residential Assistance Program BMP, to generate a target, is given in Table 4.2. In 2008 the City had 173,252 single and multi-family residential units. Based on when the City joined the Council (1997) the coverage requirement for the Residential Assistance Program is to survey 0.75% of the highest water users per year or 1,300 surveys (targets) for 2009.

Table 4.2. Coverage requirements for 2009 for Residential Assistance Program.

Customer Class	Housing Units	Coverage Requirement	Annual Target
Single Family	119,444	0.75%	896
Multi Family (Avg 6 units/account) ¹	53,808	0.75%	404
Total	173,252		1,300

¹ Multi-family housing units are determined by multiplying the number of multi-family connections by the average units per connection. In 2008 the average was six units per multi-family connection.

The remaining portion of this section discusses the targets for each BMP. Table 4.3 is a summary of all targets. The tables presented in Appendix B provide detail on how the targets for each BMP were developed.

Table 4.3. Ten year summary of BMPs targets under the Council MOU.

CUWCC Based BMP	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Foundational (ongoing and required by all Council members)										
<i>1. Utility Operations Programs</i>										
Coordinator	fund coordinator position									
Water Waste Prevention	update ordinance as necessary									
Wholesale Assistance	provide assistance									
System Audits	follow system audit procedures									
Meter Retrofits	6,400 for residential and non-residential, annually through 2024									
Retail Conservation Pricing	follows metering by one year									
<i>2. Educational Programs</i>										
Public Info	fund public information program									
School Education	fund school education program									
Programmatic (subject to cost-effective analysis)										
<i>3. Residential</i>	Implementation Targets									
Res. Asst. Prog. (surveys)	2,594	2,622	2,647	2,671	2,695	2,719	2,743	2,769	2,794	2,819
Res. Land Surveys	2,064	2,085	2,103	2,122	2,140	2,158	2,177	2,196	2,216	2,236
High Eff. Clothes Washers	1,136	1,162	1,248	1,273	1,297	1,321	1,346	1,372	1,399	1,425
WaterSense Toilet	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624
Water Sense Specifications	rate based on new home construction									
<i>4. CII (Performance Based)</i>										
CII Savings (acre-feet)	94		453		811		1,208		1,698	
<i>5. Landscape</i>										
Dedicated Land. (budgets)	120	121	121	121	121	121	121	121	121	119
Mixed Use CII	244	246	249	252	254	257	259	262	265	267

4.2. Foundational > Utility Operations Programs

These BMPs apply to all MOU signatories and are considered foundational to a water conservation program.

Coordinator – The City funds a full time Water Conservation Office Coordinator. In addition, the City has three water waste inspectors (two seasonal and one full-time), three water conservation specialists and a clerk.

Water Waste Prevention – An updated water waste ordinance went into affect in June 2009. A copy of the ordinance is available at: www.sparesacwater.org

Wholesale Assistance – Currently the City has four wholesale agreements with other purveyors within the American River place of use. The City provides these purveyors with assistance in meeting their BMPs, serving as a liaison with the Water Forum Successor Effort, helping customers accept BMP assistance, and improving awareness in water conservation.

System Audits – The City has two approaches for auditing system losses, one for areas that are fully metered and one for unmetered areas.

In unmetered areas the City completes and maintains:

1. An annually updated system map of type, size and age of pipes, pressures, and leak history.
2. Installation of devices such as pressure recorders or use of other methods designed to identify area with greater than ten percent loss.
3. An ongoing meter calibration and replacement program for all production and distribution meters.
4. An ongoing leak detection and repair program focused on high probability leak areas identified by the system map.
5. A complete system-wide leak detection program, repeated at least every ten years, unless there are special circumstances, such as age of system or planned main replacement.

In metered areas the City completes and maintains:

1. An annual system water audit, determining the difference between production and sales.
2. An annually updated system map of type, size and age of pipes, pressures, record of leaks, etc. with historic data.
3. An ongoing meter calibration and replacement program.
4. An ongoing leak detection and repair program focused on high probability leak areas identified by map.
5. A complete system wide leak detection program, repeated when the system water audit determines losses to be greater than ten percent or when the losses are less than ten percent if the program is determined to be cost effective.

Once the City is fully metered auditing procedures will be updated to reflect the Council MOU.

Meter Retrofits – The City is implementing meter retrofits through the Department of Utilities' Field Services Division Meter Shop. Given that the City signed the MOU in 1995, the City would have been required to retrofit all unmetered connections by July 1, 2009 however, due to the City charter this criteria did not apply. Assembly Bill 2572 (AB 2572) requires the installation and use of water meters by 2025, across the state, including the City of Sacramento. This law supersedes the City charter, was signed into law by Governor Arnold Schwarzenegger on September 29, 2004 and took effect January 1, 2005.

Table 4.3 lists the metering targets for unmetered connections. As of 2008 there were 99,475 single and multi-family residential connections without meters and were 2,471 unmetered Commercial, Industrial and Institutional (CII) and landscape connections. A straight-line method was used to prepare the annual retrofits targets so that all meters will be installed by 2024. The Council requires that all meters be installed one year prior to the state's 2025 deadline.

Retail Conservation Pricing – This BMP requires that the City set volumetric rates for water service. Under the CUWCC there are two options 1) rates that recover 70% of the cost through volume sold and 2) a rate design consistent with the model included in the Municipal Water and Wastewater Rate Manual published by the Canadian Water and Wastewater Association (REF).

Currently, the City's metered water rates include charges that are projected to generate cost recovery of approximately 60 percent based on customer water use and 40 percent for service charges that represent fixed costs that do not vary based on water use. The MOU allows for a phase-in period of four years. The City is committed to meeting the full requirements. A copy of the City's current rate plan is available at www.XX.org

In addition the City intends to implement a tiered water rate structure within the next five years. While moving metered customers from flat rates to metered rates provides a financial incentive for water conservation, tiered rates may provide further incentive. In response to direction from the Utilities Rate Advisory Commission, the City will report on possible tiered rate strategies and timelines. As more meters are installed, the City will monitor water usage characteristics of residential customers to ensure any new water rate structure is fair to customers and adequately recovers costs.

Customers with meters installed prior to January 1, 2009 will be switched to metered billing January 1, 2010. Those with meters installed after January 1, 2009 will receive one calendar year of comparative billing before being switched

to a metered rate. Those who receive their water meter after January 1, 2010 will have one year of comparative billing. During the comparative billing period, customers are only responsible for paying the flat rate. Comparative billing enables customers to see how their flat rate measures up to the metered rate.

4.3. Foundational > Educational Programs

Public Information –The City maintains a public information program to educate customers, through billing inserts, media campaigns, workshops, and presentations to homeowner and business groups.

School Education – The City maintains a program to educate students. The City participates in school outreach and works with its regional and statewide partners supporting and implementing the objectives of the Water Forum. As a member of the Regional Water Authority (RWA), the City participates in the water efficiency program designed to implement BMPs on a regional basis. These partnerships provide multiple resources and outlets for public education, including but not limited to school education in the classroom, media campaigns, and regional and City-wide special events.

The City supports three school education programs. One is the Newspaper in Education program that involves the Sacramento Bee newspaper and local teachers. The second involves the Sacramento Theater Company, which performs water conservation skits at school assemblies. The third is the annual tour, booth, and classes at the Recycling Facility for elementary through high school students. Additionally, "Water from Here to Eternity", and Eco-Guide educational material is provided for all elementary through high school students.

4.4. Programmatic > Residential

Residential Assistance Program – The purpose of this BMP is to provide site-specific leak detection assistance that may include, but is not limited to, the following: a water conservation survey, water efficiency suggestions, and inspections. Showerheads and faucet-aerators that meet the current water efficiency standard as stipulated in the WaterSense specifications are provided as needed.

Table 4.3 lists the residential assistance targets. These targets apply to both single and multi-family residences. Prior to the 2008 MOU, this BMP was split into two BMPs; residential audits and plumbing retrofits. In addition to the targets established under the MOU, the City has unmet targets originating from its 1995 base year with the CUWCC. The unmet targets are provided in the worksheet portion of Table B.3.

Under the WFA the targets for residential assistance are based on the number of installed meters and not the number of connections. As of 2008 the City has 26,253 meters on single and multi-family residences. Table B.4 lists the residential assistance targets based on the Water Forum criteria.

Landscape Water Survey – The purpose of this BMP is to provide site-specific landscape water surveys that include, but are not limited to, the following: check irrigation system and timers for maintenance and repairs needed; estimate or measure landscaped area; develop customer irrigation schedule based on precipitation rate, local climate, irrigation system performance, and landscape conditions; review the scheduling with customer; provide information packet to customer; and provide customer with evaluation results and water savings recommendations.

Table 4.3 lists the landscape water survey targets. These targets only apply to single-family residences. The completed and cumulative completed targets account for previous City efforts. The unmet targets are provided in the worksheet portion of Table B.5.

Under the WFA the targets for Residential Landscape Surveys are based on the number of installed meters and not the number of connections. As of 2008 the City has 24,960 meters on single-family connections.

High-efficiency Clothes Washers – The purpose of this BMP is to provide incentives or institute ordinances requiring the purchase of high efficiency clothes washing machines that meet an average water factor value of 5.0. However, if the WaterSense specification changes, then the average water factor value will change to that amount.

Table B.6 lists the high-efficiency clothes washer targets. These targets only apply to single-family residences.

WaterSense Specification Toilets – The purpose of this BMP is to provide incentives or ordinances requiring the replacement of existing toilets using 3.5 or more gpf (gallons per flush) with a toilet meeting WaterSense specification. This is an ongoing BMP that continues until 75% of the existing high volume flush toilets, within the City, have been replaced with toilets meeting the WaterSense specification.

Table B.7 lists the targets for WaterSense specification toilets. Although not shown, the annual targets were determined using the Councils coverage calculator and updating it to 2008.

WaterSense Specification for Residential Development – The purpose of this BMP is to provide incentives such as rebates, recognition programs, reduced connection fees or ordinances requiring residential construction meeting

WaterSense specification for all new residential housing until a local, state or federal regulation is passed requiring water efficient fixtures. The City uses the approach provided by the EPA at:
http://www.epa.gov/WaterSense/docs/home_rev-draftspec508.pdf

4.5. Programmatic > Commercial, Industrial and Institutional (CII)

CII – The purpose of this BMP is to implement measures to achieve the water savings goal for CII accounts of ten percent of the baseline water use over a ten-year period. Baseline water use is defined as the water consumed by CII accounts in the agency's service area in 2008. Credit for prior activities, as reported through the BMP database, is given for up to 50% of the goal; in this case, coverage will consist of reducing annual water use by CII accounts by an amount equal to the adjusted goal within ten years. The water conservation target in Table B.8 accounts for past efforts. Details on previous efforts are in Section 3 of this document.

4.6. Programmatic > Landscape

Dedicated Landscape Meters – The purpose of this BMP is to prepare water use budgets based on the California Model Water Efficient Landscape Ordinance (DWR, 2009). This ordinance requires that the prepared water budget be no more than 70% of reference evapotranspiration (ET_o). Exceptions to this include recreational areas such as turf areas in parks, playgrounds, sports fields, golf courses, or school yards in public and private projects where turf provides a playing surface or serves other high-use recreational purposes and areas permanently and solely dedicated to edible plants, such as orchards and vegetable gardens. These special landscape areas may have budgets with up to 100% ET_o. The unmet targets are provided in the worksheet portion of Table B.9.

Reference ET_o is available from the California Irrigation Management Information System (CIMIS) station in Fair Oaks (131). This station is the closest to the City and has been operation since April 1997. The historical average monthly ET_o (Table 4.4) at this station ranges from a low of 1.59” in December and January to a high of 8.67” in July. If the landscape ordinance is revised, this BMP will be revised to reflect the change.

Table 4.4. Average monthly and total reference evapotranspiration (ET_o), in inches, for the Fair Oaks CIMIS (station.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1.59	2.20	3.66	5.08	6.83	7.80	8.67	7.81	5.67	4.03	2.13	1.59	57.06

Mixed Use Landscape Meters – The purpose of this BMP is to develop and implement a strategy for providing large landscape water use surveys to CII accounts with mixed-use meters. For connections without meters this BMP is to actively market landscape surveys to existing accounts with large landscapes that have been determined by the purveyor not to be water efficient. The unmet targets are provided in the worksheet portion of Table B.10.

SECTION 5. PROGRAM COST

This section of the document analyzes the costs for implementing the BMPs. This analysis is done from the agencies perspective and does not consider the societal costs of implementing the BMPs. Society costs include what the home or business owner would have to pay to support the BMP. For example, purchasing and installing a WaterSense Toilet may cost a homeowner \$400 however the City's only covers \$125 leaving the homeowner to pay the \$275 difference.

Costs are divided into two categories; labor and BMP implementation cost. Labor costs cover what the City pays personnel to manage and implement the water conservation program. Cost for BMP implementation covers expenses associated with each action such as faucet aerators, advertising, and outside services. All cost information is based on the City's experience in implementing their water conservation program.

5.1. Cost Assumptions

Cost assumptions were developed using information obtained from the following offices in the Department of Utilities: The Water Conservation Office, Engineering, Field Services - Metering Shop, and Business Services. All information reflects the 2008 fiscal year. Details on all costs are provided in Appendix C. A summary of cost per BMP is provided in Table 5.1.

Labor costs include personnel costs for implementing and managing the BMPs. These costs include overhead.

Metering costs include the cost to retrofit existing connections and to manage meter reading and billing. Because state law (AB 2572) requires that all water purveyors that serve more than 3,000 connections must be fully metered. The estimate to retrofit all connections is \$110,000,000 or about \$1,090 per connection (Cap to Cap, 2008).

Costs for implementing the Residential Assistance Program, Residential Landscape Surveys, CII, and Mixed Use Landscape Surveys include administrative time and cost to manage the program, labor costs for providing the survey to the homeowner or business owner, material costs for aerators, nozzles etc, publicity costs for advertising the service and costs associated with monitoring or evaluating the service. Labor to provide the service includes driving time and staff time to document the visit. Program cost share is any financial assistance that is provided by other agencies. It is anticipated that the Residential Assistance Program and the Residential Landscape Survey will be

completed on the same, single-family home visit. Each survey is expected to take 1.5 hours.

Table 5.1. Summary of program costs using CUWCC targets.

BMP	2009 \$	Note
<i>Foundational (ongoing and required by all Council members)</i>		
<i>1. Utility Operations Programs</i>		
Coordinator	111,280	
Water Waste Prevention	to be determined	
Wholesale Assistance	to be determined	
System Audits	to be determined	
Meter Retrofit (installs)	451,755	
Retail Conservation Pricing	to be determined	
<i>2. Educational Programs</i>		
Public Info	25,000	
School Education	25,000	
Foundational sub-total	613,035	
<i>Programmatic (subject to cost-effective analysis)</i>		
<i>3. Residential</i>		
Res. Asst. Prog. (surveys) ¹	112,175	
Res. Land Surveys	127,530	
High Eff. Clothes Washers	92,966	
Water Sense Toilet	1,009,396	includes \$100,730 cost share
Water Sense Specifications	to be determined	
<i>4. CII</i>		
CII	281,309	includes \$102,518 cost share
<i>5. Landscape</i>		
Dedicated Land. (budgets)	23,492	
Mixed Use CII with Landscape	33,127	
Programmatic sub-total	1,679,995	
Total	2,293,030	

Costs for implementing the High-efficiency Clothes Washers and WaterSense Toilets include administrative time and cost to manage the program, washer rebate, rebate processing costs, publicity costs for advertising the rebates and costs associated with monitoring or evaluating the service. The rebate amount was set through the Regional Water Authority's, Water Efficiency Program. Program cost share is any financial assistance that is provided by other agencies or through a grant.

Costs for implementing the Dedicated Landscape Meter BMP include administrative time and cost to manage the program, labor costs for, developing and maintaining water budgets, follow up site visits and costs associated with monitoring or evaluating the service. Labor to provide the service to the participant includes driving time and staff time to document the visit. Program cost share is any financial assistance that is provided by other agencies or departments within the City.

SECTION 6. BENEFITS

Benefits are based on the amount of water conservation, the life of the water conservation action and the cost savings that occur from implementing a BMP. Water conservation benefits can occur through either or both behavioral and passive change. For example, when a 3.5 gallon per minute (gpm) faucet aerator is replaced with a 2.2 gpm aerator there is a passive savings of 1.3 gallons for every minute the faucet is operated. If, in addition to the aerator change, the faucet is used less (behavior change), such as turning the water off when brushing teeth, then the savings are even greater. An exact quantification of the savings for each water conservation action is not feasible; however, there are numerous case studies that have generated reliable estimates of the benefits of implementing conservation actions. For this analysis the estimates that are suggested by the Council are used, unless site or action specific information is available. An example of a benefit to the homeowner for implementing a BMP might be that after low-flow showerheads are installed there is a reduction in the homeowner’s energy cost for heating water.

The agency benefits are what the costs the City avoids due to conservation. This is based on the cost to produce and deliver an acre-foot of water, the marginal cost for additional supply, and the avoided cost for new infrastructure, including a discount rate for capital expenses.

6.1. Cost of Water and Conservation

In the City, the cost to develop, treat and deliver an acre-foot is just under \$500 per acre-foot (Table 6.1) (City, 2008). Of the costs to produce water only the variable costs for chemicals to treat the water and energy to pump and distribute water are considered for the cost-effective analysis. In 2008 chemical costs were \$11.47/AF and energy was \$32.10/AF for a total variable cost of \$43.57/AF. A seasonal and source basis analysis was done to capture the marginal costs for energy and chemicals. Energy information was available and it indicates that groundwater is slightly more expensive to pump than surface water. Also, there was no significant difference in the seasonal costs for energy. Because the City does not provide wastewater service, this is not a cost for consideration from the City’s perspective.

Table 6.1. Summary of the unit water production costs for 2008 and which components are affected by conservation.

Water Production Cost component	Cost	Affected By Conservation
	\$/AF	
Labor	142.25	No
Administration	99.75	No

Capital Improvement Program	172.69	No
subtotal	414.69	
Operations		
Utilities	32.10	Yes
Operations Equipment	2.68	No
Direct Operations Supplies	34.00	No
Chem & Gases	11.47	Yes
subtotal	79.55	
Total	494.24	

The remaining cost that the City could consider is the avoided cost of new infrastructure for capacity and distribution. The avoided capacity costs that can be considered for water conservation benefit analysis is the infrastructure that does not need to be built or could be delayed, due to water conservation. For example, due to the odd-even water ordinance the City may be able to reduce the number or capacity of peaking storage tanks that are required. The cost difference between what is required with and without water conservation is what can be attributed to the avoided capacity costs.

Currently the City is preparing a water master plan that will, in part, develop avoided capacity cost information. Once this information is available the value will be used to complete the monetary benefits of conservation.

An additional item when determining benefits under the Water Forum is the environmental benefit of conserving an acre-foot of water. Water Forum members assume that the benefit is \$75/acre-foot (2009) indexed for inflation. Table 6.2 presents the benefit cost components for both the MOU and the WFA.

Table 6.2. Benefit cost components for MOU and WFA.

Component	MOU Benefit	WFA Benefit
	\$/acre-foot	
Utilities	32.10	32.10
Chem & Gases	11.47	11.47
Avoided Supply Cost	3.16	3.16
Avoided Capacity Cost	To be determined	
Environmental Benefit	0	75
Total	46.73 + avoided capacity cost	121.73 + avoided capacity cost

6.2. Water Conservation Benefit

Benefits are the positive results of implementing an action that is designed to conserve water or increase water use efficiency. Benefits can be determined by measuring how much water is used pre and post intervention. Some benefit information is very easy to access - for example, toilets installed in 1980 were

typically 5.0 gpf conversely, the maximum tank volume of toilets that are available in the United States today are 1.6 gpf. When a 5 gpf toilet is replaced with a 1.6 gpf toilet the savings is 3.4 gpf. Other benefit information is more difficult to obtain such as with the toilet exchange - did the number of flushes remain constant? If they did then all an analyst needs to know is how many flushes a typical house makes in a day. Fortunately there have been many technical studies to determine the benefits associated with a particular action and associated behavior.

The main sources of benefit information for this analysis are the Council publications, City water metering data, and professional estimates. Data for the Council publications were developed from technical studies designed to determine the benefit of a conservation measure. These studies are typically based on field level investigations that are controlled to determine the affect of the conservation action. In addition, these studies are typically peer reviewed. Sources are noted for all benefit assumptions. Table 6.3 presents a summary of the water conservation benefit assumptions. Details on benefit assumptions are in Appendix C.

Table 6.3. Summary of water conservation benefit assumptions, by BMP.

BMP	Benefit/Target	Life	Note
Foundational (ongoing and required by all Council members)			
<i>1. Utility Operations Programs</i>			
Coordinator	not quantifiable		
Water Waste Prevention	not quantifiable		
Wholesale Assistance	not quantifiable		
System Audits	assume 10% of production		Council estimate
Meter Retrofit	assume 20%/meter	20 years	Council estimate
Retail Conservation Pricing	Rolled into Meter Retrofit BMP		
<i>2. Educational Programs</i>			
Public Info	not quantifiable		
School Education	not quantifiable		
Programmatic (subject to cost-effective analysis)			
<i>3. Residential</i>			
Res. Asst. Prog.	25 gpd/survey	15% decay/year	Council estimate
Res. Land Surveys	0.17 AF/yr/site	25% decay/year	Council estimate, City use
High Eff. Clothes Washers	5,280 g/year	12 years	Council estimate
Water Sense Toilet	27.4 gpd (single) 44.0 gpd (multi)	25 years	City estimate
Water Sense Specifications	not quantified		
<i>4. Commercial, Industrial and Institutional</i>			
CII	various depending on measure		
<i>5. Landscape</i>			
Dedicated Land. (budgets)	0.82 AF/yr/site	ongoing	Council estimate, City use
Mixed Use CII with Landscape	.27 AF/yr/site	15% decay/year	Council estimate

Benefits associated with implementing the Meter Retrofit and Conservation Pricing BMPs are based on the Council's generalized assumption of 20% savings. Since metering and volumetric pricing are thought to constitute the majority of the conservation in the region it would be beneficial to closely monitor water use changes that occur with implementation of metering and billing by meter.

The Residential Assistance Program BMP covers indoor and outdoor device and behavior modification. The benefit assumptions for indoor water use (Table CX) cover fixtures such as aerators and showerheads and the repair of leaking pipes and fixtures. The benefit assumptions for outdoor use are derived from hardware changes, such as replacing sprinkler heads and improving the performance of an automatic irrigation timer.

The outdoor use estimate for single-families is 0.33 AF/year (Tables 2.5 and 2.6) for an area of .057 acres. This equates to 5.78 AF/Ac/yr. It is assumed that this could be reduced by 50% to equate to 70% of ETo.

The benefits of a high-efficiency washers and toilet rebates are based on multiple studies with a variety of toilets and serve as defaults in the Council cost-effective worksheets. Toilets have a potential behavioral component as well because they are subject to multiple flushing. However, this information was collected as part of the technical studies that were used to develop the conservation estimate.

One of the updates to the 2008 MOU was to change the CII BMP coverage to a performance criterion of ten percent reduction from the 2008 CII water use. In addition, there is no prescription of what actions to implement. Accepted water savings benefits by device are used to document the savings (Table C.13). If the City implements other conservation measures then the savings per device information will be used as appropriate to determine conservation.

Water savings from implementing the Mixed Use Landscape Survey BMP can accrue from a reduction in the amount of water applied for landscaping use. Consumptive savings can occur through a reduction in the amount of water evapotranspired by plants. Non-consumptive savings can occur through reducing runoff or deep percolation. Over time a decay in savings occurs due to a decrease in equipment performance, changes in plant material, and leaks.

The savings estimates that occur through a water budget for landscape sites with dedicated meters is through a reduction in both consumptive use and a reduction in runoff and deep percolation. Unlike the Mixed Use Landscape Survey BMP, dedicated landscape meters can be physically tied to a defined use for the water and the actual plant needs can be met based on an irrigation system's performance. Additional guidance for developing water use budgets for

dedicated landscape meters is taken from the Model Landscape Ordinance developed by the DWR (ref).

SECTION 7. COST EFFECTIVENESS ANALYSIS

The balance between costs and benefits to the City are examined through a cost-effectiveness analysis. In this analysis the benefits and costs of conservation to the City (Table 7.1) are considered and compared. Section 5 covered costs and section 6 covered the benefits.

Table 7.1. Costs and benefits of water conservation – to the City, adapted from the Council’s 1999 MOU.

Benefits of Conservation to Sacramento
<ul style="list-style-type: none"> a. Costs avoided for constructing water production, transport, storage, and distribution capacity facilities. b. Operating costs, including but not limited to chemicals, energy and labor associated with water deliveries that no longer need to be made. c. Avoided costs of water purchases. d. Environmental benefits and avoided environmental costs. e. Revenues from other entities for the sale of conserved water or financial incentives from other entities.
Costs of Conservation to Sacramento
<ul style="list-style-type: none"> a. Capital expenses for equipment of conservation devices. b. Financial incentives to other water suppliers or retail customers. c. Operating expenses for staff to plan, design or implement the program. d. Costs to the environment.

When all benefit information is available (see Section 6.1), the cost and benefit analysis will be done. One of the outcomes of the cost-benefit analysis is a determination as to whether a BMP is locally cost-effective to implement. BMPs that are found to be not cost-effective are eligible for an exemption under the Council and a deferral under the Water Forum Agreement

SECTION 8. IMPLEMENTATION PLAN

This section to be completed by City water conservation staff

SECTION 9. REPORTING

This section to be completed

SECTION 10. REFERENCES

City of Sacramento, 2008 Water production costs – Excel spreadsheet, (M. Fahy, 2009).

City of Sacramento, Urban Water Management Plan, 2006.

California Urban Water Conservation Council, 2005. Draft revision of BMP costs and savings study. Prepared for the CUWCC by A&N Technical Services, Inc. Encinitas CA.

California Urban Water Conservation Council. Cost-effectiveness spreadsheets; <http://www.cuwcc.org/resource-center/technical-resources/bmp-tools/cost-effectiveness-models.aspx>

Department of Water Resources, California Irrigation Management Information System; <http://www.cimis.water.ca.gov/cimis/welcome.jsp>. 2009.

Department of Water Resources. Model water efficient landscape water ordinance. <http://www.water.ca.gov/wateruseefficiency/landscapeordinance/> 2009.

SECTION 11. APPENDICIES

APPENDIX A. PAST PERFORMANCE

APPENDIX B. TARGETS by BMP

APPENDIX C. COST AND BENEFIT ASSUMPTIONS

APPENDIX A. PAST PERFORMANCE

This appendix will contain an accounting of each BMP the City has implemented and the amount of savings.

A rollup of historical savings is presented in Section 3 of the document. The following tables were prepared under the 1999 MOU which

NOTE – RECONCILE WITH OTHER FILES BEFORE SENDING

Table A.1. Historical savings from residential Metering.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	0	0	0	0
2007	1,509	1,509	134	134
2008	1,109	2,618	232	366

¹ Based on 0.44 AF/connection and 20% annual reduction in use with 20 year life.

Table A.2. Historical savings from non-residential Metering.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	95	95	17	17
2003	39	134	24	40
2004	73	207	37	77
2005	10	217	38	115
2006	11	228	40	155
2007	155	383	68	223
2008	81	464	82	305

¹ Based on 3.5 AF/connection and 5% annual reduction in use with 20 year life.

Table A.3. Historical savings from residential audits – interior and exterior.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	10	10	1	1
2002	217	227	16	17
2003	209	436	28	45
2004	1,022	1,458	96	142
2005	961	2,419	143	285
2006	497	2,916	152	437
2007	236	3,152	146	583
2008	249	3,401	141	724

¹ Based on 20 gpd indoor savings per audit and 0.0495 AF/yr outdoor savings with 15% decay.

Table A.4. Historical savings from plumbing kits.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	606	606	1	1
2003	3,400	4,006	4	5
2004	3,170	7,176	7	12
2005	1,086	8,262	7	20
2006	2,000	10,262	9	28
2007	2,710	12,972	10	39
2008	565	13,537	9	48

¹ Based on 20 gpd indoor savings per kit, 5% install probability and 15% decay per year.

Table A.5. Historical savings from high-efficiency washer rebates.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	238	238	3	3
2007	0	238	3	7
2008	0	238	3	10

¹ Based on 5,280 gallons/yr/dwasher, 12 year life.

Table A.5. Historical savings from toilet rebates.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	573	573	17	17
2006	964	1,537	44	62
2007	940	2,477	68	130
2008	633	3,110	80	210

1 Based on 29.75 gallons/day/toilet, 25 year life, 10% free-riders.

Table A.6. Historical savings from CII audits and toilet rebates.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative ²
	count		acre-feet	
2001	0	0	0	0
2002	0	0	0	0
2003	170	170	33	33
2004	96	266	46	79
2005	936	1,202	118	197
2006	99	1,301	119	316
2007	56	1,357	113	429
2008	814	2,171	143	572

1 Based on 0.04 AF/yr for toilet rebates and 10% reduction in CII use from audit with 15% decay/yr.

2 Only 50% (286 AF) of 2008 savings can be applied under new MOU for past credit.

Table A.7. Historical savings from mixed use meters, landscape audits.

Year	Targets		Savings ¹	
	Incremental	Cumulative	Incremental	Cumulative
	count		acre-feet	
2001	0	0	0	0
2002	0	0	0	0
2003	18	18	3	3
2004	72	90	12	15
2005	37	127	16	31
2006	16	143	16	47
2007	5	148	14	61
2008	7	155	13	74

1 Based on 0.14 AF reduction per account with 15% decay per year.

APPENDIX B. TARGETS BY BEST MANAGEMENT PRACTICE

Tables in this section present the Council based targets for metering and all programmatic BMPs. Timeline for each target is based on MOU criteria with most having a ten year horizon. Also included with each table are the savings per year and cumulative savings over time.

List of Tables

Table B.1. Targets for Meter (residential) Retrofits BMP.	6
Table B.2. Targets for Meter (non-residential) Retrofits BMP.	7
Table B.3. Targets for Residential Assistance Program based on CUWCC criteria.	8
Table B.4. Targets for Residential Assistance Program based on Water Forum Agreement criteria.	9
Table B.5. Targets for the Residential Landscape Water Surveys.	10
Table B.6. Targets for high-efficiency clothes washers.	11
Table B.7. Targets for WaterSense specification toilets.	12
Table B.8. Targets for commercial, industrial and institutional water conservation.	12
Table B.9. Targets for ETo based water budgets for dedicated landscape meters.	14
Table B.10. Targets for CII customers with mixed use meter.	15

Worksheet to determine unmet targets from 1999 to 2008.										Note	
Housing Stock (CUWCC based)	Targets					Savings for					
Single-family	For applicable BMPs there is a worksheet that accounts for past activity and savings. Several BMPs require that unmet targets be met in ongoing efforts. This section quantifies the unmet targets and previous savings. More detail on savings is provided in Section 3.										
Multi-family (units)	10,534	15%	1,580	320	1,260	126	48				
TARGETS worksheet based on 2008 MOU											
HOUSING STOCK	Calendar Year and (Year of Implementation)										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018 (10)	
Single-family	This section quantifies the connections that will be used to determine the targets.										142,510
Multi-family (units)	53,928	54,782	55,636	56,413	57,189	57,965	58,741	59,517	60,217	60,918	
TARGETS	CUWCC Coverage Requirement ³ and Annual and Cumulative Targets ¹										
	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	
Single-family	This section applies the MOU coverage requirement to the number of connections to determine the annual targets.										1,069
Multi-family											457
Annual Total											2,819
Cumulative Total	2,594	5,216	7,863	10,534	13,229	15,948	18,691	21,460	24,254	27,073	
Annual	This is to report on target implementation progress. Section 8 of the document discusses reporting.										
Cumulative											3,401
SAVINGS	Annual and Cumulative Savings (Acre-feet) ^{4, 5}										
	This is to report on savings for implemented targets. It includes historical information as well as annual savings. Section 3 of the document discusses historical savings, and Section 9 discusses reporting.										
Annual											
Cumulative	200	200	200	200	200	200	200	200	200	288	

Figure B.1. MOU coverage requirement target worksheet.

Table B.1. Targets for Meter (residential) Retrofits BMP.

Residential Accounts	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Connections¹									
Total Connections	125,728	128,684	131,640	134,212	136,784	139,356	141,928	144,500	147,260	150,020
Unmetered Connections	99,475	93,258	87,041	80,823	74,606	68,389	62,172	55,955	49,738	43,520
TARGETS	Coverage Requirement (continues through 2024)²									
Annual	6,217	6,217	6,217	6,217	6,217	6,217	6,217	6,217	6,217	6,217
Cumulative Targets	6,217	12,434	18,652	24,869	31,086	37,303	43,520	49,738	55,955	62,172
Metered Accounts ³	26,253	35,426	44,600	53,389	62,178	70,967	79,756	88,545	97,523	106,500

1. Mixed use residential-commercial are not included in these estimates.
2. A straight line approach was used to retrofit all unmetered residential connections by 2024 .
3. Includes new construction. All metered accounts will be charged based on commodity rates.

Table B.2. Targets for Meter (non-residential) Retrofits BMP.

Non-Residential Accounts	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Connections ¹									
Total Connections	12,517	12,861	13,205	13,563	13,922	14,281	14,639	14,998	15,372	15,746
Unmetered Connections	2,931	2,748	2,565	2,381	2,198	2,015	1,832	1,649	1,466	1,282
TARGETS	Coverage Requirement ²									
Annual	183	183	183	183	183	183	183	183	183	183
Cumulative Targets	183	366	550	733	916	1,099	1,282	1,466	1,649	1,832
Metered Accounts ³	9,586	10,113	10,640	11,182	11,724	12,265	12,807	13,349	13,906	14,463

1. Mixed use residential-commercial are not included in these estimates.
2. A straight line approach was used to retrofit all unmetered residential connections by 2024.
3. Includes new construction. All metered accounts will be charged based on commodity rates.

Table B.3. Targets for Residential Assistance Program based on CUWCC criteria.

Worksheet to determine unmet targets from 1999 to 2008.								Note		
Housing Stock in 1999 (CUWCC base year)	Connections	Coverage Rate	Targets				Savings for Completed Targets(AF)			
			Cumulative	Completed	Remaining	Annual makeup1				
Single-family	98,357	15%	14,754	3,081	11,673	1,167	240			
Multi-family (units)	10,534	15%	1,580	320	1,260	126	48			
TARGETS worksheet based on 2008 MOU										
HOUSING STOCK	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Connections2									
Single-family	119,554	122,368	124,810	127,253	129,695	132,138	134,581	137,224	139,867	142,5
Multi-family (units)	53,928	54,782	55,636	56,413	57,189	57,965	58,741	59,517	60,217	60,91
TARGETS	CUWCC Coverage Requirement3 and Annual and Cumulative Targets1									
	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Single-family	897	918	936	954	973	991	1,009	1,029	1,049	1,069
Multi-family	404	411	417	423	429	435	441	446	452	457
Annual Total1	2,594	2,622	2,647	2,671	2,695	2,719	2,743	2,769	2,794	2,819
Cumulative Total	2,594	5,216	7,863	10,534	13,229	15,948	18,691	21,460	24,254	27,07

1. Represent unmet targets between 1999-2008 and are added in a straight line to current targets.
2. Mixed use residential-commercial are not included in these estimates.
3. 2009 coverage requirement is based on the 2008 CUWCC MOU.
4. Cumulative targets completed in 2009 and cumulative savings in 2009 includes cumulative amounts from 1999-2008.
5. Annual savings are calculated assuming that each survey results in a savings of 25 gpcd with a 15% decay (Council, 2005).

Table B.4. Targets for Residential Assistance Program based on Water Forum Agreement criteria.

Housing Stock	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Metered Connections ¹									
Single-family	24,960	33,510	42,060	50,239	58,418	66,597	74,775	82,954	91,334	99,713
Multi-family	1,293	1,916	2,540	3,150	3,760	4,371	4,981	5,591	6,189	6,786
	Water Forum Coverage Requirement ² and Annual and Cumulative Targets									
TARGETS	12% of the top 20% of water users are targeted annually - only applies to metered connections									
Single-family	599	804	1,009	1,206	1,402	1,598	1,795	1,991	2,192	2,393
Multi-family (units)	31	46	61	76	90	105	120	134	149	163
Annual Total	630	850	1,070	1,281	1,492	1,703	1,914	2,125	2,341	2,556
Cumulative Total	630	1,480	2,551	3,832	5,324	7,028	8,942	11,067	13,407	15,963

1 Estimated metered connections are based on the City's CIS and planned metering program.

2 See the water conservation element of the 2009 Water Forum Agreement for further details.

3 Annual savings are calculated assuming that each survey results in a savings of 25 gpcd with 15% decay (Council 2005).

Table B.5. Targets for the Residential Landscape Water Surveys.

Worksheet to determine unmet targets from 1999 to 2008.								Note		
Housing Stock in 1999 (CUWCC base year)	Connections	Coverage Rate	Targets				Savings for Completed Targets(AF)			
			Cumulative	Completed	Remaining	Annual makeup ¹				
Single-family	98,357	15%	14,754	3,081	11,673	1,167	671			
TARGETS worksheet based on 2008 MOU										
Single-family	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Connections²									
	119,554	122,368	124,810	127,253	129,695	132,138	134,581	137,224	139,867	142,510
TARGETS	CUWCC Coverage Requirement³ and Annual and Cumulative Targets¹									
	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Single-family	897	918	936	954	973	991	1,009	1,029	1,049	1,069
Annual Total ¹	2,064	2,085	2,103	2,122	2,140	2,158	2,177	2,196	2,216	2,236
Cumulative Total	2,064	4,149	6,252	8,374	10,514	12,672	14,849	17,045	19,262	21,498

1. Represent unmet targets between 1999-2008 and are added in a straight line to current targets.
2. Connections are based on the City's CIS and includes single and multi-family accounts. Mixed use residential-commercial are not included in these estimates.
3. 2009 coverage requirement is based on the 2008 CUWCC MOU.

Table B.6. Targets for high-efficiency clothes washers.

Housing Stock	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Connections ¹									
Single-family	119,554	122,368	124,810	127,253	129,695	132,138	134,581	137,224	139,867	142,510

CUWCC Implementation Rate² and City Targets

TARGETS	0.95%	0.95%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Single-family	1,136	1,162	1,248	1,273	1,297	1,321	1,346	1,372	1,399	1,425
Cummulative Total	1,136	2,298	3,546	4,819	6,116	7,437	8,783	10,155	11,554	12,979

1. Connections are based on the City's CIS and includes single and multi-family accounts. Mixed use residential-commercial are not included in these estimates.

2. 2009 coverage requirement is based on the 2008 CUWCC MOU.

Table B.7. Targets for WaterSense specification toilets.

Worksheet to determine unmet targets from 1999 to 2008.										
1992 housing stock	96,055	55,625	Note							
Natural replacement (% of remaining stock)	4.0%	4.0%	From 1999-2008, 3,110 toilets were installed							
Housing demolition (% of remaining stock)	0.5%	0.5%								
Units with 3.5+ gpf Toilets in 2008	50,154	29,044								
Average resale rate	4.9%	10.4%								
Percent of 1992 housing stock with pre 1980 toilets	50%	50%								
TARGETS worksheet based on 2008 MOU										
Housing Stock	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Eligible Units ¹									
Single-family	50,154	46,499	42,843	39,187	35,532	31,876	28,221	24,565	20,909	17,254
Multi-family (units)	29,044	27,076	25,107	23,139	21,170	19,202	17,234	15,265	13,297	11,328
Targets	Council Coverage Requirement									
Single-family	3,656	3,656	3,656	3,656	3,656	3,656	3,656	3,656	3,656	3,656
Multi-family (units)	1,968	1,968	1,968	1,968	1,968	1,968	1,968	1,968	1,968	1,968
Annual Total	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624	5,624
Cumulative Total	5,624	11,248	16,872	22,496	28,120	33,744	39,368	44,992	50,616	56,240

1. Estimated connections are based on the Council's coverage calculator.
2. Annual savings are calculated assuming that each results in a savings of 27.4 gpd/single-family and 44 gpd/multi-family rebate.

Table B.8. Targets for commercial, industrial and institutional (CII) water conservation.

Worksheet to determine pre 2008 CII credit, up to 50% of past performance given as credit.												
CII Category	2008 Water Use		Target (10% of 2008 Use)		Credit for pre 2008 ¹		Adjusted Target		Note			
Comm + Indus:	16,879	AF	1,688	AF	222	AF	1,466					
Institutional:	4,849	AF	485	AF	64	AF	421					
Total	21,728	AF	2,173	AF	286	AF	1,887					
TARGETS	Calendar Year and (Year of Implementation)											
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)	2019 (11)	2020 (12)
	Coverage Requirements and City Targets²											
	0.5%		2.4%		4.3%		6.4%		9.0%		10.0%	
	acre-feet (based on coverage requirement and adjusted target)											
Commercial + Industrial	73		352		630		938		1,319		1,466	
Institutional	21		101		181		270		379		421	
Cumulative	94		453		811		1,208		1,698		1,887	

1. Discussion on pre 2008 efforts are documented in section 3 of the document.
 2. CUWCC considers a purveyor on track if they achieve the percent savings per reporting period.

Table B.9. Targets for ETo based water budgets for dedicated landscape meters.

Worksheet to determine unmet targets from 1999 to 2008.								Note		
Dedicated Landscape Meters	Connections	Coverage Rate	Targets				Savings for Completed Targets(AF)			
			Cumulative	Completed	Remaining	Annual makeup ¹				
	1,329	90%	1,196	0	1,196	120	0			
TARGETS worksheet based on 2008 MOU										
	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Metered Connections									
	1,329	1,347	1,362	1,377	1,393	1,408	1,424	1,437	1,449	1,438
TARGETS	Council Coverage Requirement ³ and Annual and Cumulative Targets ¹									
	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Dedicated Meters	0	2	1	1	1	1	1	1	1	-1
Annual Total ¹	120	121	121	121	121	121	121	121	121	119
Cumulative Total	120	241	362	483	604	725	846	967	1,088	1,207

1. Represent unmet targets between 1999-2008 and are added in a straight line to current targets.
2. 2009 coverage requirement is based on the 2008 CUWCC MOU.
3. Cumulative targets completed in 2009 and cumulative savings in 2009 includes cumulative amounts from historical savings.
4. Annual savings are calculated assuming that each budget results in 0.82 AF of savings per year.

Table B.10. Targets for CII customers with mixed use meter.

Worksheet to determine unmet targets from 1999 to 2008.								Note		
Mixed Use CII Accounts	Connections	Coverage Rate	Targets				Savings for Completed Targets(AF)			
			Cumulative	Completed	Remaining	Annual makeup ¹				
	11,532	15%	1,730	155	1,575	157	13			
TARGETS worksheet based on 2008 MOU										
Mixed Use CII Accounts	Calendar Year and (Year of Implementation)									
	2009 (1)	2010 (2)	2011 (3)	2012 (4)	2013 (5)	2014 (6)	2015 (7)	2016 (8)	2017 (9)	2018 (10)
	Estimated Connections									
	11,532	11,858	12,201	12,544	12,888	13,231	13,574	13,935	14,296	14,657
TARGETS	CUWCC Coverage Requirement ² and Annual and Cumulative Targets ¹									
	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Mixed Use	86	89	92	94	97	99	102	105	107	110
Annual Total ¹	244	246	249	252	254	257	259	262	265	267
Cummulative Total	244	490	739	991	1,245	1,502	1,761	2,023	2,288	2,555

1. Represent unmet targets between 1999-2008 and are added in a straight line to current targets.
 2. 2009 coverage requirement is based on the 2008 CUWCC MOU.

APPENDIX C: COST AND BENEFIT ASSUMPTIONS

List of Tables

Table C.1. Labor costs for implementing and managing the BMPs. 16
 Table C.2. Costs for implementing Residential Assistance Program BMP. 17
 Table C.3. Costs for implementing Residential Landscape Surveys BMP. 17
 Table C.4. Costs for implementing WaterSense washers BMP. 18
 Table C.5. Costs for implementing WaterSense Toilets BMP. 18
 Table C.6. Costs for implementing the Commercial, Industrial and Institutional BMP. 19
 Table C.7. Costs for implementing Dedicated Landscape Meter BMP. 20
 Table C.8. Benefits of implementing Meter Retrofit and Conservation Pricing BMPs. 20
 Table C.10. Benefits of implementing the Residential Assistance Program BMP. 21
 Table C.11. Benefits of implementing the Residential Landscape Survey BMP. 21
 Table C.1B. Benefits of implementing the WaterSense Clothes Washer BMP. .21
 Table C.12. Benefits of implementing the WaterSense Toilet BMP. 21
 Table C.13. Savings estimates per conservation component and component life for the Commercial, industrial, and institutional (CII) BMP (CUWCC, 2008). 22
 Table C.14. Benefits of implementing the Mixed Use Landscape Survey BMP. 22
 Table C.15. Benefits of implementing the Dedicated Landscape Meter BMP. 22

Table C.1. Labor costs for implementing and managing the BMPs.

Cost Component		Note or Source
Administration Costs		
Staff hourly rate, with overhead	\$53.50 /hr	
Field Labor Costs		
Field labor hourly rate, with overhead	\$43.30 /hr	
Seasonal labor rate with overhead	/hr	
Staff Management of Landscape Budget Program		
Staff hourly rate, with overhead	\$53.50 /hr	

Table C.2. Costs for implementing Residential Assistance Program BMP.

Cost Component		Note or Source
Administration Costs		
Staff hours to administer the retrofit program	80 hrs/yr	
Materials Costs (aerators, showerheads etc)		
Unit cost of materials- single family	\$12 /unit	
Unit cost of materials- multi-family	\$12 /unit	
Publicity Costs		
Marketing collateral cost	\$4,583 /yr	Publicity costs is lump sum and apportioned for each BMP. Publicity costs is lump sum and apportioned for each BMP.
Advertising cost	\$4,583 /yr	
Evaluation and Followup Costs		
Labor & Consultant costs	\$0 /yr	currently none
Program Cost Sharing		
Cost Share from Others	\$0 /yr	currently none

Table C.3. Costs for implementing Residential Landscape Surveys BMP.

Cost Component		Note or Source
Administration Costs		
Staff hours to administer the retrofit program	80 hrs/yr	
Materials Costs (aerators, showerheads etc)		
Unit cost of materials- single family	\$12 /unit	
Unit cost of materials- multi-family	\$12 /unit	
Publicity Costs		
Marketing collateral cost	\$4,583 /yr	Publicity costs is lump sum and apportioned for each BMP. Publicity costs is lump sum and apportioned for each BMP.
Advertising cost	\$4,583 /yr	
Evaluation and Followup Costs		
Labor & Consultant costs	\$0 /yr	currently none
Program Cost Sharing		
Cost Share from Others	\$0 /yr	currently none

Table C.4. Costs for implementing WaterSense washers BMP.

Cost Component			Note and Source
Administration Costs			
Staff hours to administer the retrofit program	80	hrs/yr	if labor is covered by coordinator , enter 0
Washing Machine Rebate Costs			
Rebate (or utility incentive cost)	\$50	/rebate	
Rebate Processing Costs			
Average rebate processing cost	\$20	/rebate	
Publicity Costs			
Marketing collateral cost	\$4,583	/yr	Publicity costs is lump sum and apportioned for each BMP. Publicity costs is lump sum and apportioned for each BMP.
Advertising cost	\$4,583	/yr	
Evaluation and Followup Costs			
Labor & Consultant costs	\$0	/yr	currently none
Program Cost Sharing			
Cost Share from Others	\$0	/yr	currently none

Table C.5. Costs for implementing WaterSense Toilets BMP.

Cost Component				Note and Source
Administration Costs				
Staff hours to administer the retrofit program	80	hrs/yr		
ULFT Rebate Costs				
ULFT Cost	Single-family	Multi-family		
	\$175	\$175	/rebate	
Rebate Processing Costs				
Average rebate processing cost	Single-family	Multi-family		
	\$20	\$20	/rebate	
Publicity Costs				

Marketing collateral cost	\$4,583	/yr	Publicity costs is lump sum and apportioned for each BMP.
Advertising cost	\$4,583	/yr	Publicity costs is lump sum and apportioned for each BMP.
Evaluation and Followup Costs			
Labor & Consultant costs	\$0	/yr	currently none
Program Cost Sharing			
Cost Share from Others	\$100,730	/yr	DWR Prop 50, SRCSD

Table C.6. Costs for implementing the Commercial, Industrial and Institutional BMP.

Cost Component			Note and Source
Administration Costs			
Staff hours to administer the retrofit program	240	hrs/yr	
Rebate Costs			
Toilets	\$175	/unit	RWA rebate amount
Urinals	\$175	/unit	RWA rebate amount
Washers	\$175	/unit	RWA rebate amount
Outside Services Costs			
Consulting services costs	\$0	/yr	
Publicity Costs			
Marketing collateral cost	\$4,583	/yr	Publicity costs is lump sum and apportioned for each BMP.
Advertising cost	\$4,583	/yr	Publicity costs is lump sum and apportioned for each BMP.
Evaluation and Followup Costs			
Labor & Consultant costs	\$0	/yr	currently none
Program Cost Sharing			
Cost Share from Others	\$102,518	/yr	DWR Prop 50, SRCSD

Table C.7. Costs for implementing Dedicated Landscape Meter BMP.

Cost Component		Note and Source
Budget Development Costs		
Landscape Measurement	\$106/ site for measuring	CUWCC default
Establish Customer Notice/Billing System		
Link budgets to billing or customer notice system	\$2,000	one-time setup cost
Staff Management of Budget Development		
Staff hours to manage budget development tasks	160 hrs/yr	
Staff Management of Budget Program (post development)		
Staff hours to manage budget program	24 hrs/yr	
Customer Followup Costs		
Percent of sites receiving follow up assistance	10 %/yr	
Per site follow up cost	200 /site	
Evaluation and Follow up Costs		
Labor & Consultant costs	\$0 /yr	
Program Cost Sharing		
Cost Share from Others	\$0 /yr	
Cost Share for Program Operation	\$0 /yr	

Table C.8. Benefits of implementing Meter Retrofit and Conservation Pricing BMPs.

Meter Installation		Note and Source
Average annual water use by unmetered accounts in 2008	AF	
Average reduction in annual water use	20 %	CUWCC 2008 pg 27

Table C.10. Benefits of implementing the Residential Assistance Program BMP.

Indoor Savings Estimates	Single-family	Multi-family	Note and Source
Reduction in use	25 gpd	25 gpd	CUWCC 2005 pg 2-48
Savings Decay	15 %/yr	15 %/yr	CUWCC 2005 pg 2-48

Table C.11. Benefits of implementing the Residential Landscape Survey BMP.

Outdoor Savings Estimates		Note and Source
Average area surveyed	0.06 acres	Professional judgment
Average water use per acre	5.74 AF/acre/yr	2008 City data & professional estimate
Reduction in use	50 %	CUWCC default
Savings decay	25 %/yr	CUWCC 2005 pg 2-48

Table C.1B. Benefits of implementing the WaterSense Clothes Washer BMP.

WaterSense washers savings estimates		Note and Source
Savings per machine	5,085 gallons/year	CUWCC 2005 pg 2-13
Useful Life	12 yrs	CUWCC default
Percent free-riders	5 %/yr	Professional judgment

Table C.12. Benefits of implementing the WaterSense Toilet BMP.

Toilet Savings Estimates	Single-family	Multi-family	Note and Source
Daily savings per toilet	27.4 gpd	44 gpd	Increased CUWCC default by 20% for HET.
Natural replacement rate	4 %/yr	4 %/yr	Sacramento Co Census data
Free-riders	5 %	5 %	Professional judgment

Table C.13. Savings estimates per conservation component and component life for the Commercial, industrial, and institutional (CII) BMP (CUWCC, 2008).

Conservation Component	Annual Savings	Life
	acre-feet	years
High-efficiency toilets	0.042	25
High-efficiency urinals	0.069	25
Ultra low volume urinals	0.081	25
Zero consumption urinals	0.092	25
Commercial high-efficiency washers	0.117	10
Cooling tower conductivity controllers	1.032	5
Cooling tower pH controllers	C.982	5
Connectionless food steamers per compartment	0.250	10
Medical equipment steam sterilizers	1.538	20
Water-efficient ice machines	0.835	10
Pressurized water broom	0.153	5
Dry vacuum pumps	0.640	7

Table C.14. Benefits of implementing the Mixed Use Landscape Survey BMP.

Mixed use outdoor savings estimate		Note and Source
Average area surveyed	.05 acres	2008 City estimate
Average water use per area	4.2 AF/acre/yr	2008 City estimate
Reduction in use	15 %	CUWCCC default
Savings decay	5 %/yr	CUWCCC default

Table C.15. Benefits of implementing the Dedicated Landscape Meter BMP.

Dedicated Landscape Meters		Note and Source
Average use by sites with dedicated irrigation meters	6.38 AF	2008 City estimate
Reduction in annual use	20 %/yr	CUWCC default