



WATER DEPARTMENT MEMORANDUM

DATE: January 28, 2014

TO: Water Commission

FROM: Toby Goddard, Administrative Services manager

SUBJECT: Water Conservation Master Plan

RECOMMENDATION: That the Water Commission: 1) receive an update on the Water Conservation Master Plan, 2) provide input on additional information needed to help select a preferred water conservation program at a future meeting, and 3) provide input on the process for completing the plan.

BACKGROUND: At its October 7, 2013 meeting, the Water Commission received a progress report addressing the estimated water savings attributable to modern plumbing fixture and appliance codes and standards.

Modeling results produced by the project consultant, Maddaus Water Management, Inc., showed cumulative water savings from codes and standards of 242 million gallons per year in 2030. The water savings from codes and standards is expected to reduce total water demand from slightly above 4.0 billion gallons per year (bggy) to about 3.8 bggy in 2030, a reduction of about six percent.

The next two tasks in the work plan involve: 1) evaluating the water savings, benefits, and costs of individual water conservation measures, and 2) compiling measures into different program scenarios and evaluating the water savings, benefits, and costs of each program package. The results of this work are now complete and open for public review.

DISCUSSION: A total of 39 individual measures were evaluated using the consultant's end use model (Least Cost Planning Decision Support System Model or DSS Model). The measure description and detailed assumptions used in the DSS Model are provided in Appendix 1. Some of the key assumptions used in evaluating the water savings, benefits, and costs include the following:

- Applicable customer class
- Applicable end use
- Annual accounts (participation)
- Evaluation start and end year
- Program length, years

- Measure life, years
- Utility unit cost, \$
- Customer unit cost, \$
- Annual administration and marketing overhead

Three of the measures evaluated, Residential Washer Rebates, Residential SF Landscape Conversion/Turf removal and Residential MF/Commercial Landscape Conversion/Turf Removal are essentially identical but differ by the amount of utility and customer unit cost, program limitations, and participation level assumed. These are designated as with letters A/B with A corresponding to current incentive level and limitations, and B designating a more intensive program offering.

A summary of modeling results is provided in Table 1 and Figures 1-3. Although the model can show results for any year out to 2035, the following results focus on water savings in year 2030, corresponding to the planning horizon of the study and the time frame for current water demand projections.

Water Savings

Figure 1 shows the estimated annual water savings for each water conservation measure, expressed in millions of gallons per year (mgy) at 2030, ranked from highest to lowest. The water savings estimates are built up from small incremental water conserving activities over time to the cumulative savings shown in 2030. The program with the single largest water savings is the more intensive residential clothes washer rebate, at 48 mgy (Appendix A, Measure 14). The program with the smallest water savings is large rainwater catchment system incentive, at significantly less than 1 mgy (Appendix A, Measure 39). There are twelve measures with water savings of 10 mgy, or more, and 6 measures with water savings of 1 mgy or less. The remaining 21 measures would save between 1 and 10 mgy at 2030.

Cost of Water Saved

Figure 2 shows the cost of water saved for each program, expressed in \$/million gallons (\$/mg), ranked from lowest to highest. Dollars are the present value of utility costs from start year in 2013 through 2030. Water saved is millions of gallons at year 2030. The measure with the lowest cost of water saved is water budget-based billing for irrigation accounts at \$178/mg (Appendix A, Measure 3). The measure with the highest cost of water saved is the Residential MF/Commercial landscape conversion/turf removal B at \$49,069/mg (Appendix A, Measure 30).

There are six measures with an estimated cost of water saved that is close to or below the City's current variable operating cost of water supply of about \$500/mg. Nine of the 39 measures have an estimated cost of water saved in excess of \$10,000/mg.

Benefit-Cost Ratio

The DSS model uses Benefit/Cost ratio as an indicator of overall cost-effectiveness. Benefits are the estimated present value dollar savings to the utility from reduced water use. A measure with a B/C ratio of greater than 1.0 is considered cost-effective in that the dollar savings of a measure exceed the amount it costs the utility to implement it.

The analysis presented herein uses a placeholder value of \$2,500 per million gallons saved that represents the assumed avoided cost of some unknown future water supply. It is not tied to any particular project; rather, it simply reflects the likelihood that any future water project the City may choose to pursue will cost substantially more on a unit basis than it does for existing supply. It is also a figure that can easily be changed in the DSS Model to perform sensitivity testing. The current placeholder value is selected at 5.0 times the current cost of water produced at \$500 per mg.

Figure 3 shows the Benefit/Cost ratio for each measure, ranked from highest to lowest. The measure with the highest B/C ratio is the High Efficiency Faucet Aerator/Showerhead Giveaway program (Appendix A, Measure 9). The measure with the lowest B/C ratio is Residential MF/Commercial landscape conversion/turf removal B (Appendix A, Measure 30). Ten of the 39 measures analyzed have a B/C ratio equal to or greater than one; the rest have a B/C ratio less than one.

Water Conservation Program Scenarios

In this step of the project, the project team compiled the measures into four program scenarios, designated as Program A, B, C, and D, each representing a different suite of measures. Table 1 shows a checklist of the component measures for each program. The basis for assembling the conservation measures into the four trial programs is as follows:

Program	Description
A	This program represents the group of measures that the City is currently operating.
B	This program consists of the measures that are the most cost-effective, as well as some that are included for their customer-service value.
C	This program is a combination of measures currently being operated, cost-effective measures, and selected measures for added synergy and savings.
D	This is the essentially the entire list of measures analyzed, not including the less intensive versions of the measures s designated A/B

Tables 2, 3, and 4, and Figure 2 show the results of the water conservation program analysis, including the results of the earlier work addressing water savings from codes and standards.

Total water savings for the different programs range from 381 mgy in 2030 for program A to 572 mgy for Program D. The incremental savings (moving from one program to the next) associated with each program are as follows:

- Program A: 139 mgy (equal to 0.4 mgd)
- Program B: 106 mgy (equal to 0.3 mgd)
- Program C: 46 mgy (equal to 0.1 mgd)
- Program D: 40 mgy (equal to 0.1 mgd)

The present value of program costs range from \$5.8 million for Program A to \$21.4 million for Program D.

The water utility Benefit/Cost ratio at the program level ranges from 1.02 for Program B, to 0.55 for Program D.

Figure 4 shows a cost-effectiveness curve comparing cumulative water savings in 2030 for each program against the present value of program costs. This curve shows the classic diminishing economic returns, where the cost for additional water savings greatly increases as the gain in terms of added water savings levels out. Another way of showing this result is presented in Table 4, which lists the incremental cost and savings of each program, and the marginal cost of water saved per mgy at each program level.

Water Demands with Conservation Savings Projections

Table 5 and Figure 5 show numerically and graphically the City's projected water demands without the plumbing code, with the plumbing code, and with the water savings associated with the four different programs. As mentioned earlier, codes and standards alone account for about 242 mgy of water savings, reducing total water demand from slightly above 4.0 bgy to about 3.8 bgy in 2030.

Program A (existing conservation measures) would further reduce system water demand to 3.7 bgy. Program B would reduce system water demand to a level of about 3.6 bgy. Programs C and D would both reduce projected system demand to near 3.5 bgy.

The total water savings as a percent of total production is listed in Table 7. Including 6 percent savings achieved through codes and standards alone, the percent reduction in overall water production in 2030 is seen to vary from about 9.5 percent for Program A, 12.3 percent for Program B, 13.5 percent for Program C and 14.4 percent for Program D.

Per Capita Water Use with Conservation Savings Projections

Table 6 and Figure 6 show per capita water use in gallons per capita per day (gpcd) without the plumbing code, with the plumbing code, and with the water savings associated with the four different programs.

The DSS Model projects per capita water use in 2030 will decline slightly over time, ranging between 98 gpcd under Program A to 93 gpcd under Program D.

Discussion

The information presented above provides new insights into the potential for water conservation programs to help manage customer demand for water over the next 15 years. Previous estimates also ranged from 200 to 300 million gallons per year, but did not explicitly identify the substantial water savings attributable to modern codes and standards. The picture that emerges is one where water demand, with additional conservation, will essentially hover in the 3.5 to 3.7 bgy for the foreseeable future, depending on the choices made about the desired level of investment and actual outcomes, which may vary from the estimates in the model.

On the other hand, from a water supply planning perspective, while conservation can be seen as tempering growth in water demand more than previously expected over the next decade and beyond, it does not fully address the ongoing imbalance between available supply, estimated in

the City's 2010 Urban Water Management Plan to range between 2.6 and 2.8 bgy and ordinary demand for water in critically dry or multiple dry years.

Maddaus Water Management will be present at the February 3, 2014 meeting to review the above findings and to address any questions the Water Commission may have.

Staff is not asking that the Water Commission select a preferred program at its February 3 meeting. What staff is requesting is that the Water Commission review the attached information and identify any other types of information it might need to help select a preferred program to recommend to the City Council at a future meeting. Such information could include:

- Budget requirements
- Staffing requirements
- Cost of program to average customer (monthly, annually)
- Effect on ability to curtail water use (connection to curtailment plan)

Also, the Commission may wish to look at amending the program design such as changing the composition by moving some of the measures around between program scenarios.

Process Going Forward

The scope of work calls for a check in with City Council after this Water Commission meeting. However, because of the desire to expand community engagement over all matters affecting the City's water supply, it is staff's intent to hold a community meeting and get input about the findings before scheduling the meeting with City Council.

Afterwards, there are two factors that will dictate the schedule for completing work in the Water Conservation Master Plan. One is the Water Supply Advisory Committee. A key decision will be whether to stop work temporarily until the committee forms up and to allow it engage in the conservation planning process and provide its input on the plan, or to proceed with the preparation of a draft report while the committee is gearing up. That is a question for both the Water Commission and City Council to address.

The second factor influencing the project schedule is the critically dry conditions that the City faces right now. The ability of staff to make any headway on this project will depend on the weather. Without a major improvement in water supply conditions, drought mitigation actions will shortly overwhelm all available resources and redirect staff efforts within the Water Department to implement a drought shortage program for 2014.

The City has a responsibility under its contract with Maddaus Water Management, Inc. to inform them of scheduling issues and owes it the courtesy of being able to make arrangements with other clients in the event work on the City's project is delayed.

Table 1. Water Conservation Measures and Programs

Conservation Programs and Measures Santa Cruz, California							
Measure Name	Program A	Program B	Program C	Program D	Water Savings MGY 2030	Benefit/Cost Ratio	Cost of Water Saved \$/MG
NRW Measure Model		X	X	X	38	0.73	\$2,344
Install AMI		X	X	X	6	0.33	\$4,967
Water Budget Based Billing		X	X	X	7	9.52	\$178
Public Information Program including Various Outreach & Education Approaches	X	X	X	X	7	0.29	\$6,679
Customer Billing Report & Service				X	5	0.42	\$4,445
Real Customer Water Loss Reduction - Leak Repair and Plumbing Emergency Assistance		X	X	X	30	1.29	\$1,313
Single Family Water Surveys	X	X	X	X	3	0.14	\$12,615
Pressure Reduction				X	4	0.20	\$8,039
High Efficiency Faucet Aerator / Showerhead Giveaway	X	X	X	X	25	9.55	\$182
Residential High Efficiency Toilets (HET) Rebates	X	X			9	0.86	\$2,079
Residential Ultra High Efficiency Toilets (UHET) Rebates			X	X	22	0.38	\$4,294
Install High Efficiency Toilets, Showerheads, and Faucet Aerators in Residential Buildings					30	0.63	\$2,570
Residential Washer Rebate A	X	X			31	1.74	\$993
Residential Washer Rebate B			X	X	48	0.82	\$2,097
Require High Efficiency Clothes Washers in New Development		X	X	X	16	2.03	\$812
Provide a Rebate for Hot Water on Demand Pump Systems				X	2	0.07	\$24,031
Require Hot Water on Demand / Structured Plumbing in New Developments			X	X	7	0.66	\$2,407
Toilet Retrofit At Time of Sale	X	X	X	X	9	1.64	\$1,076
High Efficiency Washer Rebate			X	X	3	0.54	\$3,128
Customized Top Users Incentive Program	X	X	X	X	20	5.35	\$306
Promote Restaurant Spray Nozzles		X	X	X	11	7.13	\$245
CII Surveys and Top Water Users Program (Top customers from each customer category)	X	X	X	X	21	0.69	\$2,394
High Efficiency Urinal Program	X		X	X	2	0.28	\$5,968
Install sensor-activated faucets				X	21	0.31	\$5,203
School Building Retrofit		X	X	X	5	2.73	\$581
City Code Requirement for new Landscapes	X	X	X	X	8	4.24	\$382
Res SF Landscape Conversion or Turf Removal A	X		X		1	0.09	\$17,920
Res SF Landscape Conversion or Turf Removal B				X	2	0.05	\$35,839
Res MF CII Landscape Conversion or Turf Removal A	X		X		0.5	0.07	\$24,534
Res MF CII Landscape Conversion or Turf Removal B				X	1	0.03	\$49,069
Expand Outdoor Water Survey & Water Budgets			X	X	2	0.15	\$11,157
Financial Incentives for Irrigation and Landscape Upgrades				X	3	0.09	\$17,578
Weather Based Irrigation Controller Rebates				X	5	0.20	\$7,568
Rotating Sprinkler Nozzle Rebates			X	X	3	0.50	\$3,051
Residential Gray Water Retrofit				X	0.4	0.19	\$8,206
Shade Tree Program				X	5	0.29	\$5,619
Promote Rain Sensors				X	1	0.33	\$4,752
Provide Rain Barrel Incentive	X	X	X	X	5	0.58	\$2,857
Provide Rain Catchment System Incentive				X	0.006	0.04	\$42,988

Figure 1. Water Savings in 2030, (Million Gallons/Year)

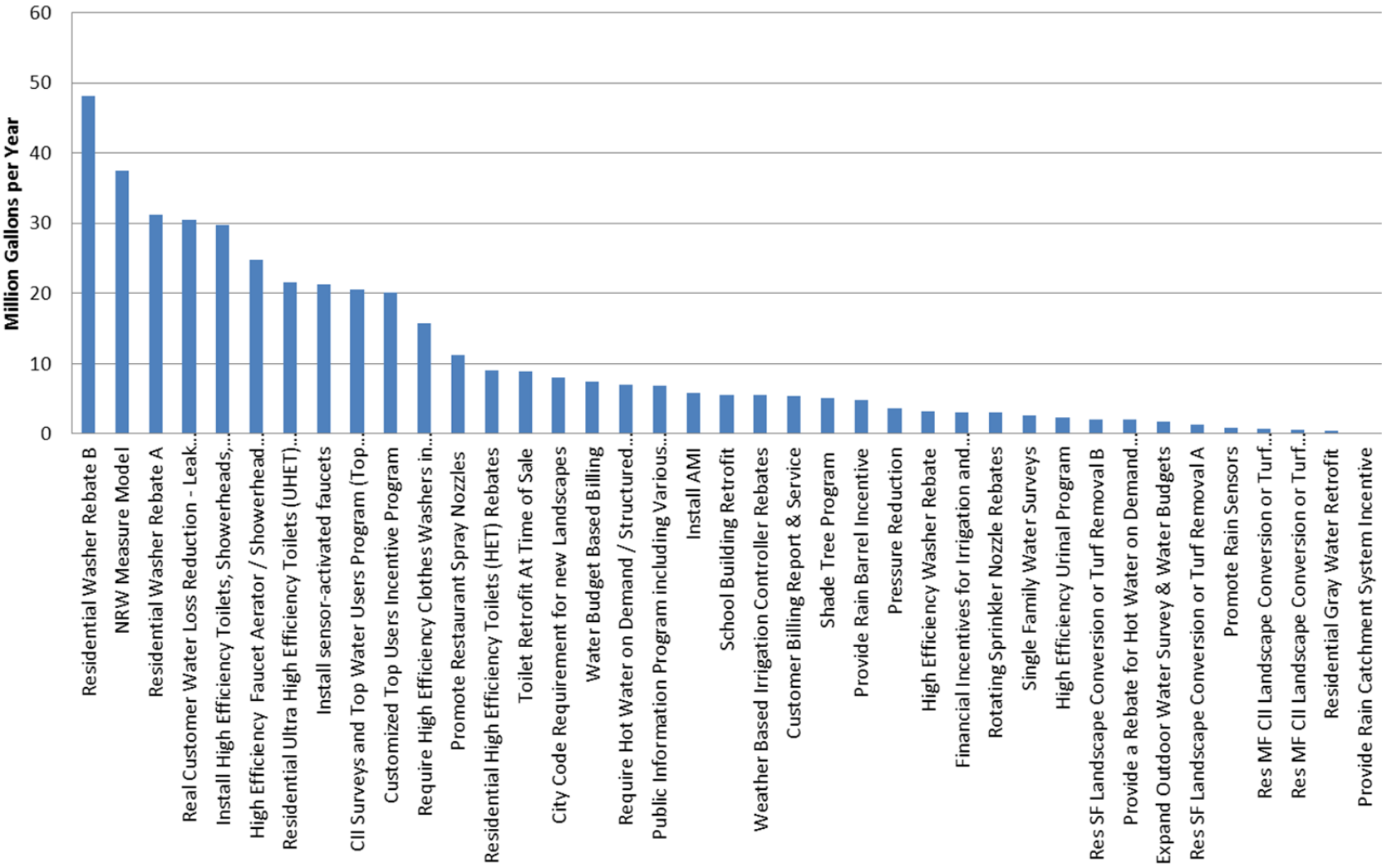


Figure 2. Cost of Water Saved, \$/Million Gallons

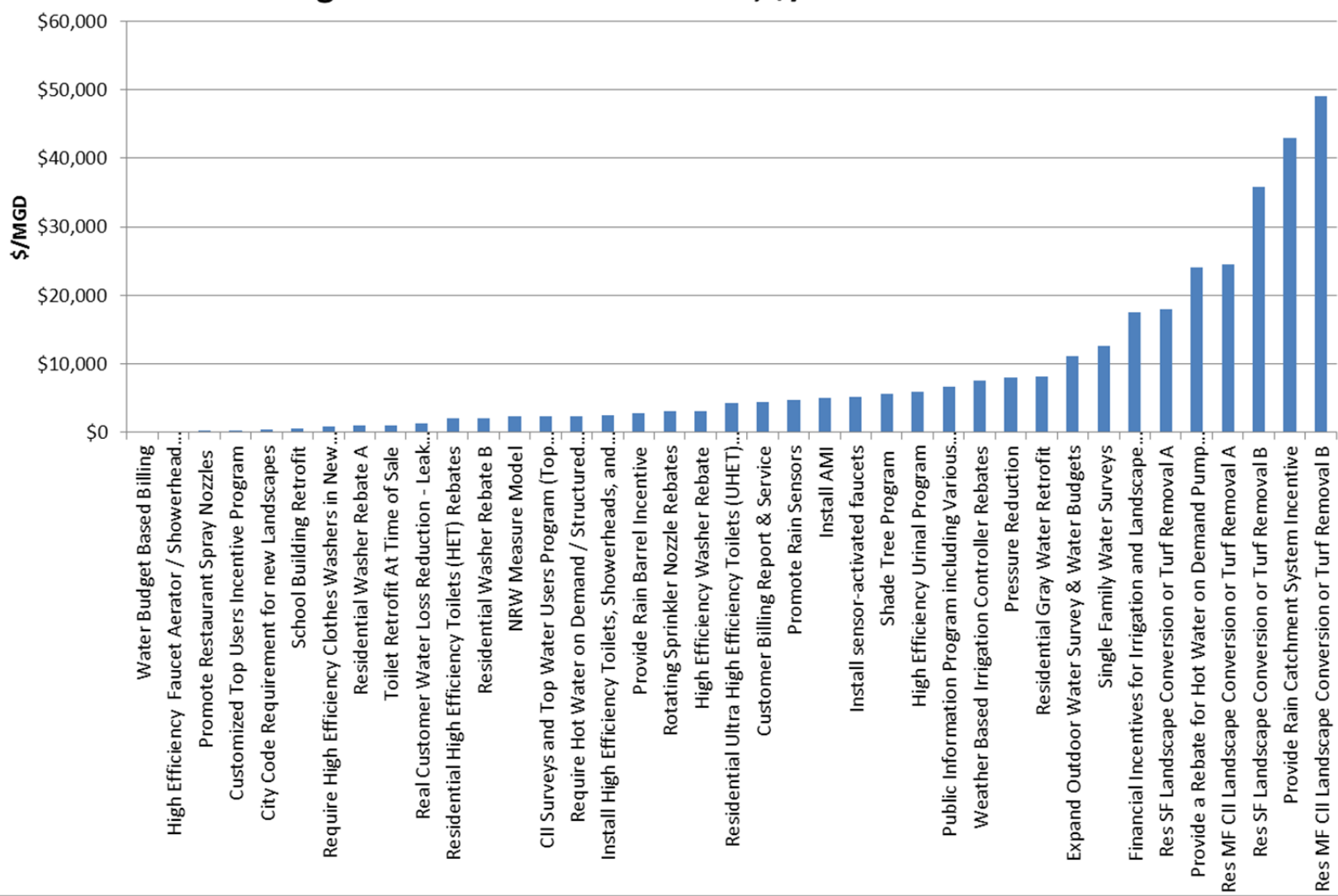


Figure 3. Benefit/Cost Ratio

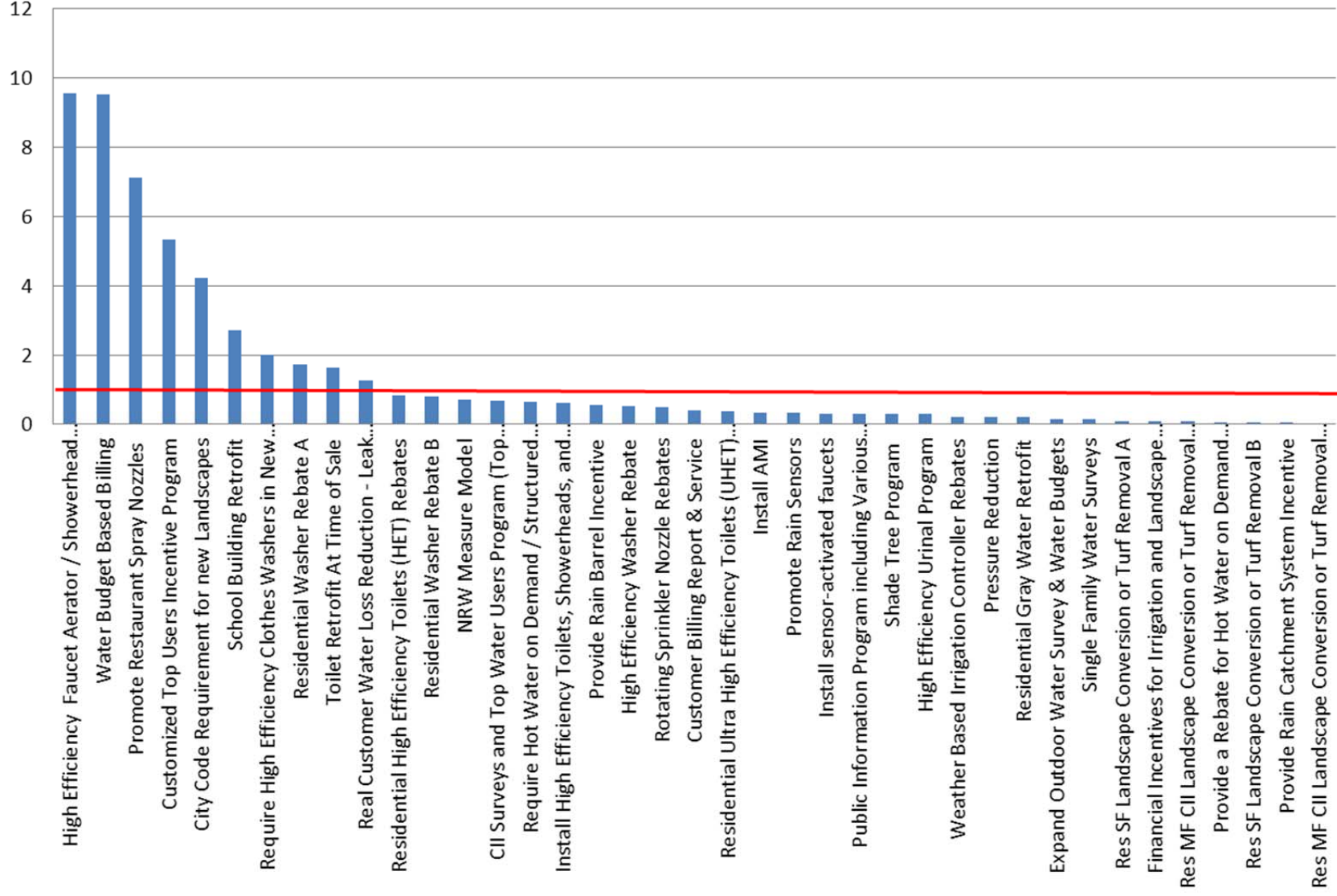


Table 2.

Santa Cruz, California		
Conservation Program	Present Value of Costs (\$1,000)	2030 Water Saved (MGY)
Plumbing Code	\$0	242
Program A	\$5,768	381
Program B	\$8,346	487
Program C	\$13,425	532
Program D	\$21,448	572

Figure 4.

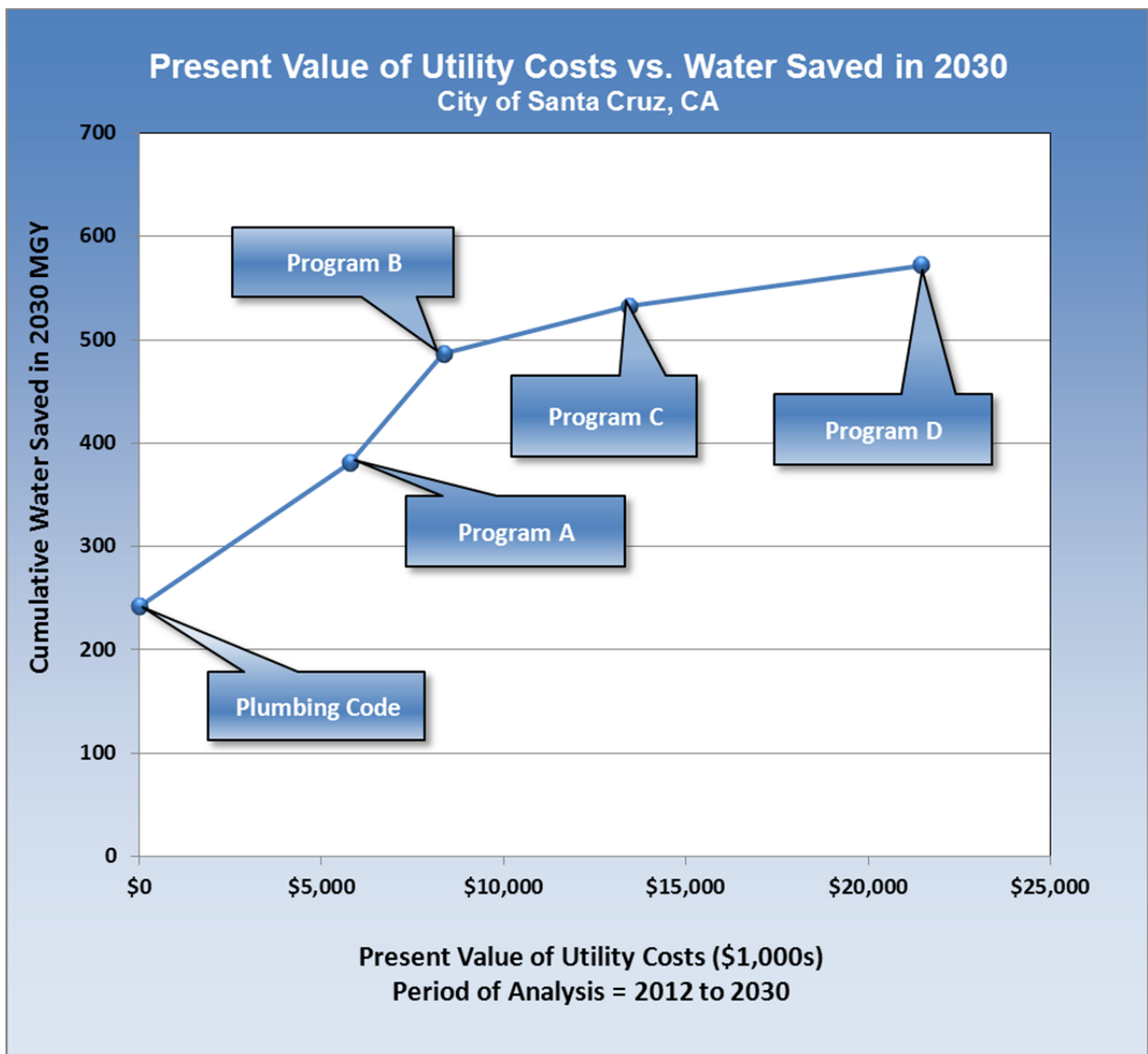


Table 3.

Long Term Conservation Program Water Savings Santa Cruz, California						
Water Savings (MGY)	2015	2020	2025	2030	Water Utility	Community
					Benefit to Cost Ratio	Benefit to Cost Ratio
Program A	47	110	143	139	0.93	0.91
Program B	73	186	243	245	1.11	1.02
Program C	68	206	282	291	0.79	0.52
Program D	68	220	310	330	0.55	0.45

Table 4.

Marginal Cost Between Programs			
Conservation Program	Incremental Cost 30-year Present Value (PV) (\$1000)	Incremental Savings, MGY	PV/MGY, \$
Plumbing Code	\$0	Baseline	\$0
Program A	\$5,768	138.87	\$41,533
Program B	\$2,578	105.90	\$24,343
Program C	\$5,080	45.76	\$111,008
Program D	\$8,022	39.80	\$201,551

Table 5.

Water Demands with Conservation Savings Projections (MGY) Planned Population Growth Santa Cruz, California						
Water Demands (MGY)	2010	2015	2020	2025	2030	2035
Water Demand without the Plumbing Code	3,517	3,690	3,861	3,969	4,075	4,076
Water Demand with the Plumbing Code	3,517	3,648	3,766	3,801	3,834	3,792
Water Demand with Plumbing Code and Program A	3,517	3,602	3,656	3,658	3,695	3,665
Water Demand with Plumbing Code and Program B	3,517	3,576	3,580	3,558	3,589	3,559
Water Demand with Plumbing Code and Program C	3,517	3,581	3,560	3,519	3,543	3,514
Water Demand with Plumbing Code and Program D	3,517	3,581	3,546	3,491	3,503	3,475
Population	91,291	94,694	98,097	100,441	102,784	102,784

Figure 5.

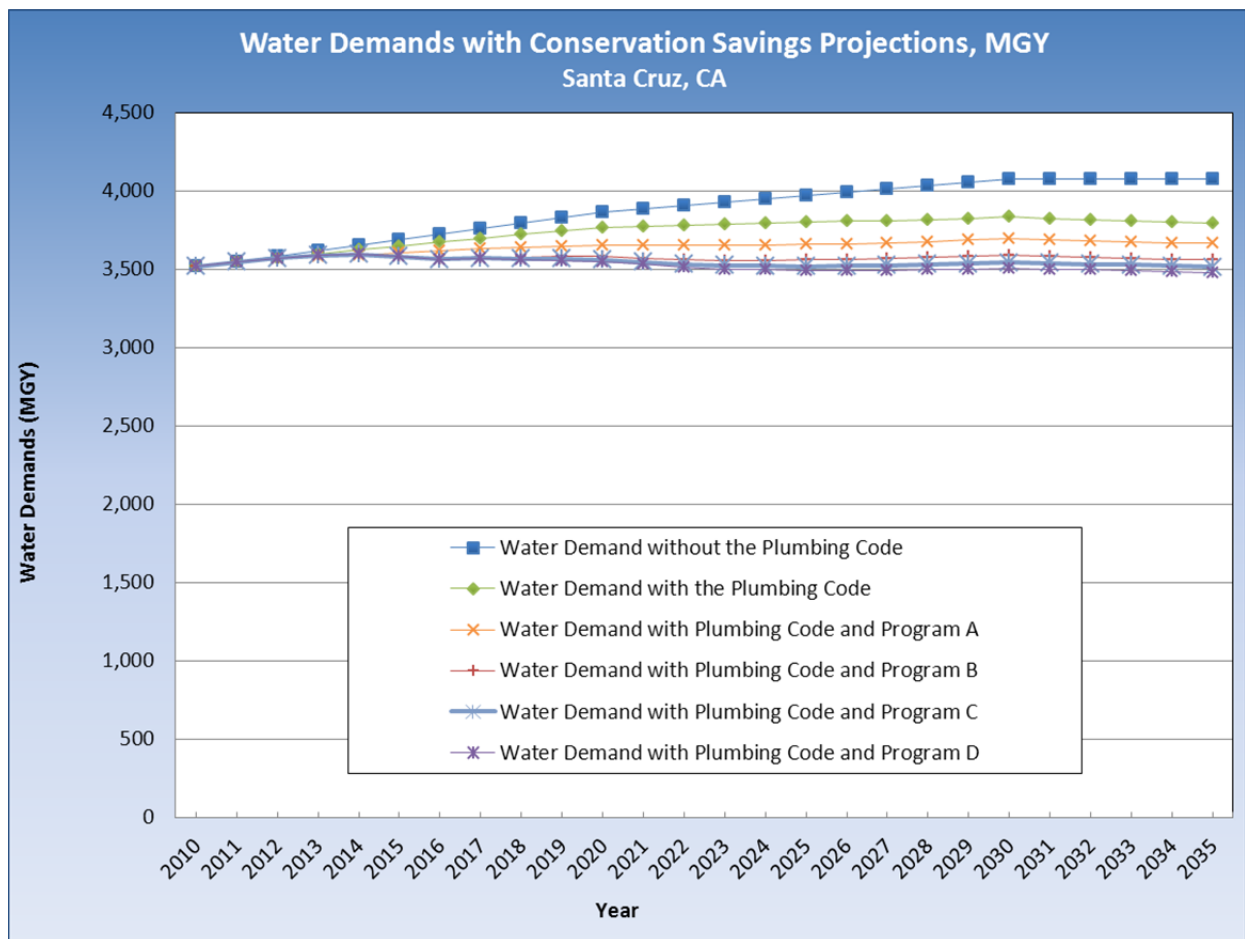


Table 6.

Per Capita Water Use with Conservation Savings Projections Santa Cruz, California						
Per Capita Water Use (gcd)	2010	2015	2020	2025	2030	2035
Per Capita Water Use without the Plumbing Code	106	107	108	108	109	109
Per Capita Water Use with the Plumbing Code	106	106	105	104	102	101
Per Capita Water Use with the Plumbing Code and Program A	106	104	102	100	98	98
Per Capita Water Use with the Plumbing Code and Program B	106	103	100	97	96	95
Per Capita Water Use with the Plumbing Code and Program C	106	104	99	96	94	94
Per Capita Water Use with the Plumbing Code and Program D	106	104	99	95	93	93

Figure 6.

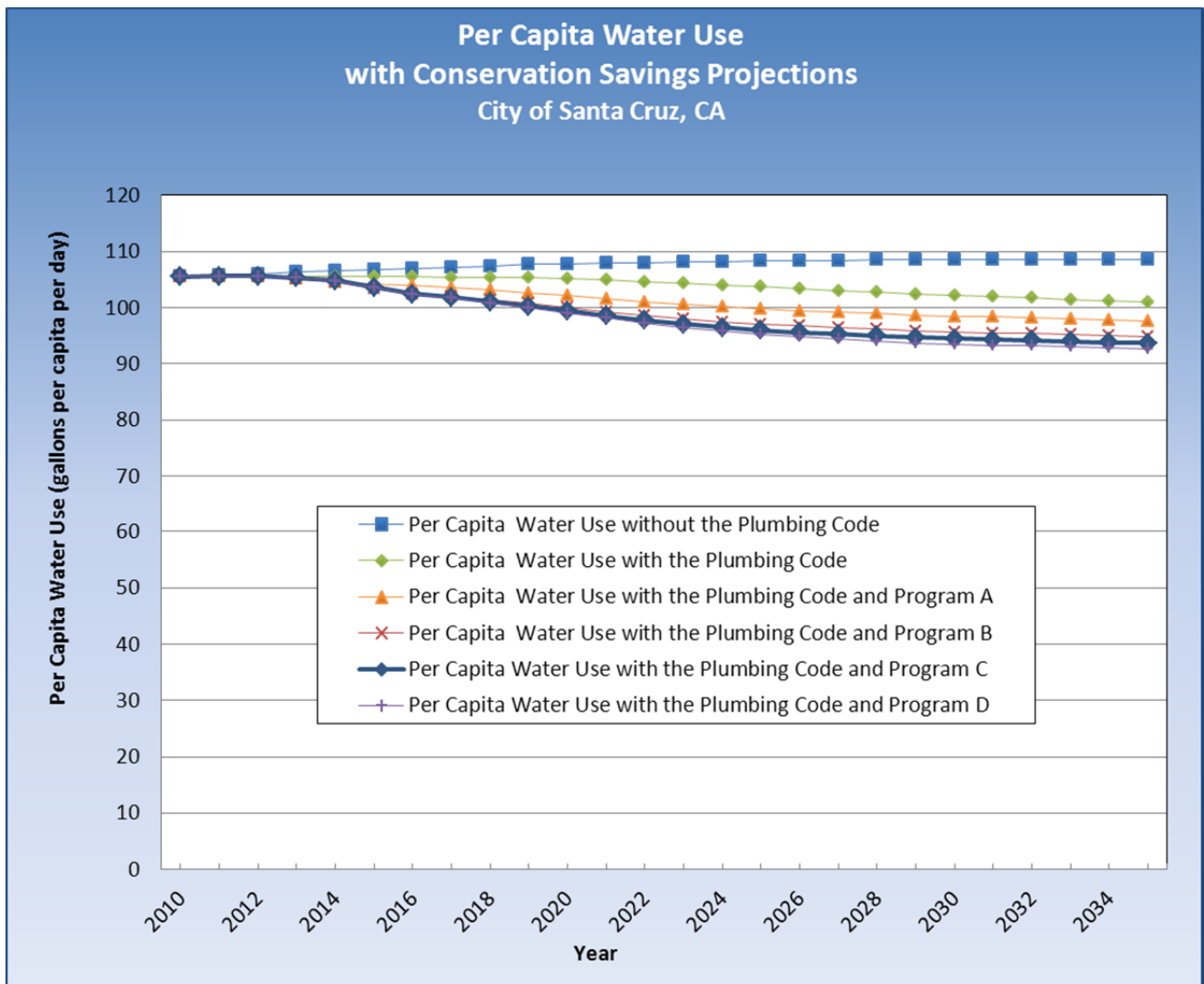


Table 7.

Economic Analysis of Alternative Programs Santa Cruz, California									
Conservation Program	Water Utility Benefit-Cost Ratio	Community Benefit-Cost Ratio	2030 Water Savings (MGD)	2030 Water Savings (MGY)	2030 Indoor Water Savings (MGD)	2030 Outdoor Water Savings (MGD)	Total Water Savings as a Percentage of Total Production in 2030	Present Value of Water Utility Costs	Annual Average Water Utility Cost in First Five Years (2013 - 2017)
Without the Plumbing Code	NA	NA	0	0	0	0	0.00%	NA	NA
With the Plumbing Code	NA	NA	0.66	242	0.66	0	5.93%	NA	NA
Plumbing Code plus Program A	0.93	0.91	1.04	381	0.97	0.07	9.55%	\$5,767,811	\$0
Plumbing Code plus Program B	1.11	1.02	1.33	487	1.23	0.10	12.32%	\$8,345,811	\$483,236
Plumbing Code plus Program C	0.79	0.52	1.46	532	1.34	0.12	13.51%	\$13,425,391	\$681,458
Plumbing Code plus Program D	0.55	0.45	1.57	572	1.42	0.15	14.55%	\$21,447,710	\$805,531

DSS Model Measure Assumptions Santa Cruz, California								
Measure Number	1	2	3	4	5	6	7	8
Measure Name	Water Loss Control Program	Install AMI	Water Budget Based Billing	Public Information Program including Various Outreach & Education Approaches	Customer Billing Report & Service	Real Customer Water Loss Reduction - Leak Repair and Plumbing Emergency Assistance	Single Family Water Surveys	Pressure Reduction
Measure Description	City of Santa Cruz's water losses are relatively low. This measure would seek to maintain low non-revenue water rates through controlling both apparent and real water losses. This would be annual tracked through the AWWA Water Balance Water System Audit.	Install or retrofit system with AMI meters and associated network capable of providing continuous consumption data to Utility offices. Improved identification of system and customer leaks is major conservation benefit. Some of costs of these systems are offset by operational efficiencies and reduced staffing, as regular meter reading and those for opening and closing accounts are accomplished without need for physical or drive-by meter reading. Also enables enhanced billing options and ability to monitor unauthorized usage (such as use/tampering with closed accounts or irrigation if time of day or days per week are regulated). Customer service is improved as staff can quickly access continuous usage records to address customer inquiries. Optional features include online customer access to their usage, which has been shown to improve accountability and reduce water use. Assume seven year change-out would be a reasonable objective based on City's past experience with AMR installation program.	Develop individualized monthly water budgets for all or a selected category of customers. Water budgets are linked to a rate schedule where rates per unit of water increase when a customer goes above their budget, or decreases if they are below their budget. Budgets typically are based on such factors as the size of the irrigated area and often vary seasonally to reflect weather during the billing period. These rates have been shown to be effective in reducing landscape irrigation demand (AWWARF Reports). This measure would require rate study and capable billing software.	Comprehensive education and public awareness campaign that would evolve over the years and seek to drive participation in other conservation programs.This measure includes support for the Landscape Water Budget & Water Use Reports and additional overall customer service and administrative support not specific to any particular conservation measure across the Water Department.	Detailed Water Billing Reports for Customers with neighborhood use comparisons and suggestions on customer specific conservation actions. Use or pattern after WaterSmart software's program.	Customer leaks can go uncorrected at properties where owners are least able to pay costs of repair. These programs may require that customer leaks be repaired, but either subsidize part of the repair and/or pay the cost with revolving funds that are paid back with water bills over time. May also include an option to replace inefficient plumbing fixtures at low-income residences.	Indoor water surveys for existing single family residential customers. Target those with high water use and provide a customized report to owner. May include give-away of efficient shower heads, aerators, toilet devices. Would include a basic outdoor survey (look leaks, irrigation problems & schedule, plant information, etc.).	Provide incentive to install pressure regulating valve on existing properties with pressure exceeding 80 psi.
Applicable Customer Classes	System	All	IRR	System	SF	SF,MF	SF	System
Applicable End Uses	Non Revenue Water	ALL	ALL	SF	SF	All	External	All
				SF Toilets,SF Baths,SF Showers,SF Faucets,SF Dishwashers,SF Laundry,SF Other,SF Int. Leakage,SF Irrigation,SF Pools,SF Wash-Down,SF Car Washing,SF Ext. Leakage	SF Toilets,SF Baths,SF Showers,SF Faucets,SF Dishwashers,SF Laundry,SF Other,SF Int. Leakage,SF Irrigation,SF Pools,SF Wash-Down,SF Car Washing,SF Ext. Leakage	SF Int. Leakage,MF Int. Leakage	SF Irrigation,SF Pools,SF Wash-Down,SF Car Washing,SF Ext. Leakage	SF Toilets,SF Showers,SF Faucets,SF Other,SF Int. Leakage,SF Irrigation,SF Wash-Down,SF Car Washing,SF Ext. Leakage,MF Toilets,MF Showers,MF Faucets,MF Other,MF Int. Leakage,MF Irrigation,MF Wash-Down,MF Car Washing,MF Ext. Leakage
Specific End Uses	System Losses	SF Int. Leakage,MF Int. Leakage,COM Int. Leakage	IRR Irrigation					
Market Penetration by End Of Program (%)	N/A	100%	100%	100%	100%	2.5%	7.5%	6.0%
Annual Market Penetration (%)	N/A	3%	36%	50%	20%	0.5%	1.5%	0.4%
Use Only New Accounts	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Affected Units	System	Account	Account	Account	Account	Account	Account	Accounts
Annual Accounts (Assumes per year)	N/A	3.0%	N/A	100%	100%	0.5%	1.5%	0.4%
Water Use Reductions For Targeted End Uses	1.0%	25%	6%	0.5%	1.0%	100.0%	10%	5.0%
Evaluation Start Year	2015	2021	2015	2013	2018	2018	2013	2021
Evaluation End Year	2035	2035	2017	2030	2030	2035	2035	2035
Program Length, years	20	14	3	17	12	17	23	15
Measure Life, years	Permanent	5	Permanent	2	2	5	5	10
Saves Hot Water	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE
Utility Unit Cost for SF accounts, \$/fixture	\$3	\$40	\$0	\$4.00	\$6	\$300	\$100	\$300
Utility Unit Cost for MF accounts, \$/fixture	\$17	\$40	\$0	\$4.00	\$0	\$600	\$0	\$300
Utility Unit Cost for Non-Res accounts, \$/fixture	\$69	\$40	\$50	\$4.00	\$0	\$0	\$0	\$0
Customer Unit Cost for SF. \$/fixture	\$0	\$500	\$0	\$2	\$0	\$0	\$50	\$0
Customer Unit Cost for MF. \$/fixture	\$0	\$500	\$0	\$2	\$0	\$0	\$0	\$0
Customer Unit Cost for Non-Res. \$/fixture	\$0	\$1,500	\$200	\$2	\$0	\$0	\$0	\$0
Annual Utility Admin & Marketing Cost	40%	40%	50%	50%	35%	45%	45%	45%
SF Number of Fixtures per Account	N/A	1	1	1	1	1	1	1
MF Number of Fixtures per Account	N/A	1	1	1	1	1	1	1
Non-Res Number of Fixtures per Account	N/A	1	1	1	1	1	1	1
Basis of Water Savings	Expanded main replacement and active leak detection	Difficult to assess since system won't be operational until infrastructure installed. Baseline Survey had a low level of leakage. Past End Use Studies have shown higher levels of leakage on a percent of average use (few homes leak significantly).	Overwatering is about 30 MGY for all participants or about 12%. Education has dropped the use about 15 MGY and Price should do the rest of 15 MGY or about 6% of this category.	Not quantified. Assume baseline of 0.5% per year average single family home use.	Assume 1-2% per year savings from SFR	Savings is difference between unrepaired and repaired leaks. Assumes accounts that have more than 100 gpd/acct leakage or more are eligible to participate. Basis for eligibility is the PGE Customer Care program	Use results from Baseline Study to support conservation potential and CUWCC Cost and Savings Study, 2006	Use research reports to document savings of 4-6% from pressure reduction.
Basis of Utility Costs	Checked with WSO, Reinhard Strum. Estimated cost is \$150k.	Assume 10% of the \$400 per connection cost to upgrade is beneficial and attributable to the conservation program.	Experience with current Waterfluence based on City data.	Based on staffing support and education materials cost	Based on WaterSmart Software Program cost at \$132k per year	Assuming that City pays 100% of costs for low income. Basis was City checking with local plumbing contractors.	Based on two hours of labor per survey	Local plumber cost estimate provided by City staff (August 2013).
Basis of Customer Costs	None additional costs (assumed included in rate structure).	Assume no customer side costs for new meter. Costs are for leak repair.	Assume some adjustment of irrigation schedule needed	Minor direct cost to customers	No direct cost to customer	Assuming that low income customers pay 0%	Cost to customer to implement recommendations	Assume that customer pays 0%.
Notes	Pay to bring in consultant to analyze our system and lay out formal water loss control strategy.	Limit the number of value of AMI investment assigned to do Water Conservation Department.	Rafetlis is doing current rate study. Future billing system update. Foster City (Steve Toler, ACM) did an update to the budget based billing. Only bill once per year. Tracks what the penalty and then get a note and if they make change a then, update the formula. Check into AWWARF Report on Water Budget based billing.	Have staffing support and web site now. Assume continuing program with approximately \$4.	Pilot study for 5,000 accounts for 6 months for \$20,000 for WaterSmart software.	Reference PG&E CARE program		http://www.atlantislumbing.com/water-pressure-regulators.php

Abbreviations:

RSF = Residential Single Family

RMF = Residential Multi Family

BUS/COM= Commercial

IND = Industrial

IRR = Dedicated irrigation meters

NRSF = New Single Family Homes

GOV = Government

INS = Institutional/Public, buildings / grounds owned by the Water Utility

DSS Model Measure Assumptions Santa Cruz, California								
Measure Number	9	10	11	12	13	14	15	16
Measure Name	High Efficiency Faucet Aerator / Showerhead Giveaway	Residential High Efficiency Toilets (HET) Rebates	Residential Ultra High Efficiency Toilets (UHET) Rebates	Install High Efficiency Toilets, Showerheads, and Faucet Aerators in Residential Buildings	Residential Washer Rebate (Current)	Residential Washer Rebate (Intensive)	Require High Efficiency Clothes Washers in New Development	Provide a Rebate for Hot Water on Demand Pump Systems
Measure Description	Utility would buy showerheads and faucet aerators in bulk and give them away at Utility office and/or community events.	Provide a rebate or voucher for the installation of a high efficiency toilet (HET). (Toilets flushing less than 1.28 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost and have been at least \$150 for HET.	Provide a rebate or voucher for the installation of an ultra high efficiency toilet (UHET). (Toilets flushing less than 1.0 gpf or less and include dual flush technology. Rebate amounts would reflect the incremental purchase cost and have been at least \$150 for UHET.	Utility would subsidize installation cost of a new UHET purchased by the utility. Licensed plumbers, pre-qualified by the Utility would solicit customers directly. Customers would get a new UHET installed at a discounted price. <i>Example: the Niagara City Smart Program</i>	Provide a rebate for efficient washing machines to single family homes and in-unit condo/apartment complexes that do NOT have common laundry rooms. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology. This program would be similar the City's current program. Current rebate \$100.	Provide a rebate for efficient washing machines to single family homes and in-unit condo/apartment complexes that do NOT have common laundry rooms. It is assumed that the rebates would remain consistent with relevant state and federal regulations (Department of Energy, Energy Star) and only offer the best available technology. This program would be similar the City's current program. Rebate would be modified to increase incentive for the most efficient washers.	Require developers to install an efficient clothes washer (meeting certain water efficiency standards, such as gallons/load). Building Department would be requested to ensure that an efficient washer was installed before new home or building occupancy. Verify that the Utility can enforce conditions of water service that may include efficiency standards for washing machines. Pattern after the North Marin Water District Program.	Provide a rebate to equip homes with efficient hot water on demand systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to reduce hot water waiting times by having a an on-demand pump on a recirculation line. Can be installed on kitchen sink or master bath, wherever hot water waiting times are more than 1/2 minute. Requires an electrical outlet under the sink, which is not common on older home bathrooms but is on kitchen sinks.
Applicable Customer Classes	SF	SF,MF	SF,MF	SF,MF	SF,MF			SF
Applicable End Uses	Internal	Toilets	Toilets	Toilets	Laundry	Laundry	Laundry	Internal
Specific End Uses	SF Showers,SF Faucets	SF Toilets,MF Toilets	SF Toilets,MF Toilets	SF Toilets,SF Showers,SF Faucets,MF Toilets,MF Showers,MF Faucets	SF Laundry,MF Laundry	SF Laundry,MF Laundry	SF Laundry,MF Laundry,COM Laundry	SF Showers,SF Faucets
Market Penetration by End Of Program (%)	20.0%	6.0%	21.0%	8.00%	29%	45%	100%	5.20%
Annual Market Penetration (%)	2.50%	1.75%	1.2%	1.0%	2.25%	3.75%	100%	0.29%
Use Only New Accounts	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE
Affected Units	Accounts	Accounts	Toilets	Toilets, Showerheads, Faucets	Washers	Washers	Washers	SF
Annual Accounts (Assumes per year)	2.50%	1.75%	1.2%	1.0%	2.25%	3.75%	100%	0.289%
Water Use Reductions For Targeted End Uses	27%	63%	38%	38%	53%	53%	53%	11.6%
Evaluation Start Year	2013	2013	2014	2018	2013	2014	2015	2018
Evaluation End Year	2020	2015	2030	2025	2025	2025	2035	2035
Program Length, years	8	3	17	8	13	12	21	18
Measure Life, years	25	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent
Saves Hot Water	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE
Utility Unit Cost for SF accounts, \$/fixture	\$12	\$150	\$150	\$300	\$100	\$200	\$50	\$300
Utility Unit Cost for MF accounts, \$/fixture	\$0	\$150	\$150	\$300	\$100	\$200	\$50	\$0
Utility Unit Cost for Non-Res accounts, \$/fixture	\$0	\$0	\$0	\$0	\$0	\$0	\$50	\$0
Customer Unit Cost for SF, \$/fixture	\$0	\$150	\$150	\$100	\$500	\$400	\$600	\$600
Customer Unit Cost for MF, \$/fixture	\$25	\$150	\$150	\$100	\$500	\$400	\$600	\$0
Customer Unit Cost for Non-Res, \$/fixture	\$25	\$0	\$0	\$0	\$0	\$0	\$1,200	\$0
Annual Utility Admin & Marketing Cost	35%	35%	35%	45%	35%	40%	40%	50%
SF Number of Fixtures per Account	2	2.2	2.2	2.2	1	1	1	3
MF Number of Fixtures per Account	1	4.0	4.0	4.0	1	1	1	14
Non-Res Number of Fixtures per Account	1	10	1	1	1	1	10	1
Basis of Water Savings	Using the Baseline Survey, assume flow rate of average of 1.8 old showerheads at 2.5 gpm replaced with 1.8 gpm showerheads and 3.5 aerators replaced at 2.2 gpm - 1.5 gpm. Same basis for MF with 1.2 showerheads and 2.4 faucets, and 4 showerheads and 10 faucets for Commercial and Municipal accounts	Calculated from fixture models based on flush volume HET vs. 3.5gpf	Calculated from fixture models based on flush volume UHET vs. 1.6 gpf	Based on Green City Program, would start after new law in place and replace ULFT with UHET	Calculated from fixture models based on washer volume, see below.	Calculated from fixture models based on washer volume, see below.	Based on new machine being paid by developer	Based on Jim Lutz paper and information from Gary Klein and David Grieshop. See spreadsheet titled "Hot Water On Demand Water Savings Estimate_2013" includes 1750 sq ft house saves 1571 gallons per year or 4.3 gpd/acct and a total of 99.5 gpd per SF home, equates to ~4.3% savings per home. Based on a review of Single Family Home use for City of Santa Cruz customers at 30.6 gpd for faucet and 37.5 gpd for showers per household results in an equivalent savings of 12% on shower and faucet end use. Overall an estimated 7.45 gpd savings or 12% by MVM. See "Hot Water Demand System Estimate"
Basis of Utility Costs	Cost of showerhead / aerator	City's Current Rebate Value	City's Current Rebate Value	City would need to provide substantial subsidy	City's Current Rebate Value	City's Higher Rebate Value	Cost of inspection. City estimates the administrative costs of having a HEW code requirement as part of construction projects would be about \$10,000 per year. This is based on 75-100 projects that would need plan review, customer contacts to explain requirements, inspections at the end of all projects, and all necessary interactions with Planning Department through the computer or by other means.	Rebate value
Basis of Customer Costs	Assume self installed or some by plumber at customer cost.	MVM estimate for plumber install	MVM estimate for plumber install	Minimal participate so they have to provide something	Incremental purchase cost for customer after rebate.	Incremental purchase cost for customer after rebate.	Developer would bear cost of clothes washer.	Installation cost
Notes	Program description calls for an office giveaway, but this also could be a systemwide distribution program. Number of fixtures per account came from baseline study. Savings and costs do not reflect distribution to hotel/motel or other commercial or multi-family properties.	There are not many UHET models right now, but may become more popular in the future.	There are not many UHET models right now, but foresee becoming more popular in the future as market transformation occurs.	We would cover much, but not all of the cost for a direct install program.	See calculations of savings below	City is considering increasing rebate amount from \$100 to \$200 or more to increase participation.	About 60 new SF homes per year for a total of 840 new homes inside the city by year 2030. Also an additional 2510 multi-family dwelling units by 2030.	Based on Jim Lutz paper and information from Gary Klein and David Greshop

Abbreviations:

RSF = Residential Single Family

RMF = Residential Multi Family

BUS/COM= Commercial

IND = Industrial

IRR = Dedicated irrigation meters

NRSF = New Single Family Homes

GOV = Government

INS = Institutional/Public, buildings / grounds owned by the Water Utility

DSS Model Measure Assumptions Santa Cruz, California								
Measure Number	17	18	19	20	21	22	23	24
Measure Name	Require Hot Water on Demand / Structured Plumbing in New Developments	Toilet Retrofit At Time of Sale	High Efficiency Washer Rebate	Customized Top Users Incentive Program	Promote Restaurant Spray Nozzles	CII & MF Surveys and Top Water Users Program (Top customers from each customer category)	High Efficiency Urinal Program	Install sensor-activated faucets
Measure Description	Work with developers and permitted remodels (of certain size or type) to equip new homes or buildings with efficient hot water on demand systems such as structured plumbing systems. These systems use a pump placed under the sink to recycle water sitting in the hot water pipes to the water heater or to move the water heater into the center of the house and/or reduce hot water waiting times by having a an on-demand pump on a recirculation line.	Work with the real estate industry to require a certificate of compliance be submitted to the Utility that verifies that a plumber has inspected the property and efficient fixtures were either already there or were installed at time of sale.	Provide a \$400 rebate for the installation of a high efficiency commercial washer (HEW) in CII and MF Common Area Laundry. Rebate amounts would reflect the incremental purchase cost. Program will be shorter lived as it is intended to be a market transformation measure and eventually would be stopped as efficient units reach saturation. Currently, eligible for City's program, this is planned as an expanded measure.	After the free water use survey has been completed at site, the Utility will analyze the recommendations on the findings report that is provided and determine if site qualifies for a financial incentive. Financial incentives will be provided after analyzing the cost benefit ratio of each proposed project. Incentives are tailored to each individual site as each site has varying water savings potentials. Incentives will be granted at the sole discretion of the Utility while funding lasts.	Provide free 1.3 gpm (or lower) spray nozzles and possibly free installation for the rinse and clean operation in restaurants and other commercial kitchens. Thousands have been replaced in California going door to door, very cost-effective because saves hot water.	Top water customers from each category would be offered a professional water survey that would evaluate ways for the business to save water and money. The surveys would be for large accounts (such as, accounts that use more than 5,000 gallons of water per day) such as hotels, restaurants, stores and schools. Emphasis will be on supporting the top 25 users for each customer category.	Provide a rebate or voucher for the installation of a high efficiency urinals. WaterSense standard is 0.5 gpf or less, though models flushing as low as 0.125 gpf (1 pint) are available and function well, so could be specified. Rebate amounts would reflect the incremental purchase cost and have been about \$300.	Consider direct install program, rebates or grants for installation of high efficiency (0.5 gpm) sensor faucet fixtures in all or selected high-use commercial or institutional buildings.
Applicable Customer Classes	SF,MF,COM	SF,MF,COM	Multifamily, Business	MF,Business	Business	MF,Business	Business,Municipal,Industrial	Business,Industrial,Municipal
Applicable End Uses	Internal	Internal	Laundry	Toilets,Showers,Faucets,Dishwashers,Laundry,I nt, Leakage,Irrigation,Ext. Leakage	Kitchen Spray Wash	Toilets,Showers,Faucets,Dishwashers,Laundry,I nt, Leakage,Irrigation,Ext. Leakage	Urinals	Faucets
	SF Showers,SF Faucets,MF Showers,MF Faucets,COM Showers,COM Faucets	SF Toilets,MF Toilets,COM Toilets	MF Laundry,COM Laundry	MF Toilets,MF Showers,MF Faucets,MF Dishwashers,MF Laundry,MF Int. Leakage,MF Irrigation,MF Ext. Leakage,COM Toilets,COM Showers,COM Faucets,COM Dishwashers,COM Laundry,COM Int. Leakage,COM Irrigation,COM Ext. Leakage	COM Kitchen Spray Wash	COM Toilets,COM Showers,COM Faucets,COM Dishwashers,COM Laundry,COM Int. Leakage,COM Irrigation,COM Ext. Leakage,MF Toilets,MF Showers,MF Faucets,MF Dishwashers,MF Laundry,MF Int. Leakage,MF Irrigation,MF Ext. Leakage	COM Urinals,MUNI Urinals,IND Urinals	COM Faucets,MUNI Faucets,IND Faucets
Specific End Uses								
Market Penetration by End Of Program (%)	100%	4.25%	3.23%	2.8%	11.4%	3.00%	20.0%	32.5%
Annual Market Penetration (%)	100%	0.85%	0.35%	0.5%	5.7%	0.5%	5.0%	2.5%
Use Only New Accounts	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Affected Units	SF MF CII Indoor	Accounts	Accounts	Account	Account	Account	Account	Account
Annual Accounts (Assumes per year)	100.0%	1.0%	0.350%		220 accts total (or 110 per year)	Same approach as menu - top user list	20.0%	20.0%
Water Use Reductions For Targeted End Uses	11.6%	63.0%	53%	10%	50%	10%	80%	75%
Evaluation Start Year	2018	2013	2015	2018	2015	2018	2017	2018
Evaluation End Year	2035	2017	2024	2023	2016	2023	2020	2030
Program Length, years	18	5	10	6	2	6	4	13
Measure Life, years	Permanent	Permanent	Permanent	Permanent	25	Permanent	Permanent	Permanent
Saves Hot Water	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE
Utility Unit Cost for SF accounts, \$/fixture	\$25	\$38	\$0	\$0	\$0	\$0	\$0	\$0
Utility Unit Cost for MF accounts, \$/fixture	\$25	\$38	\$400	\$500	\$0	\$1,000	\$0	\$0
Utility Unit Cost for Non-Res accounts, \$/fixture	\$25	\$125	\$400	\$500	\$100	\$1,000	\$300	\$400
Customer Unit Cost for SF, \$/fixture	\$600	\$80	\$0	\$0	\$0	\$0	\$0	\$0
Customer Unit Cost for MF, \$/fixture	\$2,768	\$75	\$500	\$1,500	\$0	\$500	\$0	\$0
Customer Unit Cost for Non-Res, \$/fixture	\$2,940	\$500	\$500	\$1,500	\$0	\$500	\$200	\$100
Annual Utility Admin & Marketing Cost	50%		35%	50%	40%	50%	35%	35%
SF Number of Fixtures per Account	3	2.2	1	1	1	1	1	1
MF Number of Fixtures per Account	14	4	2	1	1	1	1	1
Non-Res Number of Fixtures per Account	15	10	4	2	1	2	2	6
Basis of Water Savings	Based on Jim Lutz paper and information from Gary Klein and David Grieshop. See spreadsheet titled "Hot Water On Demand Water Savings Estimate_2013" includes 1750 sq ft house saves 1571 gallons per year or 4.3 gpd/acct and a total of 99.5 gpd per SF home, equates to ~4.3% savings per home. Based on a review of Single Family Home use for City of Santa Cruz customers at 30.6 gpd for faucet and 37.5 gpd for showers per household results in an equivalent savings of 12% on shower and faucet end use. Overall an estimated 7.45 gpd savings or 12% by MWM. See "Hot Water Demand System Estimate"	Assume City's ordinance will sunset when Statewide Retrofit on Resale SB 407 goes active 2017 for residential and 2019 for commercial properties. Savings based on replacing a 3.5 gpf with a 1.28 gpf HET.	Engineering estimate of average savings, assume water factor is 25% less for replacement	Engineering estimate of average savings for MF CII Facilities receiving an incentive. Assume targeting larger accounts above 5,000 gpd.	Back calculate from the City's baseline survey, use 1.3 gpm Fisher.	CUWCC Cost and Savings Study (2005) reports <u>potential</u> savings range from 11 to 29%, assuming all projects are implemented. Assume 30% potential and 35% compliance, CUWCC Cost and Savings Study, 2005, pg 2-66-68. Assume 10% due to survey only, rest of savings come from participation in an incentive program.	Assume reduction from 1.25 gpf down to 0.25 gpf. Baseline Survey found lower saturation in restaurants and office buildings. Schools were 100% high efficiency.	Reduction in flow rate from existing say 2 gpm down to 0.5 gpm or 75% reduction.
Basis of Utility Costs	Inspection cost	Inspection cost	City estimate	Assume cost may triple as more expensive rebates requested	Door to door distribution	CUWCC Cost and Savings Study (2005) reports costs range from \$600 to \$8,000.	Cost of Fixture	Rebate for full amount of cost
Basis of Customer Costs	Assume developer funded.	Purchase and Installation cost	Covers labor costs	Covers labor costs	no cost to customer	Covers labor costs	Installation	Installation cost
Notes	About 60 new SF homes per year for a total of 840 new homes inside the city by year 2030. Also an additional 2510 multi-family dwelling units by 2030.	Long term housing turnover is about 2.7% per year. Commercial property turns over less frequently than residential. Fewer than 1 fixture per property is now being replaced under this ordinance. Will upgrade standard to become HET.	Start by consider a combination of a mandate and City funded clothes washer program for common laundry rooms that would accelerate retirement of old inefficient equipment for the next 5- 10 years, when codes will transform market.	This is a designer rebate or grant program that depends on viable projects documented in survey.	This would be a one-year distribution type program, Plan on about 200 sites with up to 300 valves in our service area.	Large CII users are already receiving landscape water use reports and surveys	Comprehensive City, school, and other government buildings urinal replacement with 0.5 gpf or less. City could potentially fund 100 percent of costs.	Coupled with 0.5 gpm flow rate faucet.

Abbreviations:

RSF = Residential Single Family

RMF = Residential Multi Family

BUS/COM= Commercial

IND = Industrial

IRR = Dedicated irrigation meters

NRSF = New Single Family Homes

GOV = Government

INS = Institutional/Public, buildings / grounds owned by the Water Utility

DSS Model Measure Assumptions Santa Cruz, California								
Measure Number	25	26	27	28	29	30	31	32
Measure Name	School Building Retrofit	City Code Requirement for new Landscapes	Landscape Conversion or Turf Removal	Landscape Conversion or Turf Removal	Landscape Conversion or Turf Removal	Landscape Conversion or Turf Removal	Expand Outdoor Water Survey & Water Budgets	Financial Incentives for Irrigation and Landscape Upgrades
Measure Description	School retrofit program wherein school receives a grant to replace fixtures and upgrade irrigation systems. Expand current City Program, pattern after EBMUD and MWD programs. Promote to schools for cash flow upfront. Review Generation Water program.	Include less irrigation demand for new accounts due to more efficient landscape designs due to City Code (implementation of Statewide Model Landscape Ordinance)	Provide a per square foot incentive for to remove turf and replace with low water use plants or permeable hardscape. Pattern after the City's current program. Rebate is currently \$0.50 per square foot removed, and capped at an upper limit of \$500 for single family residence.	Provide a per square foot incentive for to remove turf and replace with low water use plants or permeable hardscape. Pattern after the City's current program. Rebate would be \$1.00 per square foot removed, and capped at an upper limit of \$1,000 for single family residence.	Provide a per square foot incentive for to remove turf and replace with low water use plants or hardscape. Pattern after the City's current program. Rebate is currently \$0.50 per square foot removed, and capped at an upper limit of \$2,500 for multi-family or commercial residence.	Provide a per square foot incentive for to remove turf and replace with low water use plants or hardscape. Pattern after the City's current program. Rebate is currently \$0.50 per square foot removed, and capped at an upper limit of \$2,500 for multi-family or commercial residence.	Outdoor water audits offered for existing large landscape customers. Normally those with high water use are targeted and provided a customized report on how to save water. All large multi-family residential, CII, and public irrigators of large landscapes would be eligible for free landscape water audits upon request. Tied to the Water Budget Program.	For SF, MF, CII, and IRR customers with landscape, provide a Smart Landscape Rebate Program with rebates for substantive landscape retrofits or installation of water efficient upgrades; Rebates contribute towards the purchase and installation of water-wise plants, compost, mulch and selected types of irrigation equipment upgrades. Cost shared rebate for residential accounts and for commercial customers.
Applicable Customer Classes	Municipal	Multifamily, Industrial, Business, Municipal	Single Family	Single Family	Multifamily,Business	Multifamily,Business	Irrigation	Single Family, Multifamily, Business
Applicable End Uses	Toilets, Urinals, Faucets, Showers, Int. Leakage, Irrigation, Ext. Leakage	Irrigation	Irrigation	Irrigation	Irrigation	Irrigation	IRR Irrigation	Irrigation
	MUNI Toilets,MUNI Urinals,MUNI Faucets,MUNI Showers,MUNI Int. Leakage,MUNI Irrigation,MUNI Ext. Leakage	MF Irrigation,IND Irrigation,COM Irrigation,MUNI Irrigation	SF Irrigation	SF Irrigation	MF Irrigation,COM Irrigation	MF Irrigation,COM Irrigation	IRR Irrigation	SF Irrigation,MF Irrigation,COM Irrigation
Specific End Uses								
Market Penetration by End Of Program (%)	10.0%	100%	1.97%	2.95%	0.97%	4.20%	57.2%	5.75%
Annual Market Penetration (%)	1.0%	100%	0.20%	0.30%	0.10%	0.15%	2.2%	0.25%
Use Only New Accounts	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Affected Units	Account	Account	Account	Account	Account	Account	Account	Account
Annual Accounts (Assumes per year)	2 schools/yr for 10 years, 20 total	based on growth rate of new large accounts (over 5,000 sf)			0.100%	0.150%	10	0.250%
Water Use Reductions For Targeted End Uses	25%	25%	0.20%	0.30%	25.0%	25.0%	6.6%	20.0%
Evaluation Start Year	2018	2013	2013	2013	2013	2013	2015	2018
Evaluation End Year	2027	2040	2040	2040	2040	2040	2040	2040
Program Length, years	10	28	28	28	28	28	26	23
Measure Life, years	27	27	10	10	10	10	10	25
Saves Hot Water	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Utility Unit Cost for SF accounts, \$/fixture	\$0	\$0	\$500	\$1,000	\$0	\$0	\$0	\$500
Utility Unit Cost for MF accounts, \$/fixture	\$0	\$50	\$0	\$0	\$1,500	\$3,000	\$1,500	\$2,000
Utility Unit Cost for Non-Res accounts, \$/fixture	\$2,500	\$100	\$0	\$0	\$2,500	\$5,000	\$1,500	\$2,000
Customer Unit Cost for SF, \$/fixture	\$0	\$0	\$2,500	\$2,000	\$0	\$0	\$0	\$1,000
Customer Unit Cost for MF, \$/fixture	\$0	\$1,000	\$0	\$0	\$8,500	\$7,000	\$1,500	\$3,000
Customer Unit Cost for Non-Res, \$/fixture	\$2,500	\$2,500	\$0	\$0	\$12,500	\$10,000	\$1,500	\$3,000
Annual Utility Admin & Marketing Cost	35%	35%	45%	45%	45%	45%	45%	45%
SF Number of Fixtures per Account	1	1	1	1	1	1	1	1
MF Number of Fixtures per Account	1	1	1	1	1	1	1	1
Non-Res Number of Fixtures per Account	1	1	1	1	1	1	1	1
Basis of Water Savings	Do two schools per year and assume cut use 25% below a current use of 3,000 gpd	Based on native landscaping (Xeriscape) over efficiently irrigated turfgrass per City Code Chapter 16.16 http://www.cityofsantacruz.com	Estimated savings are 19 gallons per square foot. CUWCC Cost and Savings Study (2005) reports up to 39% savings in summer. Assume 50% of landscaping removed and replaced with low water use that uses 50% less water so overall irrigation savings may be a maximum of 38%. Given some system efficiency/residual overwatering may still occur, conservatively assumed 25%.	Estimated savings are 19 gallons per square foot. CUWCC Cost and Savings Study (2005) reports up to 39% savings in summer. Assume 50% of landscaping removed and replaced with low water use that uses 50% less water so overall irrigation savings may be a maximum of 38%. Given some system efficiency/residual overwatering may still occur, conservatively assumed 25%.	Estimated savings are 19 gallons per square foot from high water use plants (turfgrass) at Plant Factor 0.8 compared to low water use plants at PF of 0.2. ET for Santa Cruz is relatively low at 36 inches per year. Assume 50% square footage is replaced.	Estimated savings are 19 gallons per square foot from high water use plants (turfgrass) at Plant Factor 0.8 compared to low water use plants at PF of 0.2. Assume 50% square footage is replaced.	Savings to-date, see notes on water budget based billing	Assume 50% of landscape water is wasted due to low irrigation efficiency in older irrigation systems or inefficient manual watering. This is assumed that these sites will be made over will save nearly half of the water waste (e.g., back to distribution uniformity of 75%).
Basis of Utility Costs	Assume \$5,000 split 50:50 with City	Application and Inspection	Assume \$3/per square foot total costs based on MWM experience.	Assume \$3/per square foot total costs based on MWM experience.	Assume \$3/per square foot total costs based on MWM experience.	Assume \$3/per square foot total costs based on MWM experience.	\$1400 per audit per contract	Extensive make-over planned at ~3/sq ft and from 300 to 1500 sq ft; City pays up to 50%
Basis of Customer Costs	Assume \$5,000 split 50:50 with City	Based on Xeriscape over turf	Net cost to customer is \$2/square foot and 1,000 square feet	net cost to customer is \$2/square foot and 1,000 square feet	net cost to customer is \$2/square foot and 1,000 square feet	net cost to customer is \$2/square foot and 1,000 square feet	Assume customer makes some changes to system to try and meet budget	Extensive make-over planned at ~3/sq ft and from 300 to 1500 sq ft; customer pays 50% or more
Notes	Might have to couple with survey of school sites first, and landscape survey	Have copy of City Ordinance (could consider as an attachment to the Plan).	Considering increasing rebate amount per square foot and limit on total square feet.	Considering increasing rebate amount per square foot and limit on total square feet.	Considering increasing rebate amount per square foot and limit on total square feet.	Considering increasing rebate amount per square foot and limit on total square feet.	10-15 audits per year on 250 participating accounts.	Flexible program landscape related improvements as opposed to individual rebate programs.

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RMF = Residential Multi Family

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IND = Industrial

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NRSF = New Single Family Homes

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DSS Model Measure Assumptions Santa Cruz, California							
Measure Number	33	34	35	36	37	38	39
Measure Name	Weather Based Irrigation Controller Rebates	Rotating Sprinkler Nozzle Rebates	Residential Gray Water Retrofit	Shade Tree Program	Promote Rain Sensors	Provide Rain Barrel Incentive	Provide Rain Catchment System Incentive
Measure Description	Provide a per station rebate (typically \$25 per station) with a cost-share for the purchase of a weather based irrigation controller. These controllers have on-site weather sensors or rely on a signal from a central weather station that modifies irrigation times at least weekly. Requires local irrigation contractors who are competent with these products, so may require sponsoring a training program in association with this measure.	Provide rebates to replace standard spray sprinkler nozzles with rotating nozzles that have lower application rates. Nozzles cost about \$6 each.	Provide a workshop to support a Gray water Challenge similar to 2013 event that was modeled after Sonoma County program. Offer rebate to assist covering certain percentage of the cost to single family homeowners per year to install gray water systems. Package from local hardware stores had the primary components would be supported by City rebate.	Provide incentives and information to promote shade tree planting as a water conservation measure. Potential for Water-Energy Partnership.	Promote installation of rain sensor shut-off devices when installing new irrigation systems if a weather based controller is not being installed.	Provide incentive for installation of rain barrels. This could involve rebates or bulk purchase and giveaways of barrels plus workshops on proper installation and use of captured rain water for landscape irrigation. Pattern after Honolulu Board of Water Supply program.	Provide incentive for installation of large rainwater catchment systems up to 2,500 gallons. This could involve rebates, grants and other cost share methods. Might require simultaneous installation of water efficient landscaping to assure that amount of water collected is capable of lasting into the peak irrigation season.
Applicable Customer Classes	Single Family, Multifamily, Business	Single Family, Multifamily, Business	Single Family	Single Family, Multifamily, Business	Single Family	Single Family	Single Family
Applicable End Uses	Irrigation	Irrigation	SF Irrigation	Irrigation	SF Irrigation	SF Irrigation	SF Irrigation
		SF Irrigation,MF Irrigation,COM Irrigation	SF Irrigation	SF Irrigation,MF Irrigation,COM Irrigation	SF Irrigation	SF Irrigation	SF Irrigation
Specific End Uses	SF Irrigation,MF Irrigation,COM Irrigation						
Market Penetration by End Of Program (%)	13.8%	11.5%	2.6%	26.6%	6.5%	35.0%	13.0%
Annual Market Penetration (%)	0.6%	0.5%	0.1%	2.0%	0.5%	2.0%	1.0%
Use Only New Accounts	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Affected Units	Account	Primarily residential	Primarily residential	Account	Account	Account	Account
Annual Accounts (Assumes per year)	0.100%	0.535%	0.1%	0.025%			
					1.0%	2.0%	1.0%
Water Use Reductions For Targeted End Uses	15.0%	10.0%	10.0%	5.0%	5.0%	5.0%	5.0%
Evaluation Start Year	2018	2018	2015	2015	2018	2013	2018
Evaluation End Year	2040	2040	2040	2025	2030	2030	2030
Program Length, years	23	23	26	11	13	18	13
Measure Life, years	25	20	Permanent	Permanent	20	20	Permanent
Saves Hot Water	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Utility Unit Cost for SF accounts, \$/fixture	\$200	\$50	\$150	\$50	\$50	\$30	\$500
Utility Unit Cost for MF accounts, \$/fixture	\$500	\$100	\$0	\$50	\$0	\$0	\$0
Utility Unit Cost for Non-Res accounts, \$/fixture	\$500	\$200	\$0	\$50	\$0	\$0	\$0
Customer Unit Cost for SF, \$/fixture	\$300	\$100	\$300	\$50	\$50	\$30	\$1,500
Customer Unit Cost for MF, \$/fixture	\$500	\$200	\$0	\$50	\$0	\$0	\$0
Customer Unit Cost for Non-Res, \$/fixture	\$2,000	\$400	\$0	\$50	\$0	\$30	\$0
Annual Utility Admin & Marketing Cost	45%	45%	45%	45%	45%	45%	35%
SF Number of Fixtures per Account	1	1	1	1	1	1	1
MF Number of Fixtures per Account	1	1	1	2	1	1	1
Non-Res Number of Fixtures per Account	1	1	1	10	1	1	1
Basis of Water Savings	IRWD experience. Other Smart Irrigation Controller Studies from USBR: http://www.usbr.gov/waterconservation/docs/WaterSavingsRpt.pdf	Assume improvement in distribution uniformity saves 10% of irrigation. Reference CUWCC Potential Best Management Practice Report on Rotating Nozzles.	Assume single fixture type system used to replace a portion of garden watering on new or existing homes.	Assume remove 50-100 sf of turf, water demand for a large (ginko) tree; Assume this amounts to a net 5% reduction in irrigated area. Could be patterned after San Jose's "Our City Forest Program" http://www.ourcityforest.org/plantingandcare/planting/getatree (supported by PGE) or the City of Roseville program in Sacramento area that was well run. http://www.roseville.ca.us/electric/shade_tree/default.asp	MWM studies of potential water savings in Bay Area due to skipped irrigations due to rain events of a significant size	We assume 4 effective fills per year for 20 years. 20 year useful life	We assume 3 effective fills per year for 20 years.
Basis of Utility Costs	~ \$25 per station	Assume cos is \$6/nozzle and rebate is \$2 per nozzle and following nozzles required: SF = 25; MF = 50; COM = 100	System costs ~\$450 and City pays ~ 1/3	Planned rebate value	Cost of device	City pays 50%	City pays 30%
Basis of Customer Costs	Remainder + installation	Remainder + installation	Installation cost	Installation cost	Installation cost	50%; customer has to install	Customer cost (70\$)
Notes	Might become easier to implement over time as technology gets easier and more familiar	No nozzle minimum; customer has to turn in old nozzles to get paid.	Plan to carefully track accounts and savings.	Start by providing funds to Parks tree program	City already requires this for new development; perhaps this program should be a voluntary approach targeted to people with existing irrigation controllers. Consider giveaway program, but would need to do market research beforehand.	If this model were available locally, we would probably stop selling them and offer a rebate instead due to storage and delivery challenges. We could also add a rebate anyway so people have more choice in models and sizes. Assume a 50 percent subsidy.	Program not found on City of Santa Rosa web site. http://ci.santa-rosa.ca.us/departments/utilities/conserve/Pages/default.aspx

Abbreviations:

RSF = Residential Single Family

RMF = Residential Multi Family

BUS/COM= Commercial

IND = Industrial

IRR = Dedicated irrigation meters

NRSF = New Single Family Homes

GOV = Government

INS = Institutional/Public, buildings / grounds owned by the Water Utility