Backup for Attachment 2

SGVMWD is a wholesale water supplier that provides untreated State Water Project (SWP) water to replenish groundwater supplies of the Main San Gabriel Basin (Main Basin). Its member cities are the cities of Alhambra, Azusa, Monterey Park, and Sierra Madre. SGVMWD owns and operates a pipeline (Devil Canyon-Azusa Pipeline) to deliver untreated SWP water to the Main Basin as supplemental water for any production in excess of Main Basin water rights by its member agencies.

The "San Gabriel Valley Municipal Water District Water and Energy Conservation Rebate Program" proposes to encourage water and energy conservation through rebates for water efficient washing machines, dishwashers, smart irrigation controllers and waterless urinals offered to residents and commercial water users in each of the four (4) member cities. These water conservation measures will reduce overall water usage for each member city, leading to decreased groundwater overproduction from the Main San Gabriel Basin which will reduce SGVMWD's supplemental water requirement and lead to decreased imported water deliveries. Therefore, the total annual water savings will be reduced from the imported water deliveries and associated energy use.

Step 1: Baseline volume of the water associated with the project

Water Source – Imported Water from the State Water Project. Table 1 shows SGVMWD's historical annual imported water deliveries from fiscal year 2003-04 through 2012-13. The 5-year average imported water delivery of 17,736 AFY has been used to calculate the baseline volume of water associated with the project.

Total baseline volume of water associated with the project: 17,736 AFY = 5,779.28 MG/year.

Step 2: Volume of water which will be delivered after the project is implemented.

The total volume of water which will be saved was calculated utilizing the following measures:

(1) Washing Machine: Attached Clothes Washer Calculations for ENERGY STAR (see Appendix A)

Assumptions:

- 6 loads per week
- natural gas hot water heater
- electric dryer
- Modified Energy Factor of 2 (minimum requirement for ENERGY STAR)
- Water Factor of 3 (minimum requirement for ENERGY STAR)
- Conventional washing machine Modified Energy Factor of 1.26
- Conventional washing machine Water Factor of 9.50

Total Energy Savings due to hot water heater: 7 Therms x 0.0341 therm/kWh = 205 kWh/year/washing machine (additional electricity savings are provided in Step 10)

Total Water Savings: 3,385 gallons/year/washing machine

(2) Dishwasher: Attached Dishwasher Calculations for ENERGY STAR (see Appendix B)

Assumptions:

- 4 cycles (wash) per week
- natural gas hot water heater
- Electricity Consumption – 295 kWh/year (minimum requirement for ENERGY STAR)
- Water Consumption – 4.25 gal/cycle (minimum requirement for ENERGY STAR)
- Electricity Consumption – 365 kWh/year
- Water Consumption – 6.50 gal/cycle

Total Energy Savings due to hot water heater: 1.5 Therms x 0.0341 therm/kWh = 41 kWh/year/dishwasher (additional electricity savings are provided in Step 10)

Total Water Savings: 468 gallons/year/dishwasher

(3) Smart Irrigation Controller: Attached WaterSense Fact Sheet (see Appendix C)

Assumptions:

- 8,800 gallons of water conserved per year per irrigation controller

Total Water Savings: 8,800 gallons/year/irrigation controller

(4) Waterless Urinal: Attached IEc Waterless Urinals Report and Evaluation (see Appendix D)

Assumptions:

- 2 urinals and 25 males working 265 days per year
- 3 urinal uses per male per day
- Waterless urinal substituted for 1.0 gallon per flush urinal

Total Water Savings: 19,500 gallons/year

Total Water Savings (See Table 3): 15 MG/year x 2 (reduction from both member city groundwater usage and imported water supplemental water requirement, assuming groundwater savings are deducted from member city overproduction) = 30 MG/year

Step 3: Volume of hot water saved from the electric water heating system.

See attached 2008 Residential Compliance Manual included in Appendix E.

Assumption:

- 10 percent of households use electric water heaters

Total Energy Savings (See Table 1): 0.8914 MG x 10% = 0.10944 MG/Year

Step 4: Volume of hot water saved from the gas water heating system.

See attached 2008 Residential Compliance Manual included in Appendix E.

Assumption:

- 90 percent of households use electric water heaters

Total Energy Savings (See Table 3): 0.8916 MG x 90% = 0.76734 MG/Year

Step 5: Useful life of the project.

See attached National Association of Homebuilders Bank of American Home Equity Report included in Appendix F.

Life expectancies were not available for smart irrigation controllers or waterless urinals.

Life Expectancy: 9.5 years

Step 6: Percentage of water which is imported.

100% of water used within SGVMWD is imported.

Step 7: EI of the system associated with water savings.

None. Only imported water delivered through the State Water Project applies to SGVMWD's total water and energy savings.

Step 8: Enter the total water output emission rate specific to the power supplier or use the default value of 0.278.

The default value of 0.278 has been used.

Step 9: EI associated with the Supply and Conveyance of imported water.

The Pearblossom Pumping Plant is the closest upstream pumping plant to Devils Canyon, which is where water delivered through the SWP would enter into SGVMWD's Devil-Canyon Azusa pipeline. According to Table 6 of the "Water Energy Grant Program Guidelines and Proposal Solicitation Package," the EI associated with the supply and conveyance of imported water through the Pearblossom Pumping Plant would be **13,606 kWh/MG.**

Step 10: Any additional annual energy savings from energy efficiency.

ENERGY STAR washing machines and dishwashers save energy (i.e. electricity) other than the hot water saved from the water heating system. These additional electricity savings are shown in the attached Washing Machine Calculations for ENERGY STAR (Appendix A) and Dishwasher Calculations for ENERGY STAR (Appendix B), and are summarized in Table 1.

Total additional energy savings: 2,627,566 kWh/year

TABLE 1

SGVMWD
HISTORIC ANNUAL IMPORTED WATER DELIVERIES
(ACRE-FEET)

Fiscal Year	Replenishment	Replacement Water	USG-5 Exchange Replacement	Direct Deliveries	Cyclic Storage	Producer Cyclic Storage	Total Deliveries
2003-04	--	672.60	1,143.80	--	**16,815.60**	0.00	18,632.00
2004-05	--	500.66	1,121.25	--	10,840.09	0.00	12,462.00
2005-06	--	0.00	1,052.99	--	12,658.01	0.00	13,711.00
2006-07	--	573.59	1,108.29	--	15,794.12	0.00	17,476.00
2007-08	--	91.76	1,132.17	--	779.07	0.00	2,003.00
2008-09	--	788.73	1,146.29	--	4,671.98	0.00	6,607.00
2009-10	--	1,886.58	976.70	--	12,340.72	0.00	15,204.00
2010-11	--	14,655.86	908.13	--	5,211.01	0.00	20,775.00
2011-12	--	**22,426.22**	1,121.78	--	0.00	0.00	**23,548.00**
2012-13	--	16,269.22	1,135.98	--	5,138.80	0.00	22,544.00

5-Year Average 17,736

Note: The maximum values are bolded.

TABLE 2
CALCULATIONS TO DETERMINE TOTAL WATER AND ENERGY SAVINGS FOR THE SGVMWD WATER AND ENERGY CONSERVATION REBATE PROGRAM

		Water Usage					Energy Usage (Water Heater)			Energy Usage (Efficiency)			
		Base Model		Energy Star Minimum Requirement		Annual Water Savings per Unit (gal)	Base Model	Energy Star Minimum Requirement	Annual Energy Savings (WH) per Unit (kWh)	Base Model	Energy Star Minimum Requirement	Annual Energy Savings (Efficiency) per Unit (kWh)	
Device	Life Span	Water Use Per Cycle (gal)	Annual Water Use (gal)	Water Use Per Cycle (gal)	Annual Water Use (gal)		Annual Energy Use (WH) (kWh)	Annual Energy Use (WH) (kWh)		(Efficiency) per Unit (kWh)	(Efficiency) per Unit (kWh)		Number of Units[2]
Washing Machine	13	--	9,188	--	5,803	3,385	352	147	205	8,328	5,777	2,551	800
Dishwasher	13	--	1,352	--	884	468	255	214	41	4,428	3,695	733	800
Smart Irrigation Timer	8	--		--	--	8,800	--	--	--				800
Waterless Urinal [1]	13	--		--	--	9,750	--	--	--				500

Notes:

[1] Based on June 2008 Waterless Urinals Report and Evaluation. Assuming 2 urinals with 25 males working 260 days per year and 3 urinal uses per day per male replacing a 1 gallon per flush urinal

[2] Based on proposed Program budget

WH = Water Heater

Washing Machine		
Number of Units	800	Units
Annual Water Savings	3,385	gal per Unit
Annual Energy Savings	205	kWh per Unit
Annual Energy Savings (Efficiency)	2,551	kWh per Unit
Total Annual Water Savings	2,708,000	gal
	8.31	AF
Total Annual Energy Savings	164,223	kWh
Total Annual Energy Savings (Efficiency)	2,041,056	kWh

Dishwasher		
Number of Units	800	Units
Annual Water Savings	468	gal per Unit
Annual Energy Savings	41	kWh per Unit
Annual Energy Savings (Efficiency)	733	kWh per Unit
Total Annual Water Savings	374,400	gal
	1.15	AF
Total Annual Energy Savings (WH)	32,845	kWh
Total Annual Energy Savings (Efficiency)	586,510	kWh

Smart Irrigation Controller		
Number of Units	800	Units
Annual Water Savings	8,800	gal per Unit
Total Annual Water Savings	7,040,000	Gallons
	21.61	Acre-Feet
Total Annual Energy Savings	0	kWh
Annual Energy Savings (Efficiency)	0	kWh

Waterless Urinal		
Number of Units	500	Units
Annual Water Savings	9,750	gal per Unit
Total Annual Water Savings	4,875,000	gal
	14.96	Acre-Feet
Total Annual Energy Savings	0	kWh
Annual Energy Savings (Efficiency)	0	kWh

Total Annual Water Savings	14,997,400	Gallons
	46.03	Acre-Feet
Total Annual Energy Savings	197,067	kWh
Total Annual Energy Savings (Efficiency)	2,627,566	kWh

TABLE 2
CALCULATIONS TO DETERMINE TOTAL WATER AND ENERGY SAVINGS FOR THE SGVMWD WATER AND ENERGY CONSERVATION REBATE PROGRAM

Total Annual Energy Savings	197,067	kWh
Percentage of Total Water Heaters Using Natural Gas	90%	
Total Annual Energy Savings for Natural Gas Water Heaters	177,361	kWh
Conversation Factor[3]	231,136	kWh per Million Gallons (MG)
Equivalent Volume of Hot Water Saved	0.76734	MG
Percentage of Total Water Heaters Using Electricity	10%	
Total Annual Energy Savings for Electrical Water Heaters	19,707	kWh
Conversation Factor[3]	180,072	kWh per Million Gallons (MG)
Equivalent Volume of Hot Water Saved	0.10944	MG
Total Volume of Hot Water Served	0.87678	MG

Notes:
[3] From DWR Attachment 2"Estimate of Water Savings, Energy Savings, and DHD Emissions Reduction)

APPENDIX A

Clothes Washer Calculations for the ENERGY STAR Appliance Calculator

Inputs - *to edit these values go to the INPUTS tab*

	DEFAULT	USER ENTRY
Average number of loads per week	6.0	6.0
Building hot water fuel type	-	natural gas
Type of dryer	-	electric
Capacity	3.10	3.10
Modified energy factor (MEF)	2.00	2.00
Water factor (WF)	6.00	6.00
Incremental cost	$50	$50

Assumptions - *users can edit the highlighted values to modify the assumptions*

ENERGY STAR model rated unit electricity consumption		186	kWh/year
Conventional model	**Rated unit electricity consumption**	417	kWh/year
	Capacity	3.10	cubic feet
	Loads per week	6.0	
	Load configuration	Top-loading	
	Modified energy factor (MEF)	1.26	
	Water factor (WF)	9.50	

Percentage of washer loads dried in machine		50%	
Gas water heater efficiency		75%	
Annual weeks of use		52	weeks
Equipment lifetime		11	years
Portion of rated unit electricity consumption	Machine	20%	
	Water heating	80%	
Energy conversion (constant)		0.0341	therm/kWh

Residential		**Commercial**		
ENERGY STAR MEF requirement	2.0	ENERGY STAR MEF requirement		2.2
ENERGY STAR WF requirement	6.0	ENERGY STAR WF requirement		4.5
ENERGY STAR rated unit electricity consu	186	ENERGY STAR rated unit electricity consu		97
Federal standard MEF	1.26	Federal standard MEF	Front-loading	2.0
Federal standard WF	9.5		Top-loading	1.6
Conventional rated unit electricity consump	417	Federal standard WF	Front-loading	5.5
Average capacity	3.1		Top-loading	8.5
Default loads per year	295	Conventional rated unit electricity consump		241
Reference loads per year	392	Average capacity		2.8
		Default loads per year	Multifamily	1,241
			Laundromat	2,190

Calculations

	Conventional		ENERGY STAR	
Loads per year	312		312	
Adjusted rated unit electricity consumption	332		148	
Total electricity (based on electric dryer)	768		484	
	Electricity	**Gas**	**Electricity**	**Gas**
Machine energy	66	-	30	-
Water heating energy	0	12.1	0	5.4
Dryer energy	218	0.0	168	0.0
	kWh	therms	kWh	therms

Annual energy & water consumption per clothes washer system

	Conventional	ENERGY STAR	Savings	
Electricity consumption	284	197	87	kWh
Gas consumption	12	5	7	therms
Water consumption	9,188	5,803	3,385	gallons

References

Loads per year:
- Res. Default - DOE Federal Test procedure, Federal Register, 77 FR 13888
- Res. Reference - DOE Federal Test Procedure, Code of Federal Regulations, Title 10, Part 430, Subpart B, Appendix J
- Commercial - DOE Technical Support Document, 2009

Energy & water efficiency & consumption:
- ENERGY STAR - ENERGY STAR specification
- EPA research on available models, 2013
- Conventional - Residential - Federal standard, Code of Federal Regulations, Title 10, Part 430, Subpart C
  Commercial - Federal standard, Code of Federal Regulations, Title 10, Part 431, Subpart I
- EPA research on available models, 2013

Unit capacity:
- EPA research on available models, 2013

Gas water heater efficiency:
- DOE Federal Test Procedure, Code of Federal Regulations, Title 10, Part 430, Subpart B, Appendix J

Equipment lifetime:
- Appliance Magazine, Market Research Report, January 2011

Incremental cost:
- EPA research on available models, 2013

APPENDIX B

Dishwasher Calculations for the ENERGY STAR Appliance Calculator

Inputs *- to edit these values go to the INPUTS tab*

	DEFAULT	USER ENTRY
Type	-	standard
Average number of cycles per week	4.0	4.0
Building hot water fuel type	-	natural gas
Rated unit electricity consumption (kWh/year)	295	295
Rated water consumption (gallons/cycle)	4.25	4.25
Incremental cost	$10	$10

Assumptions *- users can edit the highlighted values to modify the assumptions*

Conventional model	**Rated unit electricity consumption**	355	kWh/year
	Rated water consumption	6.50	gallons/cycle

Annual weeks of use	52	
Portion of dishwasher energy used for water heating	56%	
Gas water heater efficiency	75%	
Equipment lifetime	10	years
Default cycles per year	215	
Energy conversion (constant)	0.0341	therm/kWh

Calculations

Conventional use per cycle			ENERGY STAR use per cycle		
Machine energy (kWh)	**Water heater energy (kWh)**	**Water heater energy (therm)**	**Machine energy (kWh)**	**Water heater energy (kWh)**	**Water heater energy (therm)**
0.73	0.00	0.04	0.60	0.00	0.03

Annual energy & water consumption per dishwasher

	Conventional	ENERGY STAR	Savings	
Electricity consumption	151	126	26	kWh
Gas consumption	8.7	7.3	1.5	therms
Water consumption	1,352	884	468	gallons

References

Energy & water consumption: - ENERGY STAR - ENERGY STAR specification
- Conventional - Federal standard, Code of Federal Regulations, Title 10, Part 430, Subpart C

Cycles per year: - DOE Federal Test Procedure, Code of Federal Regulations, Title 10, Part 430, Subpart B, Appendix C

Gas water heater efficiency: - DOE Federal Test Procedure, Code of Federal Regulations, Title 10, Part 430, Subpart B, Appendix C

Equipment lifetime: - Appliance Magazine, Market Research Report, January 2011

Incremental cost: - EPA research on available models, 2012

APPENDIX C

look for WaterSense Meets EPA Criteria

WaterSense® Labeled

Irrigation Controllers

Residential outdoor water use in the United States accounts for nearly 9 billion gallons of water each day, mainly for landscape irrigation. Experts estimate that as much as 50 percent of this water is wasted due to overwatering caused by inefficiencies in irrigation methods and systems. Irrigation control technologies can significantly reduce overwatering by applying water only when plants need it.

SMART WATERING

WaterSense labeled irrigation controllers, which act like a thermostat for your sprinkler system by telling it when to turn on and off, use local weather and landscape conditions to tailor watering schedules to actual conditions on the site. Instead of irrigating using a controller with a clock and a preset schedule, WaterSense labeled controllers allow watering schedules to better match plants' water needs. With proper installation, programming, and maintenance, homeowners and businesses can use WaterSense labeled controllers instead of standard clock-timer controllers on their existing systems, and no longer worry about wasted water.

WATERSENSE SAVINGS

Replacing a standard clock timer with a WaterSense labeled irrigation controller can save an average home nearly 8,800 gallons of water annually. If every home in the United States with an automatic irrigation system installed and properly operated a WaterSense labeled irrigation controller, we could save $435 million in water costs and 120 billion gallons of water across the country annually from not overwatering lawns and landscapes. That's equal to the annual household water needs of nearly 1.3 million average American homes.

WaterSense labeled irrigation controllers allow watering schedules to better match plants' needs.

LOOK FOR THE WATERSENSE LABEL!

To earn the WaterSense label, landscape irrigation controllers must be able to adequately meet the watering needs of a landscape without overwatering. As with all other WaterSense labeled products, WaterSense labeled controllers are third-party certified to ensure that they meet the WaterSense criteria for efficiency and performance. For more information or a list of WaterSense labeled products, visit www.epa.gov/watersense.

WaterSense Meets EPA Criteria

KNOW WHAT MAKES IT GROW
For more water-smart landscaping tips, please visit www.epa.gov/watersense/outdoor/landscaping_tips.html.

PHONE (866) WTR-SENS (987-7367) WEBSITE www.epa.gov/watersense EMAIL watersense@epa.gov

EPA EPA-832-F-11-001
February 2013

APPENDIX D

IEc

Waterless Urinals Report and Evaluation

June 2008

prepared for:

Massachusetts

Executive Office of Energy and Environmental Affairs

and the

Executive Office of Administrative and Finance,

Operational Services Division

prepared by:

Industrial Economics, Incorporated

2067 Massachusetts Avenue

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Brookline, MA 02445

INDUSTRIAL ECONOMICS, INCORPORATED

All new construction and major renovations undertaken by state agencies in Massachusetts must meet the Massachusetts LEED Plus green building standard.[100] Massachusetts LEED Plus requires obtaining the basic LEED certification, as well as attainment of specific LEED credits, including the incorporation of strategies that will conserve 20% of building water use (*LEED-NC Version 2.2, Water Efficiency, Credit 3.1*).[101]

BENEFITS

Environmental Benefits

Water Savings

Most of the 8 to 9 million flush urinals in the U.S. average 3.0 gpf, although the newer models use 1.0 gpf or less. Therefore, most waterless urinals save 1 to 3 gallons of water per use, depending on the model of flush urinal being replaced. Water savings by building will vary depending on use. However, in a small office building with 2 urinals and 25 males working 260 days per year, assuming 3 urinal uses per male per day, water usage can be reduced by 19,500 gallons annually by substituting waterless urinals for 1.0 gpf units. Annual water usage can be reduced by 58,500 gallons by replacing 3.0 gpf units with waterless urinals.[102] Waterless urinals also eliminate the possibility of water loss due to leaking flush valves.[103]

Other Environmental Benefits

When cities and other water supply agencies do not have to pump and treat as much water and sewage, energy use is reduced.[104] If the use of waterless urinals is scaled up, they can reduce the amount of affluent flowing to sewer systems, thereby preventing water pollution by reducing the incidence of combined sewer overflows.

Economic Benefits

According to the U.S. Army Engineer Research and Development Center, simple payback time typically ranges from ½ to 3 years for new installation and retrofit with waterless urinals.[105]

Overview: Costs and Savings

Several manufacturers' websites feature worksheets for calculating the costs, savings and payback times associated with waterless urinals. Sample worksheets can be found at http://www.waterless.com/savings.php, and http://www.zeroflush.com/savings_analysis.php. An overview of the costs and savings associated with waterless urinals is presented below. The overview is followed by sample figures for costs and savings associated with waterless urinals.

Up-Front Costs

Initial costs for waterless urinals vary depending on the price of the fixtures and the price of installation.

APPENDIX E

5 Water Heating Requirements

5.1 Overview

5.1.1 Water Heating Energy

Water heating energy use is an important end use in low-rise residential buildings. Roughly 90 percent of California households use natural gas fueled water heaters, typically storage gas units with tank volumes of 40 to 50 gallons. Standby loss associated with the center flue gas storage water heater design contributes 25-35 percent of a typical gas storage water heater system's annual energy use.

Whereas natural gas, (liquefied petroleum gas), LPG or oil can be burned directly to heat water, electricity is typically generated in a fossil fueled power plant where approximately two-thirds of the energy used to produce the electricity is lost in the generation, transmission, and distribution processes. The Standards require space conditioning and water heating systems to account for hourly usage impacts of the overall efficiency of each fuel type in the form of Time Dependent Valuation (TDV). Due to inefficiencies associated with generation and transmission, electric TDV essentially precludes the use of standard electric water heaters. Only electric heat pump water heaters, with significantly higher efficiencies than electric storage units, are closer to the efficiency of typical gas systems, even after accounting for TDV impacts.

The figure below shows the energy flows that determine water heating energy usage. On the right hand side, hot water draws at the end use points define a load pattern that is imposed on the hot water distribution system that delivers water from the heating device to the use points. The heating device must meet this recovery load minus any contribution from auxiliary heat inputs, such as a solar thermal system. Energy use for water heating encompasses all energy uses; therefore, considerations of issues such as standby losses from the water heater or supplemental storage pump energy for recirculation systems, or impacts from supplemental heating must be considered in selecting a water heater that will comply.

APPENDIX F

National Association of Home Builders /
Bank of America Home Equity

STUDY OF

FEBRUARY 2007

Table 1: Life Expectancy of Different Products/Items/Materials in the Home

	Life in Years	Comments
1. APPLIANCES		
Exhaust Fan	10	
Compactors	6	
Dishwashers	9	
Disposers, Food Waste	12	
Dryers, Electric	13	
Dryers, Gas	13	
Freezers	11	
Microwave Ovens	9	
Ranges, Electric	13	
Ranges, Gas	15	
Range/Oven Hoods	14	
Refrigerators, Compact	9	
Refrigerators, Standard	13	
Washers	10	
Water Heaters, Electric	11	
Water Heaters, Gas	10	
Air-Conditioners, Room	10	
Air-Conditioners, Unitary	15	
Boilers, Electric	13	
Boilers, Gas	21	
Dehumidifiers	8	
Furnaces, Warm-Air, Electric	15	
Furnaces, Warm-Air, Gas	18	
Furnaces, Warm-Air, Oil	20	
Heat Pumps	16	
Humidifiers	8	
Note: Life expectancy is based on first-owner use.		
Source: Appliance Magazine, Sep 2005 issue, Grainger		
2. CABINETRY & STORAGE		
Cabinet Lines		
Bath Cabinets	Lifetime	
Entertainment Centers/Home Office	10	
Garage/Laundry Cabinets	100+	
Kitchen Cabinets	50	
Medicine Cabinets	20+	
Manufacturing Types		
Modular/Stock	50	
Closet systems		
Closet Shelves	Lifetime	
Source: Wellborn Cabinet, Zaca, Timberlake Cabinet Co., Wellborn Cabinet, Moduline, Canyon Creek Cabinet Co., Easyclosets.com, Wellborn Cabinet		