

Appendix B

CONSERVATION INFORMATION

This Appendix provides background information that supplements the information in Section 8, Options for Increased Conservation. This Appendix contains the following information:

- Estimated Extent of Regional Conservation Activities
- Range of Peak Day Demand Projections for Scenarios 1–4
- Descriptions of Conservation Measures
- Estimates of Water Savings and Costs for Scenarios 2, 3, and 4
- Representative Measures Illustrating Scenarios 2, 3, and 4

Estimated Extent of Regional Conservation Activities

This section provides general estimates of current (as of 2000) conservation activities being implemented by large and small utilities in King, Pierce and Snohomish Counties. The purpose is to provide context for the conservation scenarios developed in the Outlook.

Estimated Extent of Regional Conservation Activities (Based on Regional Conservation Plans, and Work Group Experience)

A) Residential Measures

Estimated Penetration of Target Population, by Utility Size ⁽¹⁾							
Utility Measures & Practices		King County		Pierce County		Snohomish County	
		Small ²	Med/Large ³	Small ²	Med/Large ³	Small ²	Med/Large ³
INDOOR	Low-flow showerheads ⁴	10%	70%	30%	70%	50%	50%
	Faucet aerators ⁴	10%	70%	30%	70%	50%	50%
	Low-flow faucets	0%	0%	0%	0%	0%	0%
	Decrease "run until hot" use	0%	0%	0%	0%	0%	0%
	Redesigned toilet flappers	0%	0%	0%	0%	0%	0%
	Toilet tank displacement devices	5%	15%	0%	10%	2%	10%
	Low-volume toilets ⁴	5%	5%	20%	15%	5%	5%
	Toilet fill-cycle diverters	2%	10%	0%	50%	0%	0%
	Efficient clothes-washers	2%	10%	0%	10%	5%	5%
	Efficient dishwashers	0%	0%	0%	0%	0%	0%
	Leak detection and repair	0%	5%	0%	5%	2%	5%
OUTDOOR	Landscape audits	0%	1%	0%	0%	0%	0%
	Irrigation system improvements	2%	10%	0%	1%	0%	0%
	Improved irrigation scheduling	2%	10%	0%	2%	0%	0%
	Soil moisture sensors	0%	0%	0%	0%	0%	0%
	Efficient landscaping practices	2%	10%	0%	5%	2%	2%
	Improved soil amendments	0%	0%	0%	5%	0%	0%
	Automatic rain shut-off devices	0%	0%	0%	10%	0%	0%
	Low-volume irrigation systems	1%	5%	0%	5%	2%	2%
	Improved swimming pool use	0%	0%	0%	0%	0%	0%
	Improved hot tub use	0%	0%	0%	0%	0%	0%
OTHER	Multifamily submetering	0%	0%	0%	0%	0%	0%
	Conservation rates	10%	75%	0%	70%	50%	50%
	Conservation ordinances	10%	75%	0%	5%	50%	50%

¹ Percentages represent an estimate of the target population that has already received each measure. Information on the intensity or adequacy of implementation has not been compiled.

² Systems with less than 1,000 connections implementing the measure (approximately 5% of the regional population is served by these water systems [note that approximately another 5% of the regional population is served by household wells instead of water systems]).

³ Systems with more than 1,000 connections implementing the measure (approximately 90% of the regional population is served by these water systems).

⁴ Includes code-related savings.

B) Non-Residential Measures

Estimated Penetration of Target Population, by Utility Size ⁽¹⁾							
Utility Measures & Practices		King County		Pierce County		Snohomish County	
		Small ²	Med/Large ³	Small ²	Med/Large ³	Small ²	Med/Large ³
INDOOR	Low-flow showerheads ⁴	10%	50%	30%	30%	10%	10%
	Faucet aerators ⁴	10%	50%	20%	30%	10%	10%
	Low-flow faucets	0%	0%	0%	0%	0%	0%
	Decrease "run until hot" use	0%	0%	0%	0%	0%	0%
	Redesigned toilet flappers	0%	0%	0%	0%	0%	0%
	Toilet tank displacement devices	5%	5%	0%	0%	0%	0%
	Low-volume toilets and urinals ⁴	5%	10%	20%	20%	5%	10%
	Toilet fill-cycle diverters	0%	5%	0%	1%	0%	0%
	Efficient clothes washers	0%	5%	0%	2%	0%	0%
	Efficient dishwashers	0%	0%	0%	0%	0%	0%
	Leak detection & repair	0%	5%	0%	2%	0%	0%
	Improved kitchen water use	0%	5%	0%	0%	0%	0%
	Improved cooling systems	0%	5%	0%	5%	0%	0%
	Improved process-water controls	0%	2%	0%	5%	0%	0%
	Improved boiler performance	0%	5%	0%	5%	0%	0%
OUTDOOR	Landscape audits	0%	2%	0%	5%	0%	0%
	Irrigation system improvements	0%	5%	0%	5%	0%	0%
	Improved irrigation scheduling	1%	5%	0%	20%	0%	0%
	Soil moisture sensors	0%	0%	0%	0%	0%	0%
	Automatic rain shut-off devices	0%	0%	0%	15%	0%	0%
	Weather-based irrigation controls	0%	2%	0%	10%	0%	0%
	Low-volume irrigation systems	0%	2%	0%	5%	0%	0%
	Efficient landscaping practices	0%	5%	0%	5%	0%	0%
	Improved soil amendments	0%	0%	0%	5%	0%	0%
	Improved swimming pool use	0%	0%	0%	0%	0%	0%
	Improved hot tub use	0%	0%	0%	0%	0%	0%
	Efficient sidewalk cleaning	0%	2%	0%	0%	0%	0%
	Efficient car washing	0%	0%	0%	0%	0%	0%
OTHER	Pressure-reducing valves	0%	0%	0%	0%	0%	0%
	Conservation rates	10%	75%	20%	30%	50%	50%
	Conservation ordinances	10%	75%	0%	10%	50%	50%

¹ Percentages represent an estimate of the target population that has already received each measure. Information on the intensity or adequacy of implementation has not been compiled.

² Systems with less than 1,000 connections implementing the measure (approximately 5% of the regional population is served by these water systems [note that approximately another 5% of the regional population is served by household wells instead of water systems]).

³ Systems with more than 1,000 connections implementing the measure (approximately 90% of the regional population is served by these water systems).

⁴ Includes code-related savings.

C) Water System Measures

Estimated Extent of Activity, by Utility Size ⁽¹⁾						
Utility Practices	King County		Pierce County		Snohomish County	
	Small ²	Med/Large ³	Small ²	Med/Large ³	Small ²	Med/Large ³
Leak detection and repair	25%	75%	0%	100%	100%	100%
Comprehensive metering	50%	100%	50%	80%	100%	75%
System flushing optimization	25%	75%	0%	80%	25%	75%
Pressure management	0%	0%	50%	50%	25%	50%
Meter testing & replacement	25%	75%	20%	80%	25%	75%
Utility bill improvements	25%	75%	10%	80%	25%	75%
Conservation planning	75%	100%	0%	100%	75%	100%
Water demand forecasting	75%	100%	100%	100%	75%	100%
Data Collection	75%	100%	50%	100%	75%	100%
Water use studies	10%	50%	0%	50%	10%	50%

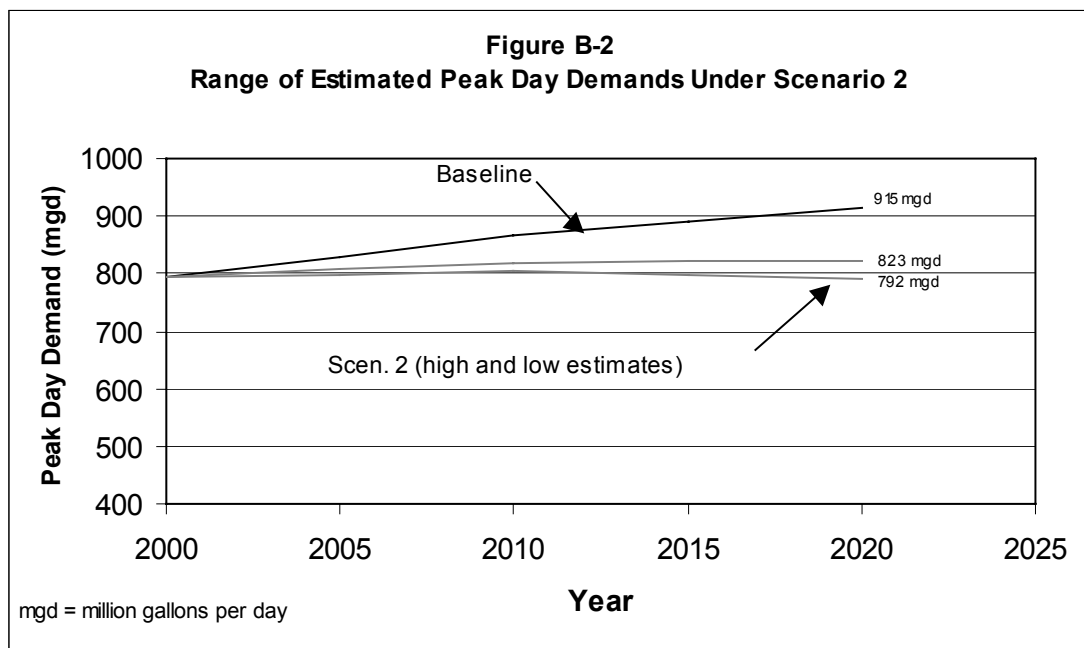
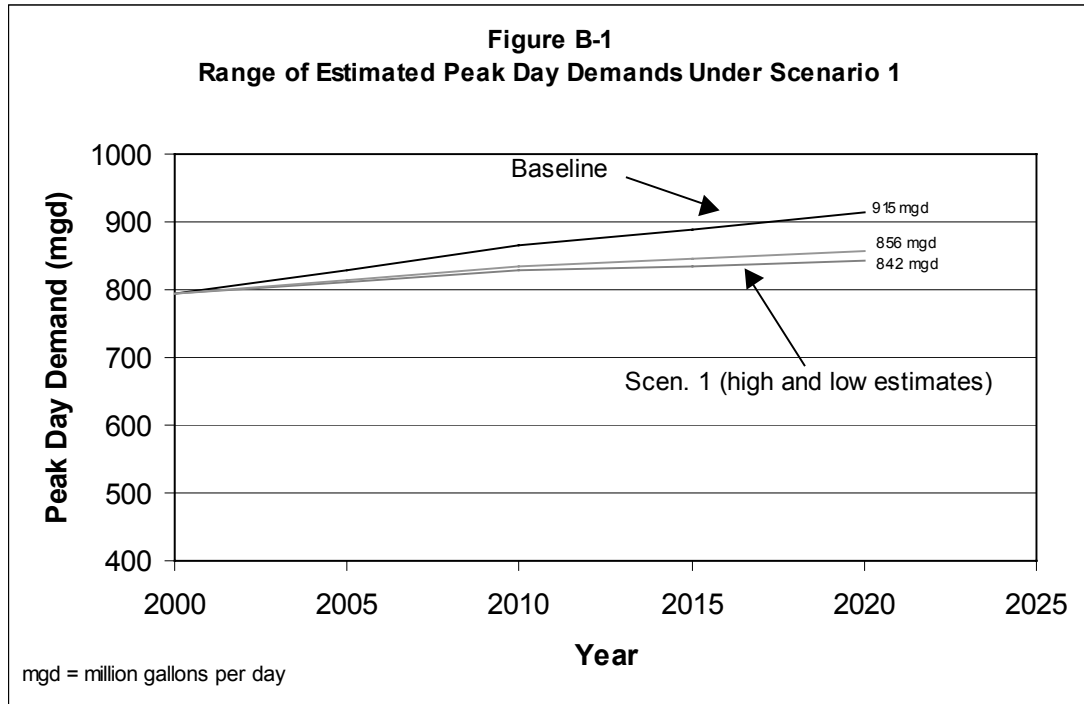
¹ Percentages represent an estimate of the percentage of water utilities implementing each measure. Information on the intensity or adequacy of these efforts has not been compiled.

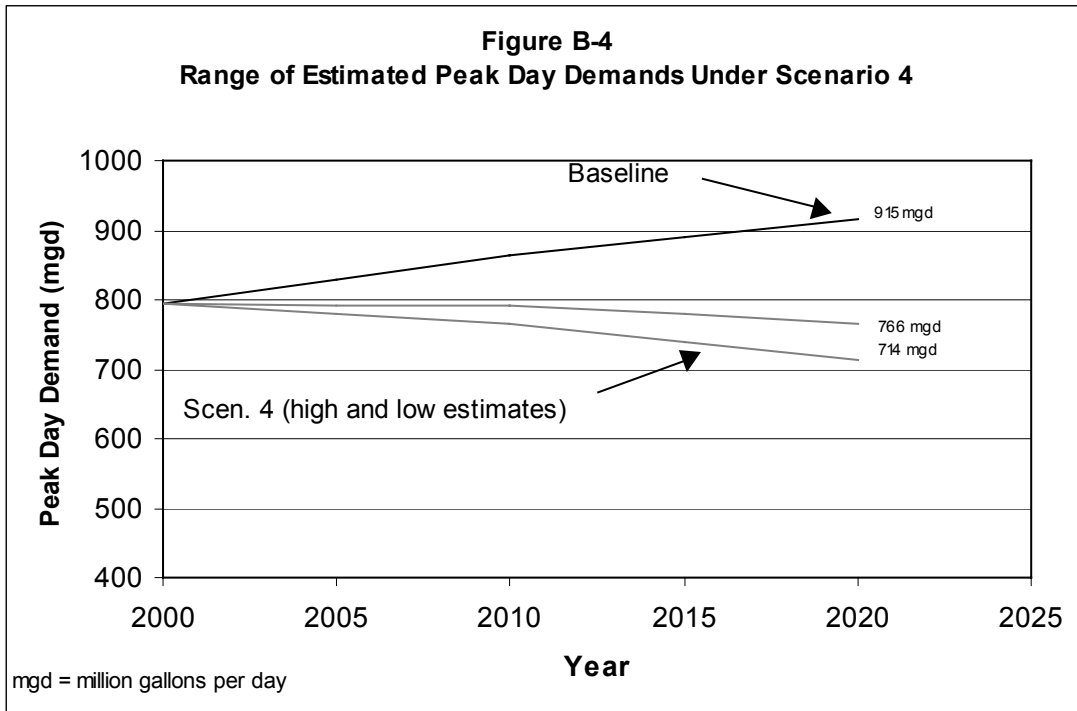
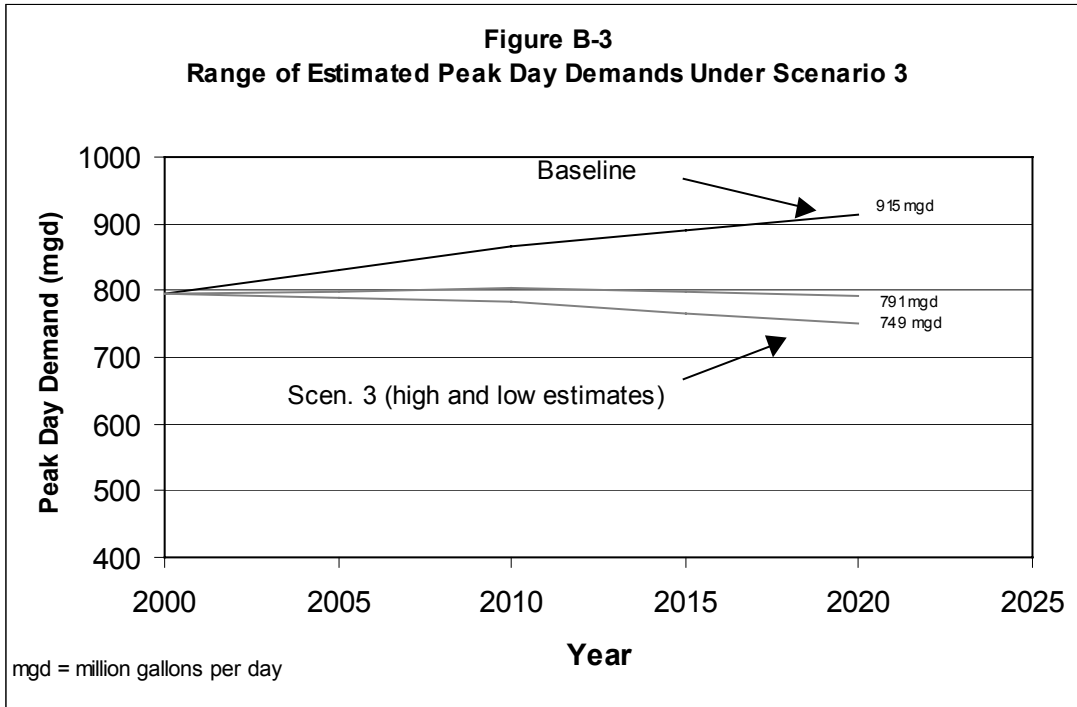
² Systems with less than 1,000 connections implementing the measure (approximately 5% of the regional population is served by these water systems [note that approximately another 5% of the regional population is served by household wells instead of water systems]).

³ Systems with more than 1,000 connections implementing the measure (approximately 90% of the regional population is served by these water systems).

Range of Peak Day Demand Projections for Scenarios 1–4

As explained in the text of Section 8, a range of estimates was developed for peak day demand, under each conservation scenario. This section displays the respective ranges, corresponding to the maximum day water savings presented in Table 8-1.





Measure Descriptions

Residential Indoor

Low-Flow Showerheads

Description: Distribute low-flow showerheads to reduce shower consumption. Accelerates savings that would occur from plumbing code.

Targeted Group: Residential accounts with older (pre-1993) showerheads.

Faucet Aerators

Description: Distribute faucet aerators to reduce flows from faucets in kitchen and bathroom sinks.

Targeted Group: Residential accounts with older (pre-1993) faucets.

Decrease “Run Until Hot” Use

Description: Install plumbing system with re-circulating pump or on-demand close proximity water heater system to provide “instant hot” water to tap in new construction and plumbing remodel accounts.

Targeted Group: New construction and plumbing remodel accounts.

Leak Detection and Toilet Flapper Repair

Description: Install redesigned, longer life toilet flappers in leaking toilets.

Targeted Group: Residential accounts with toilet flapper leaks.

Toilet Tank Displacement Devices

Description: Distribute displacement devices that reduce quantity of water used in flushing.

Targeted Group: Residential accounts with older (pre-1993) toilets. Alternative to installing low-flow toilets.

Low-Volume Toilets

Description: Install 1.6 gallon per flush toilets to replace high flush toilets.

Targeted Group: Residential accounts with 3.5 gallon per flush toilets or higher.

Toilet Fill Cycle Diverters

Description: Install fill cycle diverters in 3.5 gallon per flush or higher toilets.

Target Group: Residential accounts with 3.5 gallon per flush or higher toilets.

Dual Flush Toilets

Description: Install dual-flush toilets that use one gallon of water to dispose of liquids, and 1.6 gallons for solids.

Targeted Group: Residential accounts with 3.5 gallons per flush or higher toilets.

Efficient Clothes Washers

Description: Install new water efficient clothes washers in households with conventional washers.

Targeted Group: Households with clothes washers.

Efficient Dish Washers

Description: Install new water efficient dishwashers in households with conventional washers.

Target Group: Households with clothes washers.

Decreased Faucet Use

Description: Reduce minutes of faucet run time.

Targeted Group: Households

Decreased Shower Use

Description: Reduce showering minutes per person.

Target Group: Households

Eliminate Partial Clothes Washer Loads

Description: Reduce the number of clothes washer loads by eliminating partial loads.

Target Group: Households with clothes washers.

Eliminate Partial Dish Loads

Description: Reduce the number of dishwasher loads by eliminating partial loads.

Target Group: Households with dishwashers.

Stormwater for Toilet Flushes

Description: Install a stormwater collection and distribution system for toilet flushing for new construction.

Targeted Group: New construction residential accounts.

Decrease Toilet Flushes

Description: Reduce the number of toilet flushes per person.

Targeted Group: Households

Residential Outdoor

Irrigation System Improvements

Description: Improve the efficiency of existing irrigation systems through repair, removal, replacement, or adjustment of in-ground sprinkler system components.

Targeted Group: Residential accounts with manual and automatic irrigation systems.

Improved Irrigation Scheduling

Description: Improve the efficiency of existing irrigation systems through better irrigation scheduling.

Targeted Group: Residential accounts with manual and automatic irrigation systems.

Soil Moisture Sensors

Description: Install soil moisture sensors for automatic irrigation systems.

Targeted Group: Residential accounts with automatic in-ground irrigation systems.

Efficient Landscaping Practices

Description: Replace 300 sq ft of lawn with plants having low water use requirements in new construction and remodeled landscapes.

Targeted Group: New construction and remodeled landscapes.

Improved Soil Amendments

Description: Improve soil amendments, adding material such as compost, to new construction and remodeled landscapes.

Targeted Group: New construction and remodeled landscapes.

Automatic Rain Shut Off Devices

Description: Install automatic rain shut-off devices for automatic irrigation systems.

Targeted Group: Residential accounts with automatic in-ground irrigation systems.

Low-Volume Irrigation Systems

Description: Install drip/bubbler irrigation systems for new construction and remodeled landscapes that would have relied on in-ground sprinkler systems.

Targeted Group: New construction and remodeled landscapes.

Improved Swimming Pool Use

Description: Reduce the number of drains and fills of pools by better water quality control.

Target Group: Residential accounts with swimming pools.

Improved Hot Tub Use

Description: Reduce the number of drains and fills of hot tubs through better water quality control.

Target Group: Residential accounts with hot tubs.

Switch to Recirculating Car Wash

Description: Reduce the water used for car washing by switching from home to recirculating commercial washes.

Targeted Group: Households washing cars at home.

Dry Sidewalk Cleaning

Description: Reduce sidewalk and drive cleaning with water by switching to sweeping.

Target Group: Residential accounts using water to clean sidewalks.

50-Gallon Rain Barrel Catchment

Description: Install 50-gallon irrigation barrels and systems to gutter downspouts to collect rainwater for irrigation systems.

Targeted Group: Single-family accounts with irrigated landscaping.

1,000 Gallon Cistern Catchment

Description: Install 1,000 gallon cisterns to harvest rainwater from single-family home rooftops.

Targeted Group: New single-family houses, with irrigated ornamental landscaping and or gardens.

Improve Maintenance of Turf

Description: Improve turf maintenance through actions such as: thatching, aerating, over-seeding, and top-dressing.

Targeted Group: Residential accounts with irrigated lawn.

Improve Mulching

Description: Install mulch materials in ornamental gardens.

Targeted Group: Residential accounts with ornamental gardens.

Greywater for Irrigation – New Housing

Description: Install a greywater collection and distribution system for 400 sq ft of landscape irrigation for new construction.

Targeted Group: Single-family new construction accounts with landscaping.

Greywater for Irrigation – Existing Housing

Description: Install a greywater collection and distribution system for 400 sq. ft. of landscape irrigation for existing construction.

Targeted Group: Single-family existing accounts with landscaping.

Allow Lawn to go Dormant

Description: Reducing irrigation to minimal requirements allowing lawns to go naturally dormant.

Targeted Group: Residential accounts with irrigated lawns.

Non-Residential Indoor

Faucet Aerators

Description: Distribute faucet aerators to reduce flows from faucets in kitchen and bathroom sinks.

Targeted Group: Non-residential accounts with older (pre-1993) faucets.

Low-Flow Faucets

Description: Distribute low-flow faucets to reduce flows from faucets in kitchens and bathrooms. Accelerates savings that would occur from plumbing code. Alternative to faucet aerators.

Targeted Group: Non-residential accounts with older (pre-1993) faucets.

Decrease “Run Until Hot” Use

Description: Install plumbing system with re-circulating pump or on-demand close proximity water heater system to provide “instant hot” water to tap in new construction and plumbing remodel accounts.

Targeted Group: Non-residential new construction and plumbing remodel accounts.

Leak Detection and Toilet Flapper Repair

Description: Install redesigned, long life toilet flappers in leaking tank-type toilets.

Targeted Group: Non-residential accounts with tank-type toilet flapper leaks.

Toilet Tank Displacement Devices

Description: Distribute displacement devices that reduce quantity of water used in flushing.

Targeted Group: Non-residential accounts with older (pre-1993) toilets. Alternative to installing low-flow toilets.

Low-Volume Toilets and Urinals

Description: Install 1.6 gallon per flush toilets to replace high flush toilets and 1.0 gallon per flush urinals to replace high flush urinals.

Targeted Group: Non-residential accounts with 3.5 gallon per flush toilets or higher and non-residential accounts with high flush urinals.

Toilet Fill Recycle Diverters

Description: Install fill cycle diverters in tank type 3.5 gallon per flush or higher toilets.

Targeted Group: Non-residential accounts with tank type 3.5 gallon per flush or higher toilets.

Dual Flush Toilets

Description: Install dual-flush toilets that use one gallon of water to dispose of liquids, and 1.6 gallons for solids.

Targeted Group: Non-residential accounts with 3.5 gallons per flush or higher toilets.

Efficient Clothes Washing

Description: Replacing small commercial capacity clothes washers with high efficiency machines in accounts averaging 10 or more loads per day per machine.

Target Group: Non-residential accounts with small capacity clothes washer use.

Efficient Dishwashers

Description: Install high efficiency dishwashers in accounts providing restaurant or cafeteria food services.

Targeted Group: Non-residential accounts with dishwashing uses.

Leak Detection and Repair

Description: Reduce leaks for all types of equipment and end-uses in non-residential accounts with largest leaks.

Targeted Group: Non-residential accounts with the largest leaks.

Improved Kitchen Water Use

Description: Decrease water used to rinse, wash, and prepare food items.

Targeted Group: Non-residential accounts with food preparation uses.

Improved Cooling Systems

Description: Improve efficiency of largest accounts' HVAC and equipment cooling towers by improving water treatment and increasing cooling tower cycles.

Targeted Group: The largest non-residential accounts with cooling tower uses.

Improved Process-Water Controls

Description: Decrease process water use by improving control of process water used in manufacturing, rinsing, washing, film processing, laboratories, pollution control, and other process uses.

Targeted Group: The largest non-residential accounts with process uses.

Improved Boiler Performance

Description: Increase efficiency of largest accounts' steam boilers through improved water quality control and increasing boiler cycles.

Targeted Group: The largest non-residential accounts with steam boiler uses.

Install Waterless Urinals

Description: Install waterless urinals to replace high flush urinals.

Targeted Group: Non-residential accounts with high flush urinals.

Stormwater for Toilet and Urinal Flushes

Description: Install a stormwater collection and distribution system for toilet and urinal flushing for large scale new construction.

Targeted Group: Largest new construction non-residential accounts.

Non-Residential Outdoor

Irrigation System Improvements

Description: Improve the efficiency of existing irrigation system through repair, removal, replacement, or adjustment of in-ground sprinkler system components.

Targeted Group: Non-residential accounts with manual and automatic irrigation systems.

Improved Irrigation Scheduling

Description: Improve the efficiency of existing irrigation system through better irrigation scheduling.

Targeted Group: Non-residential accounts with manual and automatic irrigation systems.

Soil Moisture Sensors

Description: Install soil moisture sensors for automatic irrigation systems.

Targeted Group: Non-residential accounts with automatic in-ground irrigation systems.

Automatic Rain Shut-Off Devices

Description: Install automatic rain shut-off devices for automatic irrigation systems.

Targeted Group: Non-residential accounts with automatic in-ground irrigation systems.

Weather-Based Irrigation Controls

Description: Convert largest accounts with automatic irrigation systems to centrally controlled system that will adjust schedules based upon current weather conditions and plant requirements.

Targeted Group: The largest non-residential accounts with automatic in-ground irrigation systems.

Low-Volume Irrigation Systems

Description: Install drip/bubbler irrigation systems for new construction and remodeled landscapes that would have relied on in-ground sprinkler systems for 1,000 sq ft of landscaping.

Targeted Group: Non-residential new construction and remodeled landscapes.

Efficient Landscaping Practices

Description: Replace 200 sq ft of lawn with plants having low water use requirements in new construction and remodeled landscapes.

Targeted Group: Non-residential new construction and remodeled landscapes.

Improved Soil Amendments

Description: Improve soil amendments, adding material such as compost, to new construction and remodeled landscapes.

Targeted Group: Non-residential new construction and remodeled landscapes.

Improved Swimming Pool Use

Description: Reduce the number of drains and fills of pools by better water quality control.

Targeted Group: Non-residential accounts with swimming pools.

Improved Hot Tub Use

Description: Reduce the number of drains and fills of hot tubs through better water quality control.

Targeted Group: Non-residential accounts with hot tubs.

Efficient Sidewalk Cleaning

Description: Reduce sidewalk and drive cleaning with water by switching to sweeping one-half the time.

Targeted Group: Non-residential accounts using water to clean sidewalks.

Efficient Car Washing

Description: Reduce hose car washing by changing to portable, high-pressure, low-flow equipment.

Targeted Group: Largest non-residential accounts with hose car washing.

Improve Maintenance of Turf

Description: Improve turf maintenance through actions such as: thatching, aerating, over-seeding, and top-dressing.

Targeted Group: Non-residential accounts with irrigated lawn.

Stormwater for Irrigation

Description: Install a stormwater collection and distribution system for 1,000 sq ft of landscape irrigation for large scale new construction where stormwater detention is required.

Targeted Group: Non-residential new construction accounts with landscaping.

Eliminate Single-Pass Decorative Water Features

Description: Install re-circulating equipment on single-pass decorative water features.

Targeted Group: Non-residential accounts with single-pass decorative water features.

Improve Recycle Water for Vehicle Washes

Description: Improved control of recycle water use for vehicle washing in largest accounts already using recycling for vehicle washing.

Targeted Group: The largest non-residential accounts with vehicle washing use.

Source, Transmission and Distribution Efficiencies

Reduce Leakage from Mains

Description: Expand leak detection and repair activities related to water system distribution mains.

Targeted Group: Systems in top 50% of water systems in terms of main leakage (e.g. gallons per capita, gallons per mile of main, etc.).

Reduce Main Flushing

Description: Adjust main flushing schedules/protocols and or add main loops to reduce need for flushing to achieve water quality objectives.

Targeted Group: Systems in top 50% of water systems in terms of main flushing per unit.

Reduce Non-fire, hydrant usage

Description: Adjust policies, protocols and billing practices related to non-fire uses of water from hydrants (e.g. hydro-seeding, construction, street cleaning, etc.)

Targeted Group: Systems in top 50% of water systems in terms of non-fire hydrant uses per unit.

Reservoir Facilities/Practices

Description: Adjust reservoir-management practices to reduce losses.

Targeted Group: Systems in top 50% in terms of potential reductions in reservoir losses.

Additional System Efficiencies

Description: Additional system-specific practices and facilities that can improve efficiencies.

Targeted Group: All water systems.

Estimates of Water Savings and Costs

The following table summarizes the information used in calculations to estimate potential water savings associated with Scenarios 2, 3, and 4 (Scenario 1 values were estimated separately, using information provided by utilities as described in the text). All costs and water savings shown are based on an assumed participation rate of 66% (note that development of Scenario 4 required an adjustment in this participation rate to 77%. See text and tables). Explanatory footnotes for the table appear on the last page of the table.

Estimated Water Savings and Costs for Identified Conservation Actions

Category	Measure	Target Group ⁽¹⁾	Affects Existing Consumers vs. Future Consumers	Estimate of Regional Target Households or Employees	Target as Percent of Total households or employees in Region	Participation Rate (% of Target that Participates) ⁽²⁾	Total Participating Households or employees	Savings (gpd) per participating household or employee in season measure is effective	Year-round Savings (mgd)	Peak Season Savings (mgd)	Average cost (\$\$/1000 gal.), year round savings ⁽³⁾	Average cost (\$\$/1000 gal), peak season savings ⁽³⁾	Cost per Year (\$M) ⁽³⁾
RESIDENTIAL INDOOR	Low-flow showerheads ^(a)	SF and MF households w/old fixtures	E	412,712	27%	66%	272,390	16.0	4.36	4.36	0.25	0.74	0.40
	Faucet aerators ^(a)	SF and MF households w/old fixtures	E	412,712	27%	66%	272,390	9.0	2.45	2.45	0.31	0.94	0.28
	Decrease "run until hot" use ^(b)	SF and MF households - new construction	F	429,024	28%	66%	283,156	4.0	1.13	1.13	17.33	51.84	7.16
	Leak detection and toilet flapper repair ^(b)	SF and MF households w/ flapper leaks	E/F	774,696	50%	66%	511,299	9.0	4.60	4.60	0.31	0.93	0.52
	Toilet tank displacement devices ^(c)	SF and MF households w/old fixtures	E	409,891	26%	66%	270,528	4.4	1.19	1.19	0.52	1.55	0.23
	Low-volume toilets ^(b)	SF and MF households w/old fixtures	E	409,891	26%	66%	270,528	22.0	5.95	5.95	0.79	2.36	1.71
	Toilet fill-cycle diverters ^(b)	SF and MF households	E	409,889	26%	66%	270,527	2.2	0.58	0.58	0.98	2.93	0.21
	Dual Flush Toilets ^(d)	SF and MF households w/old fixtures	E	409,891	26%	66%	270,528	29.3	7.92	7.92	0.59	1.77	1.71
	Efficient clothes washers ^(b)	SF and MF households - w/ clothes washers	E/F	934,245	60%	66%	616,602	17.0	10.48	10.48	1.26	3.76	4.81
	Efficient dishwashers ^(b)	SF and MF households - w/ dishwashers	E/F	1,087,425	70%	66%	717,700	1.0	0.72	0.72	28.21	84.40	7.39
	Decreased faucet use ^(b)	SF and MF households	E/F	1,549,396	100%	66%	1,022,601	5.3	5.39	5.39	0.15	0.46	0.30
	Decreased shower use ^(b)	SF and MF households	E/F	1,549,396	100%	66%	1,022,601	7.3	7.49	7.49	0.11	0.33	0.30
	Eliminate partial clothes washer loads ^(b)	SF and MF households-w/clothes washers	E/F	983,416	63%	66%	649,055	3.7	2.41	2.41	0.22	0.65	0.19
	Eliminate partial dish loads ^(b)	SF and MF households-w/dishwashers	E/F	1,087,425	70%	66%	717,700	0.5	0.36	0.36	1.63	4.87	0.21
	Stormwater for toilet flushes ^(b)	SF and MF New Construction		76,285	5%	66%	50,348	15.0	0.76	0.76	13.71	41.03	3.79
	Decrease toilet flushes ^(b)	SF and MF households	E/F	1,549,396	100%	66%	1,022,601	4.3	4.38	4.38	0.19	0.57	0.30

Estimated Water Savings and Costs for Identified Conservation Actions (cont)

Category	Measure	Target Group ⁽¹⁾	Affects Existing Consumers vs. Future Consumers	Estimate of Regional Target Households or Employees	Target as Percent of Total households or employees in Region	Participation Rate (% of Target that Participates) ⁽²⁾	Total Participating Households or employees	Savings (gpd) per participating household or employee in season measure is effective	Year-round Savings (mgd)	Peak Season Savings (mgd)	Average cost (\$\$/1000 gal.), year round savings ⁽³⁾	Average cost (\$\$/1000 gal), peak season savings ⁽³⁾	Cost per Year (\$M) ⁽³⁾
RESIDENTIAL OUTDOOR	Irrigation system improvements ^(b)	SF/MF with in-ground systems	E/F	251,757	16%	66%	166,160	45.6	2.53	7.58	1.77	1.77	1.63
	Improved irrigation scheduling ^(b)	SF/MF with in-ground systems	E/F	251,757	16%	66%	166,160	28.8	1.60	4.79	0.49	0.49	0.28
	Soil moisture sensors ^(b)	SF/MF with automatic in-ground systems	E/F	168,544	11%	66%	111,239	40.8	1.52	4.54	1.60	1.60	0.88
	Efficient landscaping practices ^(b)	SF and MF households - new construction	F	66,714	4%	66%	44,031	12.0	0.18	0.53	1.17	1.17	0.08
	Improved soil amendments ^(b)	SF and MF households new construction	F	96,867	6%	66%	63,932	6.0	0.13	0.38	4.04	4.04	0.19
	Automatic rain shut-off devices ^(b)	SF/MF with automatic in-ground systems	E/F	168,539	11%	66%	111,236	12.0	0.45	1.33	2.02	2.02	0.33
	Low-volume irrigation systems ^(b)	SF and MF households - new construction	F	64,666	4%	66%	42,680	10.8	0.15	0.46	7.94	7.94	0.45
	Improved swimming pool use ^(b)	SF/MF with pools	E/F	39,515	3%	66%	26,080	17.0	0.15	0.44	0.14	0.14	0.01
	Improved hot tub use ^(b)	SF/MF with hot tubs	E/F	94,877	6%	66%	62,618	3.0	0.06	0.19	0.81	0.81	0.02
	Switch to recirculating car wash ^(b)	SF/MF engaging in home car-washing	E/F	764,835	49%	66%	504,791	3.6	0.61	1.82	0.67	0.67	0.15
	Dry sidewalk cleaning ^(b)	SF/MF cleaning sidewalks with water	E/F	264,278	17%	66%	174,424	2.6	0.15	0.45	0.94	0.94	0.05
	50-gal. Rain Barrel Catchment ^(b)	SF with irrigated landscaping	E/F	719,962	46%	66%	475,175	2.0	0.32	0.95	12.17	12.17	1.40
	1000-gal. Cistern Catchment ^(c)	SF with irrigated landscaping - new construction	F	64,666	4%	66%	42,680	39.8	0.57	1.70	2.57	2.57	0.53
	Improve maintenance of turf ^(b)	SF/MF that currently irrigate turf	E/F	278,781	18%	66%	183,995	3.2	0.20	0.59	25.34	25.34	1.81
	Improve mulching ^(b)	SF/MF with ornamental landscaping	E/F	359,979	23%	66%	237,586	4.1	0.32	0.97	7.19	7.19	0.85
	Greywater for irrigation - new housing ^(b)	SF new construction	F	202,265	13%	66%	133,495	19.3	0.86	2.58	42.62	42.62	13.41
	Greywater for irrigation - existing housing ^(c)	SF existing housing	E	741,613	48%	66%	489,465	19.3	3.16	9.46	213.10	213.10	245.85
Allow lawn to go dormant ^(b)	SF/MF that currently irrigate turf	E/F	554,482	36%	66%	365,958	28.4	3.47	10.39	0.13	0.13	0.17	

Estimated Water Savings and Costs for Identified Conservation Actions (cont)

Category	Measure	Target Group ⁽¹⁾	Affects Existing Consumers vs. Future Consumers	Estimate of Regional Target Households or Employees	Target as Percent of Total households or employees in Region	Participation Rate (% of Target that Participates) ⁽²⁾	Total Participating Households or employees	Savings (gpd) per participating household or employee in season measure is effective	Year-round Savings (mgd)	Peak Season Savings (mgd)	Average cost (\$\$/1000 gal.), year round savings ⁽³⁾	Average cost (\$\$/1000 gal), peak season savings ⁽³⁾	Cost per Year (\$M) ⁽³⁾
NON-RESIDENTIAL INDOOR	Faucet aerators ^(a)	All commercial, institutional, industrial	E	1,086,510	49%	66%	717,097	1.4	1.00	1.00	0.12	0.35	0.04
	Low-flow faucets ^(a)	All commercial, institutional, industrial	E	1,086,510	49%	66%	717,097	1.4	1.00	1.00	1.17	3.51	0.43
	Decrease "run until hot" use ^(b)	Commercial, instit'l, industrial - new constr.	F	579,162	26%	66%	382,247	1.0	0.38	0.38	6.33	18.93	0.88
	Leak detection and toilet flapper repair ^(b)	All commercial & institutional w/tank toilets	E/F	546,507	25%	66%	360,695	0.2	0.06	0.06	3.40	10.16	0.08
	Toilet tank displacement devices ^(c)	All commercial & institutional w/tank toilets	E	514,180	23%	66%	339,359	1.2	0.41	0.41	0.04	0.12	0.01
	Low-volume toilets & urinals ^(b)	All commercial & institutional	E	514,180	23%	66%	339,359	6.0	2.04	2.04	0.41	1.23	0.31
	Toilet fill-cycle diverters ^(b)	All commercial & institutional	E	255,572	12%	66%	168,677	0.6	0.09	0.09	1.00	2.98	0.03
	Dual Flush Toilets ^(d)	All commercial & institutional	E	541,228	25%	66%	357,211	6.3	2.24	2.24	0.28	0.83	0.23
	Efficient clotheswashing ^(b)	Institutional & Laundromats	E/F	26,392	1%	66%	17,418	74.0	1.29	1.29	0.70	2.09	0.33
	Efficient dishwashers ^(b)	Restaurants & institutional w/ dishwashers	E/F	308,349	14%	66%	203,510	3.0	0.61	0.61	3.86	11.56	0.86
	Leak detection & repair ^(b)	Commercial, institutional, industrial w/ large leaks	E/F	34,989	2%	66%	23,093	12.0	0.28	0.28	0.85	2.55	0.09
	Improved kitchen water use ^(b)	Restaurants & institutional	E/F	1,233,270	56%	66%	813,958	1.0	0.81	0.81	1.95	5.84	0.58
	Improved cooling systems ^(b)	Large commercial, institutional	E/F	573,875	26%	66%	378,757	21.0	7.95	7.95	0.50	1.49	1.45
	Improved process-water controls ^(b)	Industrial w/large water use	E/F	73,057	3%	66%	48,217	112.0	5.40	5.40	1.10	3.29	2.17
	Improved boiler performance ^(b)	Large facilities with boilers	E/F	102,783	5%	66%	67,837	4.0	0.27	0.27	1.34	4.00	0.13
	Install waterless urinals ^(b)	Non-res. Accounts w/high-flush urinals	E/F	1,967,488	89%	66%	1,298,542	2.0	2.60	2.60	0.62	1.85	0.59
	Stormwater for toilet/urinal flushes ^(b)	Large, non-res. New construction	F	3,779	0%	66%	2,494	84.0	0.21	0.21	4.66	13.96	0.36

Estimated Water Savings and Costs for Identified Conservation Actions (cont)

Category	Measure	Target Group ⁽¹⁾	Affects Existing Consumers vs. Future Consumers	Estimate of Regional Target Households or Employees	Target as Percent of Total households or employees in Region	Participation Rate (% of Target that Participates) ⁽²⁾	Total Participating Households or employees	Savings (gpd) per participating household or employee in season measure is effective	Year-round Savings (mgd)	Peak Season Savings (mgd)	Average cost (\$\$/1000 gal.), year round savings ⁽³⁾	Average cost (\$\$/1000 gal), peak season savings ⁽³⁾	Cost per Year (\$M) ⁽³⁾
NON-RESIDENTIAL OUTDOOR	Irrigation system improvements ^(b)	Commercial & Institutional w/large landscape	E/F	1,147,743	52%	66%	757,510	3.6	0.91	2.73	2.27	2.27	0.76
	Improved irrigation scheduling ^(b)	Commercial & Institutional w/large landscape	E/F	1,147,743	52%	66%	757,510	2.4	0.61	1.82	1.09	1.09	0.24
	Soil moisture sensors ^(b)	Commercial & Institutional w/large landscape	E/F	1,147,806	52%	66%	757,552	2.4	0.61	1.82	1.33	1.33	0.30
	Automatic rain shut-off devices ^(b)	Commercial & Institutional w/large landscape	E/F	1,147,727	52%	66%	757,500	1.2	0.30	0.91	1.21	1.21	0.13
	Weather-based irrigation controls ^(b)	Commercial & Institutional w/large landscape and computer control	E/F	56,367	3%	66%	37,202	12.0	0.15	0.45	1.54	1.54	0.08
	Low-volume irrigation systems ^(b)	Commercial & Institutional w/large landscape - new construction	F	88,644	4%	66%	58,505	1.2	0.02	0.07	10.48	10.48	0.09
	Efficient landscaping practices ^(b)	Commercial & Institutional w/large landscape - new construction	F	220,036	10%	66%	145,223	1.2	0.06	0.17	0.96	0.96	0.02
	Improved soil amendments ^(b)	Commercial & Institutional w/large landscape - new construction	F	330,014	15%	66%	217,809	1.2	0.09	0.26	2.18	2.18	0.07
	Improved swimming pool use ^(b)	Hotels & institutional w/swimming pools	E/F	15,367	1%	66%	10,142	25.0	0.08	0.25	0.05	0.05	0.00
	Improved hot tub use ^(b)	Hotels & institutional w/hot tubs	E/F	24,562	1%	66%	16,211	3.0	0.05	0.05	0.15	0.45	0.00
	Efficient sidewalk cleaning ^(b)	All commercial, institutional, industrial w/ sidewalk cleaning	E/F	140,681	6%	66%	92,849	1.0	0.09	0.09	0.45	1.36	0.02
	Efficient car washing ^(b)	All commercial, institutional, industrial w/ vehicle cleaning	E/F	9,149	0%	66%	6,038	3.0	0.02	0.02	4.13	12.37	0.03
	Improve maintenance of turf ^(b)	Non-res. Accounts w/irrigated turf	E/F	830,782	38%	66%	548,316	0.2	0.04	0.13	21.89	21.89	0.35
	Storm water for irrigation ^(b)	Large, non-res., new construction w/landscaping	F	151,151	7%	66%	99,760	2.3	0.08	0.23	5.51	5.51	0.15
	Elim. single-pass decorative water features ^(b)	Non-res. Accounts w/single-pass decorative features	E/F	280	0%	66%	185	153.0	0.01	0.03	0.06	0.06	0.00
Improve recycle water for vehicle washes ^(b)	Large, non-res. Accounts with vehicle washing	E/F	4,786	0%	66%	3,159	1.7	0.01	0.01	4.87	14.58	0.01	

Estimated Water Savings and Costs for Identified Conservation Actions (cont)

Category	Measure	Target Group ⁽¹⁾	Affects Existing Consumers vs. Future Consumers	Estimate of Regional Target Households or Employees	Target as Percent of Total households or employees in Region	Participation Rate (% of Target that Participates) ⁽²⁾	Total Participating Households or employees	Savings (gpd) per participating household or employee in season measure is effective	Year-round Savings (mgd)	Peak Season Savings (mgd)	Average cost (\$\$/1000 gal.), year round savings ⁽³⁾	Average cost (\$\$/1000 gal), peak season savings ⁽³⁾	Cost per Year (\$M) ⁽³⁾
SOURCE & DISTRIBUTION EFFICIENCIES	Reduce leakage from mains ⁽⁴⁾	Top 50% of systems with leaking mains	NA	NA	NA	NA	NA	NA	Unknown	Unknown	Unknown	Unknown	Unknown
	Reduce main flushing ⁽⁴⁾	Top 50% of systems with flushing	NA	NA	NA	NA	NA	NA	Unknown	Unknown	Unknown	Unknown	Unknown
	Reduce non-fire, hydrant usage ⁽⁴⁾	Top 50% of systems with non-fire, hydrant usage	NA	NA	NA	NA	NA	NA	Unknown	Unknown	Unknown	Unknown	Unknown
	Reservoir facilities/practices ⁽⁴⁾	Top 50% of systems that could be improved	NA	NA	NA	NA	NA	NA	Unknown	Unknown	Unknown	Unknown	Unknown
	Add'l system efficiencies ⁽⁴⁾	All systems	NA	NA	NA	NA	NA	NA	Unknown	Unknown	Unknown	Unknown	Unknown
SOURCE & DISTRIBUTION EFFICIENCIES	Combined Source, Transmission, Distribution Efficiencies ^{(5) (c)}	Mixture of all systems and top 50% by need	NA	NA	NA	NA	NA	NA	4.30	4.30	Unknown	Unknown	Unknown

Notes:

- (1) Target group includes only those to whom the measure apply, and who have not already implemented the measure. For example, the residential outdoor measure "allowing lawn to go dormant" affects only single-family households that currently irrigate their lawns, and who could thereby reduce regional consumption by reducing this use of water.
- (2) For consistency and simplicity, it is assumed all measures can achieve an average of 66% participation within the targeted group. Achievement of this participation rate would require appropriate outreach, financial incentives (including metering and rates) and/or regulatory requirements.
- (3) Estimated cost includes all costs of implementing the measure, without regard to whether the costs are paid by the utility or the customer. Cost-estimates include hardware, outreach, and program administration. Outreach and administration costs were pro-rated among all measures targeting similar groups, to avoid overlap in costs.
- (4) Incorporated in combined estimate, below.
- (5) Combines all potential Source & Distribution Efficiencies into one figure. Based on assumption that Outlook's regional projection of 43 mgd non-revenue water in 2020 could be reduced by 10% through a combination of system efficiencies.

Information Sources

- (a) Everett water system plan (draft 2000), extrapolated to full three-county region.
- (b) Seattle Public Utilities, Conservation Potential Assessment, extrapolated to full three-county region.
- (c) Estimated by Conservation Work Group members.
- (d) Based on information provided by Seattle Public Utilities.

Representative Measures Illustrating Scenarios 2, 3 and 4

This section provides an illustrative grouping of water conservation measures that could be used to achieve the water savings levels in Scenarios 2, 3, and 4, respectively. Scenario 1 is not included in this section, because it was developed using a different methodology, based on information on projected conservation programs by utilities in the region. The measures shown are considered illustrative only. That is, there may be other combinations of conservation measures that could achieve the savings level associated with each scenario.

The groupings shown are based on the information from the previous section, Estimates of Water Savings and Costs. Measures are arranged from least cost-per-unit of water saved, to highest cost-per-unit of water saved (summer season savings). Table B-1 presents an illustrative grouping of measures that could be used to achieve the water savings levels for Scenario 2. Table B-2 presents additional measures that could be added to those in Scenario 2, to achieve the savings levels in Scenario 3. Table B-3 presents additional measures that could be used to achieve the next increment of savings for Scenario 4. Table B-3 also shows the effects of an assumed increase in participation rates that would be necessary to achieve the savings levels in Scenario 4.

Table B-1
Representative Measures ^{1,2} Illustrating Scenario 2
(Sorted by Summer Season Unit Cost)

Conservation Measure	Sector	Summer Season Savings (mgd)	Summer Season Unit Cost (\$\$/1,000 gal.)	Average Annual Cost (\$M/yr)
Source, Trans., Distr. Efficiencies	Source, Trans., Distr. Efficiencies	4.30	Unknown	Unknown
Improved swimming pool use	Non-residential Outdoor	0.25	0.10	0.002
Elim. single-pass decor. water features	Non-residential Outdoor	0.03	0.10	0.0002
Allow lawn to go dormant	Residential Outdoor	10.39	0.10	0.17
Improved swimming pool use	Residential Outdoor	0.44	0.10	0.01
Decreased shower use	Residential Indoor	7.49	0.30	0.30
Faucet aerators	Non-residential Indoor	1.00	0.40	0.04
Improved hot tub use	Non-residential Outdoor	0.05	0.50	0.00
Decreased faucet use	Residential Indoor	5.39	0.50	0.30
Improved irrigation scheduling	Residential Outdoor	4.79	0.50	0.28
Decrease toilet flushes	Residential Indoor	4.38	0.60	0.30
Eliminate partial clothes washer loads	Residential Indoor	2.41	0.70	0.19
Switch to recirculating car wash	Residential Outdoor	1.82	0.70	0.15
Low-flow showerheads	Residential Indoor	4.36	0.70	0.40
Improved hot tub use	Residential Outdoor	0.19	0.80	0.02
Dual Flush Toilets	Non-residential Indoor	2.24	0.80	0.23
Leak detection & toilet flapper repair	Residential Indoor	4.60	0.90	0.52
Faucet aerators	Residential Indoor	2.45	0.90	0.28
Dry sidewalk cleaning	Residential Outdoor	0.45	0.90	0.05
Efficient landscaping practices	Non-residential Outdoor	0.17	1.00	0.02
Improved irrigation scheduling	Non-residential Outdoor	1.82	1.10	0.24
Efficient landscaping practices	Residential Outdoor	0.53	1.20	0.08
Automatic rain shut-off devices	Non-residential Outdoor	0.91	1.20	0.13
Soil moisture sensors	Non-residential Outdoor	1.82	1.30	0.30
Efficient sidewalk cleaning	Non-residential Outdoor	0.09	1.40	0.02
Improved cooling systems	Non-residential Indoor	7.95	1.50	1.45
Weather-based irrigation controls	Non-residential Outdoor	0.45	1.50	0.08
Toilet tank displacement devices	Residential Indoor	1.19	1.60	0.23
Soil moisture sensors	Residential Outdoor	4.54	1.60	0.88
Irrigation system improvements	Residential Outdoor	7.58	1.80	1.63
Dual Flush Toilets	Residential Indoor	7.92	1.80	1.71
Totals, Scenario 2	N/A	92	0.90	10

(1) For measure descriptions, see “Descriptions of Conservation Measures” earlier in this Appendix. For detailed values used in calculations, see table “Estimated Water Savings and Costs for Identified Conservation Actions” earlier in this Appendix. However, values from this table have been rounded.

(2) Values reported are based on an assumed participation rate of 66%. See text for discussion of participation rates.

Table B-2
Representative Measures ^{1,2} Illustrating Scenario 3 (Additional to Scenario 2 Measures)
(Sorted by Summer Season Unit Cost)

Conservation Measure	Sector	Summer Season Savings (mgd)	Summer Season Unit Cost (\$\$/1,000 gal.)	Average Annual Cost (\$M/yr)
Automatic rain shut-off devices	Residential Outdoor	1.3	2.00	0.33
Efficient clotheswashing	Non-residential Indoor	1.3	2.10	0.33
Improved soil amendments	Non-residential Outdoor	0.3	2.20	0.07
Irrigation system improvements	Non-residential Outdoor	2.7	2.30	0.76
Leak detection & repair	Non-residential Indoor	0.3	2.60	0.09
1000-gal. Cistern Catchment	Residential Outdoor	1.7	2.60	0.53
Improved process-water controls	Non-residential Indoor	5.4	3.30	2.17
Low-flow faucets	Non-residential Indoor	1.0	3.50	0.43
Efficient clothes washers	Residential Indoor	10.5	3.80	4.81
Improved boiler performance	Non-residential Indoor	0.3	4.00	0.13
Improved soil amendments	Residential Outdoor	0.4	4.00	0.19
Eliminate partial dish loads	Residential Indoor	0.4	5.00	0.21
Storm water for irrigation	Non-residential Outdoor	0.2	6.00	0.15
Improved kitchen water use	Non-residential Indoor	0.8	6.00	0.58
Improve mulching	Residential Outdoor	1.0	7.00	0.85
Low-volume irrigation systems	Residential Outdoor	0.5	8.00	0.45
Leak detection/toilet flapper repair	Non-residential Indoor	0.1	10.00	0.08
Low-volume irrigation systems	Non-residential Outdoor	0.1	10.00	0.09
Efficient dishwashers	Non-residential Indoor	0.6	12.00	0.86
50-gal. Rain Barrel Catchment	Residential Outdoor	0.9	12.00	1.40
Efficient car washing	Non-residential Outdoor	0.0	12.00	0.03
Stormwater for toilet/urinal flushes	Non-residential Indoor	0.2	14.00	0.36
Improve recycle for vehicle washes	Non-residential Outdoor	0.0	15.00	0.01
Decrease "run until hot" use	Non-residential Indoor	0.4	19.00	0.88
Improve maintenance of turf	Non-residential Outdoor	0.1	20.00	0.35
Improve maintenance of turf	Residential Outdoor	0.6	30.00	1.81
Stormwater for toilet flushes	Residential Indoor	0.8	40.00	3.79
Totals (Increment from Scen. 2 Totals)³	N/A	32	5.60	22

(1) For measure descriptions, see "Descriptions of Conservation Measures" earlier in this Appendix. For detailed values used in calculations, see table "Estimated Water Savings and Costs for Identified Conservation Actions" earlier in this Appendix. However, values from this table have been rounded.

(2) Values reported are based on an assumed participation rate of 66%. See text for discussion of participation rates.

(3) The total savings, unit cost, and average annual cost reported in this row are for the additional *increment* of conservation actions listed for Scenario 3 (above and beyond the water savings and costs listed previously for Scenario 2).

Table B-3
Representative Measures ^{1,2} Illustrating Scenario 4 (Additional to Scenario 3 Measures)
(Sorted by Summer Season Unit Cost)

Conservation Measure	Sector	Summer Season Savings (mgd)	Summer Season Unit Cost (\$\$/1,000 gal.)	Average Annual Cost ⁴ (\$M/yr)
Raise Participation for All Measures ³	N/A	19.8	2.10	5.08
Greywater for irrigation - new housing	Residential Outdoor	3.0	40.00	15.56
Decrease "run until hot" use	Residential Indoor	1.3	50.00	8.31
Efficient dishwashers	Residential Indoor	0.8	80.00	8.57
Totals (Increment from Scen. 3 Totals) ⁵	N/A	25	12.50	38

(1) For measure descriptions, see "Descriptions of Conservation Measures" earlier in this Appendix. For detailed values used in calculations, see table "Estimated Water Savings and Costs for Identified Conservation Actions" earlier in this Appendix. However, values from this table have been rounded.

(2) Values reported are based on an assumed participation rate of 77% within each targeted group. See measure descriptions.

(3) For all measures listed in Scenarios 2 and 3, this is the increment of raising participation from 66% to 77% of each targeted group. Cost may be underestimated. See text for discussion of participation rates.

(4) Annual costs higher than shown in table "Estimated Water Savings and Costs for Identified Conservation Actions" earlier in this Appendix, due to assumption of higher participation rate for Scenario 4.

(5) The total savings, unit cost, and average annual cost reported in this row are for the additional *increment* of conservation actions listed for Scenario 4 (above and beyond the water savings and costs listed previously for Scenario 3).