CIP No. 200453

RECYCLED WATER PHASE 2A					
Category	**FY 2011/12 Estimated Total Project Cost**	**Current Estimated Total Project Cost**	**FY 2011/12 Estimated Expenditures**	**Cumulative Estimated Expenditures through June 30, 2012**	**FY 2012/13 Budget**
Planning and Conceptual Design	$ 62,200	$ 154,000	$ 54,100	$ 120,000	$ 32,000
Agency Labor	21,300	27,000	9,500	20,400	6,000
Consultant	37,900	86,000	7,700	60,100	25,000
CEQA	-	-	-	-	-
Refining users, hydraulics, and phases	-	-	-	-	-
Site Investigations and Preliminary Design	-	-	-	-	-
Equipment	-	-	-	-	-
Other Direct Costs	3,000	41,000	36,900	39,500	1,000
Design (Including Bid Services)	3,160,000	3,037,000	-	-	168,000
Agency Labor	270,000	157,000	-	-	6,000
Consultant	2,860,000	2,850,000	-	-	157,000
Equipment	-	-	-	-	-
Other Direct Costs	30,000	30,000	-	-	5,000
					-
Construction Services					-
Construction Management	1,738,500	1,734,000	-	-	-
Agency Labor	155,000	151,000	-	-	-
Consultant	1,568,000	1,568,000	-	-	-
Equipment	-	-	-	-	-
Other Direct Costs	15,500	15,000	-	-	-
					-
Engineering during Construction	1,520,000	1,500,000	-	-	-
Agency Labor	-	-	-	-	-
Consultant	1,520,000	1,500,000	-	-	-
Equipment	-	-	-	-	-
Other Direct Costs	-	-	-	-	-
Capital Construction Costs	20,220,000	20,220,000	-	-	-
Construction Contract(s)	20,000,000	20,000,000	-	-	-
Construction by Agency Forces	200,000	200,000	-	-	-
Equipment	-	-	-	-	-
Other	20,000	20,000	-	-	
Additional Project Delivery Costs	325,000	380,000	-	-	90,000
Various Other Costs	50,000	105,000	-	-	90,000
Permitting	15,000	15,000	-	-	-
Land Acquisition	250,000	250,000	-	-	-
Post-Construction Monitoring and Mitigation	10,000	10,000	-	-	-
TOTAL	$ 27,025,700	$ 27,025,000	$ 54,100	$ 120,000	$ 290,000

Santa Clarita Valley
Water Use Efficiency Strategic Plan

September 2008

Santa Clarita Valley Family of Water Suppliers

By **A & N Technical Services, Inc.**
839 2nd St, Suite 5
Encinitas, CA 92024
760.942.5149

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EXECUTIVE SUMMARY

The Santa Clarita Valley Family of Water Suppliers (the Suppliers) has joined together to develop a plan to ensure the efficient use of water in our Valley. The Santa Clarita Valley Water Use Efficiency Strategic Plan (the Plan) includes programs and projects that will most effectively reduce the per capita water use in the Valley. The goal of the Plan is to achieve a long term reduction in water demand of at least 10% over the next 20 years[1].

This Plan is a tool that will generally guide the actions of the Suppliers by providing a broad perspective on a number of demand side management issues and opportunities. The Plan is described in seven chapters providing detailed information on the approach, data procurement and analysis, available water use efficiency (WUE) opportunities, defined potential program concepts, stakeholder process, recommended program mix, and funding opportunities.

Chapter 1 describes the purpose of the Plan and it provides an introduction to the Santa Clarita Valley Family of Water Suppliers:

- Wholesale Supplier
    - Castaic Lake Water Agency
- Retail Suppliers
    - Valencia Water Company
    - Santa Clarita Water Division
    - Newhall County Water District
    - Los Angeles County Waterworks District #36

Chapter 2 provides an overview of our process and approach to developing the Plan. The specific tasks were defined as follows:

- Gather end-user data and organize by sector
- Brainstorm potential water use efficiency program concepts
- Recommend viable programs
- Develop program modules
- Recommend a program mix and 5 year plan
- Finalize the WUE Strategic Plan
- Perform economic analysis

Chapter 3 provides an overview of the Customer Demand Profile—the data-intensive background work completed for the Plan. This chapter details information on data gathering methods, data content, data validation, and provides examples of some of these results. The sources of data include:

- Account level water consumption data
- The 2005 Urban Water Management Plan
- BMP Reports
- Other documents provided by agencies

[1] Appendix E contains a preliminary assessment of the impact of conservation requirements pursuant to the Governor's Statewide Water Conservation Implementation Plan and Assembly Bill 2175, both of which contain the goal of 20 Percent conservation by the year 2020.

Chapter 4 lists the specific WUE Measures that were identified as potentially viable for the Santa Clarita Valley. The project team cast a very wide net to identify all potentially relevant measures.

Chapter 5 describes the development of specific program concepts and their presentation to the stakeholder workshops. This constituted the next step in the process that specifically defined the optimal delivery method for each technology under consideration. Using a broad economic analysis, the program costs and benefits were projected for each program concept. This chapter also covers the stakeholder workshop inputs and outputs based on the presentations and stakeholder feedback.

Chapter 6 sets forth the Recommended Program Mix and economic analysis. The avoided supply costs are described, as well as program costs and savings.

Chapter 7 provides a 5 Year Implementation Plan that details the timing and resource requirements of the Recommended Programs. Also included are Facilitating Actions, such as potential partnerships, trade organizations, and funding opportunities.

Table E.1 - Five Year Implementation Plan: Budget and Savings

Program	2009	2010	2011	2012	2013
HET Rebates					
Savings (AFY)	15	31	46	61	76
Large Landscape Audits (w/ Incentives)					
Savings (AFY)	38	76	115	153	191
CII Audits and Customized Incentives					
Savings (AFY)	53	105	158	210	263
Landscape Contractor Certification (WBIC & Sprinklerheads)					
Savings (AFY)	50	151	301	502	753
HE Clothes Washer Rebates					
Savings (AFY)	5	11	16	21	26
New Construction Code					
Savings (AFY)	445	911	1,397	1,682	1,978
Total Annual Savings (AFY)[1]	607	1,284	2,033	2,629	3,287
Total Annual Budget (in Thousand $)	$743	$820	$823	$903	$983

[1] Total Annual Savings are those produced in the first five years from program implementation over the first five years. Savings after five years continue due to device lifespans that exceed five years and due to future program implemenation over the course of the planning period.

Measuring and tracking ongoing conservation program implementation is key to understanding what is working, what is not working, and how conservation program delivery can be improved. The Conservation Planning Models created for each purveyor in this project would be useful for tracking ongoing program accomplishments. Additional performance metrics can be considered in step with state-wide conservation goals.

Appendices A.1 to A.3 provide an overview of the universe of water use efficiency measures and additional detail on water use efficiency programs. Appendices B.1 to B.2 describe the economic analysis. Appendices C.1 to C.2 contain materials from the stakeholder meetings. Appendix D provides an analysis of Water Rates and Conservation. Appendix E addresses the Governors' 20X2020 Conservation Goal.

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CHAPTER 1: INTRODUCTION

Purpose and Goal of the Plan

Water is a valuable natural resource in California, requiring efficient management to ensure the availability of sufficient supplies to meet both the state and local area's agricultural, domestic, industrial, and environmental needs. The increasing demand for water requires efficient use and elimination of waste as important strategies in the overall management of water resources. Efficient and effective management of the public's demand for water is also an important element in meeting the long term water needs of the state and locally in the Santa Clarita Valley (the Valley). The public simply needs to be provided the tools and education so that they can use water efficiently.

The Santa Clarita Valley Family of Water Suppliers (the Suppliers) joined together to developed a plan to ensure the efficient use of water in our Valley. The Santa Clarita Valley Water Use Efficiency Strategic Plan (the Plan) includes programs and projects that will most effectively reduce the per capita water use in the Valley. The goal of the Plan is to achieve a long term reduction in water demand of at least 10% over the next 20 years[2].

This Plan is a planning tool that will generally guide the actions of the Suppliers. It provides the Suppliers with a broad perspective on a number of demand side management issues and opportunities. The identification of such opportunities, and the inclusion of those opportunities in this Plan, neither commits a supplier to pursue a particular water use efficiency opportunity, nor preclude a supplier from exploring water use efficiency opportunities not identified in the plan.

Funding and demographics will be key issues in how aggressively each Supplier can implement the water use efficiency (WUE) programs. Nonetheless, each Supplier is committed to implementing many of the water use efficiency programs in their respective service territories.

Santa Clarita Valley Family of Water Suppliers

The Santa Clarita Valley is served by the following water suppliers:

- Wholesale Supplier
  - Castaic Lake Water Agency (CLWA)
- Retail Suppliers
  - Valencia Water Company (VWC)
  - Santa Clarita Water Division (SCWD) of CLWA
  - Newhall County Water District (NCWD)
  - Los Angeles County Waterworks District #36 (LACWWD #36)

[2] See Footnote 1

CLWA is a public water agency that serves areas in Los Angeles and Ventura Counties. The Agency is a water wholesaler that provides more than half of the water used by Santa Clarita households and businesses. CLWA receives and treats surface ("imported") water from the State Water Project. The Santa Clarita Valley's four retail suppliers distribute the treated water.

The four retail suppliers provide water service to most residents of the Valley.

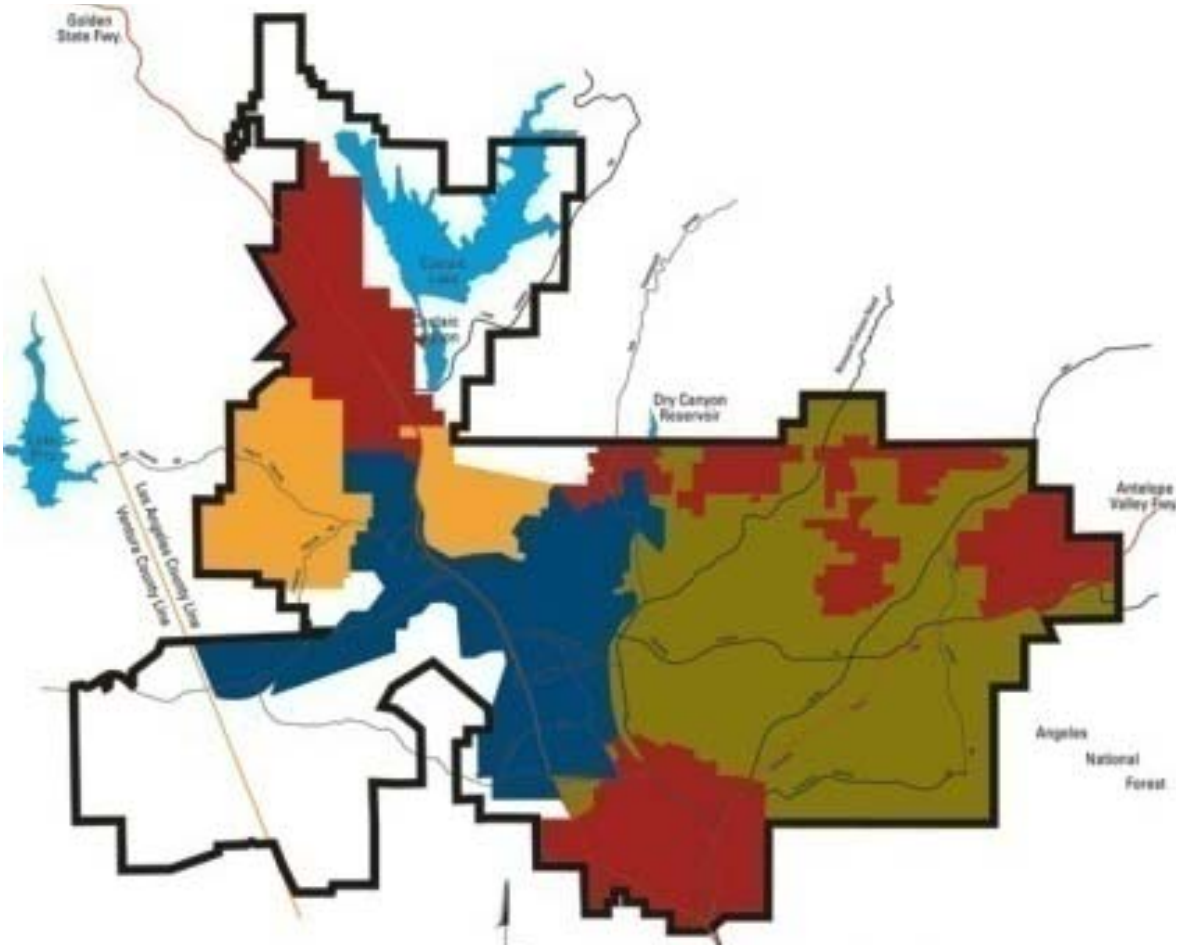


Figure 1.1 –Supplier Service Areas

LACWWD #36's service area includes the Hasley Canyon area in the unincorporated community of Val Verde. During most years, the District obtains its water supply from CLWA.

NCWD's service area includes portions of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Newhall, Canyon Country, Saugus, and Castaic. The District supplies water from local groundwater and CLWA imported water.

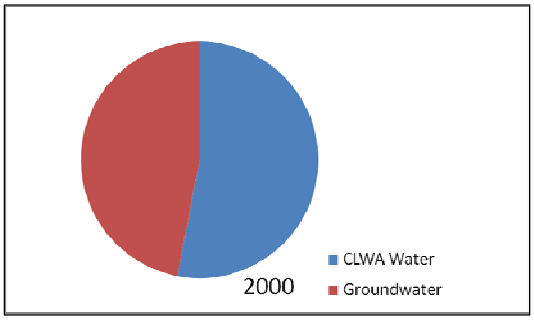
SCWD's service area includes portions of the city of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Canyon Country, Newhall, and Saugus. SCWD supplies water from local groundwater and CLWA imported water.

VWC's service area includes a portion of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Castaic, Stevenson Ranch, and Valencia. VWC supplies water from local groundwater, CLWA imported water, and recycled water.

Water Sources and Uses in the Valley

The Santa Clarita Valley is a fast growing area located in Northwest Los Angeles County. The amenities of the Valley have attracted both residential and commercial customers. Water suppliers in the area rely on local groundwater supplies and, since 1980, on water imported from the State Water Project, other imported sources and recycled water.

The water suppliers of the Santa Clarita Valley are at an important crossroads. The 2005 Urban Water Management Plan and the 2007 Santa Clarita Valley Water Report describe the reliance on ground water and imported supplies and the ongoing growth in demand. It indicates under current planning scenarios that water use practices must change in the Valley to reduce per capita water demand. This Plan focuses its attention on water use efficiency in the Santa Clarita Valley that provides not only an informed basis for additional investments but also the support and direction needed to secure funding for those water efficiency measures.



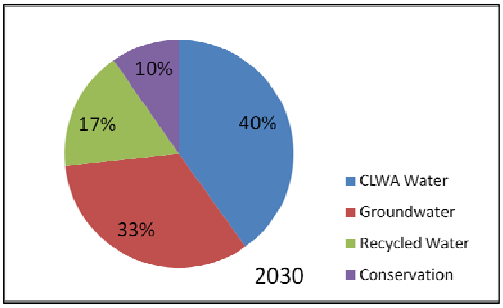


Figure 1.2 –Water Supply Sources to Meet Demand

By implementing a portfolio of water use efficiency programs, Santa Clarita Valley and the water suppliers will benefit in a number of ways:

- **Cost avoidance for purchased water**- Although Santa Clarita Valley has projected adequate water supply for the near future, the cost of water has risen dramatically and is expected to continue to rise. The best way to avoid purchasing expensive imported water is to use less through efficiency. Programs are an effective efficiency mechanism.
- **Limited State Resources**- California's water resources are becoming increasingly stretched due to population, housing growth, and decreased water supply from state water projects. Agencies need to stretch water supplies and increase efficiencies.
- **Drought Preparedness**- It is inevitable that Southern California, as well as the state, will experience another drought. The big question is when and how severe the next one will be. One way to lessen the severity of a drought's effect on Santa Clarita Valley is to prepare in advance for this event by creating a community that operates at a high level of efficiency.
- **Environmental Sustainability**- As a signatory to the California Urban Water Conservation Council, Santa Clarita Valley and its suppliers undertook the obligation to implement the BMPs for water conservation.
- **Reduced Carbon Footprint**- The production and delivery of water requires a tremendous amount of energy on both a statewide and local level. The Santa Clarita Valley can do its part to reduce green house gases by becoming water efficient.
- **Reduced Waste Water Flows**- Sanitation plants and systems must be sized to meet historic and planned waste water flows. Increasing the indoor water use efficiency will result in a reduction of waste water into the system.
- **Reduced Urban Runoff** – Achieving increased water use efficiency outdoors means less water running off landscaped areas into the streets, storm drains, and ultimately into the Santa Clara River. Education efforts and installation of efficient technologies will ensure that more of our valuable water is delivered to appropriate landscaping and less of it pollutes our communities as urban runoff.

To direct the preparation of the Plan, Santa Clarita Valley secured the services of A&N Technical Services (A&N), Maureen Erbeznik and Associates, Gary Fiske and Associates, David Mitchell of M. Cubed, and John Koeller and Associates.

With a commitment to achieve a water demand reduction of at least 10% over 20 years, Santa Clarita Valley has elected to strive for responsible environmental leadership. The WUE Strategic Plan forms the blueprint for implementation of this goal.

CHAPTER 2: APPROACH

In order to create the WUE Strategic Plan for Santa Clarita Valley, the project team deployed the following project tasks:

Process to Develop the WUE Strategic Plan

- ***Task 1-Specify Planning Goals.*** The SCV Family of Water Suppliers developed specific planning goals through the following steps:

    - A&N led initial meeting to elicit project goals from water supplier staff
    - Follow-up staff interviews to clarify ambiguities
    - Documented goals and objectives based on the initial meeting and interviews
    - Review at Stakeholder workshops

- ***Task 2 – Develop Customer Profile.*** A&N created a solid base of knowledge regarding existing conditions and opportunities by customer class and subclass as well as discovery regarding existing industry programs, technologies and ordinances that could benefit the Santa Clarita Valley.

- ***Task 3 – Develop Means of Measuring Savings.*** A & N Technical Services created a comprehensive tool demonstrating expected water use efficiency savings. Included in the Santa Clarita Valley WUE Strategic Plan are estimates of costs and savings to the year 2030.

- ***Task 4 – Identify Water Use Efficiency Measures.*** The consultant team researched a list of possible technologies, delivery mechanisms and programs. A set of Program Evaluation Criteria were developed in collaboration with water supplier staff. Each program was evaluated on a preliminary basis for cost-effectiveness, water savings potential, and ease of implementation and other key criteria of an effective program. The team then worked to refine program options and develop a short list of programs to be analyzed on a more in-depth basis.

- ***Task 5 – Analyze Cost and Benefits.*** The consultant team developed an avoided cost forecast using the AwwaRF Avoided Cost model.

- ***Task 6 – Select Water Use Efficiency Measures.*** The short list of programs was further expanded to include more program detail such as the marketing outreach, incentive format, potential program partners, preliminary budget and staffing requirements. Stakeholders and consultants eliminated low ranking programs and created a program package (the recommended package) showing the 5 year roll out plan. The plan was presented to the Santa Clarita Valley Family of Water Suppliers.

- ***Task 7- Develop WUE Strategic Plan.*** Following review, the A&N team created this document, the Santa Clarita Valley WUE Strategic Plan, to be submitted for approval. The Plan delivers a balanced portfolio of cost-effective programs for Santa Clarita Valley Suppliers' end-use customers.

An overview of the WUE Strategic Plan process is depicted below:

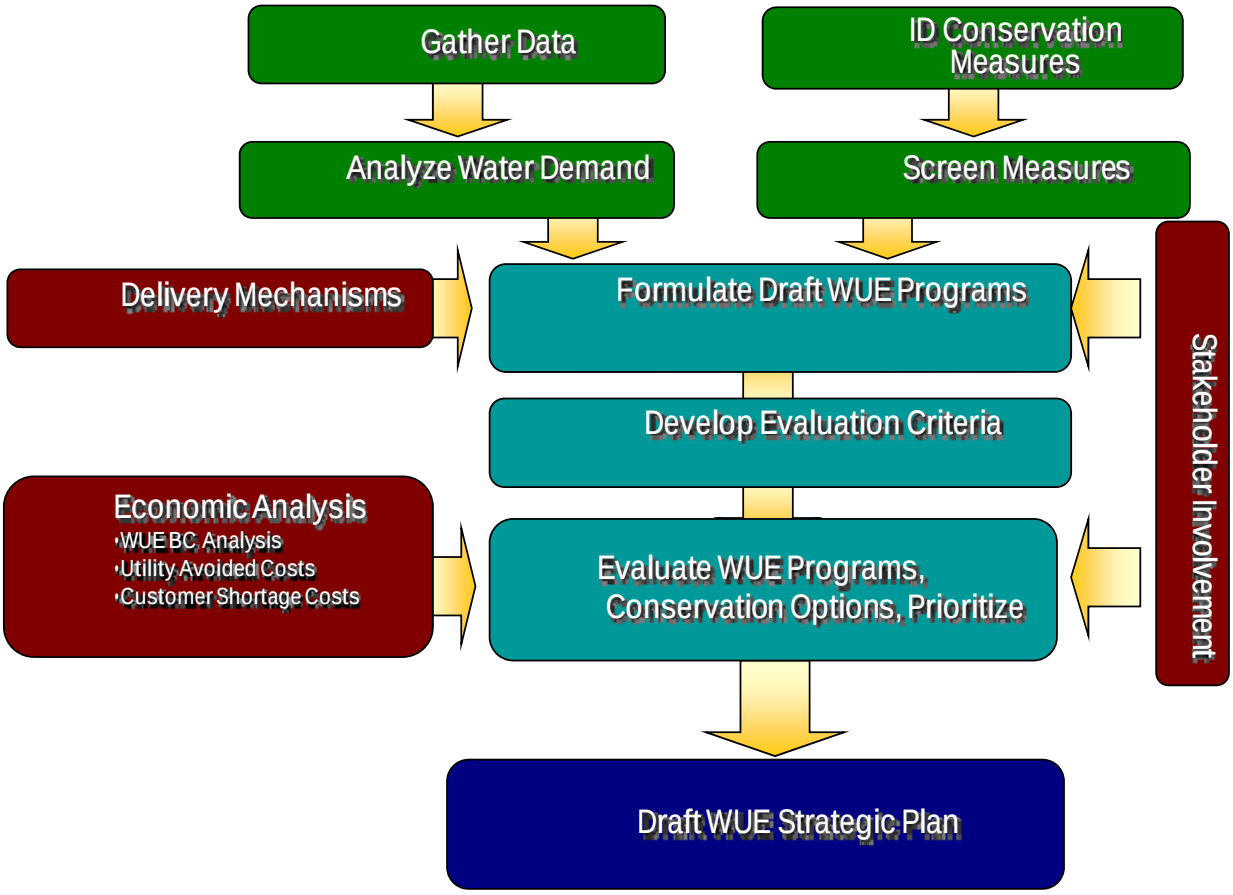


Figure 2.1 - WUE Strategic Plan Process

CHAPTER 3: CUSTOMER DEMAND PROFILE

The customer demand profile consists of the following components:

- Water Use Analysis
- Housing Units
- Past and Present Water Use Efficiency Programs
- WUE Device Saturation Analysis

Water Use

The next step in the process was to analyze water use tabulated into the following categories: 1) single-family residential, 2) multi-family residential, 3) dedicated landscape meters, 4) commercial, industrial, and, institutional (CII), 5) construction, and 6) recycled. This task was complicated (typically so) because each of the four retail water Suppliers have unique customer account data fields and formats. The water use analysis forms the foundation of the WUE Strategic Plan by first providing an understanding of water use by sector, Supplier, and season, and by providing the foundation for designing programs to include in the Plan.

The process included data collection, category identification, validation, and tabulation. A & N Technical Services Inc. acquired the data by contacting the suppliers and requesting a data dump from their billing systems. A detailed data request was presented to each of the retail Suppliers and each retail Supplier provided account level data for all customers for the most recent complete year (2006). The data included account number, account name, service address, account type, meter size and monthly volume reads. A&N ensured that all individual customer information was kept secure and confidential. Customer account identifiers and class categories were examined and each account was assigned one of the six common categories. All accounts that could be identified as dedicated landscape were grouped together because of the commonality of applicable WUE measures. Total water use was validated with existing sources such as the Urban Water Management Plan, BMP Reports, and other planning documents and data sources unique to each supplier.

As shown in Table 3.1, data on more than 66,000 accounts was collected, summing to over 30 million ccf (hundred cubic feet) per year. The single-family sector is the largest in terms of both number of customers and volume of water use.

Table 3.1 – Summary of Customers and 2006 Water Use

Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Percent of Total Volume
Single Family	55,600	16,311,530	53.7%
Multi-Family (1)	5,374	3,174,067	10.4%
Dedicated Landscape	1,400	4,202,332	13.8%
Commercial, Industrial, and Institutional	3,155	5,736,791	18.9%
Construction	568	824,043	2.7%
Recycled	10	134,618	0.4%
Total	66,107	30,383,381	100.0%

(1) The total of 5374 multi-family accounts serves 28487 multi-family housing units.

Water Use by Supplier

Table 3.2 summarizes the average number of accounts and water use for each of the Suppliers in the Santa Clarita Valley Family of Water Suppliers.

Table 3.2 – Summary of Accounts and 2006 Water Use by Supplier

Valencia Water Company Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Mean Use per Account
Single Family	25,093	6,232,892	248
Multi Family (1)	333	595,528	1,788
Landscape	444	1,438,740	3,240
CII	1,910	4,351,654	2,278
Construction	135	397,440	2,944
Recycled	10	134,618	13,462
Total	27,925	13,150,872	471

(1) VWC has 333 accounts servicing 7827 multi-family housing units.

Santa Clarita Water Division Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Mean Use per Account
Single Family	20,789	6,917,065	333
Multi Family (2)	4,671	1,884,470	403
Landscape	812	2,055,932	2,531
CII	790	862,362	1,092
Construction_Fire	331	333,005	1,005
Recycled	0	0	0
Total	27,393	12,052,834	440

(2) SCWD has 4671 accounts servicing 15574 multi-family housing units.

Newhall County Water District Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Mean Use per Account
Single Family	8,423	2,713,350	322
Multi Family (3)	366	680,771	1,860
Landscape	139	698,424	5,025
CII	450	513,687	1,142
Construction	98	92,179	1,920
Recycled	0	0	0
Total	9,476	4,698,411	496

(3) NCWD has 366 accounts servicing 4967 multi-family housing units.

LA County Waterworks District No. 36 Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Mean Use per Account
Single Family	1,295	448,223	346
Multi Family (4)	4	13,298	3,325
Landscape	5	9,236	1,847
CII	5	9,088	1,818
Construction	4	1,419	355
Recycled	0	0	0
Total	1,313	481,264	367

(4) LA36 has 4 accounts servicing 119 multi-family housing units.

Water Use by Season

For all of the suppliers, data were analyzed by month for each sector in a stacked area graph. To illustrate, Figure 3.1 shows water use by month using the 2006 account level data provided by the Suppliers. The strong seasonal pattern reflects irrigation needs during the characteristic hot dry summers. Irrigation needs are apparent in all sectors except Construction. Notice also the non-zero winter irrigation needs shown in dedicated landscape accounts.

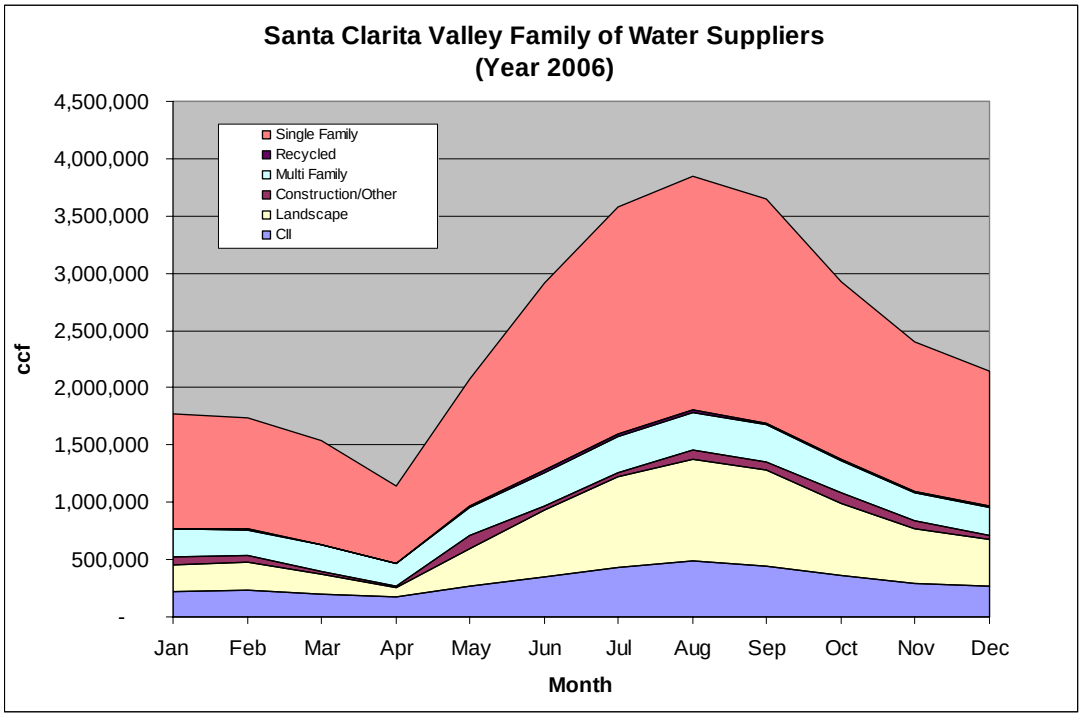


Figure 3.1 – Seasonal Pattern of Water Use

Water Use Distribution

Figures 3.2 and 3.3 show the distribution of annual water use for the single family and landscape sectors. Notice the single family distribution is the characteristic bell curve distribution, largely symmetric but with a long tail to the right indicating decreasing numbers of accounts with large water use. This graph is truncated at the extreme right tail which includes another 791 customers with use between 1,000 and 12,400 ccf per year. The purpose of displaying this distribution is to determine the similarity in use among single family customers. For example, the tall narrow shape shows a large share of the accounts fall between 100 and 500 ccf per year. A minority consume much more water (the right tail). This shape is characteristic of residential water use. In contrast, observe the distribution of dedicated landscape accounts in Figure 3.3 (also with truncated right tail). In this sector, the asymmetric distribution reflects the mix of site types including everything from large parks and schools down to small commercial strips and residential accounts.

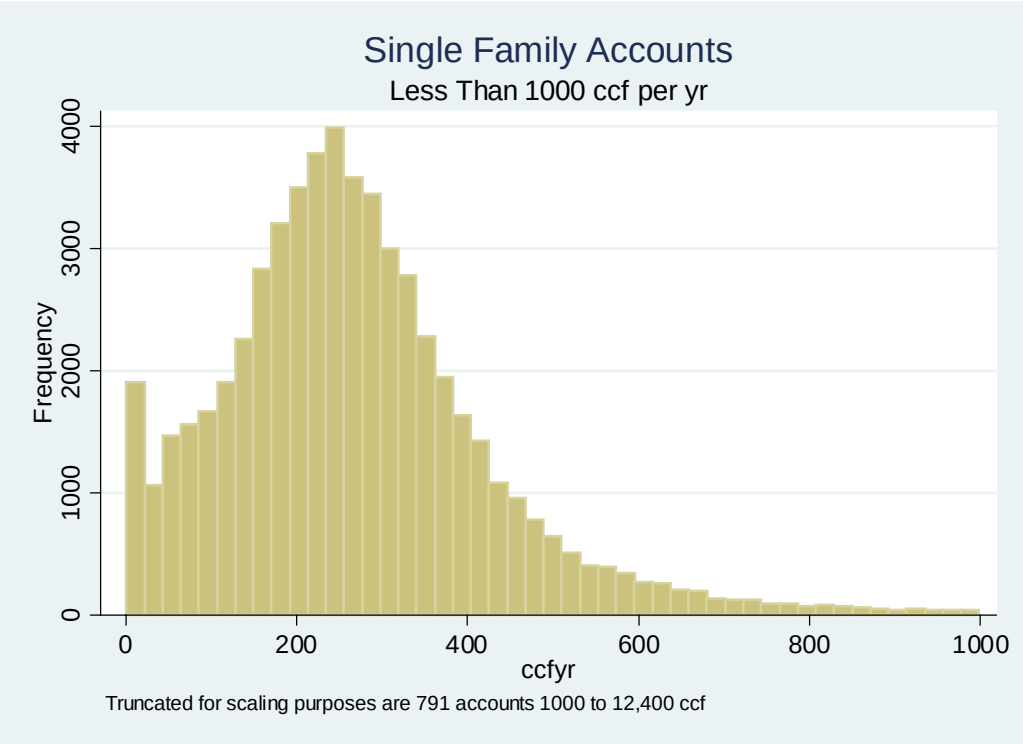


Figure 3.2 – Single Family Water Use Distribution

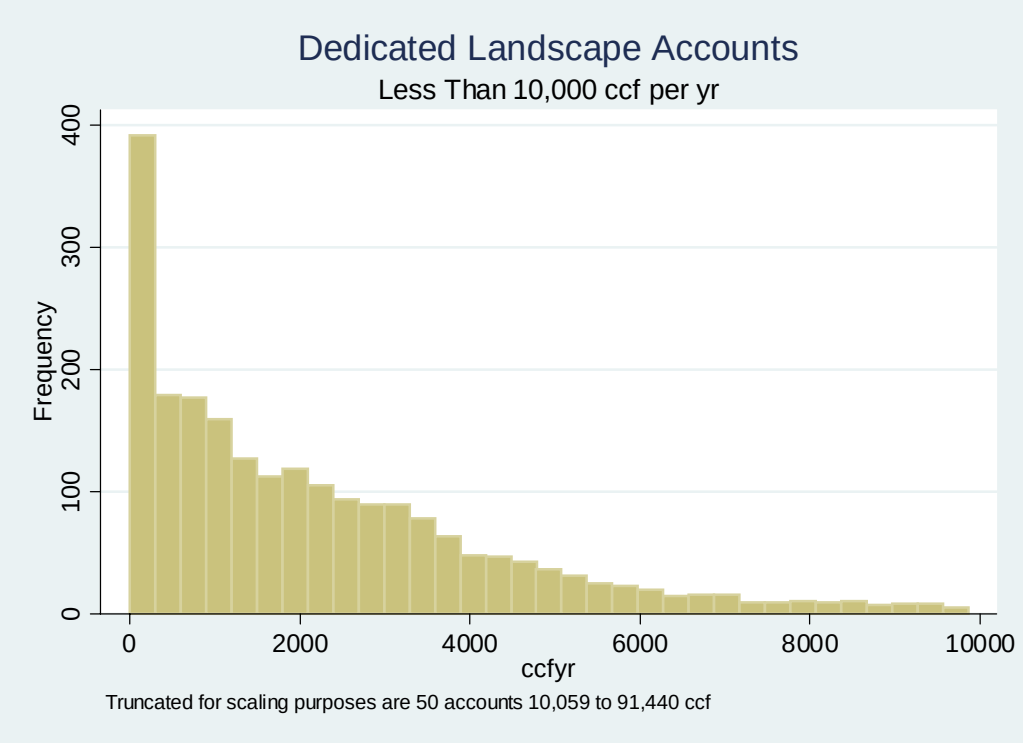


Figure 3.3 – Landscape Accounts Water Use Distribution

Housing Units

Figures 3.4, 3.5, 3.6 and 3.7 show the growth in single-family and multi-family housing units from 1991 to 2030. The data for these graphs was drawn from several sources including the 2005 Urban Water Management Plan, BMP Reports, and other planning documents provided by the Suppliers. For the period 1990 to 2006, the BMP Reports provided a source for the number of housing units in 1990 and in recent years. Housing units in Years 1990 to 2006 are inferred in some cases. For future projections, the Urban Water Management Plan is the primary source. There is a close correlation between single family accounts and housing units. However, for the multi-family sector, the number of units per account can be highly variable. For water use efficiency planning, it is important to understand the number of multi-family units in order to develop a plumbing fixture inventory. Water use summaries by residential unit and account were developed.

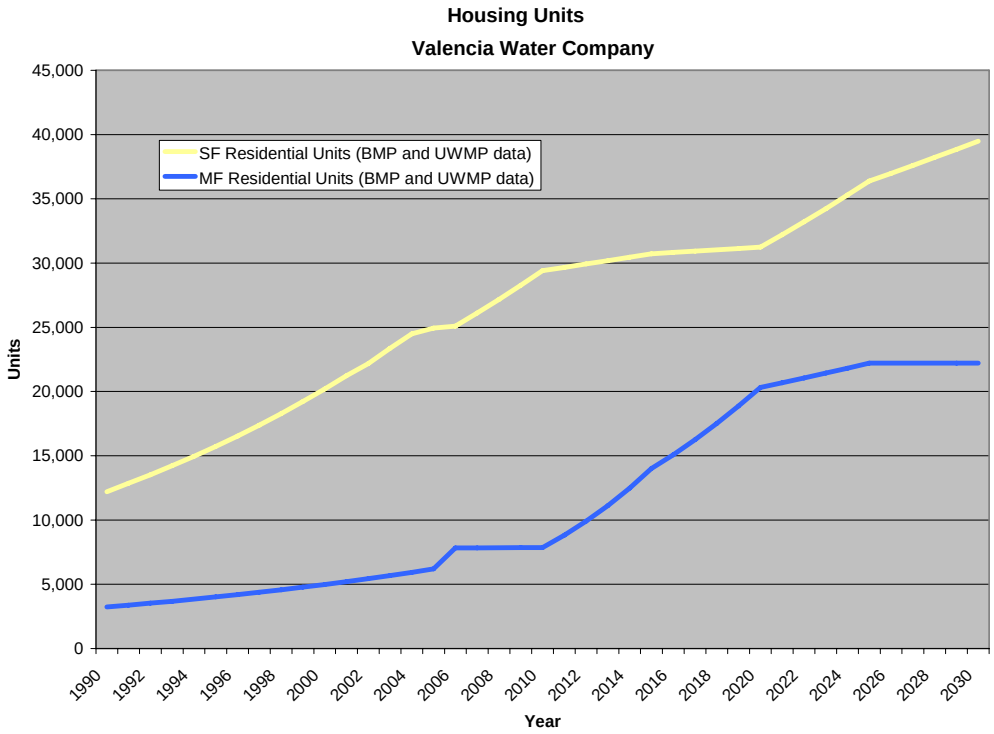


Figure 3.4 Valencia Water Company Housing Units

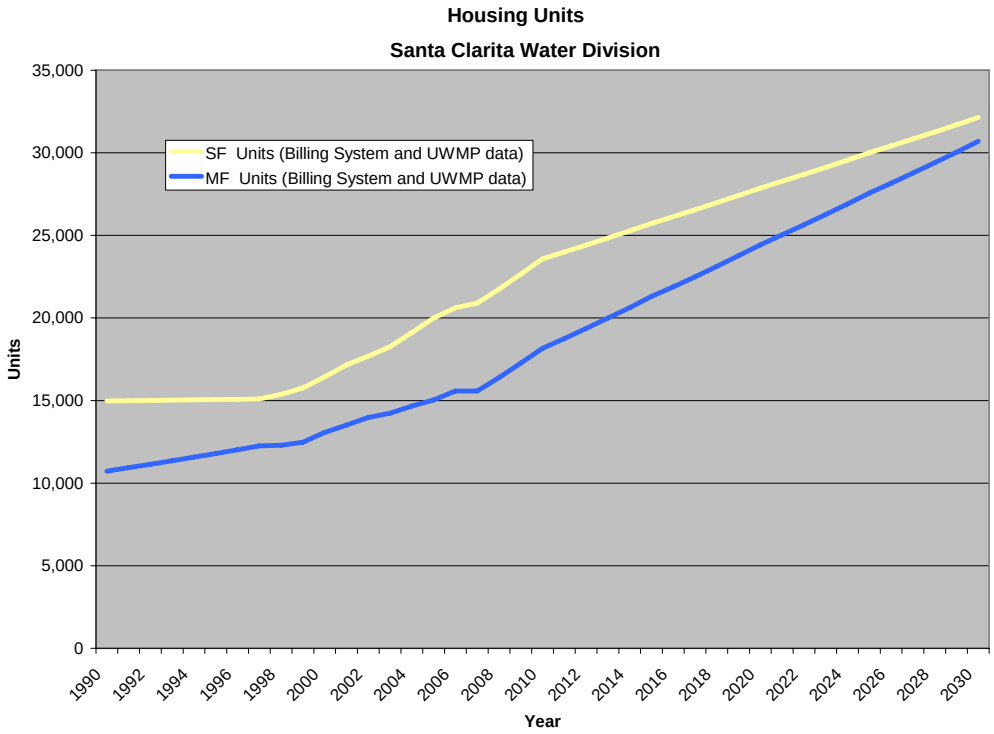


Figure 3.5 Santa Clarita Water Division Housing Units

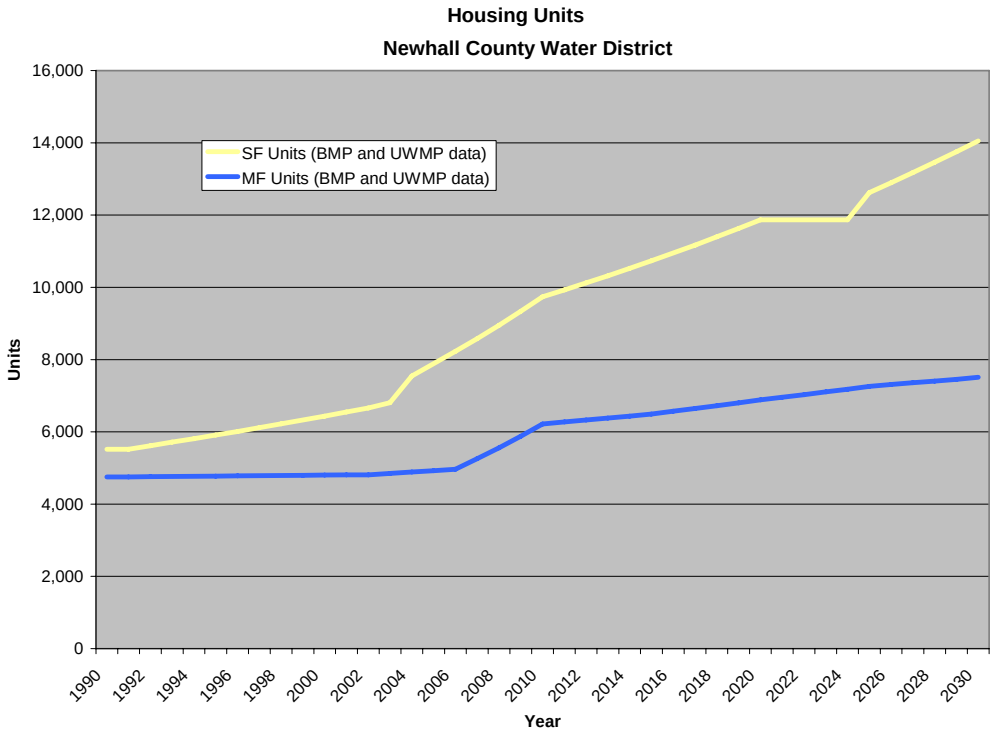


Figure 3.6 Newhall County Water District Housing Units

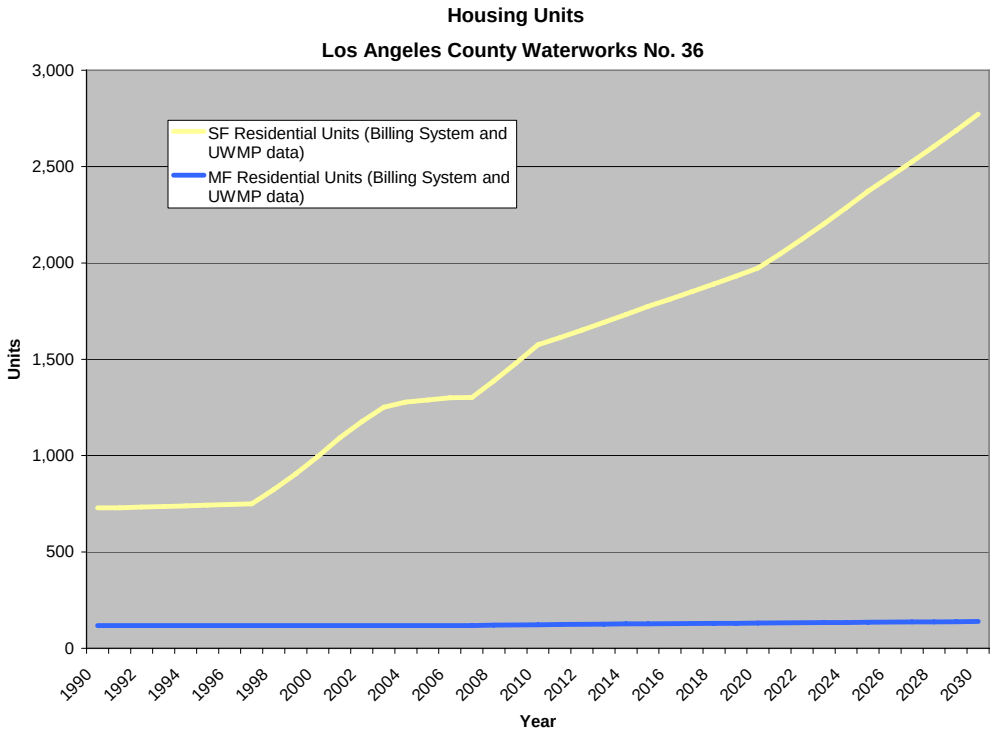


Figure 3.7 Los Angeles County Waterworks No. 36

Table 3.3 summarizes housing in 1991, the year before Ultra Low Flush Toilet plumbing code was enacted, 2007, and the projection for 2030. Because of the growth in housing units since 1991 40 percent of single family units were built post-1991 by 2007, and by 2030, 61 percent of single family units will be post-1991 construction. Post-1991 construction varies between retail service area and between single-family and multi-family sectors.

Table 3.3 Housing Units

Single-Family Housing Units

	1991Housing Units	2007 Housing Units	2030 Housing Units	Percent Post-1991 Units in 2007	Percent Post-1991 Units in 2030
Valencia Water Company	12,871	26,108	39,484	51%	67%
Santa Clarita Water Division	14,992	20,899	32,135	28%	53%
Newhall County Water District	5,522	8,580	14,050	36%	61%
Los Angeles County Waterworks District No. 36	729	1,302	2,772	44%	74%
Total	34,114	56,889	88,441	40%	61%

Multi-Family Housing Units

	1991Housing Units	2007 Housing Units	2030 Housing Units	Percent Post-1991 Units in 2007	Percent Post-1991 Units in 2030
Valencia Water Company	3,382	7,837	22,213	57%	85%
Santa Clarita Water Division	10,933	15,569	30,690	30%	64%
Newhall County Water District	4,756	5,254	7,508	9%	37%
Los Angeles County Waterworks District No. 36	119	119	140	0%	15%
Total	19,190	28,779	60,551	33%	68%

Past Achieved Conservation

For each of the Suppliers, data from the BMP reports and other sources was collected to summarize past achieved conservation due to active conservation programs. For each Supplier, the number of devices installed or measures completed was compiled, and for Castaic Lake Water Agency, the wholesaler, dollar amounts were summarized. These past achievements were incorporated into the WUE Strategic Plan

Conservation Device Saturation

To plan conservation programs it is important to know the number of target devices/fixtures, the level of past active conservation programs, and the effects of plumbing code on passive conservation. Passive conservation is the installation of conservation devices due to natural replacement, remodeling, or demolition in the presence of water efficiency plumbing code.

Combining the number of housing units with estimates of fixtures per household, an inventory of plumbing fixtures was developed. Figures 3.8 to 3.11 show how conservation devices' saturation will grow through 2030 for each water Supplier. The saturation analysis allows the Plan to target its programs to achieve savings beyond what would be achieved without the Plan. Figure 3.12 shows the savings achieved by the type of passive conservation depicted in Figures 3.8 to 3.11 across all included water Suppliers for single- and multi-family sectors.

As an example, consider the effects of passive conservation from ULF toilets, which is modeled using a rate of natural replacement whereby pre-1992 fixtures are replaced by ULF toilets at the end of their life span. In addition, conservation devices from active programs add to the number of conserving devices in the inventory. Table 3.4 shows the current saturation rates for single- and multi-family sectors by Supplier and overall. For the pre-1992 housing stock approximately 47 percent of the toilets are already ULF toilets, driven largely by natural replacement and the past ULF toilet programs run by the SCV water agencies.[3] Over all single family housing units, 67 percent of the toilets are ULF toilets—a higher saturation because all units new since 1992 were required to have ULF toilets due to plumbing code.

[3] A natural replacement rate of 4 percent was applied for toilets. Due to the earthquake and high level of remodeling, this common planning assumption may understate device saturation for the Santa Clarita Valley due to the 1994 earthquake. A full set of assumptions in the saturation model is found in Appendix B-2.

Table 3.4 Saturation of Ultra Low Flush Toilets (ULFT) by Residential Sector

	Single-Family			Multi-Family		
Retailer	ULFT Saturation: Pre-1992 Inventory	ULFT Saturation: Total Inventory	Remaining Pre-1992 Toilets	ULFT Saturation: Pre-1992 Inventory	ULFT Saturation: Total Inventory	Remaining Pre-1992 Toilets
VWC	47%	73%	13,725	46%	77%	9,001
SCWD	47%	62%	15,813	46%	62%	19,310
NCWD	47%	65%	7,291	46%	48%	2,871
LA36	46%	70%	790	46%	46%	82
Total	47%	67%	37,619	46%	64%	31,263

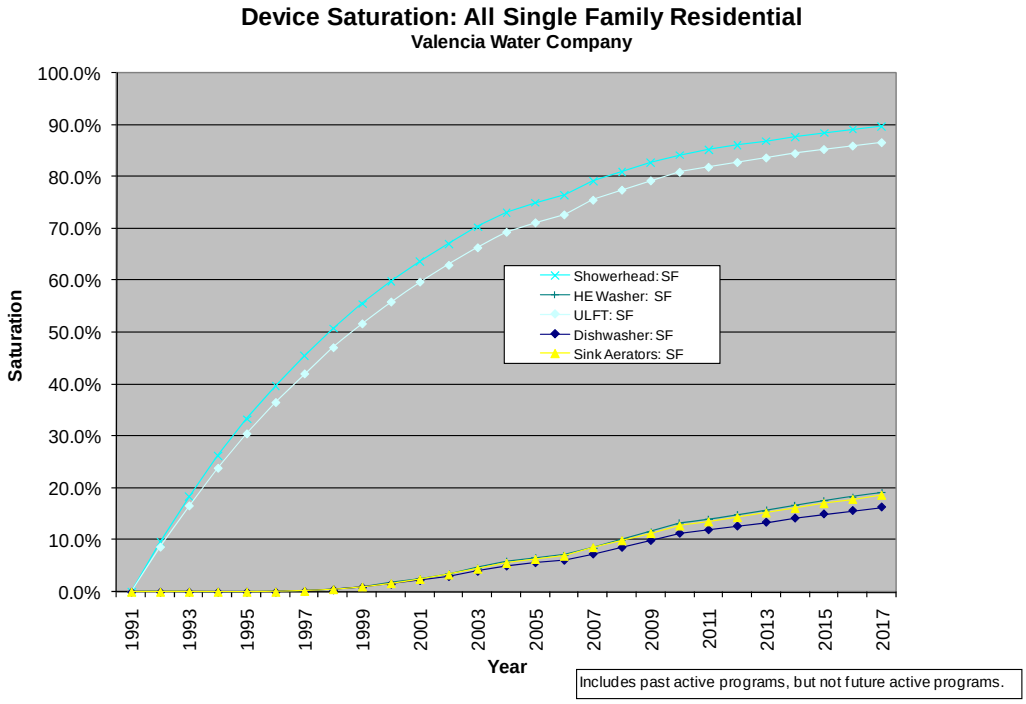


Figure 3.8 Device Saturation: Valencia Water Company Single Family Customers

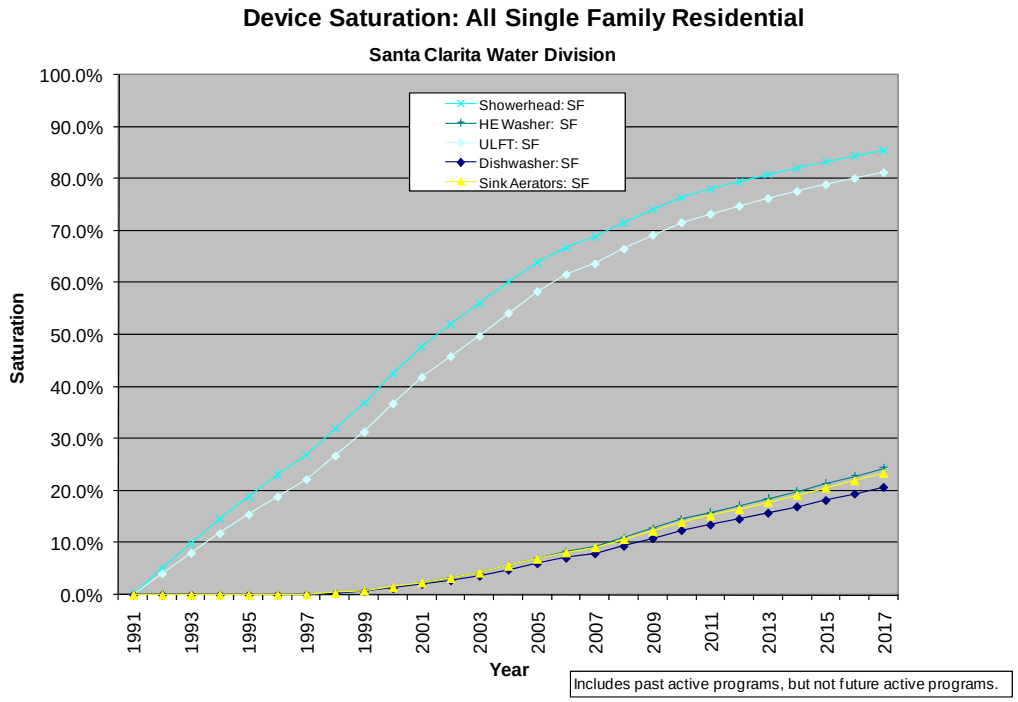


Figure 3.9 - Device Saturation: Santa Clarita Water Division Single Family Customers

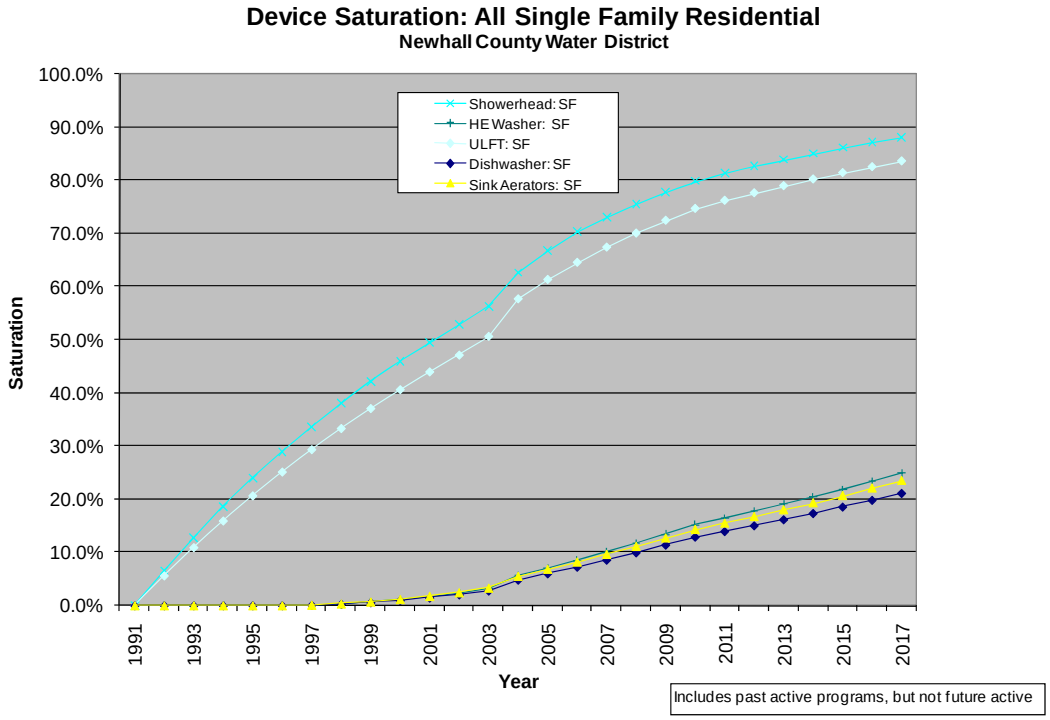


Figure 3.10 - Device Saturation: Newhall County Water District Single Family Customers

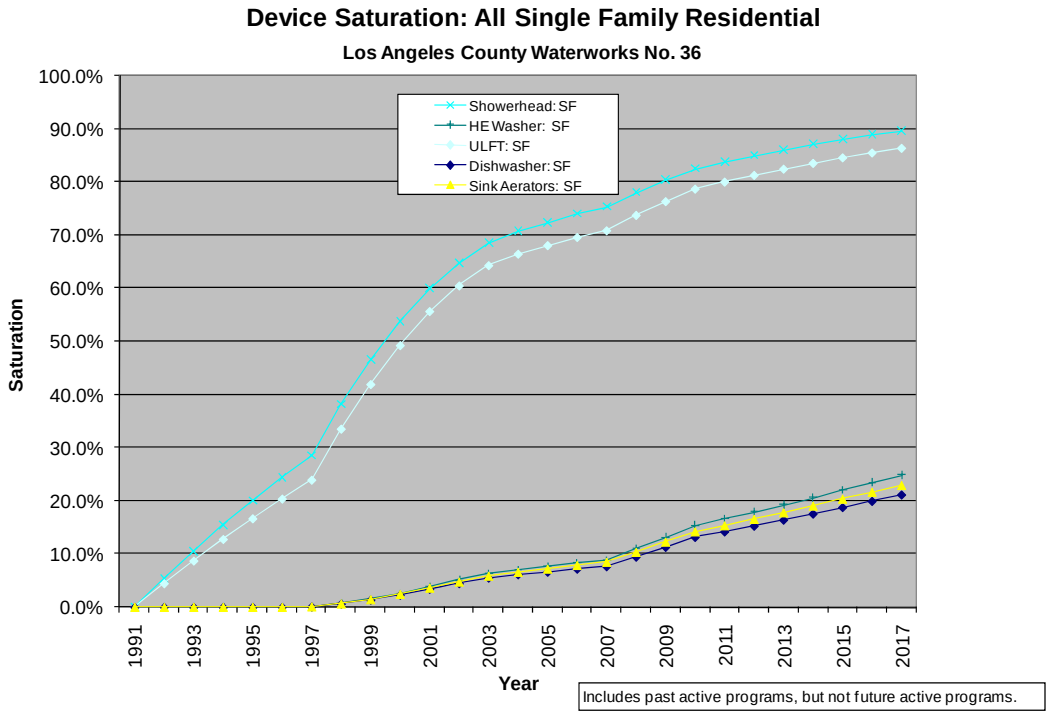


Figure 3.11 - Device Saturation: LA County Waterworks No. 36 Single Family Customers

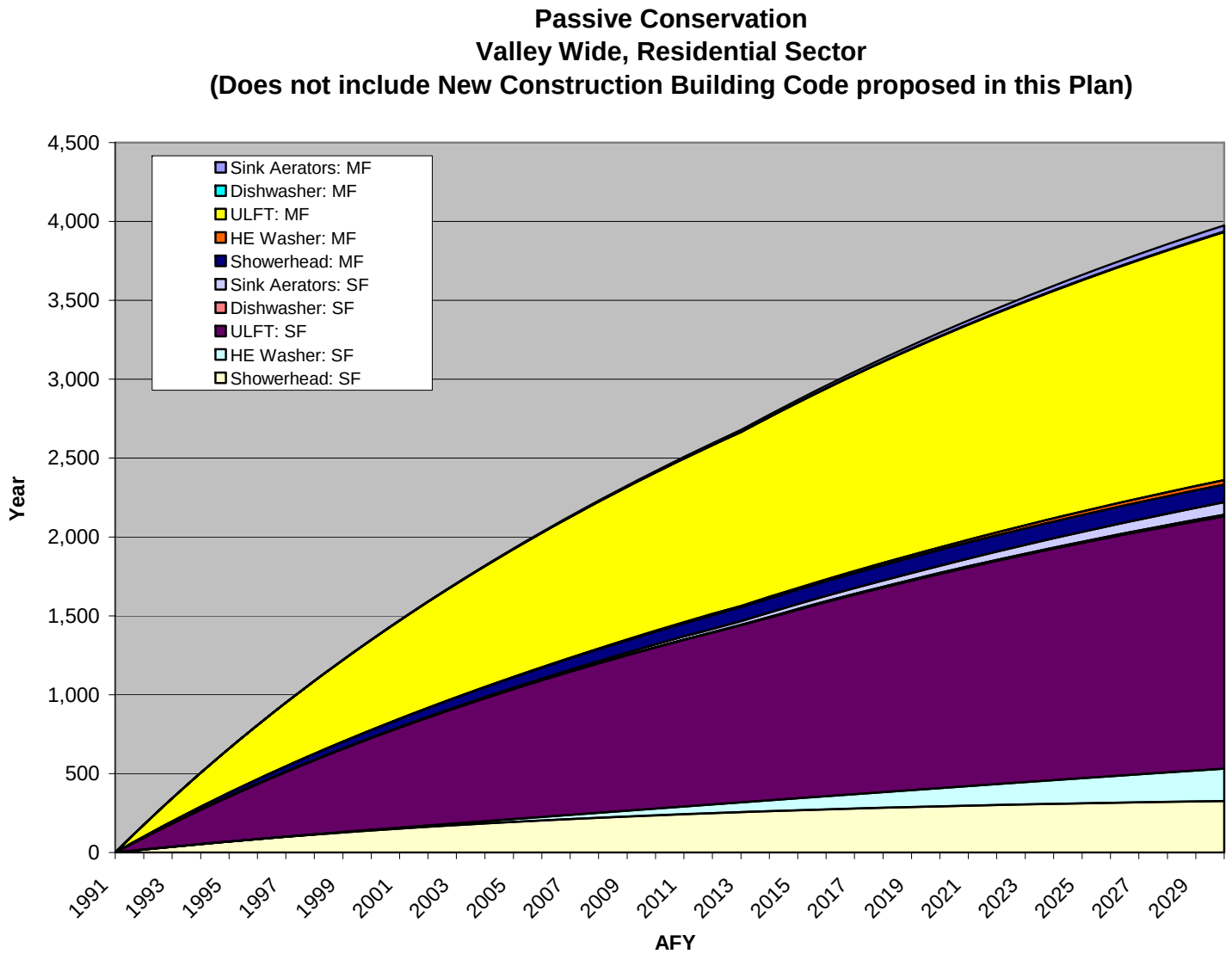


Figure 3.12 – Passive Conservation in the Valley, Residential
(Note: "ULFT" includes high efficiency toilets after 2014 due to the planned change in plumbing code.)

Using Customer Demand Profiles for Conservation Planning

In conclusion, the project team first analyzed water use and device saturation in order to develop programs that achieve savings above what would be achieved otherwise. The water use analysis lays the foundation for estimating the potential water savings and cost-effectiveness of alternative WUE programs—a necessary ingredient for a defensible and sensible WUE Strategic Plan

CHAPTER 4: AVAILABLE CONSERVATION MEASURES

After completing the data collection process, the project team conducted analyses of water conservation measures that might present opportunities for the Santa Clarita Valley Family of Water Suppliers. The objective was to identify opportunities for future water savings that might be achieved either through active conservation programs or new construction building code.

- Maureen Erbeznik summarized and analyzed a broad set of conservation measures that have been successful in the past in many types of active conservation programs (Conservation Measures Guide).

- John Koeller summarized several existing water conserving building codes from around the country and he provided commentary on a range of new technologies.

Potential Conservation Measures

In order to determine the optimum prospects for Santa Clarita Valley, the project team assembled a list of conservation technologies and practices (measures) that are currently available in the industry. Many of the measures have extensive performance histories while other options are emerging technologies with a shorter record of performance.

For the first Stakeholder Meeting, the project team distributed a *Conservation Measure Guide* providing an overview of conservation technologies for consideration. The list of measures was broadly cast to include the important conservation technologies with either a track record of performance, or strong potential for future conservation. The *Conservation Measure Guide* is provided in Appendix A.

Note that the listed products are presented independent of any particular conservation "program". Conservation programs are a more inclusive concept that specifies not only the conservation measure or measures but also a delivery mechanism—how can customers be induced to enact water efficiency measures? Figure 4.1 presents a range of delivery mechanisms from providing information, to incentives, to direct installation, to legal requirements. Conservation programs can include multiple products with overlapping administrative requirements, marketing, delivery, and verification mechanisms. Conservation programs are the topic of the following chapter.

Figure 4.1 - Delivery Mechanism for Conservation Measures

The *Conservation Measure Guide* focused on water use efficiency measures and did not directly address supply-side efficiency measures such as distribution system loss control programs or system pressure control programs. The reader should note that BMP 3—that addresses system delivery efficiency—has been undergoing revision in the last year.

Similarly, water rate reform—though not separately itemized on the Measures Guide—can play an important part in providing incentives for customers to participate in conservation programs. Water rates and conservation (tiered rates, water budget-based rates, and drought pricing) are addressed in Appendix D. An example of the cost and savings attributable to a water budget-based tier rate was also conducted.

The project team made informed decisions about which of the conservation measures might be applicable to the Santa Clarita Valley using: 1) stakeholder input; 2) data about the market described in Chapter 3; and 3) professional experience developing, implementing, and evaluating conservation programs. In general, the measures were not selected for further consideration if: 1) they did not have a relevant application to Santa Clarita Valley's territory; 2) they did not have the potential to deliver a meaningful volume of water savings; or 3) they had little chance of being cost-effective.

Tables 4.1 and 4.2 summarize the conservation measures considered and not considered for further inclusion in the Plan.

Table 4.1 - Measures Selected for Further Consideration

Measure	Action Taken
Showerheads (less than 2.5 gpm)	Added into proposed new building code
Aerators (less than 1.5 gpm)	Added into proposed new building code
High Efficiency Toilets	Recommended measure for active program and building code. Above code technology. Target pre-1992 buildings. Ideal for rebate program design. Savings based upon moving from non-ULF to high efficiency fixture.
High Efficiency, Zero Consumption and Ultra Low Flush Urinals	Above code technology. Recommend adding measure in Customized Incentive Program.
Cooling Tower Conductivity and pH Controllers	Not enough volume to support stand-alone program therefore recommend inclusion as a measure in Customized Incentive Program
Connectionless Food Steamers	Not enough volume to support stand-alone program therefore recommend inclusion as a

	measure in Customized Incentive Program
Water Efficiency Ice Makers	Still need to substantiate savings and market conditions. Not enough volume to support stand-alone program therefore recommend for inclusion as a measure in Customized Incentive Program
Residential Efficient Dishwashers	Added into proposed new building code
Commercial Efficient Dishwashers	Not enough volume to support stand-alone program therefore recommend for inclusion as a measure in Customized Incentive Program
Steam Sterilizers	Not enough volume to support stand-alone program therefore included as a measure in the Customized Incentive Program
Water Brooms	Not enough volume to support stand-alone program therefore included as a measure in the Customized Incentive Program
Industrial Process Water Use Improvement	Limited number of customers due to small market but high savings per customer therefore recommended as a customized incentive program.
Wet Cleaning	Included as part of Industrial Process Water Use recommendations. (See the CII Audit Program.)
Weather Based Irrigation Controllers (WBICs)	Selected measure. Volume of savings for both residential and commercial is significant – a large opportunity in the Valley. Recommendations for New Construction Standards include WBICs.
Car Wash Reclaim Water Systems	Many customers already implemented on their own. Screen customers and include as part of the industrial program. Note that Car Washes are covered within the CII Audit Program
Hot Water Distribution or Recirculation Systems	Per unit savings too low to justify retrofit program. Consider for building code.
Pool covers	Per unit savings too low to justify program. Consider for building code.
Drip or Low Precipitation Irrigation System	Customer education included in overall marketing and audit program. Retrofit costs too high (and required program costs) to justify its own program. Consider for building code.
Turf Buy Back	Volume of technical potential water savings was significant and Stakeholder expressed strong interest Economic savings potential is limited due to cost. (See Cash for Grass.)
Artificial Turf	Initially selected measure. Volume of savings significant and strong Stakeholder interest (see

	Cash for Grass).
Residential High Efficiency Clothes Washers	Selected measure due to customer demand.
Industrial Laundries	Selected measure. Covered by Industrial Audit Program.

Table 4.2 - Measures Not Selected for Further Consideration

Measure	Rationale
Low Flow Showerheads (2.5 gpm)	Code since 1992
Low Flow Aerators (1.5 gpm)	Code since 1992
ULF Toilets (1.6 gallons per flush)	Code since 1992 Over 40 percent of housing units built post 1992
ULF Urinals(1 gallon or less per flush)	Code since 1992
Pre-rinse Spray Valves	Code since 2006. High saturation from CUWCC installation program.
X-ray Film Processing Recycling Systems	Health care facilities moving to digital. Cannot justify lifetime savings.
Commercial High Efficiency Clothes Washers	Code
Water Softeners	New self-regenerating units banned in SCV since 2003. Rebate to voluntarily remove in place since 2005 by LA County Sanitation Districts.

New Construction Building Code

John Koeller, an expert on water conservation standards presented a review of alternative standards for new construction to the SCV water suppliers on August 27, 2007. This informational presentation addressed recent conservation related developments in building standards in California and the country, and concluded with a question and answer period.

Table 4.3 details 2 tiers of possible recommendations and future considerations for new construction based on the Smart from the Start program being developed by CUWCC.

Among single-family and multi-family residential items in table 4.3, kitchen faucets, lavatory faucets, showerheads, High Efficiency (HE, 1.2 gpf) toilets, and dishwashers are explicitly modeled in the saving calculations for New Construction Building Code. Savings from the landscape recommendations are included in the savings calculations as a percent reduction based on the assumption that a set of devices is implemented. Further detail is provided in Appendix B.2. Clothes washers are not included in New Construction Code

because they generally are not included with new housing.

All of the recommendations that apply to the CII sectors are included in the savings calculations as a percent reduction based on the assumption that a set of devices is implemented pursuant to the New Construction Code. Further detail is provided in Appendix B.2.

Table 4.3 - Recommendations for New Construction Building Standards

	TIER 1 - "SMART"	TIER 2 - "GENIUS"	FOR FUTURE CONSIDERATION
INDOOR - PLUMBING			
Kitchen Faucets	≤ 2.2gpm (EPAct 92 maximum)	≤ 2.2gpm (EPAct 92 maximum)	
Lavatory Faucets	Bathroom lavatory faucets: Maximum flow rate of 1.5-gpm. No minimum flow rate.	Bathroom lavatory faucets: Maximum flow rate of 1.0-gpm. No minimum flow rate.	Need to determine how to specify WaterSense-certified products while, at the same time, allowing for faucets with flow rates below the 0.8-gpm WaterSense minimum.
Showerheads & Shower Systems	Showerhead is defined as including the following types of emitters: a traditional showerhead, rain system, waterfall, bodyspray, bodyspa, or jet. Maximum flow rate is 2.5 gallons per minute for each.	Showerhead is defined as including the following types of emitters: a traditional showerhead, rain system, waterfall, bodyspray, bodyspa, or jet. Maximum flow rate is 2.0 gallons per minute for each. Systems or heads with a total flow rate below 2.0-gallons per minute shall include a thermostatic mixing valve matched and certified to the specific flow rate of that showerhead and/or system.	Waiting for WaterSense specification, which may not be available until late 2008 due to difficulty with defining satisfactory performance in a specification and test protocol.
Shower Stalls	Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, bodysprays, bodyspas, and jets, shall be limited to the allowable showerhead flow rate as specified above (2.5-gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 sq.in. For each increment of 2,500 sq.in. of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above shall be allowed. Exception: Showers that emit recirculated non-potable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.	Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, bodysprays, bodyspas, and jets, shall be limited to the allowable showerhead flow rate as specified above (2.0-gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 sq.in. For each increment of 2,500 sq.in. of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above shall be allowed. Exception: Showers that emit recirculated non-potable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.	
Toilets	WaterSense HET (provides for effective flush volume maximum of 1.28-gpf or less)	WaterSense HET AND effective flush volume maximum of 1.00-gpf or less	
Urinals	High-Efficiency Urinal (HEU): Maximum flush volume of 0.5 gallons	High-Efficiency Urinal (HEU): Maximum flush volume of 0.25 gallons	Wating for WaterSense specification for HEUs.
Indoor Water Pressure (line pressure)	50 psi maximum (static)	50 psi maximum (static)	Note that this maximim applies only to indoor plumbing.
INDOOR - APPLIANCES			
Dishwashers	Where an automatic dishwasher is provided, it shall be Energy Star labeled AND have a maximum water use of 5.8 gallons per full wash and rinse cycle.	Where an automatic dishwasher is provided, it shall be Energy Star labeled AND have a maximum water use of 5.0 gallons per full wash and rinse cycle.	Need to make water consumption data for each dishwasher model more readily available to builders and consumers. Currently, Energy Star Canada is the only known publicly available source. Average water consumption is on the decline; will have to update these requirements periodically.
Clothes Washers	Where a clothes washing appliance is provided, it shall be Energy Star labeled AND be listed at CEE Tier 2 or better (i.e., maximum water factor of 6.0 or better)	Where a clothes washing appliance is provided, it shall be Energy Star labeled AND be listed at CEE Tier 3 or better (i.e., maximum water factor of 4.5 or better)	Average water consumption is on the decline; will have to update these requirements periodically.

Table 4.3 - Recommendations for New Construction Building Standards, continued

	TIER 1 - "SMART"	TIER 2 - "GENIUS"	FOR FUTURE CONSIDERATION
INDOOR - HOT WATER			
Recirculating System Central Manifold System Specified Distance to Water Heater	Engineered Parallel Piping system (central manifold): WITHOUT recirc loop - Trunk line from water heater to central manifold ≤5' all twigs ≤4 cups of pipe	Structured plumbing system: trunk line >3/4" diameter, with on demand circulation pump; twig lines <1/2" diameter, within 15' and 3 cups pipe	Needs further work to define requirements
Insulation	Insulate hot water pipes from water heater to kitchen R4 Insulate all hot water pipes R4 (required for all of the plumbing layouts; includes both above and beneath slab where applicable; beneath slab hot water pipes to be contained within a chaseway)	Insulate hot water pipes from water heater to kitchen R4 Insulate all hot water pipes R4 (required for all of the plumbing layouts; includes both above and beneath slab where applicable; beneath slab hot water pipes to be contained within a chaseway)	Insulation requirement for water heater to kitchen will be a California requirement by 2009.
INDOOR - OTHER			
Direct and Indirect Evaporative Coolers	1) Maximum water use shall be 6 gallons per ton-hour of cooling, as tested and listed at CEC Title 20 design conditions of 97.5F / 68.5F (drybulb/wetbulb). 2) Bleed systems are NOT allowed; must use a pump-out system to replace water in reservoir. 3) Water discharge must be based on time of operation, or measured TDS level in reservoir water. 4) System must use rigid media and Title 20 listed saturation (or cooling) efficiency of 75% or greater. 5) Water inlet line connecting to the reservoir shall not exceed 3/8" diameter. 6) Sump overflow line shall terminate at a location that is easily visible to building occupants, not connected directly to a wastewater pipe.	1) Maximum water use shall be 5 gallons per ton-hour of cooling, as tested and listed at CEC Title 20 design conditions of 97.5F / 68.5F (drybulb/wetbulb). 2) Bleed systems are NOT allowed; must use a pump-out system to replace water in reservoir. 3) Water discharge must be based on time of operation, or measured TDS level in reservoir water. 4) System must use rigid media and Title 20 listed saturation (or cooling) efficiency of 75% or greater. 5) Water inlet line connecting to the reservoir shall not exceed 1/4" diameter. 6) Sump overflow line shall terminate at a location that is easily visible to building occupants, not connected directly to a wastewater pipe. 7) Discharged water shall be used beneficially, such as watering landscape or added to a gray water system.	
Evaporative Cooled Central Air Conditioners	1) Maximum water use shall be 5 gallons per ton-hour of cooling, as tested and listed at CEC Title 20 design conditions of 97.5F / 68.5F (drybulb/wetbulb). 2) Bleed systems are NOT allowed; must use a pump-out system to replace water in reservoir. 3) Water discharge must be based on time of operation, or measured TDS level in reservoir water. 4) Water inlet line connecting to the reservoir shall not exceed 3/8" diameter. 5) Sump overflow line shall terminate at a location that is easily visible to building occupants, not connected directly to a wastewater pipe. 6) Condensate water from AC evaporation coils must be routed to the water reservoir for the evaporative cooling.	1) Maximum water use shall be 4 gallons per ton-hour of cooling, as tested and listed at CEC Title 20 design conditions of 97.5F / 68.5F (drybulb/wetbulb). 2) Bleed systems are NOT allowed; must use a pump-out system to replace water in reservoir. 3) Water discharge must be based on time of operation, or measured TDS level in reservoir water. 4) Water inlet line connecting to the reservoir shall not exceed 1/4" diameter. 5) Sump overflow line shall terminate at a location that is easily visible to building occupants, not connected directly to a wastewater pipe. 6) Discharged water shall be used beneficially, such as watering landscape or added to a gray water system. 7) Condensate water from AC evaporation coils must be routed to the water reservoir for the evaporative cooling.	
Water Softeners	If a water softener is installed, shall not use sodium as a basis for regeneration; demand-based regeneration required.	If a water softener is installed, shall not use sodium as a basis for regeneration; demand-based regeneration required.	Restrict the installation of water softeners to areas where water supply exceeds some justifiable, scientific level of need (e.g. 400 TDS).
Drinking Water Systems	NA	NA	Include reverse osmosis filter guidelines (efficiency = yield percentage). Guidelines on other types of equipment allowed & its efficiency etc. Limitations on quantity and placement of the RO taps.

Table 4.3 - Recommendations for New Construction Building Standards, continued

	TIER 1 - "SMART"	TIER 2 - "GENIUS"	FOR FUTURE CONSIDERATION
OUTDOOR - LANDSCAPING			
Sub-metering of Landscape Irrigation System	Dedicated irrigation meter for 10,000 sq ft or more of irrigated landscape.	Dedicated irrigation meter for 5,000 sq ft or more of irrigated landscape.	
Weather-Based Irrigation Controllers and System Efficiency	Weather-based irrigation controllers required for automated systems.	Weather-based irrigation controllers required for automated systems.	Irrigation system efficiency standards and periodic inspections
OUTDOOR - OTHER			
Swimming Pools	Where a pool or spa is provided, a pool/spa cover is required.	Where a pool or spa is provided, a pool/spa cover is required. Filter backwash water shall be treated to a quality level suitable for landscape application; system shall be in place for distributing such water to the on-site landscape.	Dedicated sub-meter for each pool/spa to identify water use and leaks.
ALTERNATE SOURCES OF WATER			
Cooling Condensate Reuse	Condensate from comfort (cooling) systems shall be captured for reuse and application to the landscape.	Condensate from comfort (cooling) systems shall be captured for reuse and application to the landscape.	
Greywater Reuse	Plumb for greywater capture and reuse (at a minimum, greywater source shall include the clothes washer/laundry room regardless of whether the builder provides the clothes washer appliance)	Plumb for greywater capture and reuse (at a minimum. Plumbed potential greywater source shall include the clothes washer/laundry room regardless of whether the builder provides the clothes washer appliance) Install an operational greywater capture, treatment and reuse system	
MUNICIPAL WATER SOURCE			
Municipally Reclaimed Water	Plumb the property for the distribution and use of municipally reclaimed water where such water is available within 500 feet of the dwelling. Uses shall include landscape irrigation and other interior uses as permitted by prevailing plumbing and health codes.	Plumb the property and dwelling for the distribution and use of municipally reclaimed water where such water is available within 1,500 feet of the dwelling. Uses shall include landscape irrigation and other interior uses as permitted by prevailing plumbing and health codes.	

CHAPTER 5: POTENTIAL PROGRAMS

Program Evaluation Criteria

The next step in the evaluation process was to determine the criteria that defined a successful program. Once defined, each of the potential programs would be screened and ranked according to these criteria.

During the Kickoff Meeting, representatives from all of the Santa Clarita Valley Water Suppliers collectively defined and prioritized a list of program evaluation criteria. Definitions were developed for each criterion. Each one was given a point value showing its relative importance in relation to the other listed criteria. The most sought-after characteristics were scored the highest with 5 points. The least received a score of 1 point.

The result of this process was the list of Program Evaluation Criteria found below.

Program Evaluation Criteria

5 points Reduces Water Use – The quantified water savings potential within a service area in terms of potential acre-feet saved per year and potential participation (number of existing customers, devices, retrofit opportunities, etc.).

5 points Cost Effective – (Cost/Yield, $/AF) –Santa Clarita Valley's cost to operate the program (administration, marketing, incentives and implementation) divided by the projected or actual water savings in acre-feet. Ideally, programs should cost less than the utilities' marginal cost of water.

5 points Stakeholder Support – The programs should be developed to encourage stakeholders in the Santa Clarita Valley to support the programs.

4 points Easy for Customers to Participate In (Implement-ability) - The offer must incentivize the customer to participate. It also must have a customer-easy process, a proactive marketing strategy, a well developed plan with goals, quality operations and stakeholder acceptability and commitment.

3 points Changes Long Term Behavior – Program services, technologies or pricing mechanisms have documented successes and measurements for water savings showing long term change in conservation behavior.

2 points Good Public Relations – Program provides heightened awareness and good will towards wholesale and retail water supplier and/or water conservation.

2 points Environmentally Sensitive (peak reduction, reduced wastewater discharges and urban runoffs) – Program delivers benefits beyond water savings that are of benefit to Santa Clarita Valley's residents.

1 point Easy to Explain to Customers – Programs must be easy to explain to customers so the message of conservation and program participation is focused and effective.

1 point Encourages Partnerships – Program is eligible for grant monies, shared program costs or other outside funding sources in order to lower program costs and increase cost effectiveness.

Potential Program Concepts

A conservation program, in its basic form, is the selection of a technology in combination with an outreach delivery system. Logically the next step in the process was to identify the optimal delivery method for each technology under consideration.

Program delivery types include the following:

- Rebates
- Direct Installation
- Give-Away Events
- Provide Training and/or Education Materials
- Public Media
- Ordinance and Legislation

The project team packaged conservation measures from the *Conservation Measures Guide* with the Delivery Mechanisms listed above into a set of Programs. These programs, along with existing programs, were evaluated using the Program Evaluation Criteria and presented at Stakeholder Workshop #1 for feedback.

Table 5.1 shows the conservation programs that were developed and it provides summary description of the program's elements.

Table 5.1 Overview of Conservation Programs						
PROGRAM NAME	STATUS	TECHNOLOGY	CUSTOMER OFFER	TARGET MARKET	SERVICES PROVIDED	OTHER BENEFITS
Recommended Programs						
High Efficiency Toilet Rebates	New/ Modified	High Efficiency Toilet	Single- and Multi-Family Rebates ($100)	Single family, Multi-family, and mobile homes.	Rebate administration.	Wastewater reduction
Large Landscape Audits with Incentives	New/ Modified	Audits, incentives for conservation equipment and measures.	Comprehensive landscape audit; $300/AF rebate for savings	Dedicated Landscape Meters, especially Large sites.	Customer contact, audits, incentive administration.	Peak-Season Savings; Runoff reduction
CII Audits and Customized Incentives	New / Modified	Audits, process improvements, conservation equipment incentives.	Audits and $300/AF rebate for savings	Commercial, Industrial, and Institutional Customers	Extensive customer contacts, scoping audit, comprehensive audits; rebate administration.	Peak-Season Savings; Runoff reduction ; Wastewater reduction
Landscape Contractor Certification	Modified	Weather-Based Irrigation Controllers; Conserving Sprinkler heads	Landscape contractor training; free WBICs and Sprinkler heads	Residential, Commercial, Institutional, and Large Landscape Customers	Training landscape contractors, equipment provision, verification and inspections.	Peak-Season Savings; Runoff reduction
High Efficiency Clothes Washer Rebates	New	High Efficiency Clothes Washers	Rebate $65/ HE Clothes Washer	Residential	Rebate administration, site inspections	Wastewater Reduction
New Construction Building Code	New	HE Toilets, landscape conservation, faucet aerators, showerheads, HE dishwashers	Required in new construction	All	Consistent new construction requirements; coordination with County.	Peak-Season Savings; Runoff reduction; wastewater reduction.

Table 5.1 Overview of Conservation Programs						
PROGRAM NAME	STATUS	TECHNOLOGY	CUSTOMER OFFER	TARGET MARKET	SERVICES PROVIDED	OTHER BENEFITS
Programs to Consider Further						
Cash for Grass	New	Turf replacement	$0.45 per sq.ft. incentive to customer	Residential, Commercial, and Institutional Sectors	Pre- and post-inspection, rebate administration	Peak-Season Savings; Runoff reduction
Industrial Process Audits and Incentives	New/ Modified	Audits, incentives for conservation equipment and measures.	Comprehensive audit; $300/AF rebate for savings	Commercial and Industrial	Customer contact, audits, incentive administration.	Wastewater reduction; Peak-Season Savings; Runoff reduction
HET Rebates, Aggressive Implementation	New/ Modified	High Efficiency Toilet	Single Family Rebates ($150), Multi-family and Mobile home rebate ($200)	Single family, Multi-family, and mobile homes, Non-ULFT households (pre-1992)	Rebate administration; phone support to identify pre-1992 fixtures; spot checks	Wastewater reduction

Stakeholder Workshop #1

With the criteria developed and list of preliminary program concepts completed, the next step was to hold the first of two scheduled Stakeholder Workshops. The primary goal of the Workshop was to secure feedback on the overall Master Plan process, the Conservation Measures Guide, and the programs as preliminary concepts. Stakeholder Workshop #1 was held on September 18, 2007. Invitations to attend were sent to Santa Clarita Valley customer groups, environmental groups, water conservation vendors, and local and state agencies.

At the workshop, Santa Clarita Valley staff along with the A&N consultant team walked attendees through a PowerPoint presentation that detailed the reasons for a Master Conservation Plan; the process to develop the Plan; promising markets and technologies; and preliminary program concepts. The presentation can be found in Appendix C.

At the end of the meeting, stakeholders were given the Stakeholder Feedback Form and asked to rank the top three programs and provide additional input as to programs that they believed were important to include in the master plan and reasons why.

In their feedback, attendees ranked the top seven programs as priorities:

1. High Efficiency Toilet Rebate Program
2. Large Landscape Audit & Customized Incentive Program
3. Landscape Contractor Certification and WBIC Distribution Program
4. CII Audit & Customized Incentive Program
5. Mandatory Indoor/Outdoor Efficiency Standards
6. Cash for Grass
7. Water Budgets

Attendees also provided comments on each of the above programs as well as general comments.

Development of Detailed Program Modules

Based upon the feedback gained during Stakeholder Workshop #1, the preliminary selection of seven programs was validated and the list remained intact. The project team undertook the next step to develop a comprehensive overview and evaluation of every one of the recommended programs. Each program overview was expanded to include specific details

regarding market potential, productivity levels, annual and lifecycle water savings, costs per unit and overall budget.

Stakeholder Workshop #2

Stakeholder Meeting #2 was held December 11, 2007. The primary objectives of the meeting were to:

1. Review the additional information for each preliminary program concept
2. Perform a final evaluation and ranking of the list of programs
3. Provide any additional feedback

The project team, with the aid of a PowerPoint presentation, walked stakeholders through the details for each of the recommended programs. Following the presentation, an open forum discussion was held to solicit feedback and concerns from attendees.

Table 5.2 depicts the Stakeholder Feedback Form used in this meeting to elicit feedback on the Conservation Programs.

Table 5.3 shows the how the programs were scored using the Stakeholder Criteria defined above. The column labeled Stakeholder Feedback is the average of the stakeholder scores collected with the Stakeholder Feedback Forms (adjusted to be commensurate with the 5 point scale).

Table 5.2 Stakeholder Feedback Form

Santa Clarita Valley Family of Water Suppliers
Water Conservation Strategic Plan

Ranking of New Proposed Programs

Program	Ranking *1-7 7 being best*	Comments
High Efficiency Toilet Rebate Program		
Large Landscape Audit & Customized Incentive Program		
Landscape Contractor Certification and WBIC Distribution Program		
CII Audit & Customized Incentive Program		
Mandatory Indoor/Outdoor Efficiency Standards		
Cash for Grass		
Water Budgets		

Additionally we would like to hear about other products or programs you are interested in, please write down any of your ideas.

Note: It was explained verbally that Mandatory Efficiency Standards would be implemented through standards for New Construction.

Table 5.3 – Program Evaluation Matrix

Program	Reduces Water Use (Certainty of Savings)	Reduces Water Use (Volume of New Potential Savings)	Cost Effective (Cost/Yield $/AF)	Stakeholder Support	Easy for Customers to Participate	Changes Long Term Behavior	Good Public Relations	Environ-mentally Sensitive	Easy to Explain to Customers	Encourages Partnerships	Weighted Point Score
Weights → / Programs ↓ / Points ↘	5		5	5	4	3	2	2	1	1	
Recommended New Programs											
HET Rebates, Single Family	5	3	3	3	5	5	5	3	4	2	11.9
HET Rebates, Multi-Family	5	2	4	3	5	5	5	3	4	2	12.2
Large Landscape Audits (w/ Incentives)	4	5	3	4	3	3	4	4	3	3	10.9
CII Audits and Customized Incentives	4	3	3	3	3	4	4	3	3	3	10.1
Landscape Contractor Certification (WBIC & Sprinklerheads)	4	4	4	3	5	3	5	4	3	3	11.7
HE Clothes Washer Program (1)	5	2	2	3	5	5	5	4	5	3	11.5
Building Code for New Construction (1)	5	5	5	3	3	5	3	4	3	3	12.4
Programs to Consider Further											
Cash for Grass	5	5	1	2	3	4	5	4	5	3	10.2
Industrial Process Audits and Incentives (1)	5	2	3	3	2	5	3	4	4	3	10.2
HET Rebates, Aggressive Implementation	5	3	3	3	5	5	5	3	4	2	11.9
Water Budgets	5	5	3	3	4	5	4	4	2	1	11.5
Programs Considered, but Not Recommended											
Untargeted ULFT Rebate Program (1)	5	1	2	3	5	5	5	3	4	2	10.8
Untargeted HET Rebate Program (1)	5	2	3	3	5	5	5	3	4	2	11.6
Toilet Give-Away Programs (1)	5	1	2	3	4	5	5	3	3	3	10.3
Toilet Direct Install Program (1)	5	2	2	3	5	5	5	3	3	2	10.9
Residential Audit Program (1)	3	1	1	3	3	1	5	2	3	2	7.1
Existing Programs											
HET Rebate (1)	5	1	2	3	5	5	5	3	4	2	10.8
Free Residential Audit (VWC) (1)	3	1	1	3	3	1	5	2	3	2	7.1
Retrofit Devices (1)	5	2	3	3	4	3	5	3	4	2	10.5
WBICs (1)	4	5	4	3	3	4	5	4	2	3	11.5
Education and Schools (1)	2	3	3	3	5	5	5	3	5	2	11.2
Media Partnership (1)	1	3	3	3	5	3	5	3	5	2	10.2
CII Audits (1)	3	1	1	3	3	1	5	2	3	2	7.1
Pre-Rinse Spray Nozzles (1)	5	1	4	3	5	4	5	4	4	3	11.9
Landscape Training (1)	3	4	3	3	3	3	4	4	3	3	10.1
Demonstration Garden (1)	2	2	3	3	3	4	5	4	4	3	9.9

CHAPTER 6: RECOMMENDED PROGRAMS

Program Mix Considerations

In addition to the elements of effective programs discussed in Chapter 5 and tabulated in Table 5.3, there were additional considerations that went beyond the boundaries of the program impacting the quality of the overall portfolio. Staff identified the following three additional portfolio considerations:

Program Mix Considerations

1. **Integrates into the Long Term Water Resources Plan-** Program neatly fits into the long term objectives of the water resource plan.

2. **Adds to the Overall Technology Mix of Programs.** Program expands the list of programs in various lifecycle stages (R&D, feasibility, pilot program, innovative technology, full scale)

3. **Contributes to the Goal of a Comprehensive Portfolio of Programs Targeting All Market Segments Including Hard-to-Reach Markets –** Program fills a desired "niche" in the overall portfolio that otherwise would not be addressed.

With final stakeholder input and program ranking completed, the project team then factored in practical aspects of program implementation. Elements that were considered in the final program review were:

- Budget implications
- Staffing requirements
- Variety in portfolio
- Transitioning existing program

The final selection of programs is listed below.

- **HET Rebates (Single and Multi-Family)**
- **Large Landscape Audits (w/incentives)**
- **CII Audits and Customized Incentives**
- **Landscape Contractor Certification (WBIC & Sprinkler-heads)**
- **HE Clothes Washer Rebates**
- **New Construction Building Code**
- **Valley-Wide Marketing**

Table 6.1 provides the Five Year Implementation Plan for the proposed conservation programs including the required budget and programs savings.

Table 6.1 - Five Year Implementation Plan: Savings and Annual Budget

Program	2009	2010	2011	2012	2013
HET Rebates					
Savings (AFY)	15	31	46	61	76
Large Landscape Audits (w/ Incentives)					
Savings (AFY)	38	76	115	153	191
CII Audits and Customized Incentives					
Savings (AFY)	53	105	158	210	263
Landscape Contractor Certification (WBIC & Sprinklerheads)					
Savings (AFY)	50	151	301	502	753
HE Clothes Washer Rebates					
Savings (AFY)	5	11	16	21	26
New Construction Code					
Savings (AFY)	445	911	1,397	1,682	1,978
Total Annual Savings (AFY)[1]	607	1,284	2,033	2,629	3,287
Total Annual Budget (in Thousand $)	$743	$820	$823	$903	$983

[1] Total Annual Savings are those produced in the first five years from program implementation over the first five years. Savings after five years continue due to device lifespans that exceed five years and due to future program implemenation over the course of the planning period.

WUE Program Costs and Savings

The WUE program cost benefit analysis is provided in Table 6.2 below.

Table 6.2 – Active WUE Program Costs and Savings

Program	Total Costs, Present Value	Lifetime Savings (AF)	Total Benefits, Present Value	Net Benefit (Benefit - Costs)	Benefits/Costs
HET Rebates, Single Family	$ 399,406	1,364	$ 703,415	$ 304,009	1.8
HET Rebates, Multi-Family	$ 470,981	2,859	$ 1,474,335	$ 1,003,354	3.1
Large Landscape Audits (w/ Incentives)	$ 2,621,163	8,400	$ 4,499,900	$ 1,878,737	1.7
CII Audits and Customized Incentives	$ 4,499,560	11,563	$ 6,194,075	$ 1,694,515	1.4
Landscape Contractor Cert. (WBICs, Sprinklerheads)	$ 3,202,176	26,596	$ 14,543,471	$ 11,341,294	4.5
HE Clothes Washer Rebates	$ 313,765	632	$ 351,542	$ 37,777	1.1
Valley-Wide Marketing Costs	$ 278,751				
Total Costs, Active Programs	$ 11,785,802				
Total Benefits, Active Programs		51,414	$ 27,766,737		
Benefit Cost Analysis				$ 15,980,935	2.4
New Construction Code		87,348			
Total w/ Marketing and New Construction Code		138,762			

Note: For active programs, total unit cost (Present Value Costs divided by Present Value Acre Feet) is: $354 /AF

Below are definitions of the terms listed above:

Total Costs, Present Value: The present value of all direct program costs
Lifetime Savings (AF): Cumulative water savings over all estimated participants
Total Benefits, Present Value: The present value of program benefits, taken over the lifetime savings.
Net Benefits: The difference between benefits and costs.
Benefit Cost Ratio: Benefits divided by costs.

Water Savings from Recommended Water Use Efficiency Programs

Figures 6.1 to 6.4 provide depictions of the future water savings through time of

- Active Conservation Programs
- New Construction Building Code
- Price-Induce Conservation
- All Savings Combined of the WUE Strategic Plan

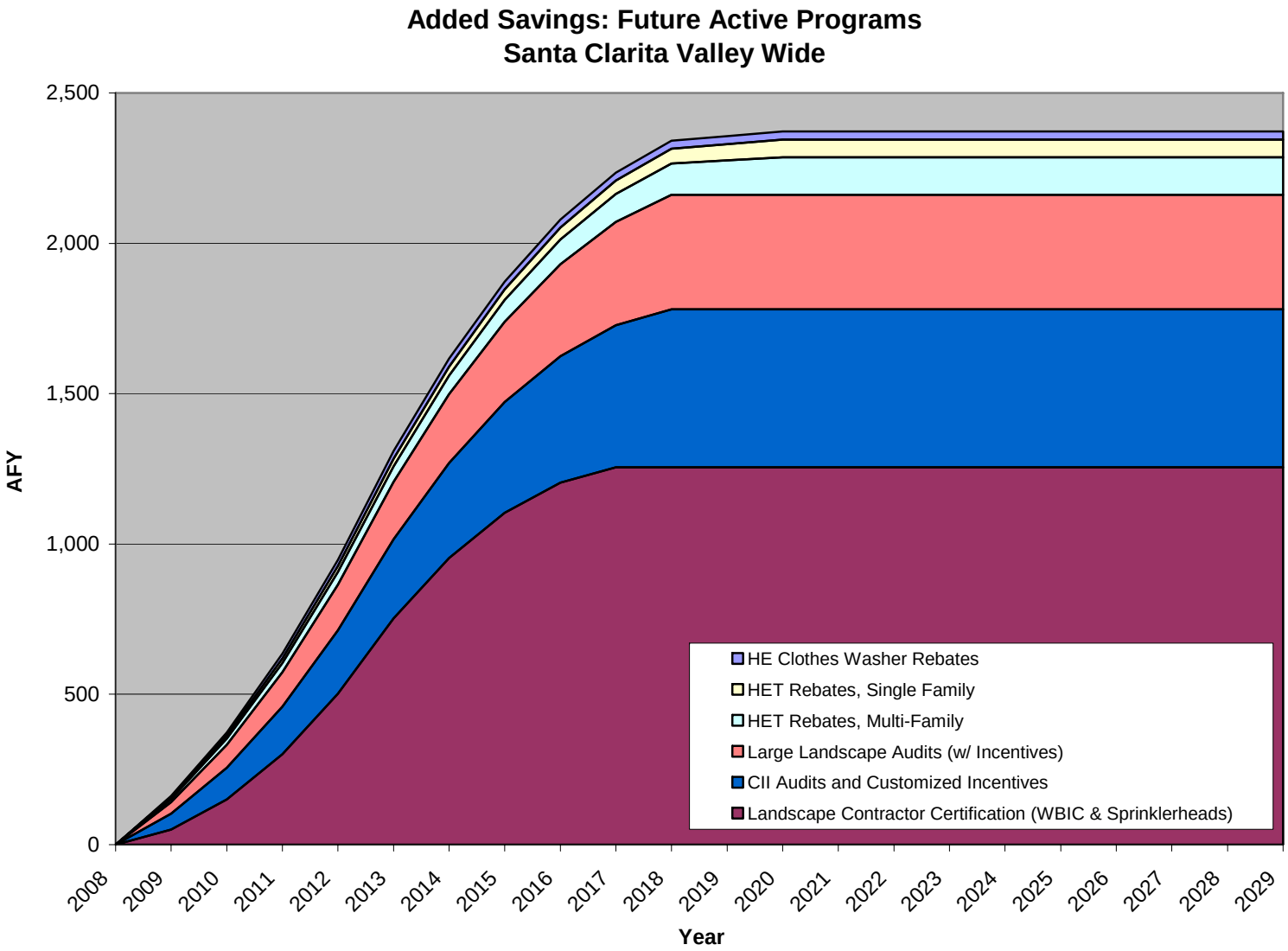


Figure 6.1 – Recommended Active Conservation Program Future Savings

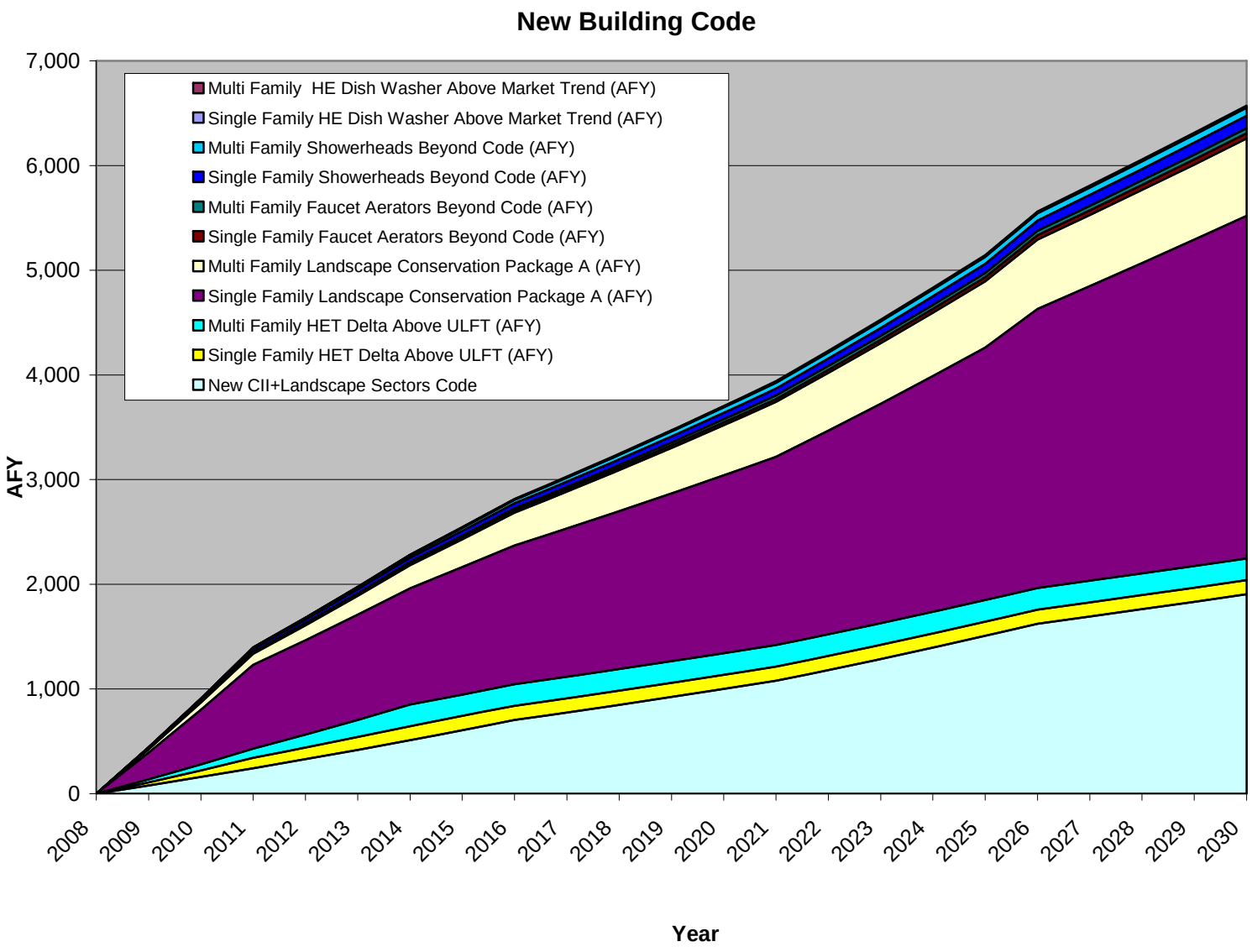


Figure 6.2 – Recommended New Construction Building Code Future Savings

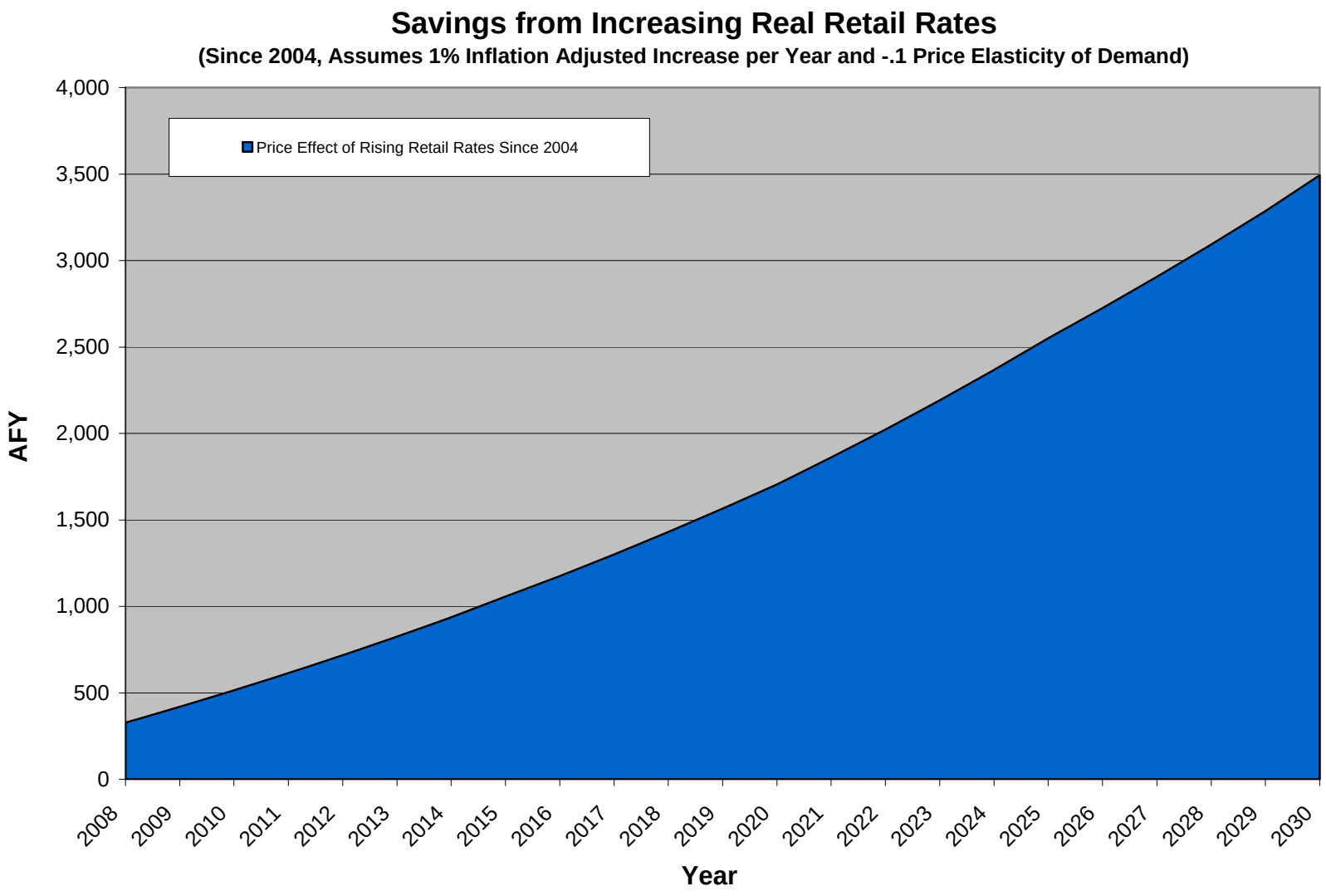


Figure 6.3 – Effect of Price-Induced Conservation Savings

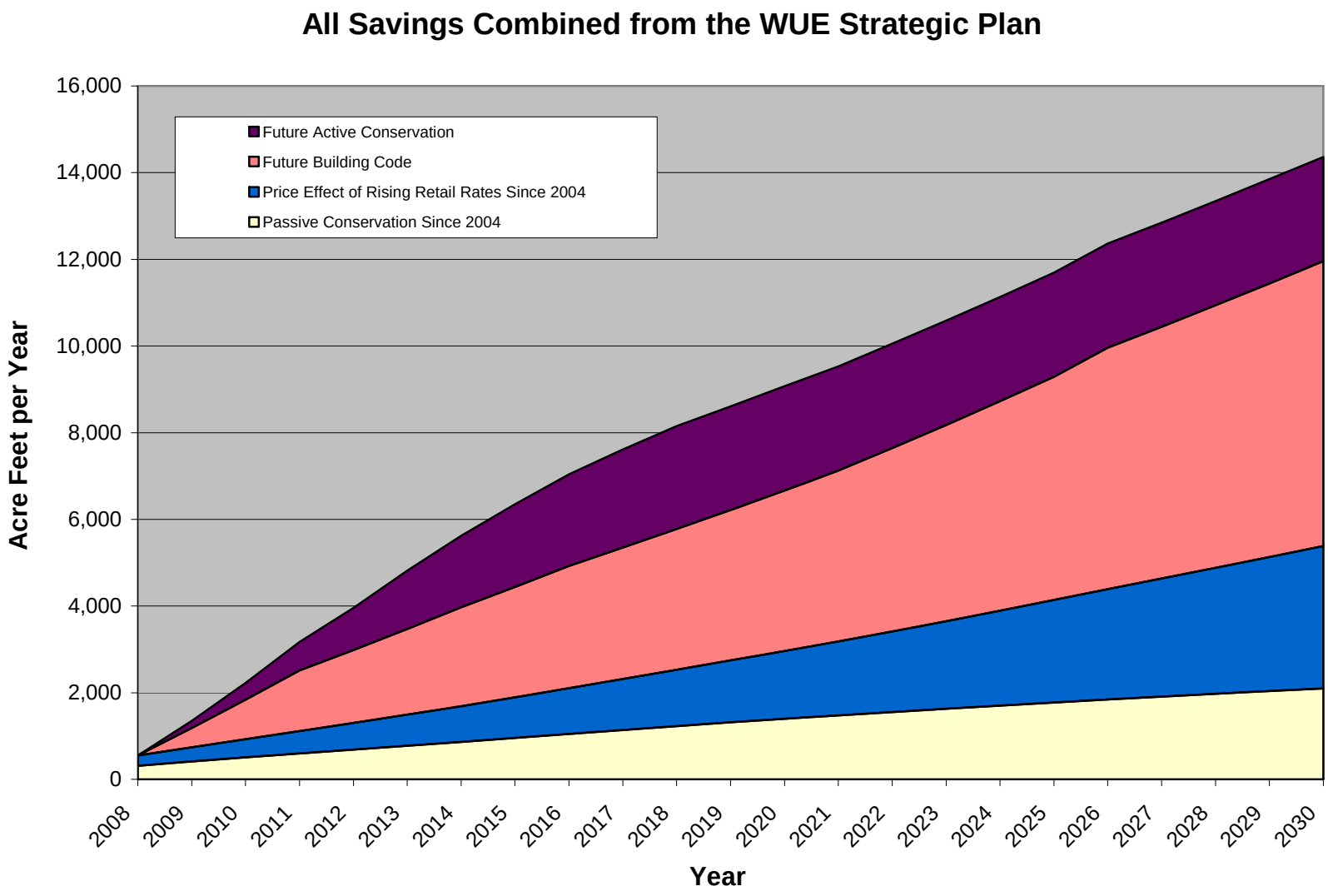
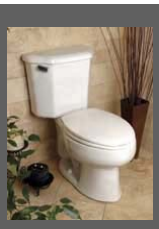


Figure 6.4 – All Savings Combined from the WUE Strategic Plan

Recommended WUE Program Details

On the following pages are WUE (conservation) program overviews with information regarding market opportunity, measure and program water savings and costs. Additionally there is information regarding program design and implementation requirements.



Solution for BMP 2

Santa Clarita Valley High Efficiency Toilet Rebate Program

Why Offer This Program?

Although the Santa Clarita Valley has an estimated 66 percent saturation rate for water efficient toilets (67 percent of single family toilets and 64 percent of multi-family toilets), there is significant opportunity for water savings in targeting the remaining old toilets, and saving even more water by promoting new "High Efficiency Toilets" throughout the service area.

Since 1992, only ULF toilets can be sold in the United States. Although this was a major advancement in residential water efficiency, there is still more that can be achieved. It is time to "raise the bar" and promote the newer high efficiency toilet (HET) technology which saves even more water.

The Santa Clarita Valley has a high percentage of new housing stock with 40 percent of single family and 33 percent of multi-family housing units built after 1992. As a result, these homes already utilize water saving ULF toilets. The savings opportunity lies within older residential sites that are utilizing non-ULF toilets.

Program Design

This is an open rebate program for residential customers, budgeted at approximately 500 rebates per year. Customers will be offered the following incentives for replacing a non-ULFT with an HET:

- Single family = **$100** rebate for HET replacement
- Multi-family and mobile home = **$100** rebate for HET replacement

Customers would be able to download program application form from utility website. Once new product is purchased and installed, customer completes application form and attaches original receipts. Then, the customer would be sent a rebate check or get a credit on their water bill.

New or Existing?	***Technology***	***Target Market***
Modified Program	High Efficiency Toilets	Single, Multi, Mobile home Non-ULFT households

Market Data

Pre 1992 Toilets: Single Family

	Total Toilets	Remaining non-ULF Toilets	Percent Remaining of Pre-1992	All Toilets	Remaining Potential Savings AFY
VWC	50,186	13,725	47%	73%	307
SCWD	41,238	15,813	47%	62%	354
NCWD	20,565	7,291	47%	65%	163
LA36	2,600	790	46%	70%	18
Total SF	114,589	37,619	47%	67%	843

Pre 1992 Toilets: Multi-Family

	Total Toilets	Remaining non-ULF Toilets	Percent Remaining	All Toilets	Remaining Potential Savings AFY
VWC	11,741	2,740	46%	77%	61
SCWD	31,148	11,838	46%	62%	265
NCWD	5,960	3,090	46%	48%	69
LA36	179	97	46%	46%	2
Total MF	49,027	17,764	46%	64%	398
Grand Total	163,616	55,383	46.5%	66.2%	1,241

Program Production

HET Rebates: Single-Family

	2009	2010	2011	2012	2013	5-Year Total
VWC	105	105	105	105	105	524
SCWD	104	104	104	104	104	522
NCWD	37	37	37	37	37	185
LA36	5	5	5	5	5	25
Total	251	251	251	251	251	1,256

HET Rebates: Multi-Family

	2009	2010	2011	2012	2013	5-Year Total
VWC	105	105	105	105	105	524
SCWD	104	104	104	104	104	522
NCWD	37	37	37	37	37	185
LA36	5	5	5	5	5	25
Total	251	251	251	251	251	1,256

Program Savings

A total of 2,512 HETs would be installed in the first five years of the program. A total of 6,030 HETs with the ongoing program of 500 per year until 2019 will save a total of **4,223 acre-feet** of water over the life of the product.

Program Costs

HET Rebate Program Cost per Acre Foot =

$475/acre-foot Single Family

$267/acre-foot Multi-Family

Santa Clarita Valley Large Landscape Audit & Incentive Program

Solution for BMP 5

Why Offer This Program?

In the Santa Clarita Valley, a high percentage of water is used for outdoor irrigation. Despite this high water use customers have little understanding of ways to alleviate excessive watering while still maintaining the health of their plants and turf.

Large landscape sites can be categorized into two types: public and private sector. Private sector customers, both property owners and Homeowner's Associations, typically pay landscape professionals to keep their grass green. They do not control the irrigation, the landscape companies do. On the flip side the landscape companies do not pay the water bill and have no incentive to reduce water use. To achieve success we must get both the landscape professional and the property owner engaged.

Public sector sites such as parks are typically maintained by city staff and require a somewhat different approach than private sector. The program must obtain support from multiple departments and staff levels.

The Large Landscape Program will build on a program conducted by CLWA that trains large landscape managers to properly set irrigation clocks and repair line leaks and sprinkler head malfunctions. The existing program consists of three components: 1) training on-site maintenance personnel about operating and maintaining the large landscapes; 2) retrofitting self-adjusting weather based irrigation controllers; and 3) demonstrating how to improve distribution uniformity at a single station through the installation of high uniformity nozzles.

Program Design

The program will offer water audits, minor repairs, equipment incentives, and water budgeting to public and private sector large landscape sites with high water use. At the onset the key targets will be the City of Santa Clarita Landscape Maintenance Districts, Los Angeles County Parks, and Homeowner's Associations.

Targeted customers, both public and private sector, will be contacted via phone to solicit participation. Private sector customers will be asked to invite their landscape service company to the audit whereas public sector customers will be asked to invite the on-site maintenance staff and their respective supervisors.

During the audit process, the field auditor will assess the efficiency of the irrigation system and identify leaks and repair opportunities. Minor repair of problems such as broken sprinkler lines and faulty spray heads will be performed.

Following the site visit, an analysis of the irrigation system's efficiency will be conducted to determine

the proper watering schedule for the landscape. In addition a water budget will be developed based upon the size of their landscape. Using the information from the site visit and the analysis, a report will be generated with upgrade recommendations, available incentives, new irrigation schedules, a water budget and a cost/benefit analysis. If possible the report will be delivered in person to further educate the customer. In addition customer will be provided with regular communication regarding their performance to budget.

Included in the report will be an application for available incentives. The available incentives include: high efficiency nozzles and weather based irrigation controllers. In order to maximum the incentive it is recommended that the incentive be customized based upon the customer's site and paid at a per acre foot saved valve. Using the report as back up documentation the customer would submit the application for incentive reimbursement. Then, the customer would be sent a rebate check or get a credit on their water bill.

New or Existing?

New program (existing pilot with the City of Santa Clarita)

Technology and/or Service

- Audit
- Installation of efficient spray nozzles and weather based irrigation controllers
- Irrigation system minor repairs
- Water budgeting
- Install sub meters

Target Market

Residential, Homeowners Associations & CII customers with 2 or more acres of irrigated landscape.

Program Production

Production	2009	2010	2011	2012	2013	5 Year Total
Initial Contact	140	140	140	140	140	700
Audited Sites	28	28	28	28	28	140

Program Savings

The 140 landscape audits in the first five years of the program, and another 140 in the second five years, will result in **8,400 acre-feet** in a program that sustains constant savings through 2030. [4]

Program Costs

Large Landscape Audit and Incentive Cost per Acre Foot = **$486/acre-foot**

[4] Lifetime savings result from 280 audits in the first ten years, and a total of 615 audits in a program that replicates at the end of savings life to sustain constant savings through 2030.

Santa Clarita Valley CII Audit & Customized Incentive Program

Solution for BMP 9

Why Offer This Program?

Approximately 19% of Santa Clarita Valley water is consumed by Commercial, Industrial, and Institutional customers. Unlike the residential market, commercial, industrial and institutional (CII) sites vary widely in their functionality and water consuming equipment.

As a result, water efficiency programs need to go beyond the menu-based programs to also allow customized incentives for site-specific opportunities. Because this is a smaller customer segment for the Valley it is all the more important for the program to be tailored to the customer to identify the best opportunities.

Program Design

The program will offer comprehensive water audits and reporting of cost effective recommendations in a clear and concise format with a focus on payback. Recommendations will include both the site-specific opportunities such as waterbrooms at Magic Mountain or cooling tower modifications at the College of the Canyons. Customers will then be offered a per acre-foot saved incentive based upon the findings of the audit.

The program will target high opportunity customers. These customers include: amusements parks, colleges and universities, hotels, hospitals and other customers identified by the retail water agencies. The key decision maker will be identified and contacted via phone to enlist participation.

If possible the audit report will be delivered in person and fully explained to customer. The staff person delivering the report would be able to answers questions and motivate and aid the customer in accomplishing the recommended retrofits.

If the customer moves forward with the conservation measures they will be required to submit an application to the water agency. The application will be compared against the report and then the customer would be sent a rebate check or get a credit on their water bill.

A number of water audits have already been performed by Valencia Water Company and others. For sites that already have audits, the program will focus on achieving recommended conservation actions.

New or Existing?	***Technology and/or Service***	***Target Market***
Modified program	▪ Audit	Commercial, Industrial

- Customized incentive for equipment retrofits

and Institutional water users

Targeted equipment

- High efficiency toilets and urinals
- Waterbrooms
- Commercial/coin op HEWs
- Cooling tower conductivity controller
- Sub-meters for landscape

Market Data

For 2006, the number of CII customers (Frequency) and their associated water consumption are depicted below for each supplier.

Supplier	Freq.	Sum (ccfyr)	Mean (ccfyr)
VWC	1,910	4,351,654	2,278
SCWD	790	862,362	1,092
NCWD	450	513,687	1,142
LA36	5	9,088	1,818
	3,155	5,736,791	1,819

Program Production

Production	2009	2010	2011	2012	2013	5 Year Total
Initial Contact	316	316	316	316	316	1,578
Audited Sites	63	63	63	63	63	316

Program Savings

The 316 audits over the first five years of the program, and another 316 over the second five years will save **11,563 acre-feet** of water in a program that sustains constant savings through 2030. [5]

Program Costs

CII Audit and Customized Incentive Cost per Acre Foot = **$606/acre-foot**

[5] Lifetime savings result from 632 audits over ten years, and a total of 1,387 audits in a program that replicates at the end of savings life to sustain constant savings through 2030.

Solution for BMP 5

Santa Clarita Valley Landscape Contractor Certification and Weather-based Irrigation Controller Program

Why Offer This Program?

A large portion of Santa Clarita Valley water consumption is for residential outdoor water use. A new technology that is proving to save a tremendous amount of water savings is weather-based irrigation controllers (WBIC) or smart controllers. This is ideal for large lot sizes with excessive watering, WBICs save water by changing irrigation schedules much more frequently and more accurately than controllers that are manually set. WBICs follow either average historical data or real-time evapotranspiration (ET) through a radio frequency signal or on-site weather sensor.

Since WBICs are an emerging technology, they have limited availability on suppliers' shelves. The product is best obtained directly from manufacturers. Adding to the limited product availability, most customers do not know how to install and operate WBICs. To make things more complex typical landscape contractors and maintenance companies may not have sufficient incentive to install water efficient technology. They are paid to keep the customer's landscape green and do not pay the water bill. There can also be language issues to overcome.

These barriers have greatly impacted the quantity of WBICs being moved in the market. Water agencies, therefore, must rethink how WBICs can most effectively be introduced in the market. Because landscape service providers are the key influencer in the market chain it makes sense to leverage these companies.

It will be necessary to educate landscape service providers on the value of WBICs and installation guidelines as well as incentivize them to install them at customer sites. In addition to WBICs, replacement of high flow sprinkler nozzles with water efficient models will further reduce excessive water flows and increase spray quality for the residential homeowner. This measure will be offered under the program, as well.

Program Design

The Program would target all landscape contractors and maintenance companies in the Santa Clarita Valley. These companies would be invited to water efficiency training workshops where their staff would be trained in the classroom and in the field on the importance of general water use efficiency, properly installed WBICs, hydro-zoning, and high distribution uniformity. Each staff person as well as the landscape company would receive an official certification for attending the workshop and committing to implementing water use efficiency at their customer's sites. Proactive contractors would be encouraged to sign up for the California Landscape Contractors Association (CLCA) Water Manager Certification Program [http://www.clca.org].

End use customers would be marketed via their landscape contractors. A list of landscape contractors will be developed through local business licenses. These companies will be sent a direct mail piece inviting them to a water use efficiency workshop. The mailer will also highlight the benefits of the training &

certification and free WBICs.

The one day workshop consists of basic irrigation principles, irrigation scheduling, the value of WBICs and guidelines to proper installation. Classes should be taught in English and Spanish and offered at least every year. Every participant would receive a certificate for attending training. This certificate would allow them to install the Free WBIC or supervise installations.

After attending the training and receiving certification, landscape contractor would be eligible to receive Free WBICs and Free high efficiency nozzles. The contractors would receive one WBIC and one set of nozzles after the initial training. They would be required to install them at a customer's site within the participating Supplier's service area. The installation must be inspected and installed properly before they were eligible to receive additional product. As contractors need additional product they would submit an application to the utility or their program vendor and the product would be picked up at the water Supplier's office. The first two – four installations for each installer would be required to have an inspection. Regular customers (not landscape contractors) would also be able to participate and attend the classes, but they get the equipment only for their home.

New or Existing?	***Technology and/or Service***	***Target Market***
NEW program	▪ Landscaper training and certification ▪ Weather based irrigation controllers ▪ HE spray nozzles	Customers of landscape service providers receiving certification

Program Production

Production	2009	2010	2011	2012	2013	5 Year Total
Initial Contacts	5	5	5	5	5	25
Personnel completing tra	25	25	25	25	25	126
Sites Retrofitted	301	603	904	1,206	1,507	4,522
Controllers	301	603	904	1,206	1,507	4,522
Sprinklerheads	6,030	12,059	18,089	24,119	30,149	90,446
Inspections	30	60	90	121	151	452

Program Savings

The 4,500 WBICs and 90,500 high efficiency nozzles installed over the five year program will save **26,596 acre-feet** of water in a program that replicates over time to sustain constant savings through 2030.

Program Costs

Landscape Contractor Certification/WBIC Program Cost per Acre Foot = **$184/acre-foot.**

Solution for BMP 6

Santa Clarita Valley Residential High Efficiency Clothes Washer Rebate Program

Why Offer This Program?

Residential High Efficiency Washers cut water and sewer flows by 60% and energy use by 50% per machine. HEWs with a water factor of 6.0 or less save an estimated 5,085 gallons per year. With a 12 year life, the savings per machine are substantial.

Currently it is estimated that the saturation rate of residential HEWs is less than 10% in Santa Clarita Valley.

Unfortunately, many customers are still resistant to purchase HEWs due to the higher price tag. Standard clothes washers are still $200 - $500 less expensive than high efficiency models. Because this is a large ticket item for most customers the program can only leverage the annual replacement sales. Getting customers to replace their clothes washer without already needing to is extremely challenging.

HEW customer incentives reduce this differential, therefore overcoming the product's major barrier to sale. Currently the Southern California Gas Company offers an instant or point of purchase incentive of $35 for 2008 Energy Star Qualified HEWs. Although the water savings does not justify a large incentive even a $65 incentive coupled with the Gas Company's incentive will help the customer make a purchasing decision.

Program Design

The program would target single family and multi-family residential customer purchasing a new clothes washer. Because this is a large ticket item for most customers the program can only leverage the annual replacement sales. Getting customers to replace their clothes washer without already needing to is extremely challenging.

The program would offer an incentive of $65 for the replacement of a non-efficient washer with a high efficiency model. The model must be a qualified Energy Star model with a water factor of 6.0 or less and an energy factor of 1.72 or greater.

The program would be advertised through point of purchase materials displayed at local appliance stores, hardware stores and big box retailers and websites of water suppliers.

Customers would be able to download program application form from utility website. Once new product is purchased and installed, customer completes application form and attaches original receipts. Then, the customer would be sent a rebate check or get a credit on their water bill.

New or Existing?	*Technology*	*Target Market*
Modified Program	High Efficiency Clothes Washers	Single family and Multi-Family

Market Data

There are approximately 58,200 single and multi-family residences with clothes washers in the Santa Clarita Valley, of which perhaps 4,600 are high efficiency. High efficiency clothes washers currently represent approximately 30 percent of new sales.

Program Production

Proposed production is 0.5 percent of total (single and multi-family) residential units per year for five years.

Production	2009	2010	2011	2012	2013	Total
Administration (per Rebate)	422	422	422	422	422	2,110
Rebates	422	422	422	422	422	2,110

Program Savings

The 2,110 high efficiency washers installed over the five year program will save 632 **acre-feet** of water in a program that sustains constant savings through 2030.[6]

Program Costs

HEW Rebate Program Cost per Acre Foot $740**/AF.**

[6] Lifetime savings result from 2,110 units installed in the first five years, and a total of 4,219 units in a program that replicates at the end of savings life to sustain constant savings through 2030.

CHAPTER 7: IMPLEMENTATION PLAN

Facilitating Actions

The programs described in the previous chapter do not describe all the needed work from Santa Clarita Valley Family of Water Suppliers to implement conservation in the area. There are additional non-programmatic actions—to be performed by the water Suppliers—that are needed to facilitate implementation of cost-effective programs. These include:

- Pursuit of local and state-wide changes to building code;
- Pursuit of local ordinances supporting water use efficiency and water recycling;
- Local, state, and federal legislative advocacy on conservation-related issues;
- Active participation in trade groups and policy forums such as the California Urban Water Conservation Council working groups;
- Support of research and studies on new technologies and approaches to water use efficiency;
- Education and training within communities on water use efficiency and conservation practices;
- Outreach and marketing to cities, agencies, consumers, and other stakeholders, either directly or through partnerships with other agencies and entities; and
- Identification of outside funding possibilities and coordination of partnering agencies.

Partnerships

Santa Clarita Valley is fortunate to have a number of capable organizations and coalitions with which to join forces on programs and water efficiency initiatives. Organizations that may share interests and want to develop partnerships include the utilities and agencies that provide electricity, natural gas, wastewater collection and treatment, surface runoff mitigation, and other conservation and planning activities.

Trade Organizations

There are a number of trade organizations that actively drive changes and advancements within the state of California. Santa Clarita Valley Suppliers actively participate in these organizations and derive many benefits including:

- Energy/water policy
- Efficiency Standards
- Legislation for water efficiency

CUWCC is the lead organization in California, affecting much positive change in the industry over the past ten years. Santa Clarita Valley could also benefit from the recent

water/energy collaborative policy processes under way. Santa Clarita Valley Suppliers will continue to support these efforts.

Funding Opportunities

By securing outside funding, the Santa Clarita Valley Family of Water Suppliers will be able to leverage its funding and increase the cost effectiveness of programs.

- United States Bureau of Reclamation
- Department of Water Resources
- Partnerships with other local utilities (electric, gas, sanitation) and customer agencies.

Department of Water Resources
DWR issues grants under Prop 50, formerly issued under Prop 13. Funding is issued for a two year cycle. Based upon a DWR-issued timetable, agencies can download RFP requirements from the DWR website and submit their grant proposal(s) for programs. DWR funding is appropriated for programs that are innovative in marketing outreach or technology. Generally, DWR supports newer technologies as long as there is some record of product performance.

United States Bureau of Reclamation
USBR provides a smaller pool of grant money than DWR, but is worth pursuing none the less. USBR creates an annual time calendar for grant submittals and posts the RFP and response template on their website. Programs receiving grant awards are innovative in design or meet the needs for a niche market.

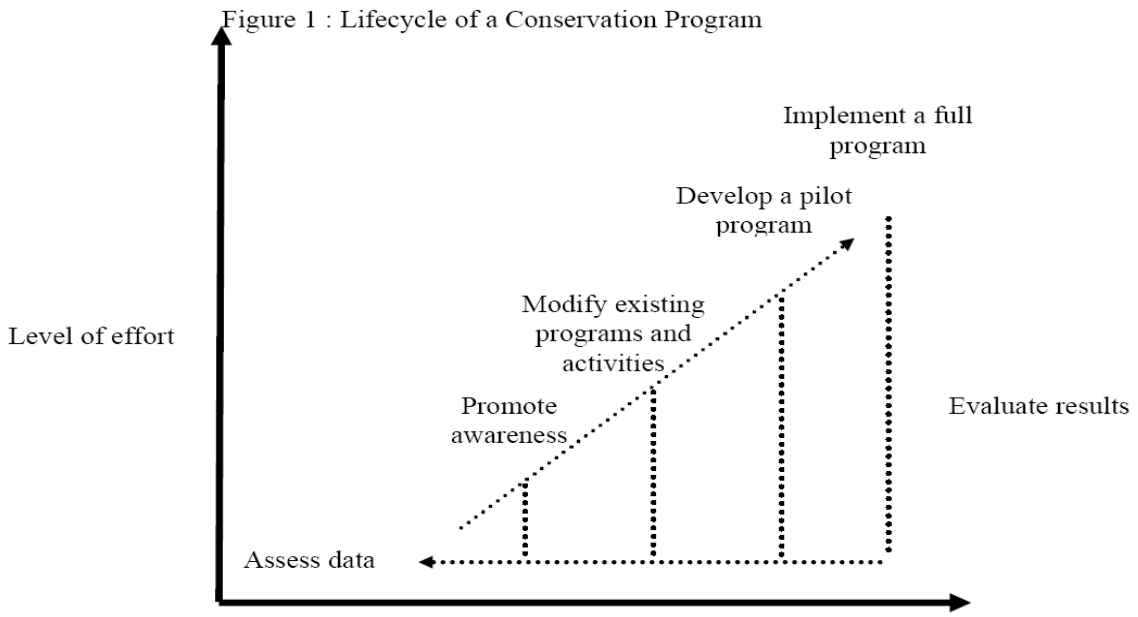
Energy Utilities - Southern California's energy utilities are becoming an ever more viable program resource for water suppliers. Presently there are four general categories of program opportunities for water agencies to pursue:

- **Internally-operated utility programs -**Water suppliers can often piggyback energy programs, adding a water measure, audit, or service onto the site visit. The water agency typically pays only an incremental cost for their portion of the program.
- **Programs awarded through a competitive bid -**Water suppliers can submit bids to the energy utility to provide shared services for a program.
- **Partnership Programs -** Programs such as Rinse & Save are partnership programs that are funded by a number of organizations in order to operate the program on a larger and more cost effective basis.

Santa Clarita Valley Suppliers are keeping track of the various funding entities and timetables in order to gain maximum benefit from these organizations.

Program Life cycle

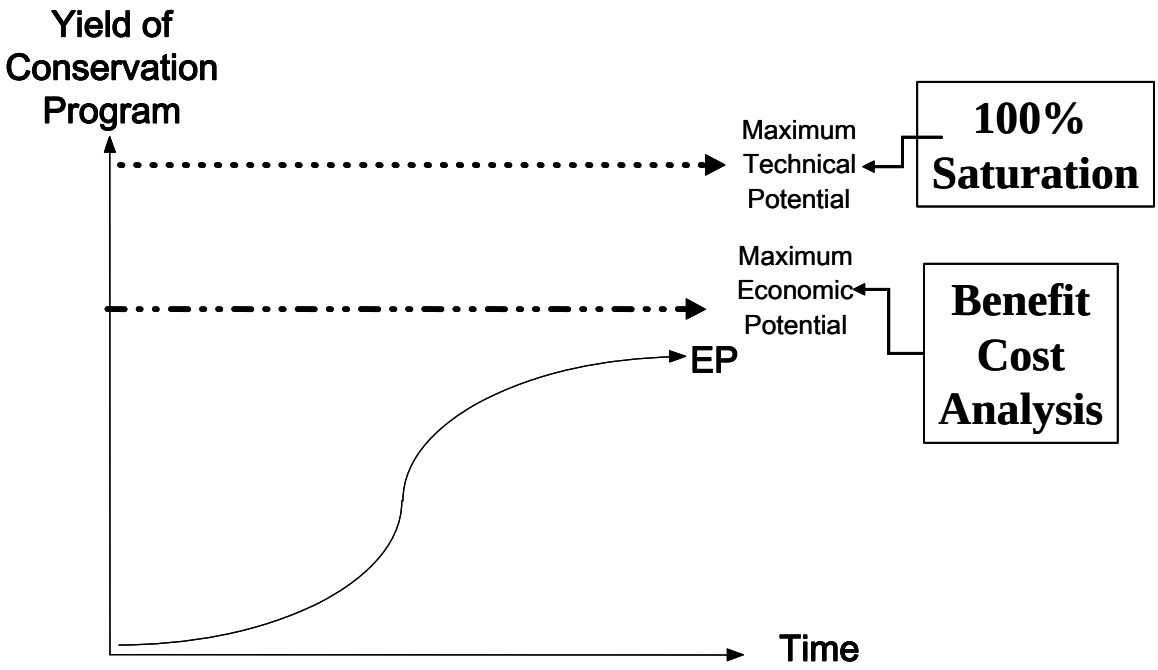
As additional funding opportunities appear and as successful programs prove themselves, it is intended that this master plan be periodically updated. Figure 7.1 below depicts the first stages in the Lifecycle of a Conservation Program. Much of the data assessment has been performed in the process of creating this master plan, but the remaining stages can vary from program to program.



Source: *Socioeconomic Impacts of Conservation*, AwwaRF 2001.

Figure 7.1: Lifecycle of a Typical Conservation Program

Even fully functioning programs will, however, face decreasing returns to scale as the market for the particular water efficient technology or measure becomes saturated. Figure 7.2, on the following page, depicts a typical *S*-shaped technology diffusion curve that describes the adoption and diffusion of new technologies. Thus, today's most attractive conservation program opportunities will, if correctly implemented, become less attractive at some point in the future.



Source: Authors' Construct

Figure 7.2: Expansion Path (EP) of a Typical Conservation Program

The relationship between cost and yield from conservation programs can be summarized in a "supply curve". Figure 7.3 depicts this economic relationship between conservation supply and cost based on estimates provided in the economic analyses conducted in this study.

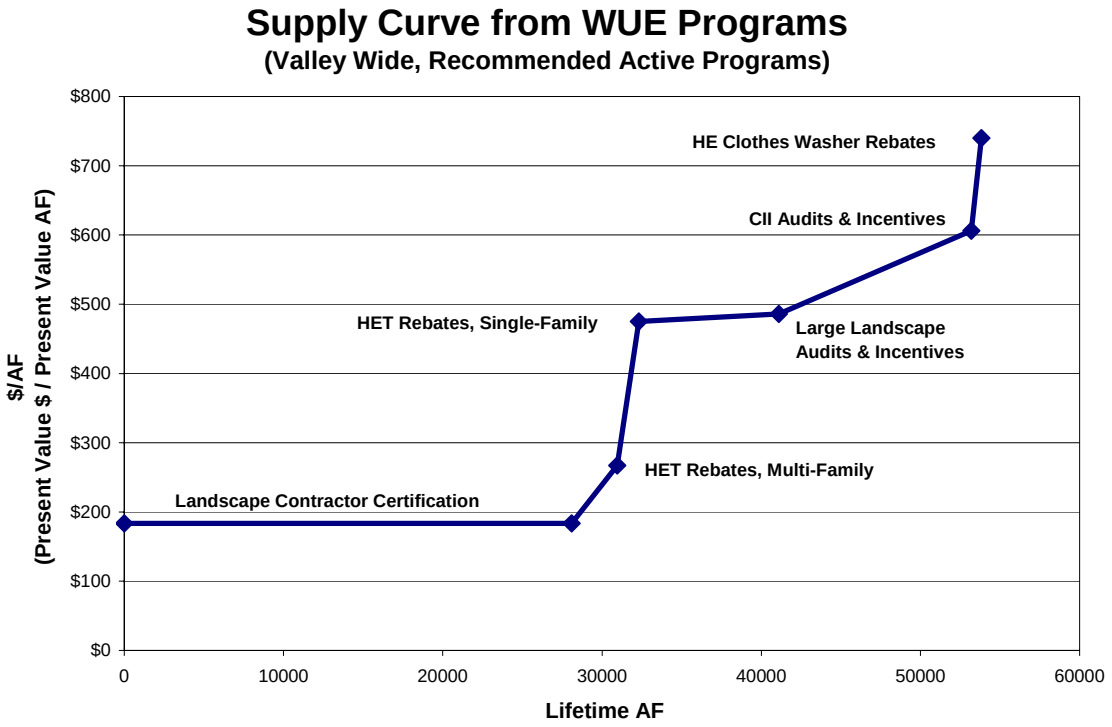


Figure 7.3: Supply Curve of Active WUE (Conservation) Programs

The reader should note that the estimated supply curve from conservation is based upon prospective data estimates of expected costs and yield from conservation programs. Each implemented program saves water over their life of their respective installed devices. Figures 6.1 to 6.4 displayed in the previous chapter depict the estimated "yield" from conservation programs over time. The lifetime cost of all recommended WUE Programs is less than the avoided costs. Note this Plan was designed so that active conservation savings do not decay over time (Figure 6.1). To achieve this, the Plan includes replicating programs at the end of their savings life

Updates to the Plan

The current implementation plan has positive net benefits for Santa Clarita Valley and the region. The adopted 5-year implementation plan represents a significant commitment from Santa Clarita Valley, beyond its direct economic costs. The implementation hurdles that need to be addressed include marketing challenges, negotiations with potential co-funding partners, support for enabling building codes and legislation, and facilitating political support. If the current comprehensive set of conservation programs can be implemented

feasibly and cost-effectively, the suppliers can be expected to expand the scale of the effect programs. On the other hand, if some conservation programs cannot be effectively implemented, the suppliers can and should scale these programs back. Measuring and tracking ongoing conservation program implementation is key to understanding what is working, what is not working, and how conservation program delivery can be improved. The Conservation Planning Models created for each purveyor in this project would be useful for tracking ongoing program accomplishments. Additional performance metrics can be considered in step with state-wide conservation goals (See Appendix E, Achieving the 20X2020 Conservation Goal).

This WUE Strategic Plan is designed to be a living document that adapts as each water Supplier learns more about delivering conservation programs. Santa Clarita Valley Suppliers will need to revisit and revise this WUE Strategic Plan on an on-going basis to reflect changing outside funding, learning of what works with existing opportunities, and new market opportunities.

APPENDIX A.1: CONSERVATION MEASURE GUIDE

This appendix contains the Conservation Measure Guide.

MEASURE GUIDE

Devices	Ultra Low Flush Toilets (ULFTs) RESIDENTIAL	Ultra Low Flush Toilets (ULFTs) COMMERCIAL	High-Efficiency Toilets (HETs) DUAL FLUSH	High-Efficiency Toilets (HETs) PRESSURE-ASSISTED
Types of Programs	Rebate or Voucher Distribution Direct Installation Vendor delivery (mf) Retrofit on resale ordinance	Rebate or Voucher Direct Installation Vendor delivery Valve replacement	Additional Rebate Direct Installation	Additional Rebate Direct Installation
Description	1.6 gallons per flush (gpf) Mandated since 1992; maximum 1.6-gpf sold in CA. Since 1994 only 1.6 sold in US. Residential toilets are typically tank-type models with round bowls. There are two types of tank models: gravity fed and pressure assisted. Gravity toilets are the most common type. They rely on the weight of the water and head pressure to remove the waste through the trap. Pressure assisted models supply line pressure to force the waste through the trap. Pressure assisted models typically costs $100+ more. There is also a third type, vacuum gravity models, a hybrid of the these two.	1.6 gallons per flush (gpf) Mandated since 1994; maximum 1.6-gpf installed in US. (except for blowout toilets, for which maximum is 3.5-gpf) There are two types of toilets installed in commercial facilities: flushometer valve and tank-types. Flushometer valve toilets are activated through a handle or automatic sensor located above the toilet bowl. They tend to be installed in locations that receive high use. Tank-type toilets are similar to residential models except when used by the public are required to have an elongated bowl. Sloan has introduced a the Crown Flushometer Valve which can not be inadvertently retrofitted to use more than 1.6 gallons per flush as is the case with the Sloan crown valves as well as those from other manufacturers	"Short Flush" for Liquids: 0.8-1.1-gpf "Full Flush" for Solids and Liquids: 1.6-gpf High-efficiency dual-flush toilets are tank type toilets that have two flushes: one for liquids with a reduced flow of 0.8 to 1.1-gpf and one for solids at 1.6 gpf. Pressure assisted dual flush toilets are now on the market and dual flush flushometer type toilets are now on the market.	0.8 to 1.0-gpf Typical high-efficiency pressure assist toilet fixtures flush at 1.0-gpf. There are now gravity flush toilets available at 1.3 gpf.
Savings	Single Family 21 – 27 gpd Multi Family 36 – 63 gpd Depends on persons per household and toilets per household	16 – 57* gpd *Depends on type of facility and amount of use	6 gpd above standard ULF savings	6 gpd above standard ULF savings
Product Life Cycle	Gravity: 20 years Pressure: 25 years	Gravity: 20 years Pressure: 25 years Flushometer: 30 years	Same as standard ULF models	Same as standard ULF models
Per Unit Program Cost	$60 – $230+ per unit $60 – $125 for rebate or distribution $150 – $230 for installation	$90 – $350+	$80+ above standard program costs	Cost is equal to that for conventional 1.6-gpf pressure-assist fixtures
Studies, Standards and Other Technical Documents	• CUWCC Assumptions & Methodology for Determining Estimates of Reliable Water Savings from the Installation of ULFTs, 1992 • MaP, Maximum Performance (MaP) Testing of Popular Toilet Models- updated periodically • LADWP Supplementary Purchase Specification (SPS) List of Certified Toilet Fixtures • CUWCC Toilet Flapper Study, CUWCC Library or Purchase	• CUWCC CII ULFT Study, 2001 • Seattle Public Utilities Testing of Wall-mounted Flushometer Valve Toilets • http://www.sloanvalve.com/index_2983.htm	WaterLogue Volume 2, No. 5 – Fall 2003 Summary three separate studies • Dual Flush Fixture Studies www.cuwcc.org/uploads/product/Dual_Flush_Fixture_Studies.pdf • Jordan Valley ULFT Study, 2003 www.cuwcc.org/uploads/product/Jordan_Valley_ULFT_Study.pdf • US Department of Energy and Pacific Northwest National Laboratories, 2001	• Product Listing *www.cuwcc.org/uploads/product/HET.pdf*
Program References with Contacts	• LADWP CBO Distribution and Installation Program *Contact:* Tom Gackstetter • SDCWA Voucher Incentive Program *Contact:* Cindi Hansen • City of Austin Rebate Program *Contact:* Tony Gregg	• SDCWA Voucher Incentive Program *Contact:* Rose Smutka • MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell • Contra Costa CII Rebate Program *Contact:* Chris Dundon • City of Austin Rebate and Free Toilet Program which allows only Crown Flushometer Valve *Contact:* Tony Gregg	• Pasadena Water and Power Dual Flush Installation Program in Restaurants *Contact:* Jane Raftis • City of Redwood City Toilet Replacement Program *Contact:* Manny Rosas	• SCVWD CII HET Installation Program *Contact:* Karen Morvay • EBMUD Toilet Rebate Program *Contact:* Andrea Balazs

MEASURE GUIDE

Devices	Urinals ULTRA LOW FLUSH (ULF)	ZERO CONSUMPTION	HIGH EFFICIENCY (HEU)
Types of Programs	Rebate or Voucher Vendor delivery Valve replacement	Additional Rebate Direct Installation Vendor delivery	Additional Rebate
Description	1.0 gpf Mandated since 1994, max of 1.0-gpf sold in US. A conventional non-efficient urinal is rated at 1.5 – 3.0-gpf.. A typical urinal uses a flushometer valve. The components in the valve can be retrofitted with a low flow flush valve kit for considerably less than replacing the entire unit.	0 gpf Non-water-consuming, zero consumption or dry urinal fixtures do not require a water supply or flushometer valve to remove the contents of the fixture. These fixtures are designed to receive and convey only liquid waste through a trap seal and into a gravity system without the use of water for this function. These fixtures have an integral or removal trap with a liquid seal. These seals require regular periodic replacement or maintenance.	0.5-gpf or below Although not commonly installed, HEU flushing urinals are readily available from most manufacturers. Like conventional urinals, these fixtures use a flushometer or pilot valve to deliver water to the fixture. A number of companies are working on pint flushing urinals for home use.
Savings	4 – 56 gpd	9 – 131 gpd	8 – 112 gpd
Product Life Cycle	30 years	25 years	Same as standard ULF urinals
Per Unit Program Cost	$20 - $300	$90 - $400+	Same as standard ULF urinals
Studies, Standards and Other Technical Documents	• Behling and Bartilucci, 1992 • City of Bellvue, 1992a and b • WaterLogue Volume 1 No. 7 in Petaluma	• To be determined	• To be determined
Program References with Contacts	• MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell or Greg Kozykoski	• Central Basin MWD Prop 13 Zero Consumption Urinal Direct Installation Program *Contact:* Gus Meza	• To be determined

MEASURE GUIDE

Devices	High Efficiency Clothes Washers RESIDENTIAL	 COMMERCIAL	Water Softeners RESIDENTIAL & COMMERCIAL	Industrial Laundries COMMERCIAL, INDUSTRIAL & INSTITUTIONAL
Types of Programs	Rebate or Voucher New construction requirement (mf)	Rebate or Voucher New construction requirement	Financial incentives Operating restrictions Ordinance for new construction	Audits and Customized Incentives
Description	High-efficiency clothes washers (HEWs) utilize technological advances to deliver excellent wash performance while saving both water and energy. Efficient models use 35 - 50% less water. This reduction in water use means less energy needed to heat the water (approximately 50% less energy). Models of residential high-efficiency washers are offered by Whirlpool, Kenmore, Maytag, LG, GE, Frigidaire, Bosch Asko and Staber Commercial machines are offered by Maytag, Speed Queen, , Unimac, and Wascomat, . Typically residential HEWs cost on average $200-400 more than an inefficiency model but the differential is declining as manufacturers introduce new lower priced models to meet the 2007 standard. On February 4, 2004, the California Energy Commission adopted water efficiency standards for residential clothes washers. It is a tiered standard based on the "water factor" of the clothes washer, which is the number of gallons per cubic foot of wash load. The lower the water factor rating, the more water efficient the clothes washer. In 2007, the maximum water factor which will be allowed is 8.5 per machine. By 2010 the standard will be further reduced to 6.0. California is awaiting approval from the Department of Energy to implement these standards A revised federal standard takes effect on Jan. 1, 2007 includes a minimum MEF of 1.42. There is no WF standard. The current Energy Star criteria for clothes washers is a minimum MEF of 1.42. Energy Star has adopted new residential clothes washer criteria that goes into effect on Jan. 1, 2007. The criteria include a maximum WF of 8.0 and minimum MEF of 1.72. Most utilities use the Consortium for Energy Efficiency http://www.cee1.org/resid/seha/rwsh/rwsh-main.php3 Qualifying Product List of clothes washer to determine those eligible for incentives. There are three tiers to select from. Tier 1 currently is essentially the 2007 standard and Tier 3 contains the most efficient models.	Standard commercial HEWs are the same as virtually the same technology as residential models, however most are coin-operated and located in laundromats or multi-family common area laundry. Because of their increased use they save more. In February of 2003 the California Energy Commission adopted a 9.5 water factor standard for commercial clothes washers beginning in 2007. The 2005 Federal Energy Policy Act include the same standard and effective date. Multi-load Washers: 30 – 80 lb. capacity, save additional water through the replacement of single load washers with highly efficient multi-load washers.	Replace older softeners with newer units that use less water, Recharge should be based on volume of use or by a hardness controller. Softeners with timers should be prohibited. Reverse osmosis and nanofiltration equipment should be used only where absolutely necessary. Where used, the water reject rate should be less than the volume of filtered water produced. The reject water should be reused beneficially wherever possible. Where pumps are used, they should have mechanical seals instead of packing glands wherever allowed by code. Packing glands should have some weepage but limited to 1/4 to _ gallon per minute for most buildings pumps, higher for larger industrial pumps. As the packing ages, it leaks at a faster rate and thus wastes water. This measure also offers potential wastewater and energy benefits	Commercial and institutional laundry facilities include those that wash linens, uniforms, and other items for hotels and motels, hospitals, nursing homes, diaper services, and restaurants. Laundry facilities often consume large quantities of water for operations that include the wash and rinse cycles of washing machines, steam heated dryers, steam pressing equipment, and reclamation of dry cleaning solvent. Conventional washer extractors used by most laundry facilities operate with a rotating drum that agitates the laundry during wash and rinse cycles, then spins at high speeds to extract the water. Washer-extractors and most other conventional large scale washing machines use freshwater for each wash and rinse cycle; there is no internal recycling. The capacity of washer -extractors ranges from 35-800 dry pounds per load. They use 2.5 - 3.5 gallons of water per pound of laundry, the equivalent of 1,000 to 1,400 gallons of water per 400 pound load. Water efficient laundering equipment, such as continuous batch (usually called tunnel) washers and water reclamation systems, can reduce water use by as much as 80% at commercial and institutional facilities equipped with conventional washer extractors. For example, a commercial laundry in the Boston area saved more than 25 mgy by installing a continuous batch washer. The cost of the new laundry system was $1 million, but with a $500,000 reduction in annual water and operating costs, the new system paid for itself in less than two years.
Savings	21 – 27 gpd	53 – 107 gpd	• To be determined	10 – 76 million gallons per year
Product Life Cycle	12 years	8-10 years	• To be determined	10 years
Per Unit Program Cost	$100 -$150	$150 – $300	• To be determined	$25,000 - $100,000+ Would be customized based upon the savings
Studies, Standards and Other Technical Documents	• CEE The Residential Clothes Washer Initiative *www.ceeformat.org/eval/ RCWI_Eval.pdf* *http://www.ceeformt.org/resid/seha/ rwsh/rwsh-main.php3* • Thelma Laboratory Testing of Clothes Washers, Multiple documents CUWCC Library • Berns Kansas Clothes Washer Study Final Report, CUWCC Library	• SCE High Performance Clothes Washer Demonstration at Leisure World, 2000, CUWCC Library	• To be determined	• PBMP Study to be published soon
Program References with Contacts	• To be determined	• MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell or Greg Kozykoski • SDCWA Voucher Incentive Program and SDCWA Multi-load Washer Study (in process) *Contact:* Rose Smutko	• To be determined	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili • Commercial Laundry Facilities Study CUWCC *Contact:* John Koeller

MEASURE GUIDE

Devices	Cooling Tower Controllers STANDARD CONDUCTIVITY	 pH CONTROLLERS	Pre-rinse Spray Valves	Food Steamers BOILERLESS	Ice Makers EFFICIENT
Types of Programs	Rebates or Vouchers Standards	Rebates, Vouchers or Customized Incentives Standards	Direct Installation Rebate New construction ordinance	Rebate New construction ordinance	Rebates or Vouchers to Customer Upstream Incentives to Distributors
Description	Cooling towers are part of the air conditioning system of large commercial buildings. These towers are used to expel heat from the system through evaporation. In order to keep salts and other impurities out of the circulating water and protect the tower equipment it is necessary to bleed water out and add chemicals in. Three items are needed to effectively manage a cooling tower: conductivity meter, a meter on the makeup water and a meter on the blowdown water. Conductivity controllers are used to monitor conductivity of the water, open and close the bleed valve and add water treatment chemicals. This would have to be done manually or continuously if a controller was not used and therefore more water would be bled. Older or poorly maintained units would also use more water. The conductivity meter cannot detect leaks and spills, therefore the need for metering makeup and blowdown water. With all three items in place, a mass and volume balance can be closed. Standard conductivity controller would use water 1-3 time before dumping it (bleeding) down the drain.	A pH controller is a more sophisticated controller that by monitoring the pH and adding a different set of chemicals water can be used 5-7 times before sending it to the drain.	Maximum flow rate of 1.6-gpm Pre-rinse spray valves are part of the dishwashing assembly and are used to pre-clean dishes prior to placement in the dishwasher. CEC standard will become effective in January 2006 requiring all spray valve manufactured or sold in California to flow at a maximum of 1.6-gpm. The Federal Energy Policy Act included the same standard and effective date.	Food steamers are used by restaurants and commercial kitchens to cook, warm and hold food. Boiler-based steamers employ once-through cooling, dumping raw steam condensate down the drain. However, code restrictions limit the temperature of discharges into the drain to 140 degrees F. As such, boiler-based steamers use tap water to temper the discharges bringing them in compliance with the code. Boiler-based steamers typically send up to 30 gallons per hour of water into the drain to waste. Boilerless food steamers (aka connectionless steamers), however, recirculate and recycle the condensate and require no direct connection to either a water line or drain line. Boilerless steamers used several gallons of water per day, are both water- and energy-efficient, and are priced at less than the average boiler based equipment, Connectionless steamers save approximately 350 to 400 gallons of water a day. It is important to note that while all connectionless steamers are water efficient, boilerless steamers that have both a connection and a discharge (blowdown) are not water efficient. Boilerless steamers with only a refill device without a discharge also save water. There are incentives of $750 - $900 per steamer available through the Investor Owned Utilities 2005 Express Efficiency Rebate Program.	Commercial ice-makers are purchased by hospitals (40%), hotels (22%), restaurants (14%), schools (9%), retail outlets (9%), and others (6%). Water is used in the ice-making process including melting and release of cubes. Water use ranges from 15 – 45 gallons per 100 lbs. of ice. Some self-cleaning models use three times this much water, but save on labor costs for cleaning. Water-cooled units use a significant amount of condenser water; much of this could be recycled by using a cooling tower as opposed to a one-through system. Data on water use is available in the Air-Conditioning and Refrigeration Institute (ARI) database. Generally, water-cooled machines are the most energy-efficient, while air-cooled machines are the most water-efficient. This difference in operating characteristics has led to some uncertainty and disagreement over which type of technology to promote. The new CEE ice machine specifications (http://www.cee1.org/com/com-kit/ice-specs.pdf) give recommended water use factors. The recommendations also state that the use of once through cooling with potable water is not promoted (i.e. not in compliance) with these specifications. As for savings for air-cooled vs. water-cooled, the savings range from 100s to 1000s of gallons a day depending on the size of machine and hours of operation. John Koeller is leading a study to determne the actual savings.
Savings	921 gpd	3,554+ gpd	135 – 300 gpd	60 – 240 gpd 30 gallons per hour total savings depends on how long they operate	100 – 300 gpd
Product Life Cycle	5 – 10 years	5 – 10 years	5 years	10 years Old Product tends to hang around as used equipment and it is hard to get rid of it from the marketplace. Probably a measure better regulated than rebated.	10 years
Per Unit Program Cost	$300 - $600	$600 - $4,000+	$50 - $180	$200 - $400	$200 - $400 incentive Would be based on cost effective savings
Studies, Standards and Other Technical Documents	• MWD Innovative Conservation Program Evaluation of Cooling Tower Conductivity Controllers	• Customer and Savings Numbers available from LADWP Technical Assistance Program	• CUWCC Pre-rinse Spray Valve Installation Program Final EM&V Report, 2004 *http://www.cuwcc.org/uploads/product/SBW_Final_EMV_Report_Phase_1.pdf*	• Recently completed study by the Food Technology Center and Koeller and Company	• Study is being initiated by a coalition of water agencies in conjunction with the FSTC
Program References with Contacts	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili • MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell or Greg Kozykoski • SDCWA Voucher Incentive Program *Contact:* Rose Smutka	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili	• CUWCC Pre-rinse Spray Valve Installation Program *Contact:* Maureen Erbeznik or John Koeller	• *Contact:* Don Fisher, Food Service Technology Center *Contact:* John Koeller, Koeller and Company for CUWCC	• City of Austin CII Rebate Program Water Cooled Machine Replacement *Contact:* Bill Hoffman • EBMUD Study *Contact:* John Koeller, CUWCC *Contact:* Don Fisher, Food Service Technology Center

Devices	Dishwashers		Steam Sterilizers	
	EFFICIENT RESIDENTIAL	EFFICIENT COMMERCIAL	CONDENSATE DRAIN WATER MODIFICATION	EJECTOR WATER MODIFICATION
Types of Programs	Rebates or Vouchers to Customer Upstream Incentives to Distributors New construction ordinance	Rebates or Vouchers to Customer Upstream Incentives to Distributors New construction ordinance	Rebates or Vouchers	Rebates or Vouchers
Description	High efficiency dishwashers are both water and energy efficient. These new model dishwashers clean better. Machine pre-rinsing should be promoted over rinsing in the sink. The use of a dishwasher in a typical residential setting has been declining. DOE data shows that an average of 200 uses per year. Water use varies from 5 to 10 gallons per normal cycle. DOE has announced a revised EnergyStar dishwasher criteria effective January 1, 2007. The new criteria is a minimum energy factor (EF) of 0.65 for standard machines and a minimum EF of 0.88 for compact machines. DOE declined to set a water factor even though it is not clear that there is a close correlation between energy and water use. A stakeholder group will be formed to determine if the criteria should be expanded to include water efficiency, product performance, and standby power. There is some survey data that indicates that pre-rinsing dishes in the sink can use up to 15 gallons per load. DOE will work with partners and stakeholders to support promotions and disseminate consumer education materials urging consumers to use their dishwasher instead of hand washing their dishes. The DOE will support promotions encouraging consumers to refrain from pre-washing their dishes by hand	Commercial dishwashers are available in a variety of designs, ranging from the undercounter type, similar to those used in single family residential applications, to the flight type, used in the highest volume establishments, such as institutional kitchens, cafeterias, etc. The measure of throughput and efficiency is the standard 20-inch by 20-inch dishwashing "rack". While efficient machines use water at the rate as low as 1.0 gallons per rack, the industry standard of 1.20-gallons per rack is still a good benchmark. The less-than-efficient dishwashers are rated at 2.5 gallons per rack and above. Food service dishwashers (restaurants and commercial kitchens) are a potential source of significant water savings, due to heavy usage of these machines. John Koeller working in conjunction with the Food Service Technology Center (FSTC), has begun a field study of the various types of commercial dishwashers. CEE will be reviewing efficiency criteria for commercial dishwashers in 2006.	First, there are ethylene oxide sterilizers and smaller connectionless types that use little water. They should be used where applicable. However, for larger operations in hospitals and laboratories, steam sterilizers are the only feasible types of equipment. Steam sterilizers are utilized to disinfect surgical operating instruments. Low-pressure steam is injected into the sterilization chamber to render bacteria and other microbial organisms harmless. Many hospitals run their units 24 hours per day. There are two configurations, the vacuum type and gravity type. The vacuum system with the water pump and ejector is an equipment used for exhausting air or vapor out of the chamber. If enhances sterilization and drying effect with a strong vacuum force and minimizes noise and malfunction. During standby mode, the sterilizer is kept at an elevated temperature by periodically injecting steam into the chamber to keep it sterile so that it can be utilized at a moment's notice. The steam eventually condenses and flows to the trap drain. For both types, the water from the steam trap must be cooled to below 140 degrees F before being discharged to the sewer according to code. The old way still found on a very large percent of sterilizers is to have water run down the drain 24/7, at rates between 0.5 – 3+ gpm. New sterilizers have water tempering devices that only run water when the steam trap operates. For older systems, kits such as the Water-Mizer are available that accomplish the same thing. These tempering devices reduce water use by 600 to 1000 gallons a day. For vacuum systems, the vacuum is typically created by a venturi ejector. It uses as much as 100 gallons per cycle. Both mechanical vacuum systems and water recirculation systems that circulate water through the venture and a large holding reservoir. When the water becomes too warm cold water is added until it is cool enough. The Water-Mizer Plus is an example of this technology	For vacuum and gravity units water is passed through an ejector to create a vacuum seal in the sterilization chamber. Water passes through the ejector one time and flows to the drain. The modification takes a portion of that water and channels it into a small tank where it is used again.
Savings	3 gpd	100 – 300 gpd	710 – 1,775 gpd 1,243 gpd average	407 – 3,051 gpd 1,384 gpd average
Product Life Cycle	12 years	5 - 20 years depending upon the type of dishwasher and the application	10 years	10 years
Per Unit Program Cost	Not recommended	$200 - $400 incentive Would be based on cost effective savings	$600 - $4,000+	$600 - $4,000+
Studies, Standards and Other Technical Documents	• Not available	• Study of commercial dishwashers is being initiated by a coalition of water agencies working in conjunction with the Food Service Technology Center. No study exists nor is contemplated at this time for residential machines.ta would be available in late 2006.	• PBMP Report	• PBMP Report
Program References with Contacts	• *Contact:* John Koeller, CUWCC *Contact:* Don Fisher, Food Service Technology Center	• *Contact:* John Koeller, CUWCC *Contact:* Don Fisher, Food Service Technology Center	• PBMP Report *Contact:* John Koeller, CUWCC	• PBMP Report *Contact:* John Koeller, CUWCC

MEASURE GUIDE

Devices	X-ray or Film Processing RECYCLING SYSTEM	Wet Cleaning Systems	Faucets and Taps SENSOR-OPERATED & SELF-CLOSING	Water Brooms
Types of Programs	Rebates or Vouchers	Rebates or Customized Incentives	Rebates	Rebates Distribution
Description	Standard X-ray or film processors use a constant flow of water to cool the machine and develop the film (from .25 to 2.5 gpm) The recycling system captures the water in larger processors and re-circulates it back through the unit. The system includes a reservoir, pump and an algaecide dispenser. Many medical facilities are moving to digital x-rays which would eliminate any water use at all. This should be considered when implementing programs.	Wet cleaning systems are replacing traditional dry cleaning technologies in California, as a result of mandates by air quality authorities. The wet cleaning technology uses water and specially formulated detergents and chemicals to clean clothes. The use of perchloroethylene as a dry cleaning solvent is being phased out. Three technologies are vying as replacement technologies. These are (1) supercritical carbon dioxide cleaning, (2) silicon based cleaning fluids, and (3) special wet washing systems. The latter uses water, but the others can use water if cooling towers are used for cooling process fluids. The technology of choice would be either 1 or 2 with remote head air cooled compressor system for cooling the fluid	Sensor-operated or self-closing faucets automatically turn on and off when they sense a person's hands under the faucet. Manufacturers publicize savings of up to 70%, however there are NO validated savings. A study is currently being conducted.	The water saving technology cleans and removes dirt from concrete, asphalt, aggregate or any other composition surface using a combination of air and water pressure. This technology should only be used where washing of pavement is required for health and safety reasons. Replaces using a hose, nozzle or high pressure water broom (power washer) that typically use 8 – 18 gpm with an low flow model that uses 2.0 or less gpm.
Savings	2,856 gpd	Undetermined	Manufacturers state 70% savings	198 gpd
Product Life Cycle	To be determined	To be determined	To be determined	5 years
Per Unit Program Cost	$600 - $4,000+	Not Available	Not Available	$50 - $225
Studies, Standards and Other Technical Documents	• MWD Innovative Conservation Program Study of X-ray or Film Processor Recycling Systems	• Not Available	• Study is currently being conducted.	• MWD Innovative Conservation Program Study of Water Brooms
Program References with Contacts	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili • MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell • EBMUD *Contact:* LeeAnn Gustason	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili • City of Austin *Contact:* Bill Hoffman	• Hillsborough County Florida *Contact:* John Koeller and Bill Gauley • EBMUD *Contact:* LeeAnn Gustafson	• MWD CII Save a Buck Rebate Program *Contact:* Bill McDonnell

MEASURE GUIDE

Devices	Car Wash Reclaim Water System	Industrial Process Water Use Improvement
Types of Programs	Audits and Customized Incentives Standards	Audits and incentives
Description	Car washes can reduce their water use by 80% by reclaiming their water. The Clean Water Act legislates that car washes capture their wastewater and governs the disposal of this waste. Also, the US Environmental Protection Agency has banned the construction of new drains connected to motor vehicle disposal wells. Once this ban is enacted, more carwashes will be forced to look into reclaim systems. There are two types of reclaim systems; biological and mechanical. Biological systems use chemicals to treat the water prior to reuse. Mechanical systems use ozone and media filters to treat the water. Examples of wash applications include the following: **Self-service wash** This is the most demanding process to address due the uncontrolled use of water in the typical self-service application. Successful operation requires some wash equipment modification. The first requirement for this application is to change the wand nozzle from 5 gpm-tips to 2.5-gpm tips. The second requirement will be to install a bypass circuit for the fresh-water rinse function to drop the water pressure from a standard 1,000 pounds per square inch (psi) to approximately 600 psi. Vehicle rinsing will still be efficient, but customers will be discouraged from rinsing only with fresh water, which is prevalent in a self-service environment. Water for all wash functions in this application, with the exception of fresh water rinse, can be generated by reclaim equipment. A closed-loop system can be installed due to the high amount of vehicle carry-off and evaporation found in this application. That's because the carry-off in the self-service application is greatly impacted by the absence of automated air-drying equipment. **In-bay automatic high-pressure wash** The typical in-bay automatic will use reclaim water for all wash functions except the last pass of fresh water. Here a pass is defined as one movement of the carwash equipment. Normally, reclaimed water will be used during the first pass of rinse and changed over to fresh water just before the pass is completed. This early purging is the means to clear any reclaim water from the existing lines prior to the final fresh-water rinse pass. One modification used in closed-loop environments is to make the undercarriage wash a standard feature - instead of an optional service - to ensure a high amount of vehicle carry-off. Many in-bay automatics also offer spot-free rinse, either as a standard, or as an option, usually using deionized water. Water treated by reverse osmosis also can be used during this process and reclaim systems can handle the reject water produced by this method. **Tunnel wash applications** The typical tunnel application, depending on size and volume, will use either a single or double reclaim unit system. In a double-unit system, one unit is dedicated to reusing wash water while the second unit is dedicated to rinse water. The carwash conveyor will contain a dam, which will separate the two types of water. The wash-side unit will provide treated water for prep guns, cool down, presoak, tire blaster and high-pressure wash. The other unit will provide high-pressure rinse with a final application of fresh water to spray off any remaining reclaim rinse water. The typical tunnel application operating in a closed-loop environment sometimes will use a tank level control system, which consists of a float sensor on the wash side of the tunnel. This level control system is the mechanism used to transfer water carried over the conveyor dam from wash to rinse. The water transfer is accomplished by interconnection of the reclaim equipment. Short-length tunnels more often will use a single reclaim unit. Here, one unit will provide all water for the washing equipment up to the last high-pressure, low-volume fresh water rinse.	Process water in the commercial and industrial sectors is used primarily to clean products, remove or transport ingredients, contaminants, or products and to control pollution or dispose waste. Some of the more common uses of process water are for washing and rinsing, materials transfer, photographic film and x-ray processing, and pulp, paper, and packaging production. The quantities of water used for processing vary according to use and are usually site specific. Process washing and rinsing are water intensive but necessary operations for a number of industries, particularly metal finishing and computer chip manufacturers. Water in a rinse bath may be static, constantly flowing or flowing in a countercurrent pattern. A static rinse bath is a tank filled water and process chemicals. Products are dipped in the bath to remove contaminants and extraneous material, and the tank is regularly drained and refilled with freshwater for process that requires multiple rinses. Constant overflow rinse baths or running rinses have water continuously flowing into the tank and an overflow connected to a discharge drain. Some constant-flow rinse baths are operated continually even though they are used only occasionally. Each rinse bath is usually an essential part of the manufacturing methods and may involve delicate processes and chemical interactions. Thus rinse baths should be carefully evaluated before water-efficiency modifications are made. In the electronics and metal finishing industries, product components are often rinsed with ultra pure deionized water to remove the chemical residue accumulated during manufacture. Deionized water is produced from public of private sources using treatment techniques such as filtration, ion exchange, reverse osmosis, carbon absorption, or ultraviolet radiation. Because deionized water is relatively expensive to produce, reducing its use will also cut down on the cost of its production. In some cases deionized water can be treated and reused. Microchip manufacturers are finding more innovative ways to increase the percent of water that is recycled and are demanding process tools that use less water. Silicon Valley Study = Ten electronics firm in the study. The amount of water savings ranged from 2 to 365 million gallons annually and water use typically reduced from 20 to 40%. Annual cost savings ranged from $28,000 to $153,000. Paybacks were less than one year.
Savings	80% reduction Need range	2 – 365 million gallons per year
Product Life Cycle	To be determined	To be determined
Per Unit Program Cost	Would be customized based upon savings	$25,000 - $100,000+ Would be customized based upon savings
Studies, Standards and Other Technical Documents	• To be determined	• SCVWD Commercial, Industrial and Institutional Water Use Survey Program Final Report, March 2004
Program References with Contacts	• Chris Brown, consultant in Texas • International Car Wash Association website	• LADWP Technical Assistance and Incentive Program *Contact:* Mark Gentili • SCVWD Water Efficient Technology Incentive Program *Contact:* Karen Morvay [a] City of Austin ICI Program *Contact:* Bill Hoffman

MEASURE GUIDE

Devices	Gray Water Systems	Hot Water Distribution or Recirculation Systems			Pool Covers
		POINT OF USE	HOT WATER DEMAND SYSTEMS	HOT WATER RE-CIRCULATING SYSTEMS	
Types of Programs	To be determined	Rebates or Vouchers	Rebates Retrofit on resale	Rebates or Vouchers	Rebate or Voucher
Description	"Gray water" is wastewater collected from clothes washers, bathtubs, showers, and laundry or bathroom sinks. Gray water systems collect and re-use the water for irrigation. Gray water is distinguished from "black water", which is wastewater from toilets, kitchen sinks and dishwashers. Black water should never be reused in the home because of possible contamination by bacteria, viruses, and other pathogens. Gray water may contain food particles, detergent or soap residue, and possibly some human pathogens. But as a general rule, gray water does not require extensive chemical or biological treatment before being used for landscape irrigation. Gray water can be put to other uses. It is best to use gray water on ornamental plants and lawns, or to irrigate trees, rather than on food plants, especially those that are often eaten raw; such as carrots or lettuce or herbs. Soap and detergent are the components in gray water, which could adversely affect plants the most. The wastewater from the shower or lavatory sink generally contains only a small amount of soap, and has few solid residues. However, re-using water from a clothes washer may be much easier, from a plumbing standpoint. Special detergents can be purchased to lessen any harmful impacts on plants. Gray water may be immediately directed to landscaping, or it may be stored for later use. When stored, filtering the water is more important, to reduce the growth of any pathogens. Gray water should not be used for dust control, cooling, spray irrigation, or any other use that would result in air-borne droplets or mist. In some areas, reuse of water is either prohibited by health officers and/or plumbing inspectors, or requires an inspection and permit.	Point of use hot water systems incorporate a water heater (gas or electric) at the fixture from which hot water is drawn. These may also be termed “tankless” water heaters.	Hot water demand distribution systems provide hot water on demand to the most remote fixtures from the water heater. The device is typically installed under the furthest. When activated cool water that would normally go down the drain is circulated back to the after heater through the cool water line. At the same time, the system fills the hot water line with hot water from the water heater. When hot water reaches the system, the zone valve closes and the pump shuts off.	Re-circulating systems generally use a looped plumbing system whereby hot water is continually or intermittently pumped through the loop to provide hot water at all fixtures in the home. These systems are considered to be energy inefficient, particularly where hot water pipes are not insulated.	Pool covers prevent water evaporation, keeps water cleaning so backing washing can be less frequent and reduce the requirement for make-up water by 30-50%. If a pool is heated, the heat loss is reduced by 50-70% with the cover. Less evaporation also means the customer will reduce their chemical usage by 35-40%. The savings are realized predominately during summer peak demand periods, when evaporation is the highest. Backwash water can be recovered for use on landscaping There are several different kinds of covers; bubble, vinyl, or insulated vinyl. In order to achieve significant water evaporation reduction it is recommended the thickness be at least 12 millimeters. Covers cost approximately $75 without a reel and $120 with a reel.
Savings	To be determined	To be determined	To be determined	To be determined	17 gpd
Product Life Cycle	15 – 20 years	To be determined	To be determined	To be determined	7 years
Per Unit Program Cost	NA	To be determined	To be determined	To be determined	$50 - $100
Studies, Standards and Other Technical Documents	• To be determined	• To be determined	• SCVWD Hot Water Recirculation Pilot Study, March 2002	• To be determined	• MWD and IEUA Study
Program References with Contacts	• City of San Diego *Contact:* Luis Generoso	• California Energy Commission *Contact:* Gary Klien	• California Energy Commission *Contact:* Gary Klien • Santa Clara Valley Water District *Contact:* Karen Morvay	• California Energy Commission *Contact:* Gary Klien	• IEUA Pool Cover Incentive Study *Contact:* Dave Hill

MEASURE GUIDE

Devices	Landscape and Irrigation DRIP OR LOW PRECIPITATION IRRIGATION SYSTEMS	WEATHER BASED IRRIGATION CONTROLLERS	LANDSCAPE DESIGN	TURF BUY BACK	ARTIFICIAL TURF
Types of Programs	Retrofit on resale ordinance Ordinance specifying irrigation standards on resale New construction design standards	Direct Install Rebate or Voucher Distribution	Rebates Ordinance Specifying Design Standards on Resale Ordinance for New Construction Standards	Rebate	Rebate or Voucher
Description	Drip, micro, low volume or low precipitation irrigation is the slow application of water to a plant's root zone. This delivery reduces evaporation and eliminates overspray. Plants thrive on the an optimum balance of oxygen and moisture around their roots.	Weather based, ET or "smart" controllers save water by changing irrigation schedules much more frequently and more accurately than controllers that are manually set and adjusted by end users. The current weather based controllers on the market today derive irrigation schedules from either average historical or real-time evapotranspiration (ET) data, which is a function of weather conditions and plant type.	To minimize water use and maintenance in landscape, the design needs to be done well. This includes: identifying existing conditions and putting plants in the right place, grouping plants according to their watering needs, planning for appropriate lawn area, designing an efficiency watering system, choosing a good controller, incorporating hardscape and knowing your local weather and microclimate in order to select the best plants. Water Efficiency Landscape Design can be promoted through customer incentives and ordinances for new construction and resale.	A Turf Buy Back Program would offer customers an incentive to remove their existing lawn and install drip or low precipitation rate irrigation for remaining or new plants. Although a large scale program has been extremely successful in southern Nevada it is still to be determined if a turf buy back program can be cost effective in California.	Artificial or synthetic turf is a natural grass replica. Its intended purpose is to replace natural grass in areas where it is hard to grow grass and where water efficiency is promoted as a way of life. The product is applicable for both commercial and residential sites and eliminates the need for watering, mowing and poisonous chemicals for fertilization. Additionally, synthetic turf eliminates runoff due to over watering. These benefits translate to decreased pollution in the air and groundwater and oceans. Artificial turf or AstroTurf has been used as a sport surfacing material used by NFL teams and other agencies for over 38 years. The product currently costs $6.00 - $7.00 per square foot installed. The price for installation varies based on the scope of work, such as old grass removal, sprinkler capping, etc. Natural grass costs approximately $3.50 per square foot installed. This includes an irrigation system and controller.
Savings	To be determined	.05 acre-feet per year per station	To be determined	25 – 67 gallons per square foot per year depending upon the evapotranspiration rate of the retrofitted area and the amount of irrigation	14 – 84 gallons per square foot per year depending upon the usage prior to replacement
Product Life Cycle	To be determined	5-10 years	To be determined	15 years	15 – 20 years
Per Unit Program Cost	To be determined	$100 - $1000	To be determined	$1.25 - $2.00 per square foot	$1.25 - $3.00 per square foot
Studies, Standards and Other Technical Documents	• To be determined	• USBR Weather Based Technologies for Residential Irrigation Scheduling Technical Review Report, May 2004 • Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine 'ET Controller' Study", July 2001 • ET Controller Savings through the Second Post-Retrofit Year, A Brief Update	• To be determined	• A Five-Year Investigation into the Potential Water and Monetary Savings of Residential Xeriscape in the Mojave Desert	• MWD Innovative Conservation Program Study of Artificial Turf
Program References with Contacts	• SDCWA Landscape Assistance Program *Contact:* Vickie Driver • RWA Landscape Irrigation System Incentive Grant *Contact:* Lisa Maddaeus	• Irvine Ranch Water District *Contact:* Fiona Sanchez • MWDOC *Contact:* Joe Berg • SDCWA Voucher Incentive Program *Contact:* Vickie Driver	• To be determined	• Southern Nevada Water Authority Water Smart Landscape Rebate Program *Contact:* Doug Bennett	• MWD Innovative Conservation Program Study of Artificial Turf *Contact:* Bill McDonnell • Anaheim PUD *Contact:* Cathy Templeton

APPENDIX A.2: ADDITIONAL PROGRAMS/MODIFICATIONS TO PROPOSED PROGRAMS

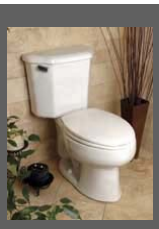
This appendix contains the program description sheets that are not part of the recommended programs for one of two reasons:

1. Alternative WUE Programs that depend on local conditions for implementation:
    a. Santa Clarita Valley Cash for Grass Rebate Program – The Santa Clarita Valley Family of Water Suppliers has decided to review implementation of a "Cash for Grass" program. A recent Center for Disease Control (CDC) health advisory that cited concerns about lead levels found in certain kinds of artificial turf recently tested in New Jersey.
    A follow-up evaluation by the U.S. Consumer Product Safety Commission (CPSC) staff of various synthetic athletic fields concluded that young children are not at risk from exposure to lead in these fields. CPSC staff evaluation showed that newer fields had no lead or generally had the lowest lead levels. Although small amounts of lead were detected on the surface of some older fields, none of these tested fields released amounts of lead that would be harmful to children.

    b. Santa Clarita Valley Industrial Process Audits and Incentives Program—this would replace part of the CII Audit Program with a specialized program for large industrial customers.

2. Aggressive implementation of WUE Programs that are contingent on additional funding:
    a. Aggressive HET Program – This program, contingent on additional funding, would attempt to accomplish 50% of the HET replacements within a 5-year time frame.

It is important for the WUE Strategic Plan to be flexible and adaptable. The programs in this appendix could be used if outside funding can be obtained or if more aggressive implementation is desired.



Solution for BMP 2

Santa Clarita Valley Aggressive High Efficiency Toilet Rebate Program

Why Offer This Program?

Although the Santa Clarita Valley has an estimated 66 percent saturation rate for water efficient toilets (67 percent of single family toilets and 64 percent of multi-family toilets), there is significant opportunity for water savings in targeting the remaining old toilets, and saving even more water by promoting new "High Efficiency Toilets" throughout the service area.

Since 1992, only ULF toilets can be sold in the United States. Although this was a major advancement in residential water efficiency, there is still more that can be achieved. It is time to "raise the bar" and promote the newer high efficiency toilet (HET) technology which saves even more water. The Santa Clarita Valley has a high percentage of new housing stock with 40 percent of single family and 33 percent of multi-family housing units built after 1992. As a result, these homes already utilize water saving ULF toilets. The savings opportunity lies within older residential sites that are utilizing non-ULF toilets.

Program Design

For this program, staff will target the market comprised of older residential housing stock that carries a high likelihood for existing non-ULF toilets. Bill stuffers and direct mail would be utilized to target the older residential housing stock. Previous rebate program participants would be removed from the mailings. The main objective is to replace non-ULF toilets. Customers will be offered the following incentives for replacing a non-ULFT with an HET:

- Single family = **$150** rebate for HET replacement
- Multi-family and mobile home = **$200** rebate for HET replacement

Multi-family and mobile home customers are offered a higher rebate due to the higher density of people per home and therefore higher water savings. Customers would be able to download program application form from utility website. Once new product is purchased and installed, customer completes application form and attaches original receipts. Then, the customer would be sent a rebate check or get a credit on their water bill.

New or Existing?	*Technology*	*Target Market*
Modified Program	High Efficiency Toilets	Single, Multi, Mobile home Non-ULFT households

Market Data

Pre 1992 Toilets: Single Family

	Total Toilets	Remaining non-ULF Toilets	Percent Remaining of Pre-1992	All Toilets	Remaining Potential Savings AFY
VWC	50,186	13,725	47%	73%	307
SCWD	41,238	15,813	47%	62%	354
NCWD	20,565	7,291	47%	65%	163
LA36	2,600	790	46%	70%	18
Total SF	114,589	37,619	47%	67%	843

Pre 1992 Toilets: Multi-Family

	Total Toilets	Remaining non-ULF Toilets	Percent Remaining	All Toilets	Remaining Potential Savings AFY
VWC	11,741	2,740	46%	77%	61
SCWD	31,148	11,838	46%	62%	265
NCWD	5,960	3,090	46%	48%	69
LA36	179	97	46%	46%	2
Total MF	49,027	17,764	46%	64%	398
Grand Total	163,616	55,383	46.5%	66.2%	1,241

Program Production

HET Rebates: Single-Family

	2009	2010	2011	2012	2013	Total
VWC	1,372	1,372	1,372	1,372	1,372	6,862
SCWD	1,581	1,581	1,581	1,581	1,581	7,907
NCWD	729	729	729	729	729	3,645
LA36	79	79	79	79	79	395
Total	3,762	3,762	3,762	3,762	3,762	18,809

HET Rebates: Multi-Family

	2009	2010	2011	2012	2013	Total
VWC	274	274	274	274	274	1,370
SCWD	1,184	1,184	1,184	1,184	1,184	5,919
NCWD	309	309	309	309	309	1,545
LA36	10	10	10	10	10	49
Total	1,776	1,776	1,776	1,776	1,776	8,882
Grand Total	5,538	5,538	5,538	5,538	5,538	27,692

Program Savings

The 27,692 toilets will save **24,022 acre-feet** of water over the life of the product.

Program Costs

HET Rebate Program Cost per Acre Foot =

$385/acre-foot Single Family

$231/acre-foot Multi-Family

Solution for BMP 9

Santa Clarita Valley Industrial Process Audits and Incentives Program

Why Offer This Program?

In the Santa Clarita Valley, industrial customers consume approximately 23% of all CII use. However, few if any, water conservation programs have been directed at industrial customers, many of which use “process water” for which there are often conservation opportunities.

Five industry sectors offer the most promising opportunities for water efficiency improvements in industrial processes:

- food processing
- textiles
- fabricated metals
- electronics
- industrial laundries

Program Design

Commercial and industrial survey and incentive programs are known to have low participation greatly due to poor marketing, customer support and minimal customer follow through with the retrofit process. The Santa Clarita Valley Program will be initiated to break through these traditional barriers.

The program will overcome these obstacles by providing superior customer support to aid the customer with education and assistance through each step of the retrofit process.

Traditional programs attempt to identify every opportunity for savings; allowing the customer to pick through the report and likely select the easy retrofit, such as toilets. The Santa Clarita Valley Program will focus on the process upgrade, the value of the retrofit, how to make it happen and available incentive monies.

The Survey Process

The survey will not include all retrofits possible for the site. The engineer will focus on the best bang-for-the-buck for the customer and the program. For this reason, the program will include two levels of surveys, the Focused Survey and the Comprehensive Survey.

The Focused Survey will include a limited number of measures; those most likely to be implemented by the customer. The engineer will determine which measures to include, balancing between the customer's interest and those which save the most water. The Focused Survey might include only one building or one major process. The engineer will provide diagrams and photos to clearly illustrate their recommendations. The overall goal is to give the customer a template so they learn how to secure the incentives; how to retrofit and how to incorporate water reduction and reuse into their everyday business.

The Comprehensive Survey will be used for customers who express a strong interest in a wide-ranging list of retrofits as well as motivation to implement the retrofits. The engineer will spend up to three days on-site measuring flows to determine equipment design ranges; identifying reduction, recycling and reuse opportunities. The engineer will diagram system modifications including before and after water balance, take supporting photos and detail a thorough list of measures for the site. It is anticipated that 20% of all surveys will be Comprehensive Surveys and that 80% will be Focused Surveys.

The Survey Report

Typical survey reports, with all their technical detail, say little to the customer on how the upgrades can benefit their business. The report is often stuffed with technical terminology yet fails to roll up the recommendations for the customer in a summary page. As importantly, there is no practical next step information that would aid the customer in retrofitting their facility.

<u>The survey report for this program will be clear and concise, with heavy use of photographs and diagrams</u>. The report will focus on water saving opportunities that have the highest potential for retrofit, not every savings opportunity.

The reports created for both the Focused and the Comprehensive Survey will be customer friendly and provide a guide to retrofitting their facility.

The report will include:

- Use of color and photos
- A summary page listing all recommended retrofits with costs, savings and payback information
- A water use summary page
- Information that is customized to their specific industry
- Next steps page telling the customer how to make the retrofits happen

Report Delivery

The next step in the process is to deliver the report to the customer. This will be done in person and target attendees should include: program sales person, the engineer that conducted the audit and if possible the customer's technical staff as well as the decision maker. In the meeting the technical information will be overviewed as well as the benefits to making the retrofits and the retrofit process.

Application Submittal

Once the customer has agreed to perform the retrofits, it will be necessary for the program staff to assist the customer in completing all program paperwork.

Customer Support through Retrofit Process

Traditional programs have failed to support the customer once the survey is delivered. Once the report is delivered, a technical trained program staff person will follow up with the customer on a continuous basis. The job of the staff member is to provide solutions, facilitate contact with vendors and answer questions.

Focus on the Money

Every step of the program, starting with front-end marketing, will emphasize the financial benefits to the customer. The sales team, the auditor/field engineer, the printed report, and the follow-up customer support team will all incorporate the financial benefits when delivering information to the customer.

The customers' incentive package with program rebates will provide strong financial motivation to complete the retrofit process. The amount of the incentive will be based upon the water savings and calculated at $9.20 per thousand gallons per year saved ($300/AF, 10 year savings). The incentive will be based upon total water saved and will be given to the customer at the onset of the project. The Program will not end with delivery of the customer report. Program staff will stay connected to the customer and gently push them and support them through each step.

New or Existing?	*Technology*	*Target Industrial Processes*
This will be a new program	Process water use reduction and reuse technologies	▪ food processing ▪ textiles ▪ fabricated metals ▪ electronics ▪ industrial laundries

The table below shows the full set of customers identified as industrial in the Santa Clarita Valley. Of these, we propose to include 32 with 10 AFY or more (20.1AFY mean savings).

Industrial Customers			
VWC	433	775,353	1,791
SCWD	19	55,243	2,908
NCWD	7	30122	4303
LA36	0	0	0
Total	459	860,718	1,875

Note: These customers are included in the CII Audit Program and cut sheet elsewhere in this document.

Program Savings

The program will result in 1,004 acre-feet of water saved.

Program Costs

The program will cost $715/AF.

Santa Clarita Valley

Cash for Grass Rebate Program

The Santa Clarita Valley Family of Water Suppliers has decided to suspend immediate implementation of a “Cash for Grass” program due to a recent Center for Disease Control (CDC) health advisory that cited concerns about lead levels found in certain kinds of artificial turf recently tested in New Jersey.

Limited testing by New Jersey health officials of artificial turf playing fields has indicated several artificial turf products made of nylon or nylon-blended fibers contain levels of lead that may pose a potential health concern. According to the advisory, the fields found to have high lead levels in New Jersey were weathered and dusty, used frequently, and the turf fibers were abraded, broken, or faded.

The CDC advisory indicated the risk of harmful lead exposure is low from fields that are new or in good condition and it will continue to monitor the situation in coordination with other agencies.

The Santa Clarita Valley Family of Water Suppliers will hold off implementing this program as a precautionary measure until more definitive information and a recommendation on the safety of artificial turf is made available by the CDC or other proper public health and consumer product regulatory agencies.

The original program description follows.

Why Offer This Program?

A large portion of Santa Clarita Valley water consumption is for residential and business outdoor water use. A significant amount of that water is used to irrigate water-thirsty turf grasses.

In recent years water agencies, including Las Vegas Valley Water District, Southern Nevada Water Authority and the City of Scottsdale have had success with turf removal programs. Southern Nevada Water District, for example, states that their customers have removed and replace over 90 million square feet of grass with water efficient landscape saving over 5 billion gallons per day.

Program Design

For this program, Santa Clarita Valley customers would be offered an incentive of $.45 per

square foot for the removal of turf and replacement with low water using landscape and efficient irrigation. Synthetic turf would be allowed as a replacement option. $.45 would pay for roughly 9% of the average cost to remove turf and replace it with low water using plant material and an efficient irrigation system which averages $5.00 per square foot. This may not achieve a high volume of customers but stays within the cost effectiveness threshold and provides a complete menu of water conservation measures.

Staff will promote the program during water audits and on the supplier web sites.

Customers would be able to download a program application and guidelines from the utility website. Preliminary site inspection by program staff will take place, prior to turf modifications, in order to confirm customer eligibility. Exposed soil where turf has been removed must be covered with mulch, rock, synthetic turf, or approved low water use plant material. When the landscape renovation is finished, a final inspection is required. Upon final approval, the customer would be sent a rebate check or get a credit on their water bill.

The program would be offered to single and multi-family customers, HOAs, and commercial and industrial customers in the first two years as a stand-alone program. Thereafter, it will be offered through the CII and Large Landscape Audits. This design would allow interested customers to receive an incentive without an audit in order to jump start the market. Then customers would be targeted through the audit programs.

New or Existing?	***Technology and/or Service***	***Target Market***
NEW Program	▪ Turf removal ▪ Low water using plants ▪ Synthetic turf ▪ Efficient irrigation	Residential, commercial, and industrial sites with inefficient turf usage

Program Production

Production	2009	2010	2011	2012	2013	5 Year Total
Administration & Inspection (per Rebate)	41	41	41	41	41	205
Sq. Ft. Replaced: Comm. And Industrial	41,000	41,000	41,000	41,000	41,000	205,000
Sq. Ft. Replaced: Residential Sector	41,000	41,000	41,000	41,000	41,000	205,000
Total Sq. Ft	82,000	82,000	82,000	82,000	82,000	410,000

Program Savings

The 410,000 square feet of turf replace in the five year program will result in 846 **acre-feet** in a program that sustains constant savings through 2030.[7]

Program Costs

Turf Removal Program Cost per Acre Foot = **$707/acre-foot.**

[7] Lifetime savings result from 410,000 sq. ft. replaced turf in the first five years, and a total of 984,000 sq. ft. in a program that replicates at the end of savings life to sustain constant savings through 2030.

APPENDIX A.3: CONSERVATION – PAST ACHIEVEMENTS

This appendix contains a summary of past conservation achieved by the Santa Clarita Valley Family of Water Suppliers.

CLWA – Santa Clarita Water Division

BMP 1, Residential Survey - None reported.
BMP 2, Residential Plumbing Retrofit

- Showerheads distributed to SF and MF residential (1.3-6). Advertise in newspaper, flyers, newsletters, and distribution events.
- All funding provided by CLWA in 2003 report. (1.3).
- Track which address get LF devices.
- City of Santa Clarita requires low flow BMP 2 plumbing fixtures during drought (NCWD 6).

BMP 3, System Audits and Leak Detection

- No pre-screening system audit reported in BMP reports.
- Visual inspections and responses to customer. (1.3).

BMP 4, Metering and Commodity Rates

- All connections metered (1.3)

BMP 5, Large Landscape

- Information and training provided by CLWA. Irrigated water at SCWD has dedicated meters. (1.4).

BMP 6, High-Efficiency Washers

- No existing program. (1.3)
- Los Angeles County Sanitation District has program for reduced rates if a customer makes a 20% reduction in sewer discharge. (NCWD 6)

BMP 7, Public Information

- CLWA runs public information program for SCWD. Bills show last year's usage. (1.4)

BMP 8, School Education

- CLWA runs public information program for SCWD. (1.4)
- See CLWA reports for specifics.

BMP 9, CII Conservation

- SCWD has identified and ranked CII accounts (1.6)

BMP 11, Conservation Pricing

- Uniform rates (1.6)

BMP 12, Conservation Coordinator

- Yes, 10% FTE (1.6), provided by CLWA.

BMP 13, Water Waste Prohibition

- Non-recirculating car washes and new decorative fountains are prohibited under City of Santa Clarita and LACSD ordinances. (1.6).
- Agency supported LACSD water softener ban ordinance adopted in 2003.

BMP 14, Residential ULF Toilets

- Residential Rebate Program. CLWA has run the residential ULFT rebate program for all suppliers in the SCV since 2003. Rebates for pre-1992 toilets start June 1. Rebate is $50 for single family and $60 for multi-family. $20,000 total for all four suppliers is split up based on population/eligible residents. (2)
- No retrofit on resale ordinances apply to SCV. (2)

ET Controller Program - None reported.

Sources

(1.1 - 1.6) Santa Clarita Water Division, BMP Report, 2001-2006
(2) Santa Clarita Water Division, BMP Coverage Report, 2005-06

Los Angeles County Waterworks District No. 36

BMP 1, Residential Survey - None reported.
BMP 2, Residential Plumbing Retrofit - None reported.
BMP 3, System Audits and Leak Detection

- Pre-screening completed 2001-2006. (2.6)
- Leak detection conducted by consultant throughout the year. Leaks reported by personnel in the field. Main replacements made with street repairs. (1.4)
- Full scale audit completed. (1.2)

BMP 4, Metering and Commodity Rates

- All connections metered. (3)

BMP 5, Large Landscape

- None reported.

BMP 6, High-Efficiency Washers

- No existing program. (1.3)
- Los Angeles County Sanitation District has program for reduced rates if a customer makes a 20% reduction in sewer discharge. (NCWD 6)

BMP 7, Public Information

- "Three full time staff dedicated to water conservation practices – newsletter, bill inserts, Web site, radio PSA's, outreach materials at public counter and at public events, planned BMP program for next year." (1.4)

BMP 8, School Education

BMP 9, CII Conservation

- LA36 has identified and ranked CII accounts. (2.6)

BMP 11, Conservation Pricing

- Uniform rates. (1.6)

BMP 12, Conservation Coordinator

- Yes, 4% FTE. (1.6) Reported to be 20% in 2004. (1.4)

BMP 13, Water Waste Prohibition

- On March 21, 1991, the County Board of Supervisors adopted. Ordinance No. 91-0046U that called for "No Water Wasting" in only unincorporated areas of the County. They include the following measures: * Washing down paved surfaces is prohibited unless required for health or safety * Landscape watering is prohibited between 10:00 a.m. and 5:00 p.m. * Excessive landscape watering that results in runoff into adjoining streets, parking lots or alleys is prohibited * Plumbing leaks must be repaired as soon as practical * Washing of vehicles is prohibited excepted at a commercial carwash or with a hand-held bucket or hose equipped with an automatic shutoff nozzle * Serving drinking water at public eating places is prohibited unless requested by customers * Water used in decorative fountains must flow through a recycling system." "These measures could have resulted in fines up to $500. However, this Ordinance was active from March 1991 to January 1993. Currently, there is no water wasting ordinance in effect in the District. Two cities within our service have a similar ordinance implemented." (1.4)

BMP 14, Residential ULF Toilets

- Residential Rebate Program. CLWA has run the residential ULFT rebate program for all suppliers in the SCV since 2003. Rebates for pre-1992 toilets start June 1. Rebate is $50 for single family and $60 for multi-family. $20,000 total for all four suppliers is split up based on population/eligible residents. (2)
- No retrofit on resale ordinances apply
- County Ordinance No. 91-0097U requires all new buildings to use ULF toilets and urinals. (1.2)
-

Sources

(1.1 - 1.6) Los Angeles County Waterworks No. 36, BMP Report, 2001-2006
(2.4 and 2.6) Los Angeles County Waterworks No. 36, BMP Coverage Reports, 2003-04 and 2005-06.
(3) Los Angeles County Waterworks No. 36, BMP Base Year Data
(NCWD 6) Newhall County Water District, BMP Report, 2003

Newhall County Water District

BMP 1, Residential Survey

- Survey program started in 2003. (2)
- Self report survey with $5 bill credit for completion (3).
- Conservation packets with self audit info distributed in 2002-03. Created tracking database (6)

BMP 2, Residential Plumbing Retrofit

- Showerheads distributed to SF and MF residential (2)
- City of Santa Clarita requires low flow BMP 2 plumbing fixtures during drought (6)

BMP 3, System Audits and Leak Detection

- Pre-screen audits completed in 2003, 2005, and 2006. Full audit in 2004.(2)
- District compares production and sales with monthly records (6)

BMP 4, Metering and Commodity Rates

- On track to meet 100% metering. (2)
- All customers metered and billed based on usage. Water rate study conducted about 2004-05. (6)
- Dedicated irrigation meters already on appropriate CII sites (6)

BMP 5, Large Landscape

- Surveys offered for mixed-use CII accounts, none reported completed (2)

BMP 6, High-Efficiency Washers

- No existing program. (1, 2)
- Los Angeles County Sanitation District has program for reduced rates if a customer makes a 20% reduction in sewer discharge. (6)

BMP 7, Public Information

- NCWD has had a public information program since at least 1999. (2)
- Comprehensive program for public education for SF and MF customers that includes public events and newsletters. (6)

BMP 8, School Education

- NCWD has had a public information program since at least 2003. (2)
- Education program has been provided by CLWA since 1993 for K through 6th grades. (6)

BMP 9, CII Conservation

- NCWD has identified and ranked CII accounts (2)
- Some informal surveys in the context of customer service (6)

BMP 11, Conservation Pricing

- Tiered rates, 12 billing cycles per year (1). Conserving sewer rate structure reported in 2003 and 2004, but not 2005 and 2006 (2).
- Tiered rate structured was adopted in July 2005 and effective January 2005. Rate structure was previously a uniform rate. (7)

BMP 12, Conservation Coordinator

- Yes, 50% FTE (1). Since 2002 (2).

BMP 13, Water Waste Prohibition

- Water Conservation Ordinance, Adopted 1/1991, rev. 7/2005 (1). Ordinance 112 amended Ordinance 101. Includes irrigation hours and schedules, inspect and repair leaks, vehicle washing, fountains, serving water in restaurants.
- State of California, County of Los Angeles, and City of Santa Clarita ordinances apply. State urban runoff and county health codes prohibit gutter flooding.
- Supports DIR water softeners, provides information

BMP 14, Residential ULF Toilets

- Residential Rebate Program. CLWA coordinated residential ULFT rebate program for all suppliers in the SCV. Rebates for pre-1992 toilets start June 1. Rebate is $50 for single family and $60 for multi-family. $20,000 total for all four suppliers is split up based on population/eligible residents. (2)

ET Controller Program

- Rebate of $40 per valve up to $480 per residence for an ET controller. (4)
- Rebate was lower before May 2007; they raised it increase participation. (5)

Sources

(1) Newhall County Water District, BMP Report, 2006
(2) Newhall County Water District, BMP Coverage Report, 2005-06
(3) Residential Water Survey flyer
(4) ET Controller letter and application
(5) NCWD staff
(6) Newhall County Water District, BMP Report, 2003
(7) www.ncwd.org, printout provided by NCWD staff

Valencia Water Company

BMP 1, Residential Survey

- Free Residential Water Audit Program implemented by a contractor (Water Wise Consulting). Contact highest water users and low income users and offer indoor / outdoor survey and monetary incentives to replace devices such as toilets and irrigation controllers. Started February 2007 with the intent to survey 300 homes per year. (4)
- School Education and Retrofit Kits. Local schools with VWC contractor Resource Action Programs provides kits to 6th grade students. Intends to reach 2000 homes per year. (4)

BMP 2, Residential Plumbing Retrofit

- LF showerheads, toilet displacement devices, leak detection dues, and aerators are installed through the Free Residential water Audit program during surveys. (4)
- Weather-based Irrigation Controller give away program is also integrated into the Free Residential Water Audit Program. (4)

BMP 3, System Audits and Leak Detection

- Annual review of water purchases and sales. Leak detection capability also used in its radio meters. (4)
- Aggressive meter replacement program in 2006 (replaced 2000 meters). (4)
- Pre-screening completed 2001-2006. (2.6)
- Leak detection conducted by consultant throughout the year. Leaks reported by personnel in the field. Main replacements made with street repairs. (1.4)
- Full scale audit completed. (1.2)

BMP 4, Metering and Commodity Rates

- All connections metered. (3) (4)

BMP 5, Large Landscape

- VWC contracts with Resource Management Corporation to contact large CII customers to offer and conduct water audits. The program conducted 87 mixed use surveys since 2003. (4)

- Starting in 2008, AB 1881 requires separate irrigation meters for new service for non single family landscape areas greater than 5,000 sq. ft. (4)

BMP 6, High-Efficiency Washers

- No existing program. (1.3)

BMP 7, Public Information

- VWC participates via newsletter, bill inserts, Web site, radio PSA's, outreach materials at public counter and at public events, planned BMP programs for next year. (1.4)
- CLWA offers classroom and garden setting classes through their Landscape Education Program. They also have a 7 acre demonstration garden. (4)

BMP 8, School Education

- School retrofit kits (see BMP 1)
- VWC administers an extensive school education program that provides interactive activities regarding water conservation.

BMP 9, CII Conservation

- VWC contracts with Resource Management Corporation to provide free water audit s to CII customers, including restaurants, schools, hotels, and manufacturing companies. Recommendations have included pre-rinse spray nozzles, toilets, urinals, cooling tower conductivity controllers, HE washers, irrigation clock management and drought tolerant plants. VWC has done 89 since 2003. (4)

BMP 11, Conservation Pricing

- Uniform rates. (1.6)

BMP 12, Conservation Coordinator

- Yes, full time beginning in 2006.

BMP 13, Water Waste Prohibition

- "VWC includes wastewater prohibitions in its tariffs. The voluntary provisions are encouraged at all times; however mandatory restrictions are enforced only during drought conditions." (4)

BMP 14, Residential ULF Toilets

- ULF Toilet Rebate Program. In cooperation with CLWA, VWC offers a rebate program during its "Water Awareness Month." The program has provided over 300 rebates and it is funded by CLWA. (4)
- The Free Residential Water Audit program offers Ultra Low Flow (ULF is a 1.6 gallon per flush) and High Efficiency (HE is a 1.2 gallon per flush) toilet rebates that supplement the program during Water Awareness Month. The program started in February 2007.
- No retrofit on resale ordinances apply

ET Controller Pilot Study

- VWC has funded and is conducting a pilot study to assess savings and customer acceptance of ET controllers. The pilot and analysis will be conducted in 2008 with the intent to use the results to refine a give away program. (4)

Sources

(1.1 - 1.6) Valencia Water Company, BMP Reports, 2001-2006
(2.4 and 2.6) Valencia Water Company, BMP Coverage Reports, 2003-04 and 2005-06.
(3) Valencia Water Company, BMP Base Year Data
(4) "2006 Annual Report Valencia Water Company," to the Public Utilities Commission for the year ended December 31, 2006.
(5) "Valencia Water Company Results of Operations, Revenue Requirement, and Rate Design Test Years 2007-2008 and 2008-2009," before the Public Utilities Commission of the State of California, June 2006.

APPENDIX B.1: ECONOMICS - AVOIDED COST ANALYSIS

Each unit of water conservation provides an economic benefit to Santa Clarita Valley by allowing the Castaic Lake Water Agency (CLWA) to avoid certain supply and/or infrastructure costs. To estimate these costs, we used the CUWCC/AwwaRF Avoided Cost Model. The model estimates the costs that CLWA will avoid as a result of additional conserved water. There are two types of avoided costs that are estimated, so-called short run and long run costs.

Following are descriptions of the manner in which each of these was estimated for the Valley.

Short-Run Avoided Costs

As water conservation programs reduce demand, less water must be purchased, produced, pumped, and/or treated. These reduced variable operating costs constitute the so-called 'short-run' avoided costs. They are typically expressed in dollars per acre-foot.

To estimate the short-run avoided costs, it must be determined which supplies will be cut back and/or for which facilities the utilization will be reduced in response to conservation-induced demand reductions. In the case of CLWA, it was determined that the 'marginal' supply is currently the water being purchased from the Buena Vista Water District in Kern County. Moreover, it was assumed that this supply will continue to be the marginal supply through the planning period.

There are three cost components associated with this supply that are avoidable:

- Cost of water. The current purchase cost of this supply is $589/AF.
- Wheeling. CLWA pays $117/AF to wheel the Buena Vista water to its service territory.
- Treatment. For each acre-foot of water, it is estimated that about $22 of power and chemical costs is avoided.

The total short-run cost that is avoided as a result of not having to purchase, wheel, and treat this supply is thus $728 per acre-foot. In addition, we must account for system losses, which are estimated at 8%. That is to say, for each acre-foot of water produced at the treatment plant, approximately 0.92 acre-foot is actually consumed and paid for by end-users. Thus, the total avoided cost per acre-foot of demand reduction is approximately $790/AF.

It is assumed that these costs will stay constant in real terms (i.e. they will increase at the overall rate of inflation).

Long-Run Avoided Costs

In addition to the immediate reduction on variable operating costs, peak-season demand reductions may, in the long run, also enable the water supplier to defer or downsize planned future capital investments in supply or infrastructure capacity. For CLWA, two such projects were identified:

- The Rio Vista Treatment Plant expansion, scheduled to become operational in 2015. The cost of this investment, expressed in 2007 dollars, is assumed to be $20 million, with fixed annual operating and maintenance costs of $500,000.

- A recycled water plant scheduled to become operational in 2020. The cost of this investment, also in 2007 dollars, is assumed to be $20 million, with fixed annual O&M costs of $100,000.

The long-run avoided costs associated with each of these projects begin in each project's on-line year (2015 and 2020 respectively). Thus, beginning in 2015, and based on the annualized costs of these projects, the peak-season avoided costs include both long-run and short-run components.

Table B.1.1 shows the forecasted avoided supply costs in real (2007) dollars through 2030.

Table B.1.1

Total Direct Utility Avoided Costs: 2007 Dollars

($/AF)

Year	Peak Season			Off-Peak Season		
	Short-Run	Long-Run	**Total**	Short-Run	Long-Run	**Total**
2007	$790	$0	**$790**	$790	$0	**$790**
2008	$790	$0	**$790**	$790	$0	**$790**
2009	$790	$0	**$790**	$790	$0	**$790**
2010	$790	$0	**$790**	$790	$0	**$790**
2011	$790	$0	**$790**	$790	$0	**$790**
2012	$790	$0	**$790**	$790	$0	**$790**
2013	$790	$0	**$790**	$790	$0	**$790**
2014	$790	$0	**$790**	$790	$0	**$790**
2015	$790	$86	**$876**	$790	$0	**$790**
2016	$790	$85	**$875**	$790	$0	**$790**
2017	$790	$84	**$874**	$790	$0	**$790**
2018	$790	$83	**$872**	$790	$0	**$790**
2019	$790	$82	**$871**	$790	$0	**$790**
2020	$790	$130	**$919**	$790	$0	**$790**
2021	$790	$128	**$917**	$790	$0	**$790**
2022	$790	$126	**$915**	$790	$0	**$790**
2023	$790	$124	**$914**	$790	$0	**$790**
2024	$790	$122	**$912**	$790	$0	**$790**
2025	$790	$120	**$910**	$790	$0	**$790**
2026	$790	$118	**$908**	$790	$0	**$790**
2027	$790	$117	**$906**	$790	$0	**$790**
2028	$790	$115	**$905**	$790	$0	**$790**
2029	$790	$113	**$903**	$790	$0	**$790**
2030	$790	$111	**$901**	$790	$0	**$790**

APPENDIX B.2: ECONOMICS – COST AND SAVINGS ASSUMPTIONS

This appendix contains cost and savings assumptions used in the cost benefit analysis.

Global Assumptions

- Dollars are real 2007 dollars (a.k.a. constant dollars $2007)
- One year time increments; end of year accounting; present is Year 0.
- Year 1 of the plan is 2009

Recommended Active Programs

High Efficiency Toilets

Program

- Open program, single- and multi-family.
- 500 rebates per year, ongoing until the Year 2019, which is 5 years after plumbing code requires HETs.
- A contractor will administer rebates.

Costs

- Administration (per Rebate) $30
- Rebates $100

Savings

- CMHC 2004 and Aquacraft 2000 reported in AWWARF 2007 indicate savings from HETs are approx. 24%-26% greater than savings from ULFTs.
- Percent replacing pre-1992 toilets is assumed to be 50% replace ULFTs and 50% replace pre-ULF fixtures--based on un-targeted program.
- Savings life assumed to be 23 years after which replacement savings are include in passive savings.

Large Landscape Audit and Incentives

Program

- Agency outreach to enough customers to get 10% to respond each year for 10 years. Of those 10% each year that respond, 20% agree to participate. After 10 years the program has audited 20% of the total.
- Includes all dedicated landscape meters in all sectors.
- Target existing accounts; new construction accounts will be covered under New Construction Code.

Costs

- Initial Contact $50 per responsive customer.
- Audited Sites $1,500
- Rebate $/AF Saved, Lifetime Savings (AF) $300

Savings

- Savings assumed to be 20% of current use.
- Life span of savings assumed 10yrs.
- Savings after end of life span continued by replication of program costs and savings.

CII Audits and Customized Incentives

Program

- Agency outreach to all customers in this class. Successfully contact 10% per year for 10 years.
- Of those responding, 20% participate each year, so after 10 years you have audited 20%.
- Assume you can get 20% savings.
- Incentive is $/AF at the time the conservation measures are put in place.

Costs

- Initial Contact $50 per customer who responds.
- Audited Sites $1,700
- Rebate $/AF Saved, Savings (AF) $300

Savings

- Savings assumed to be 20% of current use.
- Life span of savings assumed 10yrs.
- Savings after end of life span continued by replication of program costs and savings.

Landscape Contractor Certification

Program

- 5 large contractors recruited for the program
- Each contractor sends 5 employees for training each of the five years
- 12 sites retrofitted per trained person per year
- 1 WBICs per site on average
- 20 sprinkler heads per site on average
- 10% of sites inspected

Costs

- Initial Contact per contractor $50
- Personnel completing training $200
- Controllers $150 with rain sensor
- Sprinkler heads $5
- Inspections $150

Savings

- Residential Sprinkler head. Assume 10% of ET savings. Assume 80 sprinkler heads per acre (1 new per 2 replaced old on average for MP Rotators) for single family or small CII sites. Works out to 4.6 gpd per sprinkler head.
- ET Controller: 37 gallons per day.
- Life span of savings assumed 10yrs.
- Savings after end of life span continued by replication of program costs and savings.

High Efficiency Clothes Washer Rebates

Program

- Contractor administer rebates; spot check on site installations; document installation receipts
- .5% of residential units get rebates each year for 5 program years.

Costs

- Administration (per Rebate) $30

- Rebates $65

Savings

- Savings of 5085.6 gpy from literature (gross savings). If we assume 20% free riders, this converts to 11.1 gallons per day. Savings life span is assumed to be 12 years.
- Savings after end of life span continued by replication of program costs and savings.

Joint Marketing – Valley Wide

Program

- Two bill suffers in the first year, then one per year for the remaining 4 years of the 5 year program.
- 50 Radio ads per year for Years 1-3, then 10 per year for Years 4-5
- 36 Radio ads per year for Years 1-3, then 3 per year for Years 4-5
- 5 Radio ads per year for Years 1-3, then 3 per year for Years 4-5

Costs

- Stuffers $0.05 per stuffer
- Radio Ads $1,000 per ad
- Newspaper Ads $1,000 per ad
- Public Events $3,000 per event
- Cost share to suppliers based on total number of accounts.

Active Programs to Consider Further

Cash for Grass

Program

- Assume 410,000 square ft. replaced over a five year program life.[8]
- Assume program is enacted at 205 sites with 2,000 sq ft each.
- Sites distributed across suppliers based on percent of total accounts in SCV.
- Administration includes pre- and post-inspection as well as rebate forms and distribution.

Costs

- Administration & Inspection (per Rebate) $100
- Sq. Ft. Replaced: CII Sector .45c
- Sq. Ft. Replaced: Residential Sector .45c

Savings

- Savings assumed to be 80% of ETo. Assume ETo requirement of 60 inches per year. Sovocol and Rosales 2001 report that conventional landscape uses 4 to 5 times that of xeriscape).
- Savings assumed to last 10 years.
- Savings after end of life span continued by replication of program costs and savings.

Industrial Audits

Note that the Industrial Audit Program is an option for consideration that would replace part of the CII Audit Program with a specialized program for large industrial customers. This

[8] •As base of comparison, Las Vegas did 90 million sq. ft. 2,000 was typical of rebates in Las Vegas program. An important difference is that the ETo in Las Vegas is 90 inches and they get 4" of rain.

program is not on the list of recommended programs at this time; however, the industrial customers that would participate are included in the CII Audit Program on the list.

Program

- Applies to sites with 10 AFY or more (n=32)
- Intensive marketing to recruit for program.
- Sites that participate in Scoping Audit: 50% of n
- Sites that participate in Full Audit: 25% of n
- Sites that implement Full Audit recommendations: 20% of n

Costs

- Marketing (Sites) $500
- Scoping Audit (Sites) $2,000
- Full Audit (Sites) $10,000
- Rebate is $300/AF savings

Savings

- 30% savings
- Savings life: 10 years

High Efficiency Toilets, Aggressive Implementation

Program

- Bill stuffers will be sent to all pre-1992 units in Years 1 and 3.
- A contractor will administer rebates, providing phone support for identifying pre-1992 fixtures and spot check installations.
- 10% of pre-1992 toilets get rebates each year for five years.

Costs

- Direct Mail to Pre-1992 Housing Units $0.50 each
- Administration (per Rebate) $30
- Aggressive Rebates $150 SFU
  $200 MFU

Savings

- CMHC 2004 and Aquacraft 2000 reported in AWWARF 2007 indicate savings from HETs are approx. 24%-26% greater than savings from ULFTs.
- Percent replacing pre-1992 toilets is assumed to be 20% replace ULFTs and 80% replace pre-ULF fixtures--based on a program design with targeted direct mail and phone support to identify pre-1992 fixtures and spot checking.
- Savings life assumed to be 23 years after which replacement savings are include in passive savings.

New Construction Code

HE Toilets

Code Requirements

- New construction code for toilets could require all new fixtures meet the standards for High Efficiency Toilets.

Savings

- Savings from New Construction Code is defined as the additional increment of savings above ULFT savings required in Plumbing Code.
- Savings are estimated at 24% above ULFT savings (CMHC 2004 and Aquacraft 2000 reported in AWWARF 2007). ULFT savings are calculated based on persons per household according to the method in CUWCC Cost and Savings Study. Savings are calculated separately for single family and multi family.
- Added savings from new units are attributed to new construction code only until 2014 when plumbing code requires all new fixtures meet HET standards. Savings from devices installed before that date continue to be attributed to New Construction Code. (If period of analysis is extended beyond 2030, need to add lifespan to savings because savings would then be counted in passive savings.)

Residential Landscape

Code Requirements

- New construction landscape code could include limits on square footage of new irrigated area in new sites, requirements for very low water need vegetation, efficient irrigation equipment and practices (weather-based "Smart" irrigation controllers, high efficiency sprinklers, hydro zones, smart edgescapes), or combinations thereof. Since new construction often includes only front-yard landscaping, code would need to apply to subsequent landscape work at new sites.

Savings

- Savings in the SF and MF residential sectors due to New Construction Code include an ambitious package of these water efficiency measures mentioned above that achieve 30% savings using 2006 mean outdoor use per unit.
- Outdoor use for SCV is estimated roughly to be 53% of annual use for SF and 34% of annual use for MF – using a simple ratio method.

Faucet Aerators and Showerheads

Code Requirements

- New Construction Code for sink aerators and showerheads can include requirements for savings beyond required in plumbing code.

Savings

- For sink aerators, the model assumes a move from 2.2 gpm to an aerator with an unspecified lower flow rate that achieves in practice .5 gallons per day savings. Kitchen models would have toggle for fast filling and variable spray control to improve device retention.
- For showerheads, 1.6gpm flow rates are 36% less than 2.5 gpm. Typical savings from empirical savings of 2.5gpm showerheads is 5.5gpd, so we assume that each 1.6gpm fixture due to the new building code saves an additional 1.98gpd (5.5gpd *.36).

High Efficiency Dish Washers

Code Requirements

- New Construction Code for dish washers could require the installation of high efficiency machines in all new units.

Savings

- The model assumes 1.2 gallons per day savings per machine by moving from an average of 9.5 to 7.5 gallons per cycle, 215 cycles per year.
- Prevalence of dish washers is assumed to be 65% for single family and 48% for multi family as midpoints found between two empirical studies on this issue (EBMUD 2002, Market Penetration Study, OC Saturation Study 2002). Arguments can be made for higher or other rates depending on the style of new planned construction.

CII and Landscape Sectors

Code Requirements

- Savings would come from: 1) landscape accounts with dedicated meters and master meters and 2) industrial process efficiency improvements for new industrial customers.
- New construction landscape code could include limits on square footage of new irrigated area in new CII sites, requirements for very low water need vegetation, efficient irrigation equipment and practices (weather-based "Smart" irrigation controllers, high efficiency sprinklers, hydro zones, smart edgescapes), or combinations thereof.
- New construction industrial code could include requirements for rinse water recycling where feasible, high efficiency water consuming equipment (e.g., industrial clothes washers, dishwashers, food processers and steamers, car washes, cooling towers, film processing, etc.). Also included are code measures listed in the residential sector that apply (e.g., toilets).

Savings

- Assume savings of 10% of all new deliveries projected for CII and Landscape in the UWMP. Savings due to code are from 2008-2030. These actions would work toward the objectives of AB 1881.

Passive Conservation

Passive Conservation is that which would occur without programs implemented by agencies. One reason it is important to identify passive conservation is to understand full extent of conservation. Another reason is to assure that savings attributed to Active Conservation are only the additional increment of savings beyond passive savings. Since you are spending hard earned dollars on Active Conservation, you want to be sure to know what you are getting for your money and not to spend money on conservation that would be achieved without the Active Program.

Assumptions:

- Passive conservation is driven by growth in housing units and plumbing code.
- Housing unit growth summarized in Chapter 3.
- Devices per housing unit summarized in Table B.2.1.
- Natural replacement Rate summarized in Table B.2.2.
- Existence/Adoption Rates summarized in Table B.2.3.
- Savings per device summarized in Table B.2.4.

Table B.2.1 - Conservation Device Saturation Parameters

Parameters	SCWD	LA36	NCWD	VWC	Source
SF Toilets per structure pre-92	2	2	2.5	2	BMP Report Base Year Data
SF Toilets per structure >= 92	2	2	2.5	2	BMP Report Base Year Data
SF Showers per HH	1.8	1.8	1.8	1.8	EBMUD 2002, Market Penetration Study
SF Persons per HH	3.30	2.93	3.35	3.00	BMP Report Base Year Data
SF Pct HH with Clothes Washer	93%	93%	93%	93%	EBMUD 2002 Market Penetration Study (90%); OC Saturation Study 2002 (96.5%)
SF Pct HH with Dishwasher	65%	65%	65%	65%	EBMUD 2002, Market Penetration Study (60%), OC Saturation Study 2002 (83.0%)
MF Toilets per structure pre-92	2	1.5	1.2	1.5	BMP Report Base Year Data
MF Toilets per structure >= 92	2	1.5	1.2	1.5	BMP Report Base Year Data
MF Showers per HH	1.1	1.1	1.1	1.1	EBMUD 2002, Market Penetration Study
MF Persons per HH	3.30	2.93	2.51	3.00	BMP Report Base Year Data
MF Pct HH with Clothes Washer*	26%	15.0%	15.0%	26.0%	EBMUD 2002, Market Penetration Study (15%), OC Saturation Study 2002 (25.6%)
MF Pct HH with Dishwasher**	48%	30.0%	30.0%	48%	EBMUD 2002, Market Penetration Study (30%), OC Saturation Study 2002 (65.8%)

* If multi-family is mostly apartments, use EBMUD Study because multi-family were only apartments in that study.

** If multi-family is mix of apartments and condos use mean of both studies because OC Study included many condos.

Table B.2.2 - Replacement/Remodel Rate* Assumptions for Passive Conservation Model

	SCWD	LA36	NCWD	VWC
Showerhead: SF	5.0%	5.0%	5.0%	5.0%
HE Washer: SF	3.0%	3.0%	3.0%	3.0%
ULFT: SF	4.0%	4.0%	4.0%	4.0%
Dishwasher: SF	3.0%	3.0%	3.0%	3.0%
Sink Aerators: SF	4.0%	4.0%	4.0%	4.0%
Showerhead: MF	5.0%	5.0%	5.0%	5.0%
HE Washer: MF	3.0%	3.0%	3.0%	3.0%
ULFT: MF	4.0%	4.0%	4.0%	4.0%
Dishwasher: MF	3.0%	3.0%	3.0%	3.0%
Sink Aerators: MF	4.0%	4.0%	4.0%	4.0%

*This is the rate at which the existing stock of devices gets replaced either due to repair OR remodel OR demolition.

Table B.2.3 – Existence / Adoption Rates

Existence/Adoption/Compliance Rate

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Showerhead: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	5.0%	8.0%	11.0%	14.0%	17.0%	20.0%	23.0%
ULFT: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	7.0%	9.5%	12.0%	14.5%	17.0%	19.5%
Sink Aerators: SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	7.0%	9.5%	12.0%	14.5%	17.0%	19.5%
Showerhead: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: MF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	5.0%	8.0%	11.0%	14.0%	17.0%	20.0%	23.0%
ULFT: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: MF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	7.0%	9.5%	12.0%	14.5%	17.0%	19.5%
Sink Aerators: MF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.5%	7.0%	9.5%	12.0%	14.5%	17.0%	19.5%

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Showerhead: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: SF	26.0%	29.0%	32.0%	35.0%	38.0%	41.0%	44.0%	47.0%	50.0%	53.0%	56.0%	59.0%	62.0%	65.0%
ULFT: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: SF	22.0%	24.5%	27.0%	29.5%	32.0%	34.5%	37.0%	39.5%	42.0%	44.5%	47.0%	49.5%	52.0%	54.5%
Sink Aerators: SF	22.0%	24.5%	27.0%	29.5%	32.0%	34.5%	37.0%	39.5%	42.0%	44.5%	47.0%	49.5%	52.0%	54.5%
Showerhead: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: MF	26.0%	29.0%	32.0%	35.0%	38.0%	41.0%	44.0%	47.0%	50.0%	53.0%	56.0%	59.0%	62.0%	65.0%
ULFT: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: MF	22.0%	24.5%	27.0%	29.5%	32.0%	34.5%	37.0%	39.5%	42.0%	44.5%	47.0%	49.5%	52.0%	54.5%
Sink Aerators: MF	22.0%	24.5%	27.0%	29.5%	32.0%	34.5%	37.0%	39.5%	42.0%	44.5%	47.0%	49.5%	52.0%	54.5%

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Showerhead: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: SF	68.0%	71.0%	74.0%	77.0%	80.0%	83.0%	86.0%	89.0%	92.0%	95.0%	98.0%	100.0%
ULFT: SF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: SF	57.0%	59.5%	62.0%	64.5%	67.0%	69.5%	72.0%	74.5%	77.0%	79.5%	82.0%	84.5%
Sink Aerators: SF	57.0%	59.5%	62.0%	64.5%	67.0%	69.5%	72.0%	74.5%	77.0%	79.5%	82.0%	84.5%
Showerhead: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HE Washer: MF	68.0%	71.0%	74.0%	77.0%	80.0%	83.0%	86.0%	89.0%	92.0%	95.0%	98.0%	100.0%
ULFT: MF	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dishwasher: MF	57.0%	59.5%	62.0%	64.5%	67.0%	69.5%	72.0%	74.5%	77.0%	79.5%	82.0%	84.5%
Sink Aerators: MF	57.0%	59.5%	62.0%	64.5%	67.0%	69.5%	72.0%	74.5%	77.0%	79.5%	82.0%	84.5%

Notes: If there is code, this is compliance rate.
If there is no code, this is the adoption rate.
If the conserving technology is not on the market yet, this value is zero.

Table B.2.4 - Passive Conservation Savings Inputs by Measure

Measures	Gallons per Day	Days Per Yr	Days Per Yr
Showerhead: SF	5.5	365	See AWWARF 2007 p 140
HE Washer: SF	13.9	365	See AWWARF 2007 p 122
ULFT: SF	23.1	365	See AWWARF 2007 pp 149-154
Dishwasher: SF	1.2	365	See CUWCC Potential PBMP p 10
Showerhead: MF	5.5	365	See AWWARF 2007 p 140
HE Washer: MF	13.9	365	See AWWARF 2007 p 122
ULFT: MF	49.1	365	See AWWARF 2007 pp 149-154
Dishwasher: MF	1.2	365	See CUWCC Potential BMP p 10

Note: ULFT savings are calculated in this table using localized estimates of persons per household. Savings were calculated separately for each agency.

AWWARF 2007 refers to "Water Efficiency Programs for Integrated Water Management," American Water Works Research Foundation, 2007, Appendix C, "Compendium of WUE Savings and Cost Assumptions."

CUWCC Potential BMP p 10 refers to "Potential Best Management Practices: Year 3 Report," January 2007, prepared for CUWCC by John Koeller

APPENDIX C.1: STAKEHOLDER MEETING 1 PRESENTATION

Santa Clarita Valley
Water Conservation Strategic Plan

Stakeholder Meeting
September 18, 2007

AGENDA

1. Welcome & Introductions
2. Goals & Background
3. The Santa Clarita Valley Family of Water Suppliers
4. Strategic Plan Goals, Process & Programs
5. Next Steps / Wrap-up

Welcome and Introductions

- You are welcome!
- Please introduce yourself

Goals for Today's Meeting

- **Origin of the project**
- **Understand the "whys" and "hows" of the Strategic Plan Process**
- **Review the universe of conservation measures to be considered**
- **Review criteria for evaluating programs**
- **Review concepts for conservation programs**
- **Receive feedback**

Water Suppliers in Santa Clarita Valley

- **Wholesale**
  - Castaic Lake Water Agency
- **Retailers**
  - Valencia Water Company
  - Santa Clarita Water Division
  - Newhall County Water District
  - Los Angeles County Waterworks District #36

Key Consultant Team Members

- **Thomas W. Chesnutt, Ph.D.**
  - Project Manager
  - Economic Analysis
- **David M. Pekelney, Ph.D.**
  - Cost-Benefit Analysis
  - Planning Model Adaption
- **Maureen Erbeznik, John Koeller**
  - Program Design, Task Mgr.
- **Gary Fiske, David Mitchell**
  - Economic Analysis
  - Program Design

Programs in the Valley

Recycled Water Systems

Education & Outreach

IRWMP-Integrated Regional Water Management Plan

Water Use Efficiency

Conservation Approach

Residential Indoor

Education
Marketing
Legislative
Outreach
Research

Landscape

Commercial
Industrial
Institutional

Current Programs

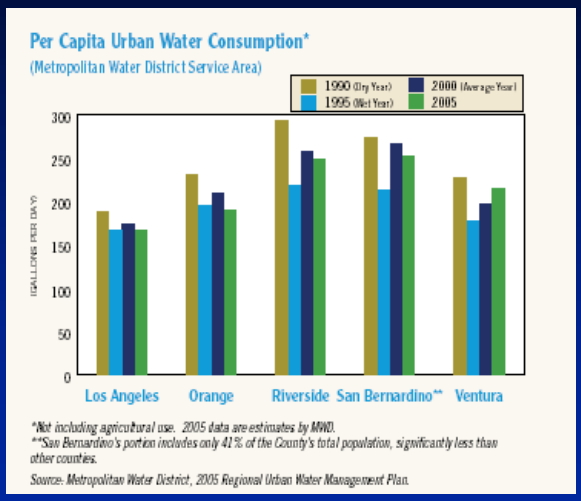
Residential	CII	Landscape
◆ ULFT Rebate ◆ Free Residential Audit ◆ Retrofit devices ◆ Education and Schools ◆ Media Partnership	◆ Audits ◆ Pre-Rinse Spray Nozzles	◆ Landscape training ◆ Residential Weather-Based Irrigation Controllers ◆ Demonstration Garden

Participation in the Statewide Memorandum of Understanding

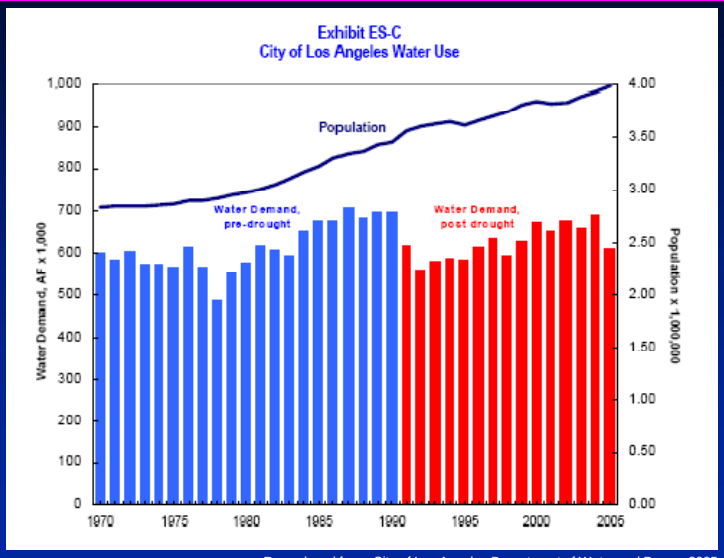
- Los Angeles County Waterworks District #36
  - MOU Signed in 1997 (LA County)
  - BMP Reports 2001 to 2006
- Castaic Lake Water Agency
  - Signed MOU in 2001 (for itself and for its retailer)
  - BMP Reports 2001 through 2006
- Santa Clarita Water Division
  - MOU Signed in 2001
  - BMP Reports 2001 to 2006
- Newhall County Water District
  - MOU Signed in 2002
  - BMP Reports 2003 to 2006
- Valencia Water Company
  - MOU Signed in 2006
  - BMP Reports 2001 through 2006

Enhancing Our Conservation Efforts

Decreasing Per Capita Use is Possible



Decreasing Per Capita Use is Possible



Reproduced from: City of Los Angeles Department of Water and Power, 2005 urban water management plan

Plan Considerations

- 20-year water savings target with near-term action plan
- Helps meet objectives of IRWMP
- Provides for education and outreach opportunities
- Provide cross-over water quality benefits for watershed management
- Reflect appropriate balance between cost and water savings
- Raising awareness of water as a precious resource

Objectives of the Water Conservation Strategic Plan

- Balanced and flexible mix of programs
- Stakeholders find plans valuable
- Final product is "Implementable"
- Maximize partnership funding
- Final plans are produced on time and on budget

Terminology

- Conservation Measures
  - Technologies, Plumbing Fixtures, Management Practices,
- Delivery Mechanism
  - Education, Rebates, Incentives, Direct Install, Ordinances
- A Conservation Program =

  Conservation measure(s) + delivery mechanism

Conservation Measures

Residential	Landscape	CII
Aerators	Audits	Analyst Survey I
Flappers w/Survey	Central Controllers	Analyst Survey II
High-Efficiency Washers	Education – Mem Agy	Cooling Tower Cond Meter
Irrig Eval with Timers	ET Controllers	Engineer Survey
Irrig Eval without Timers	Irrigation Controllers	Flush Valve Kit
Multi-Family Surveys	Moisture Sensors	High-Efficiency Washers
Weather-Based Controller	Landscaper Training Class	Industrial Process Improve
Showerheads	Efficient Landscape Design	Pre-Rinse Spray Head
Showerheads – Distributed		ULF Toilets - Dual Flush
Surveys, Single Family		ULF Toilets - Flush Valve
Surveys, Single Family-Old		ULF Toilets - Tank Type
Toilet Displacement		ULF Urinals
ULF Toilets – Distribution		Water Broom
ULF Toilets – Rebate		Water Management Study
ULF Toilets - Dual Flush		X-Ray Processor

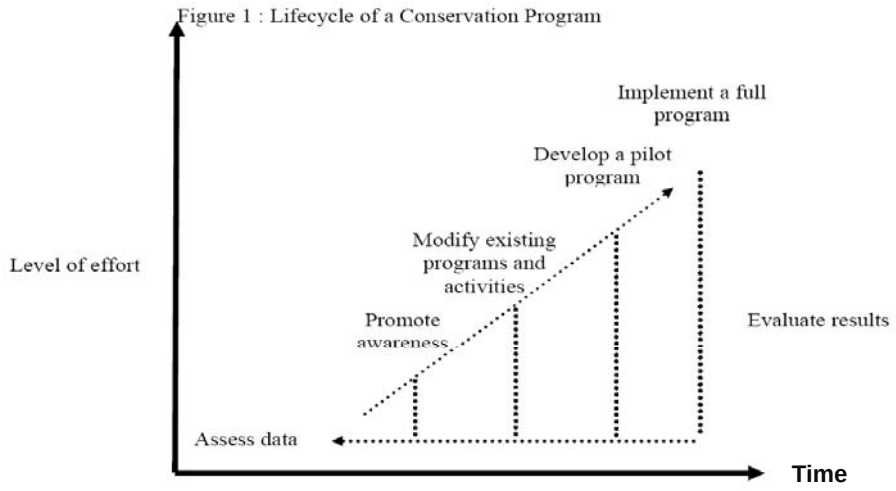
Blue = Backed by existing or new plumbing codes.

Delivery Mechanisms

- How can Conservation measures be delivered?
- Delivery Mechanisms include a range

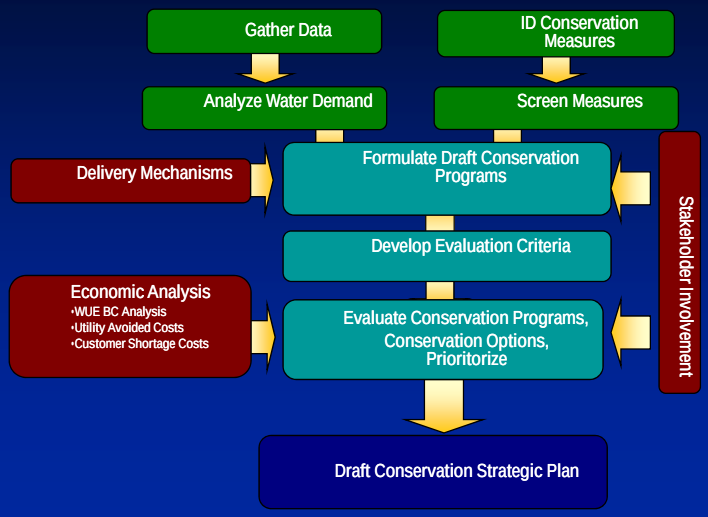
Education, Public Awareness	Program Marketing, Rebates & Incentives	Legislation Ordinances Regulation
Information	Incentives & Active Programs	Requirement

Program Life Cycle



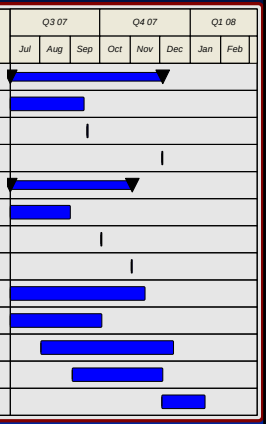
Source: *Socioeconomic Impacts of Conservation*, AwwaRF 2001.

Strategic Plan Process



Project Schedule

ID	Task Name	Start	Finish	Duration (days)
1	**Task 1: Specify Conservation Planning Goals**	**7/2/2007**	**12/3/2007**	**111d**
2	Specify Planning Goals with Staff	7/2/2007	9/14/2007	55d
3	Community Stakeholder Workshop Number 1	9/18/2007	9/18/2007	1d
4	Community Stakeholder Workshop Number 2	12/3/2007	12/3/2007	1d
5	**Task 2: Develop a Santa Clarita Valley Customer Profile**	**7/2/2007**	**11/2/2007**	**90d**
6	Subtask 1 – Identify Customers: Data Collection	7/2/2007	8/31/2007	45d
7	Subtask 2 – First Data Report: End Users by Customer Sector	10/2/2007	10/2/2007	1d
8	Subtask 3 – Second Data Report: Customer Geography	11/2/2007	11/2/2007	1d
9	**Task 3: Develop Appropriate Means of Measuring Savings**	7/2/2007	11/15/2007	99d
10	**Task 4: Identify Water Conservation Measures**	7/2/2007	10/2/2007	67d
11	**Task 5: Analyze Costs and Benefits**	8/2/2007	12/14/2007	97d
12	**Task 6: Select Conservation Measures - Formulate Programs**	9/3/2007	12/3/2007	66d
13	**Task 7: Develop Implementation Plan**	12/3/2007	1/15/2008	32d



Conservation Measures Identified

MEASURE GUIDE

	Ultra Low Flush Toilets (ULFTs) RESIDENTIAL	COMMERCIAL
Devices		
Types of Programs	Rebate or Voucher Distribution Direct Installation Vendor delivery (mf) Retrofit on resale ordinance	Rebate or Voucher Direct Installation Vendor delivery Valve replacement
Description	1.6 gallons per flush (gpf) Mandated since 1992; maximum 1.6-gpf sold in CA. Since 1994 only 1.6 sold in US. Residential toilets are typically tank-type models with round bowls. There are two types of tank models: gravity fed and pressure assisted. Gravity toilets are the most common type. They rely on the weight of the water and head pressure to remove the waste through the trap. Pressure assisted models supply line pressure to force the waste through the trap. Pressure assisted models typically costs $100+ more. There is also a third type, vacuum gravity models, a hybrid of the these two.	1.6 gallons per flush (gpf) Mandated since 1994; maximum 1.6-gpf installed in US. (except for blowout toilets, for which maximum is 3.5-gpf) There are two types of toilets installed in commercial facilities: flushometer valve and tank-types. Flushometer valve toilets are activated through a handle or automatic sensor located above the toilet bowl. They tend to be installed in locations that receive high use. Tank-type toilets are similar to residential models except when used by the public are required to have an elongated bowl. Sloan has introduced a the Crown Flushometer Valve which can not be inadvertently retrofitted to use more than 1.6 gallons per flush as is the case with the Sloan crown valves as well as those from other manufacturers
Savings	Single Family 21 – 27 gpd Multi Family 36 - 63 gpd Depends on persons per household and toilets per household	16 – 57* gpd *Depends on type of facility and amount of use

Stakeholder Feedback # 1

- Guide to Conservation Measures
- Audience Participation Time

Benefit Cost Analysis depends on good local data

	Today	Meeting 2	Completion
Data	Still arriving	70-80%	90%+
Savings/ Costs	Industry standard estimates	Customized to Valley	Customized to Retailers
Benefits	Identify Multiple Benefits	Identify Cost-Sharing Partners	Identify Contacts
Benefit/ Cost Analysis	Qualitative Screening	Customized to Valley	Integrated Planning Tools

Screening Conservation Programs

High Cost-Effectiveness		**No Brainer**
Low Cost-Effectiveness	"LL" **Loser**	
	Low — Implementation Feasibility — High	

Screening Criteria

- **Reduces Water Use**
- **Cost Effective – (Cost/Yield, $/AF)**
- **Stakeholder Support**
- **Easy for Customers to Participate In**
- **Changes Long Term Behavior**
- **Good Public Relations**
- **Easy to Explain to Customers**
- **Environmentally Sensitive**
- **Encourages Partnerships**

Source: Developed from Water Supplier Input

Concepts for Conservation Programs

- Based on the existing analysis to date, we can identify some promising concepts
- These are presented by sector
- Not all programs will be implemented by each retailer
- The Strategic Plan seeks to develop a portfolio of conservation programs
- We will elicit feedback on these concepts

Promising Market Opportunities

- Large Landscape
  - Parks, Multi-Family and HOA common areas
- Commercial, Industrial, Institutional (CII)
  - Commercial Industrial: Getting from audits to action
  - School Program: Landscape, Indoor, Education
- Residential
  - Landscape, toilets, clothes washers
- Rate Reform
- Ordinances, Standards for New Construction

Large Landscape: Strategy

- **Work From the Ground Up**
  1. Survey and plan
  2. Sprinkler system: repairs, adjustment, head replacement, low precipitation systems
  3. Water budget and upgraded weather-based controller
  4. Efficient Landscape Design
  5. Maintenance and communication

- **Program Delivery**
  - Surveys and outreach
  - Free heads and rotors
  - Low precipitation irrigation system and controller incentives
  - Follow up tracking and communication

Commercial and Institutional: Strategy

- **From "Audits to Action"**
  - Build on audits already completed
  - Motivate with outreach and financial incentives
  - Customize approach for large sites
- **Program Delivery**
  - Surveys and outreach
  - Equipment incentives, e.g.
    - Incentive based on water saved
    - Finance conservation investments over time
  - Assistance with product research, purchasing and installation
  - Follow up tracking, "green eyeshade"

School Program: Strategy

- **Education**
  - Build on existing education programs
  - Students/schools cross water retailer boundaries
  - Student-conducted home water audits
  - School site demonstration gardens, education
  - Water efficient "demonstration restroom"

(Large school landscapes covered in Large Landscape Program)

Residential Sector: Strategy

- **Narrow Targeted Program**
  - High-use customers and older homes with high savings potential
  - Minimize free riders, know your savings
- **Broad Un-Targeted Program**
  - Larger scale
  - Public relations and education value
  - Simplify implementation
- **Program Delivery**
  - Advertised rebates for HE toilets and HE washers
  - Landscape surveys and rebates
  - ET controller and HE toilets give-aways
  - Year-round (not just Water Awareness Month)

Rate Reform: Strategy

- Some progress has been made
- Conservation Strategic Plan cannot set rates for any agency
- Plan can make the case for rate reform

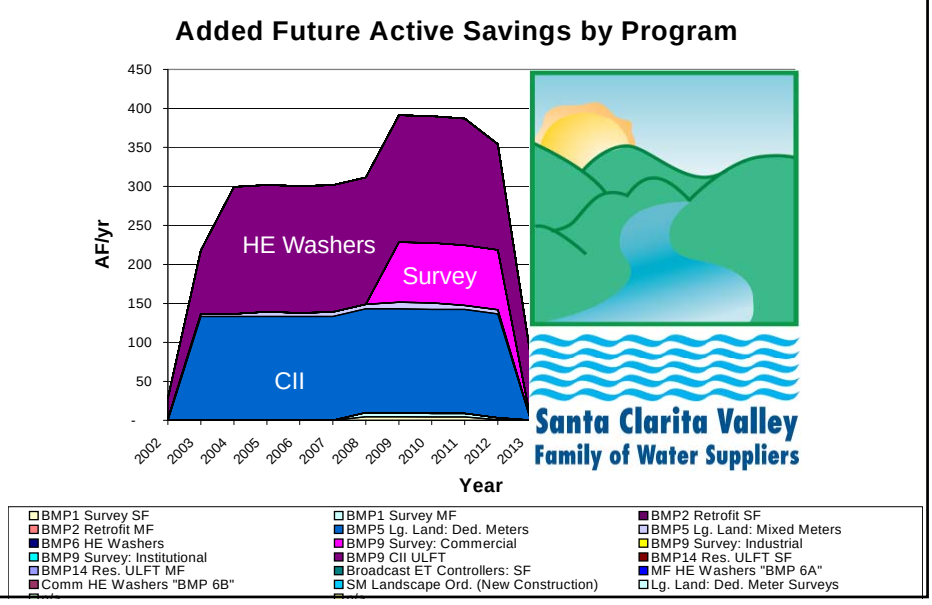
Stakeholder Feedback # 2

- Audience Participation Time

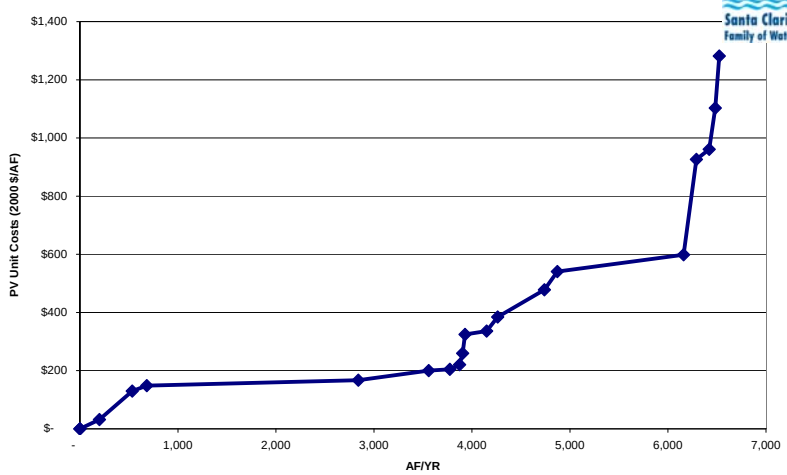
Next Steps

- Program refinement and analysis
- Program ranking and selection:
- Choosing the right mix
  - Achieving the target
  - Cost-effectiveness

Made up Example of Conservation Yield



Example 2: Conservation Cost and Yield



Update Supply Curve Graph

Question and Answer Time

More Feedback?

Contact:

Greg Milleman
(661) 295-6512
gmilleman@valencia.com

Thomas Hawes
(661) 513-1253
thawes@clwa.org

Melinda Barrett
(626) 300-3362
mbarrett@dpw.lacounty.gov

Robert McLaughlan
(661) 259-3610
robertm@ncwd.org

Cathy Hollomon
(661) 259-2737
chollomon@scwater.org

Backup Slides

APPENDIX C.2: STAKEHOLDER MEETING 2 PRESENTATION

Santa Clarita Valley
Family of Water Suppliers
Water Conservation Strategic Plan

Stakeholder Meeting
December 11, 2007

Agenda for Today's Meeting

1. Welcome and Introductions
2. Conservation Strategic Plan Overview
3. Review of Identified Programs
4. Evaluation of Programs Against Criteria
5. Wrap-up

Welcome and Introductions

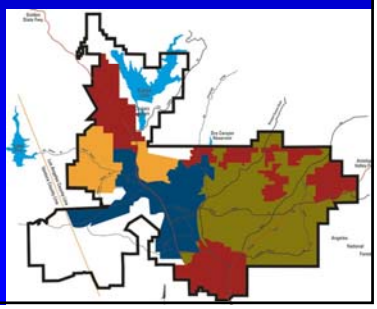
- You are welcome!
- Please introduce yourself

Goals for Today's Meeting

- **Overview of the Conservation Strategic Plan process**
- **Review the new conservation programs**
- **Evaluating programs for implementation ranking**
- **Provide any additional feedback**

Water Suppliers in Santa Clarita Valley

- **Wholesale - Castaic Lake Water Agency**
- **Retailers**
  - Valencia Water Company
  - Santa Clarita Water Division
  - Newhall County Water District
  - Los Angeles County Waterworks District #36



Key Consultant Team Members

- **Thomas W. Chesnutt, Ph.D.**
  - Project Manager
  - Economic Analysis
- **David M. Pekelney, Ph.D.**
  - Cost-Benefit Analysis
  - Planning Model Adaption
- **Maureen Erbeznik, John Koeller**
  - Program Design, Task Mgr.
- **Gary Fiske, David Mitchell**
  - Economic Analysis
  - Program Design

Programs in the Valley

Recycled Water Systems

Education & Outreach

IRWMP-Integrated Regional Water Management Plan

Water Use Efficiency

Conservation Approach

Residential Indoor

Education
Marketing
Legislative
Outreach
Research

Landscape

Commercial
Industrial
Institutional

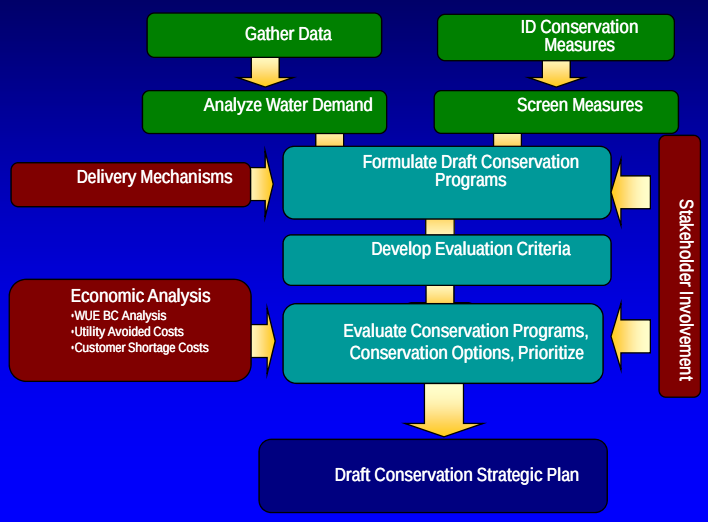
Current Programs

Residential	CII	Landscape
◆ ULFT Rebate ◆ Free Residential Audit ◆ Retrofit devices ◆ Education and Schools ◆ Media Partnership	◆ Audits ◆ Pre-Rinse Spray Nozzles	◆ Landscape training ◆ Residential Weather-Based Irrigation Controllers ◆ Demonstration Garden

Conservation Strategic Plan Overview

- Flow Chart of Conservation Strategic Plan
- Overview of Data—Good data drive good plans
- Program Design—
  Conservation measures and delivery mechanism
  = A Conservation Program
- Program Evaluation
  – Ranking Programs from Quantitative and Qualitative Criteria
- 5 Year Implementation Plans

Strategic Plan Process

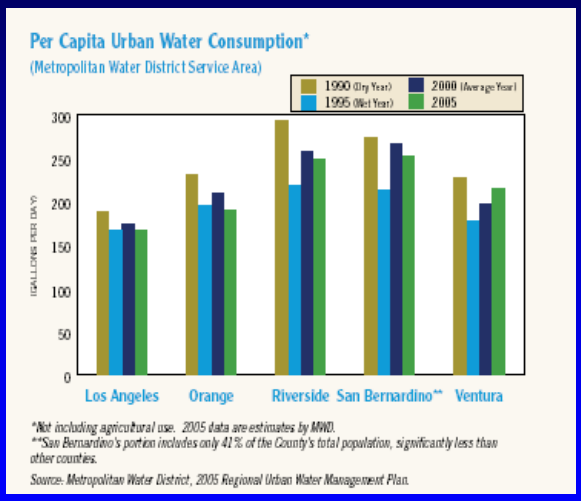


Plan Considerations

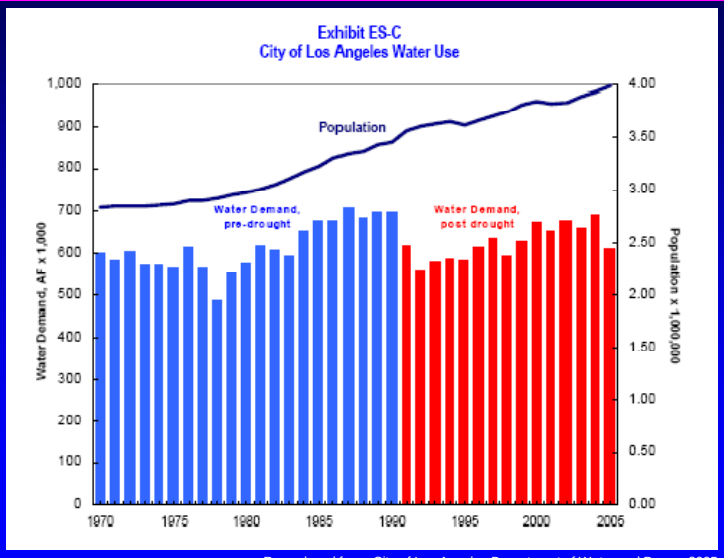
- 20-year water savings target with near-term action plan
- Helps meet objectives of IRWMP
- Provides for education and outreach opportunities
- Provide cross-over water quality benefits for watershed management
- Reflect appropriate balance between cost and water savings
- Raising awareness of water as a precious resource

Enhancing Our Conservation Efforts

Decreasing Per Capita Use is Possible



Decreasing Per Capita Use is Possible

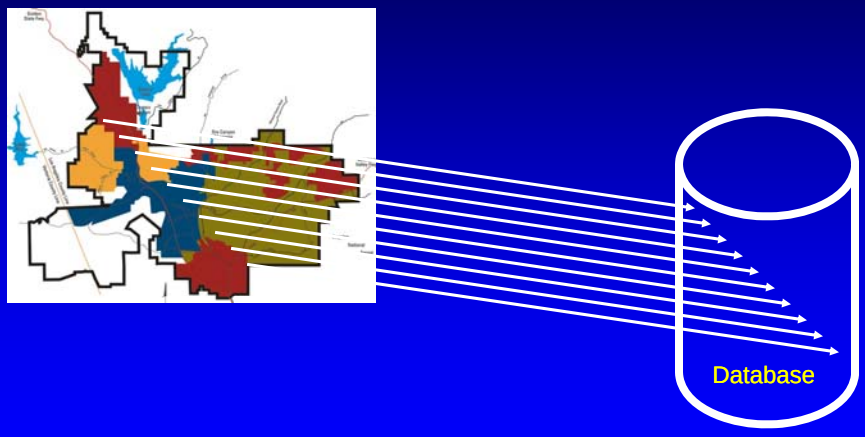


Reproduced from: City of Los Angeles Department of Water and Power, 2005 urban water management plan

Overview of Conservation Strategic Plan

- Flow Chart of Conservation Master Plan
- Overview of Data—Good data drive good plans
- Program Design—
  Conservation measures and delivery mechanism
  = A Conservation Program
- Program Evaluation
  - Ranking Programs from Quantitative and Qualitative Criteria
- 5 Year Implementation Plans

Consumption Data



Overview of Conservation Strategic Plan

- Flow Chart of Conservation Master Plan
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- Program Design—
  Conservation measures and delivery mechanism
  = A Conservation Program
- Program Evaluation
  - Ranking Programs from Quantitative and Qualitative Criteria
- 5 Year Implementation Plans

Program Design

- Identify promising measures
- Sculpt a delivery mechanism
- Estimate program costs and benefits

Terminology

- **Conservation Measures**
  - **Technologies, Plumbing Fixtures, Management Practices,**
- **Delivery Mechanism**
  - **Education, Rebates, Incentives, Direct Install, Ordinances**
- **A Conservation Program =**

  Conservation measure(s) + delivery mechanism

Delivery Mechanisms

- How can Conservation measures be delivered?
- Delivery Mechanisms include a range

Education, Public Awareness	Program Marketing, Rebates & Incentives	Legislation Ordinances Regulation
Information	Incentives & Active Programs	Requirement

Program Evaluation

	Evaluation Criteria				
	1	2	3	4	5 . . .
Existing Program 1					
Existing Program 2			?		
New Program 1					
New Program 2					

Evaluation Criteria

- Qualitative / Cost effectiveness
- Saturation / Local opportunity
- Implement-ability
- Certainty of water savings
- Additional benefits
- PR Value
- Potential for outside funding
- Quickly scalable

Overview of Conservation Master Plan

- Flow Chart of Conservation Master Plan
- Overview of Data—Good data drive good plans
- Program Design
  - Conservation measures and delivery mechanism
  - = A Conservation Program
- Program Evaluation
  - Ranking Programs from Quantitative and Qualitative Criteria
- 5 Year Implementation Plans

End Result: 5 Year Implementation Plan

	Year 1	Year 2	Year 3	Year 4	Year 5
Develop Local Marketing and Implementation Plan					
Existing Program 1: ULF Toilets					
Existing Program 2: Weather Based Irrigation Controllers					
New Program 1: High Efficiency Toilets					
New Program 2: Large Landscape Water Budget Program					
Pilot Studies					
Technical Assistance					
Projected Water Savings	AF	AF	AF	AF	AF
Recommended Budget, Staff	$	$	$	$	$

Example of a 5 Year Implementation Plan

3. Review of Identified Programs

Santa Clarita Valley
Family of Water Suppliers

New Programs for current implementation:

- High Efficiency Toilet Rebate
- Large Landscape Audit and Incentive
- CII Audit and Customized Incentive
- Landscape Contractor Certification (WBIC)
- Mandatory Indoor and Outdoor Efficiency Standards
- Valley-Wide Marketing, Measurement & Evaluation

Programs to requiring further implementation analysis:

- Cash for Grass, Water Budgets
- Rate Reform, Existing Programs

High Efficiency Toilet Rebate

- Targeted direct mail to pre-1992 housing units
- Rebate: $150 single family, $200 multi-family
- Contractor operations:
  - Process rebates, phone support to ID pre-1992 fixtures; spot check installations
- Single family; B/C Ratio = 1.9
- Multi-family; B/C Ratio = 2.9

Large Landscape Audit and Incentive

- Water audits, minor repairs, equipment incentives, and water budgeting
- Incentive: ~ $300/AF saved
- Public and private customers (e.g., HOAs)
  - Target sites > 2 acres
- Incentives for sprinkler heads, controllers
- B/C Ratio = 1.7

CII Audit and Customized Incentive

- Comprehensive water audits, water budgets, reporting, and customized incentive
  - For previous audits, incentives for action
- Incentive: ~$300/AF saved
- Target large sites; select with agency staff
- Incentives for HE toilets and urinals, water brooms, cooling tower controllers, industrial process savings
- B/C Ratio = 1.1

Landscape Contractor Certification

- Training and certification
  - Value and installation of WBICs and efficient sprinkler heads
  - Contractor / staff certification
- Free Weather-Based Irrigation Controllers (WBIC) and nozzles certified contractors to install, inspection after installation
- B/C Ratio = 1.9

Mandatory Efficiency Standards

- New Construction Standards
  - Consistent with state-wide long term water supply plans
  - Predicated on cost-effective conservation
- County Water Conservation Ordinance
- Support for Water Recycling Ordinance

Valley-wide Marketing and Measurement

- Marketing and Public Information
  - Needed to
    - inform customers of incentive programs
    - Provide information to help change long term water using practices
- Measurement and Evaluation
  - Needed to
    - Confirm and improve effectiveness of existing programs
    - Pilot new technologies and programs

Programs Requiring Further Implementation Analysis

- Some programs struggled with cost effectiveness
  - Cash for Grass
  - Single Family Audits
- Other programs require additional work
  - Water Budget-based programs
  - Water Rate Reform

Cash for Grass

- Rebate for each sq. ft. turf removed
  - Replace with low water use or artificial turf
- $2/sq. ft will move market
  - $.45 sq. ft. will break even
- Target inefficient sites (e.g., median strips)
- Pre- and post inspections
- Cost per AF does not include customer maintenance savings (about 1/3)
  - B/C Ratio = 0.3 (@ $2.00 / sq. ft.)
  - B/C Ratio = 1.0 (@ $0.45 / sq. ft)

Water Budgets

- Planning and System Development
  - Design and policy choices
  - Data Requirements
- Customer Communications
  - Essential for successful acceptance
- Customer Interaction
  - Expect calls / variances

(Costs could vary widely depending on design, existing systems, and policy development process.)

Water Rate Reform

- Water Rates are key
  - Communicate to customers of the cost consequences of consumption
  - Public agencies attempt to provide water supply at "least cost".
- Water Rate Reform
  - Balances
    - affordability of this basic human requirement with
    - appropriate price signals for a scarce precious natural resource
- Water Rate Reform remains a local water supplier prerogative

4. Evaluation of Programs

Stakeholder feedback form to elicit reactions to our evaluation

Question and Answer Time

More Feedback?

Contact:

Greg Milleman
(661) 295-6512
gmilleman@valencia.com

Thomas Hawes
(661) 513-1253
thawes@clwa.org

Melinda Barrett
(626) 300-3362
mbarrett@dpw.lacounty.gov

Robert McLaughlan
(661) 259-3610
robertm@ncwd.org

Cathy Hollomon
(661) 259-2737
chollomon@scwater.org

APPENDIX D: WATER RATES AND CONSERVATION

by David Mitchell, M.Cubed (dmitchell@mcubed-econ.com)
and
Tom Chesnutt, A & N Technical Services, (tom@antechserv.com)

Introduction

This appendix provides a discussion of water rate structures and conservation, sometimes referred to as "conservation pricing". It addresses 1) the theoretical and empirical underpinnings for viewing rate structure design as a key tool for promoting efficient water use decisions, 2) alternative conservation-oriented water rate structures, and 3) cost-of-service considerations of rate design.

Linkages Between Rates and Water Use

Analysts have pointed out that water rates can be an extremely valuable public policy tool. Water rates can be more than a means of meeting utility revenue requirements. Water rates can be used to communicate to water users the private and social costs of water development. Water users can then base their consumption decisions on a more accurate accounting of the benefits and costs of using more or less water. If done correctly, the pricing of water can be a powerful means of signaling the cost and scarcity of the resource to water users, most of whom experience very little connection between their water usage and their total bill. In an era in which customer water demands are increasing while water supplies are constant or diminishing, it is important to apply economic tools to communicate the true value of fresh water.

The "Law of Demand" underpins the ability of conservation-oriented rate structures to promote water conservation. The "Law of Demand" derives from the empirical fact that, all else equal, as the price of a good or service increases, the quantity demanded tends to decrease.[9] This relationship is why graphical depictions of demand curves are usually presented as downward sloping.

To be sure, some goods and services exhibit this tendency to a greater degree than others. Economists use the concept of "price elasticity" to measure the extent to which the demand for a good or service is sensitive to changes in its price. Price elasticity tells you the percentage change in demand for a one percent change in price. For example, if a good has an elasticity of magnitude 1.0, then a 10% increase in its price will produce a 10% decrease in its demand.[10] If instead, the good had an elasticity of magnitude 0.5, then the same 10% increase in price would produce only a 5% decrease in demand. A good or service with an elasticity of magnitude less

[9] Economists have noted rare exceptions to this "Law"; these exceptions include some luxury goods and heroin. Presumably, potable water supply is not included in this subset of goods immune to the "Law of Demand".
[10] Price elasticity actually has a negative sign because price and quantity demanded move in opposite directions. To keep the discussion simple, we are presenting elasticity as a positive parameter. Technically, what we actually are presenting is the absolute value of the elasticity parameter.

than 1.0 is termed "inelastic,"[11] which means the percentage change in demand will be less than the percentage change in price. Conversely, an "elastic" demand is one with a price elasticity magnitude greater than 1.0. For an elastic demand, the percentage change in demand is greater than the percentage change in price.

Over the historic range of prices and consumption, urban demand for water has been relatively inelastic – generally the percentage change in customer water demand has been smaller than the percentage increase in water price. A large body of empirical research over the last 30 years has demonstrated this conclusively.[12] While the demand for water in urban settings is inelastic, its elasticity is not zero, as has been sometimes assumed by most water planning studies done over the past several decades. This distinction is crucial. If demand for water exhibited zero elasticity, what economist's term "perfect inelasticity," water rates would have no relevance to consumer decisions about water use, and rate structure would prove an ineffective policy instrument for encouraging water conservation. But customer demand for water is not perfectly inelastic. It is relatively inelastic, yes, but not perfectly inelastic. This means that rates can be used strategically to influence the level of demand.

Comprehensive reviews of the empirical evidence have suggested the following regarding the price elasticity of residential customers demand for water:[13]

- The majority of empirical studies have found the long-term residential price elasticity to range between 0.2 and 0.6. After reviewing the evidence, Griffin (2006) concluded that price elasticity for annual residential water use is likely to lie in the range of 0.35 to 0.45, meaning a 10% rate increase may produce a 3.5% to 4.5% reduction in demand over time.[14]
- Outdoor residential demand is more elastic than indoor residential demand. All else equal, residential water users will reduce outdoor consumption more readily than indoor consumption. The corollary of this finding is that summer demand tends to be more elastic than winter demand, because most outdoor use occurs during the summer.
- Residential customer demand for water is more responsive to price over the long-term than over the short-term. Another way of stating this is that it takes time for price changes to fully influence the demand for water. Right after a price increase, consumers are mostly locked into their water using appliances and landscaping. While they can modify their water using behavior in response to the price increase or change in rate structure, they may not be able to adjust their stock of water using capital, at least not right away. Over time, as this stock of capital wears out and is replaced, improvements in the efficiency of the capital can be realized. Thus, long-run demand tends to be less inelastic than short-run demand. Griffin (2006) estimates that long-run demand elasticity

[11] Note that many often read the label of "inelasticity" to mean "no elasticity". The authors are unaware how the label of "inelasticity" was chosen to mean "limited elasticity". Economists refer to a complete lack of demand responsiveness to price as "perfectly inelastic". This subtlety has been a longstanding and unfortunate source for misunderstanding between economists studying water demand and non-economists.
[12] Renzetti, Steven (2002). The Economics of Water Demands, Kluwer Academic Publishers, Boston.
[13] Epsey, M., J. Epsey, and W. Shaw (1997). *Price Elasticity of Residential Demand for Water: A Meta-Analysis*. Water Resources Research 33 (June) 1369-1374. Also see Dalhuisen, J., et. al. (2003). *Price and Income Elasticities of Residential Demand: A Meta-Analysis.* Land Economics 79 (May): 292-308.
[14] Griffin, Ronald C. (2006). Water Resource Economics: The Analysis of Scarcity, Policies, and Projects. The MIT Press, Cambridge, MA.

is typically on the order of 0.2 points higher than short-run elasticity (e.g. if long-run elasticity is 0.4, then short-run elasticity is probably around 0.2). These are broad generalizations, however. Demand responses are often specific to the time and circumstances in which the price adjustment occurs, and therefore can significantly vary by region and time period.

Far fewer studies have been completed for commercial and industrial customer demand for water than for residential customers and the heterogeneity of commercial and industrial water uses can make generalizations more difficult. Some industrial uses, such as flow through cooling, have been found to be very elastic – probably because of the relatively low cost involved in switching to more water efficient cooling practices once cost for water begins to increase. Process water uses are generally less elastic than cooling uses. Commercial and office uses, which are primarily related to sanitation, space cooling, and landscape irrigation, also have been shown to be relatively inelastic. The empirical evidence suggests the following about commercial and industrial price elasticity:

- Industrial demand tends to be less price inelastic than commercial demand, though demand for certain industrial processes requiring very high quality water can be very inelastic.
- Commercial demand tends to be inelastic, though empirical estimates span a wide range. Commercial water demand studies reviewed by Renzetti (2002) reported price elasticity's ranging from 0.1 to 0.9. Elasticity varied considerably by commercial sector.
- As with residential customer demand for water, commercial and industrial demands are less inelastic in the long-run than in the short-run.

Using Rates to Influence Customer Demand for Water

Different rate structures have different types of effects on customer demand for water. Water agencies use rates to help manage water demand—throughout the year, during periods of seasonal peak demand, or in specific geographical zones.

Goal 1 - Reduce average system load. Conservation rates can reduce total annual water use, that is, reduce average day demand. This goal may be particularly appropriate if the agency faces a supply source constraint that could necessitate the importing or purchasing relatively costly supplies. Demand management through pricing can help utilities avoid these costs.

Goal 2 - Reduce peak system load. A related goal for a water agency in implementing conservation rates can be to reduce seasonal water demand. This objective may be particularly appropriate for agencies facing costly capacity expansion. Again, these costs may be avoidable through effective demand management.

Goal 3 - Reduce system diseconomies. Finally, agencies may want to ensure that customers in expensive-to-serve areas absorb the cost of this capacity through rates.

Agencies should also recognize, however, that customers willing to pay more for expensive types of water service are communicating a willingness to pay for additional investments to

provide additional water service. Rather than a failing of conservation pricing, customer preferences for additional water service should be viewed as a form of desirable two-way price signaling.

The evidence on how residential, commercial, and industrial customer demand for water typically responds to changes in the cost of water can be used to structure rates to promote conservation. Before discussing the advantages and limitations of specific conservation-oriented rate designs, some general principals are presented. These are as follows:

- Conservation-oriented rates are likely to have the most impact on outdoor water uses because these uses are more responsive to price than indoor uses. Thus, rate structure can play an important role in promoting efficient landscape water use. As we will see in the case study section, combining a well-designed rate structure with landscape budgets or other landscape conservation programs can be particularly effective.
- Because customer demand for water exhibits strong seasonality, as do many water system costs, differentiating rates by season can both promote more efficient outdoor water use and more equitably allocate water system costs among water users.
- Water rates can influence the choice of landscaping, water-using appliances, fixtures, and processes. These are decisions that can affect regional water demands for many years into the future. Rate structures can be designed to promote water efficient capital investments. They can also be paired with conservation programs promoting replacement of inefficient water using appliances, irrigation systems, and landscaping materials.
- Water agencies need rates primarily to recover the costs of providing water service, not just to promote conservation. Sometimes the concern is expressed that using rates to promote conservation will result in lower water sales and jeopardize the financial integrity of the utility. As a factual matter, the evidence strongly suggests that this concern is misplaced. When customer demand for a good is inelastic, as is the case for urban water uses, the positive effect on revenue of the higher price will outweigh the negative effect of lower sales. The net effect will be an increase, not a decrease, in sales revenue.15

Conservation-Oriented Rate Designs

Water rates have been designed in a variety of ways to promote water conservation. Three of the most commonly employed designs are: (1) increasing-block rates, (2) seasonally adjusted rates, and (3) budget-based rates. This section describes each of these approaches as well as how they can be combined to further refine the price signal or meet other policy or financial objectives.

Increasing-Block Rates

With an increasing-block rate, the price of water increases with the quantity of water consumed. The rate structure defines two or more consumption blocks (or tiers) and the price for water in each block. For example, a 3-block structure might define the first block as monthly consumption between 0 and 6 CCF; the second block as monthly consumption between 6 and 10 CCF; and the third block as anything more than 10 CCF. A customer consuming 7 CCF in a

[15] Because rate increases sometimes follow periods of mandatory, non-price rationing during droughts, the effect on utility revenues of the non-price rationing and the rate increase are sometimes confused. Non-price rationing results in lower water use and lower system revenue. Price rationing, on the other hand, results in lower water use but higher system revenue.

month would pay the lower first block price for the first six CCF and the higher second block price for the seventh. A customer consuming 12 CCF would pay the first block price for the first six CCF, the second block price for the next four CCF, and the third block price for the last two CCF.

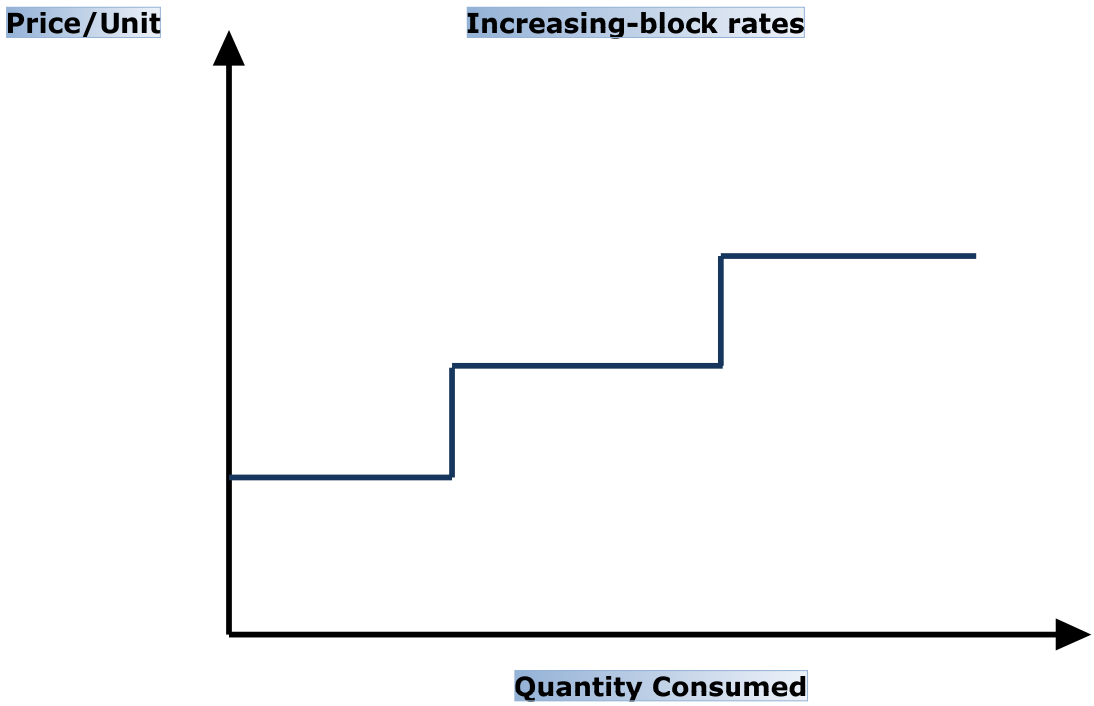

Figure 1 Increasing-block Rates

Water agencies typically use increasing-block rate designs to send a price signal to their customers that higher amounts of consumption require the agency to acquire, treat, and distribute more expensive water supplies. Ideally this is done by setting the price for water equal to the marginal cost of supply. Doing this, however, can result in the water agency collecting too much revenue. Agencies can use a block-rate design to avoid over collecting revenue. The upper-block rates are set to approximate the marginal cost of water supply. The lower-block rates are set so the agency does not exceed its revenue requirement.

The effectiveness of increasing block-rates as a conservation tool depends on the design of the blocks and block-prices. As previously noted, upper-block prices should reflect long-run system marginal costs. The blocks should be such that transitions between blocks are attainable through reasonable modifications in water using behavior and capital. For example, designing a block-rate so the top 25% of residential water users fall within the upper block and could through modest to moderate investments in water use efficiency move into the lower block would be more effective than a block-rate structure where 75% of residential water users fall into the upper-block and only a small percentage would be expected to move into the lower block through moderate to extraordinary investments in water use efficiency. In all cases, designing a good block-rate structure requires thoughtful analysis of customer water usage patterns and water system costs.

Seasonal Rates

Seasonal rates can be used to reflect temporal differences in the cost of providing water service. For many water agencies, costs increase during the summer months because of the need for extra capacity to serve increased outdoor demand. Some water agencies may also have to increase their reliance on more expensive sources of water during summer periods. A seasonal rate design can be used to signal to water users that the resource they are demanding costs more to provide in some periods than others. This is a type of peak-load pricing; a pricing structure commonly used in the electricity, gas, communication, and transportation industries.

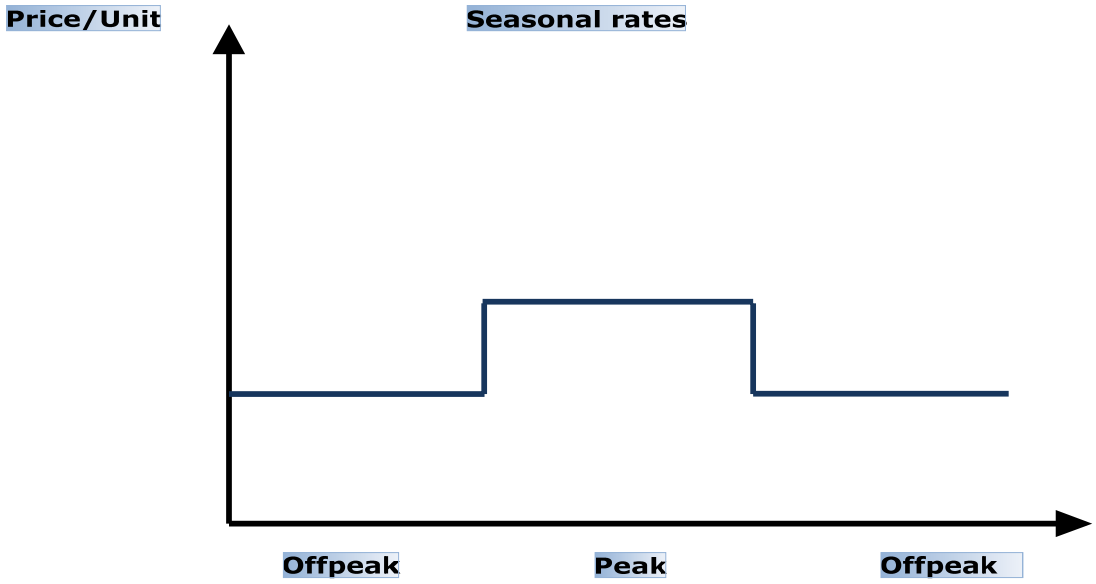

Figure 2 Seasonal Rates

Seasonal pricing can be especially effective in promoting outdoor water conservation. As discussed previously, empirical studies have shown outdoor water use tends to be more responsive to rates. Partly this is because at historic prices water users have not placed much emphasis on landscape water use efficiency. As price rises, relatively easy changes in irrigation scheduling and maintenance can result in significant changes in water use. Also, a seasonal rate increase provides water users with a bigger financial incentive to fix outdoor leaks. Given that outdoor water uses typically account for almost two-thirds of residential water demand, using a rate structure that signals to customers the full cost of meeting these demands is a good way to promote more efficient water use. Seasonal rate designs can be an effective way to do this.

Budget-Based Rates

Budget-based rates combine a water use budget (typically for landscape-only water uses) with a schedule of rates. Rates are tiered to provide a financial incentive to stay within the water use budget. Exceeding the budget results in a higher rate or surcharge. Charges for exceeding the budget can be on a sliding scale, increasing as the amount the budget is exceeded increases. Budget-based rates are a requirement of BMP 5 for accounts with dedicated landscape meters.

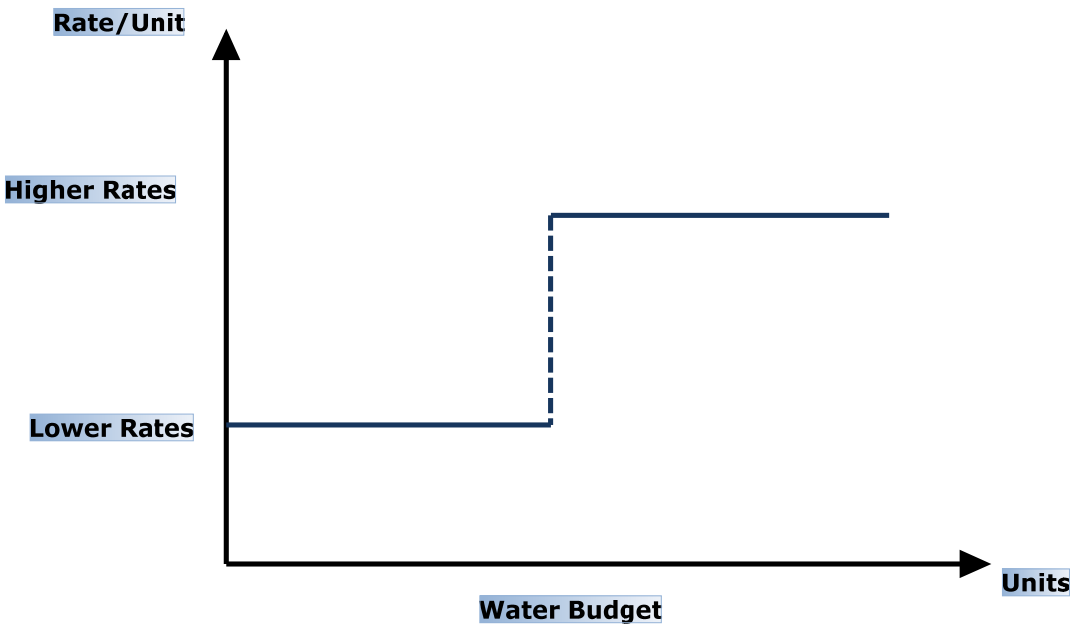

Figure 3 Water Budget Based Rates

Budget-based rates have several key advantages for promoting landscape water use efficiency. First, they establish for customers the correct amount of landscape water usage designed to keep both landscape healthy and water use reasonable. This is important because a surprisingly large proportion of water users really have no idea how much water their landscape requires to stay healthy and vibrant. Given this lack of knowledge, many water users adopt a "more is better" approach to watering. Second, the budget allows the water agency to identify customers with excessive outdoor water usage and provide direct assistance to them to become more water efficient. Third, the budget provides information about whether landscape water usage is excessive to the person responsible for paying the water bill. This is useful because for accounts with large landscaped areas it is frequently the case that the person responsible for paying the water bill is not the same as the person managing the landscape. In these cases, the person paying the bill learns whether they are using too much water for landscape and need to work with their landscape manager to curb usage.

A study of four southern California water agencies with budget-based rates found they reduced landscape water use by about 20%.[16] The study also found that the rates were effective at reducing seasonal peak demand and that customers became more responsive to information about evapotranspiration and plant water needs.[17]

[16] A&N Technical Services (1997), "Landscape Water Conservation Programs: Evaluation of Water Budget Based Rate Structures," prepared for the Metropolitan Water District of Southern California, September.

[17] Budget-based rates have been criticized as less than perfectly conservation-oriented because they primarily aim to improve water use efficiency of current landscape (short run efficiency). Budget-based rates may provide insufficient incentive to change to a more efficient landscape mix (long run efficiency). These rates represent an informative tradeoff that communities have made between administrative costs, equity of water shortage allocations, and short and long run water efficiencies.

Drought Pricing

The concept of drought pricing is to incorporate water rates into drought/shortage planning. Water agencies in California currently develop drought management plans (refer to USBR Drought Management Planning Guidelines) that call for coordinated response to water shortages. Part of the coordination needs to include planning for water rates. The AWWA M1 Manual of Rates includes a section on Drought Pricing. The basic idea is as follows: when a water agency declares a shortage emergency and requests voluntary or mandatory customer curtailment of water use a corresponding change in water rates for the duration of the drought emergency will accomplish several things:

- Customers are sent a higher price signal to indicate the scarcity value of water during a drought emergency.
- Water agencies avoid the inevitable "unexpected" revenue shortfall that follows a successful citizen response to calls for curtailed water use.
- Water agencies can avoid the political backlash if water rates are increased after customers have heeded the call to perform a civic duty by curtailing use.

Hybrid Designs

Different rate designs can be combined to better tailor the price signal to specific policy objectives. Seasonally differentiated rates, for example, can also incorporate block- or budget-based components. Existing rates can be combined with excess use surcharges or discounts to discourage wasteful water uses and reward efficient practices. In San Francisco, for example, customers that retrofit their homes or businesses with low water using fixtures are eligible for a lower rate than those that do not. Water budgets have been very successfully married to drought pricing in areas that have experience severe water shortages.[18]

Cost-of-Service Considerations

It is practically a truism to say that higher water rates will result in lower water use. One could thus conclude that in terms of promoting water conservation, the higher the rate the better. But this would be wrong. Rates should be designed to accurately transmit to water users the cost of providing water service. This is a fundamental requirement for economically efficient pricing policies and also a legal requirement in California.[19] A detailed cost-of-service study should be at the core of every rate design. Rates should be designed to allocate and recover system costs in a way that closely approximates the causation of those costs. Simple rates based on average system costs often fail to do this because they ignore important temporal, spatial, and volume differences in daily, monthly, and annual demands that drive system capacity and operating requirements. More sophisticated rate designs that reflect long-run marginal costs and include seasonality can do a better job at equitably and efficiently allocating system costs while simultaneously helping to meet an agency's water conservation policy objectives.

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[18] See the recent AwwaRF study by Mayer, DeOreo, Chesnutt, Pekelney, and Summers, *Water Budgets and Rate Structures– Innovative Management Tools*, 2007.

[19] The passage or Proposition 218 in 1996 amended the California Constitution to require a strong nexus between cost-of-service and the fees charged to property owners for a property-related service. A recent decision by the California Supreme Court (Bighorn-Desert View Water Agency v. Beringson) affirmed that water service is subject to these requirements.

APPENDIX E: ACHIEVING THE 20X2020 CONSERVATION GOAL

Summary

This appendix contains a preliminary early assessment of the impact of conservation requirements at the state level including policy pursuant to the Governor's Statewide Water Conservation Implementation Plan and Assembly Bill 2175 both of which contain the goal of 20 percent conservation by the Year 2020. The following summarize key conclusions of the analysis in this Appendix:

- The policy pursuant to the Governor's 20x2020 Plan is under development by a team of state agencies. AB 2175 likewise is developing in that it has been amended a number of times.
- It is likely under either that the SCV Family of Water Suppliers would be required to make reductions in terms of gallons per capita per day.
- According to the proposed AB 2175, the reductions could be as much as 20 percent, or 15 percent if a set of listed conservation measures is implemented.
- If a 15 percent reduction is required, then the WUE Strategic Plan will meet this goal in 2015, but it will not meet the goal in 2020. In 2020, an additional 11 gallons per capita per day (gpcd) or 4.3 percent from the UWMP forecast would need to be conserved to meet the goal.
- If 20 percent reduction is required, then an additional 24 gpcd (9.5 percent) would need to be reduced.

The reader should note some important caveats to these findings:

- Since the population and production metrics have not been formally defined, the "base daily water per capita use" cannot be formally analyzed. Thus, this Appendix cannot arrive at firm conclusions regarding the required reduction. Water agencies do not measure water demand in "gpcd", formal analysis awaits formal definition of this construct.
- The Agency Team working on the 20x2020 Plan is still in progress. Until the outcome of their policy development is finalized, much of the analysis herein is necessarily speculative.
- Other factors could significantly change the outcome of an analysis, such as disaggregating commercial, industrial, and institutional sectors from the residential sector.

Governor's Plan

In February 2008, California's Governor announced a plan to solve water problems in the Sacramento-San Joaquin Delta. A key element is "a plan to achieve a 20 percent reduction in per capita water use statewide by 2020." Subsequently, the "20x2020 Agency Team" was created to develop the plan. The team includes the following agencies:

- CALFED California Federal (Bay Delta Authority)
- CDPH California Department of Public Health
- CEC California Energy Commission
- CPUC California Public Utilities Commission
- CSUS California State University, Sacramento
- CUWCC California Urban Water Conservation Council
- DWR California Department of Water Resources
- SWRCB California State Water Resources Control Board
- USBR US Bureau of Reclamation

The Team held a scoping meeting on June 2 and the first workshop is on September 15, 2008. Some of the early topics of discussion for the Team include definition of what "per capita water use" includes exactly, and a definition of the baseline year from which the 20 percent reduction would be measured.

AB 2175

In January 2008, Assembly Bill 2175 was introduced with the objective of increasing water conservation in California. After the Governor's announcement, the bill was amended to include the 20% reduction goal. Among other items, the bill requires the following:

- Establishment of statewide target in urban per capita water use by 2020;
- Requirement for urban water suppliers to reduce per capital use by 20% by 2020;
- Requirements for reporting for each urban water supplier regarding per capita water use; and
- Establishment of agricultural water conservation target of not less than 500,000 AF by 2020.

The bill is under development and was most recently amended August 27, 2008. A synopsis of potentially relevant provisions of the current version of AB 2175 for the Santa Clarita Valley Family of Water Suppliers includes:

- By the end of 2020, each urban retail supplier would be required to meet their minimum reduction from their "Base daily per capita water use." Half of the targeted reduction must be met by the end of 2015.
- Base year or years should reflect current normal water use, and should be based on use in year 2004 or later.
- The California Standard level of daily per capita water use is 170 gpcd, based on the assumption that the majority of residents in the four retail areas live in Zone 11 or higher.
- Daily per capita water use is "the gross water use in the calendar year divided by the average number of residents that year divided by 365 days per year." Gross water use is defined as total water entering the distribution system, excluding agricultural and recycled water deliveries. Thus, increasing recycled water entering the system implies the daily per capita water will decrease—all other things equal. (In other words, the numerator in the gallons per capita per day measure does not appear to include recycled water).
- "Urban retail water supplier" is one that supplies more than 3,000 AFY.
- The minimum reduction to achieve by December 31, 2020 for urban retailers is as follows:
    - If retailer's base gpcd is <= 110, then retailer at a minimum may not increase
    - If retailer's base gpcd is >110 and <= California Standard, then retailer shall reduce at a minimum 5%
    - If retailer's base gpcd is >California Standard by less than 20% and the agency has implemented the listed demand management measures, then the retailer shall "at a minimum, reduce its gallons per capita per day water use by the greater of the following: (i) Fifteen percent or the percent reduction necessary to reach the applicable California standard, whichever is less. (ii) Five percent."
      [Min. Reduction = MAX(MIN(15 percent , percent to reach California Standard) , 5 percent)]
    - If retailer's base gpcd is >California Standard by less than 20% and the agency has not implemented the listed demand management measures, then the retailer shall "at a

minimum, reduce its gallons per capita per day water use by the greater of the following: (i) The percent reduction necessary to reach the applicable California standard. (ii) Five percent."
[Min. reduction = MAX(percent to reach California Standard , 5 percent)]

- If retailer's base gpcd is >California Standard by 20% and the agency has implemented the listed demand management measures, then the retailer shall reduce its gallons per capita per day water use by at least 15 percent.
- If retailer's base gpcd is >California Standard by 20% and the agency has not implemented the listed demand management measures, then the retailer shall reduce its gallons per capita per day water use by at least 20 percent.

- The listed Demand Management Measures include the following:
  (A) System water audits, leak detection and repair.
  (B) Metering with commodity rates.
  (C) Public information.
  (D) School education programs.
  (E) Conservation pricing.
  (F) Conservation coordinator.
  (G) Water waste prohibition.
- Although qualification of the California Standard must be based on aggregate water use, the targeted reduction that is required can be met by disaggregating residential from CII customers. If using disaggregated measure, then
  - Reduction for non process use water must be at least 10%
  - BMPs for process water are required (if cost-effective)
  - There should be recognition of water needed for producing products or services
- Adjustments to the targeted reduction or base year requirements may include changes in CII water use since the base year, unreasonable impacts, and unique climatic conditions.

Approach

The following is a step by step approach to analyzing the potential impacts of the 20x2020 requirements on the Santa Clarita Valley Family of Water Suppliers.

1. Screen available measures of gpcd to determine whether the SCV retailers are close to the California Standard.

Table E.1 below is reproduced from Table 2-8 in the 2005 UWMP. The population figures are from the One Valley One Vision (OVOV) process and they are based on SCAG data and projections from the year 2000 to 2030. Table E.1 also shows that daily per capita water use in 2005 is above the California Standard (170 gpcd for Zone 14) and more than 20 percent greater as well (170 * 1.2 = 204 gpcd). Although this is a quick screen and the base per capita water use needs to be examined in greater detail, we can conclude that reductions by 2020 are likely to apply.

Table E.1 (Reproduced from UWMP)

Projected Household Water Use

Projected Water Use	2005	2010	2015	2020	2025	2030
Water Use (af/household) (1)	0.97	0.95	0.95	0.93	0.95	0.94
Water Use (gpcd) (2)	264	255	258	258	267	270

Notes:

(1) Based on dividing the total annual demand projections provided in Table 2-2 by the projected annual households provided in Table 2-7.

(2) Based on dividing the total annual demand projections (converted from af to gpd) provided in Table 2-2 by the projected annual populations provided in Table 2-7.

Notes:

- LA36 delivers less than 3,000 AFY and thus might not have to meet the requirements, but since this conservation plan is for the total Valley and since we do not currently have available separate population values for the individual retailers, we will include it.
- Likewise, although the requirements appear to be at the retailer level, we do not at this time have available population data by retailer.
- This is a quick screen. There may be reasons why the water use figures are not representative of the Base per capita water use in the proposed AB 2175 or that derives from the Agency Team process, and this should be examined in more detail before proceeding with policy action.
- If the retailers exceed the California Standard by 20 percent upon further examination, they may be required to reduce by 20 percent or 15 percent depending on whether the listed conservation measures are implemented. Although the conservation measures are not further defined, the SCV Family of Water Suppliers has implemented and planned to implement programs that cover many of the listed topics. Conservation pricing is one area that needs further definition and examination.

2. Assemble population and water production data for as many recent years as readily available to construct aggregate gpcd measure.

The best available population that we have collected at this time is from the 2005 UWMP Table 2-7 reproduced in Table E.2 below.

Table E.2 (Reproduced from UWMP)

Adjusted Santa Clarita Valleywide General Plan [1][2]
(SCAG 2004 RTP, Projections: Years 2000 to 2030)

Jurisdiction	2000 [3]	2005	2010	2015	2020	2025	2030	Change	Average Annual Growth
City of Santa Clarita									
Population	151,088	171,290	196,680	210,280	222,290	232,830	242,620	91,532	1.6%
Households	50,787	55,614	62,837	67,832	72,883	77,868	82,806	32,019	1.6%
Employment	51,380	59,640	68,820	73,240	77,490	81,460	85,190	33,810	1.7%
Jobs/Household ratio	*1.01*	*1.07*	*1.10*	*1.08*	*1.06*	*1.05*	*1.03*	0.02	
Persons per Household	*2.97*	*3.08*	*3.13*	*3.10*	*3.05*	*2.99*	*2.93*	(0.04)	
SCV Unincorporated Area									
Population	61,523	78,053	105,094	125,850	146,401	166,557	185,589	124,066	3.7%
Households	17,973	20,645	28,108	34,609	41,154	47,941	54,630	36,657	3.8%
Employment (estimated)	10,790	13,900	18,830	23,190	27,980	33,080	38,240	27,450	4.3%
Jobs/Household ratio	*0.60*	*0.67*	*0.67*	*0.67*	*0.68*	*0.69*	*0.70*	0.10	
Persons per Household	*3.42*	*3.78*	*3.74*	*3.64*	*3.56*	*3.47*	*3.40*	(0.03)	
SCV Planning Area[4]									
Population	212,611	249,343	301,774	336,130	368,691	399,387	428,209	215,598	2.4%
Households	68,760	76,259	90,945	102,441	114,037	125,809	137,436	68,676	2.3%
Employment	62,170	73,540	87,650	96,430	105,470	114,540	123,430	61,260	2.3%
Jobs/Household ratio	*0.90*	*0.96*	*0.96*	*0.94*	*0.92*	*0.91*	*0.90*	(0.01)	
Persons per Household	*3.09*	*3.27*	*3.32*	*3.28*	*3.23*	*3.17*	*3.12*	0.02	

Notes:
(1) Source: Stanley R. Hoffman Associates, Inc.; Southern California Association of Governments, 2004 Regional Transportation Plan (RTP).
(2) The SCAG population and household projections are used as control totals for the entire "One Valley One Vision" (OVOV) planning area while the allocation between the City and unincorporated areas is based on 2000-2003 Department of Finance (DOF) population and household trend data. The 1998-2003 Employment Development Department data is used to calibrate the 2005 base year for employment. However, the employment totals for the unincorporated area are allowed to exceed the SCAG RTP 2004 forecast based on local information from the County of Los Angeles Planning staff.
(3) 2000 Population and Household data is based on DOF estimates benchmarked to the 2000 U.S. Census Figures.
(4) The Santa Clarita Valley Planning Area estimates are the sum of the City and unincorporated area.
(5) On May 11, 2005, the OVOV Team agreed to use these adjusted RTP data for the OVOV General Plan Update.

Table E.3 shows Year 2006 water use for the valley derived from billing system data developed for this Water Use Efficiency Strategic Plan.

Table E.3

Customer Category	Number of Accounts	Water Use in 2006 (ccf)	Percent of Total Volume
Single Family	55,900	16,311,530	53.7%
Multi-Family (1)	5,374	3,174,067	10.4%
Dedicated Landscape	1,400	4,202,332	13.8%
Commercial, Industrial, and Institutional	3,155	5,736,791	18.9%
Construction	568	824,043	2.7%
Recycled	10	134,618	0.4%
Total	66,407	30,383,381	100.0%

(1) The total of 5374 multi-family accounts serves 28487 multi-family housing units.

3. Look at sector breakdown prepared for the master plan and judge whether it is likely to make a significant difference to examine gpcd on a disaggregate basis.

The decision to disaggregate or not hinges on factors such as the share of water use in the CII sectors, the amount of process water in CII sectors, the cost-effectiveness of CII conservation, and how these terms get defined as the policy process develops. Although it is premature to conduct a detailed analysis of the question of disaggregation, the following notes are worth considering:

- In 2006, Valley-wide water use was 18.9 percent CII.
- The 10% reduction for non-process water in AB 2175 is less than the 15% and 20% overall reductions, so there may be some strategic advantage in cases where Base per capita annual water use exceeds the California Standard by 20 percent.

4. Consider characteristics of the SCV service area that make the reduction qualifications and requirements difficult.

- There has been considerable new development in the recent past and this is expected to continue in the future. The implication of the fact that much of the existing housing stock is new is that the Base per capita annual water use, even if you go back to 2004, includes a high percentage of fixtures subject to water conserving plumbing code. In other words, although AB 2175 acknowledges conservation efforts with the provision of listed conservation measures, it does not account for whether the housing stock is new or old.
- Recycled water has been implemented. Although less than 1 percent of total water deliveries at this time, it is expected to grow. Recycled water is not included in the Base per capital water use definition in AB 2175. A good question during ongoing policy development would be to confirm that increased use of recycled water would count toward the reduction in water use.
- The Santa Clarita Valley has a hot and dry climate. The California Standard includes Zones 11 and higher, so the Santa Clarita Valley is at the higher and more challenging end of the "Zone 11 and higher" range.

5. Compare the required reductions to those in the Conservation Master Plan as it stands now.

Figure E.4 compares gallons per capita per day for the following:

- UWMP forecast without conservation
- SCV WUE Strategic Plan (using the 2006 Base Year for illustrative purposes only)

- California Standard for Regions 11 or greater (170 gpcd)
- 20x2020 Reduction in 2020 if 20% is required
- 20x2020 Reduction in 2020 if 15% is required
- 20x2020 Reduction in 2015 if 20% is required
- 20x2020 Reduction in 2015 if 15% is required

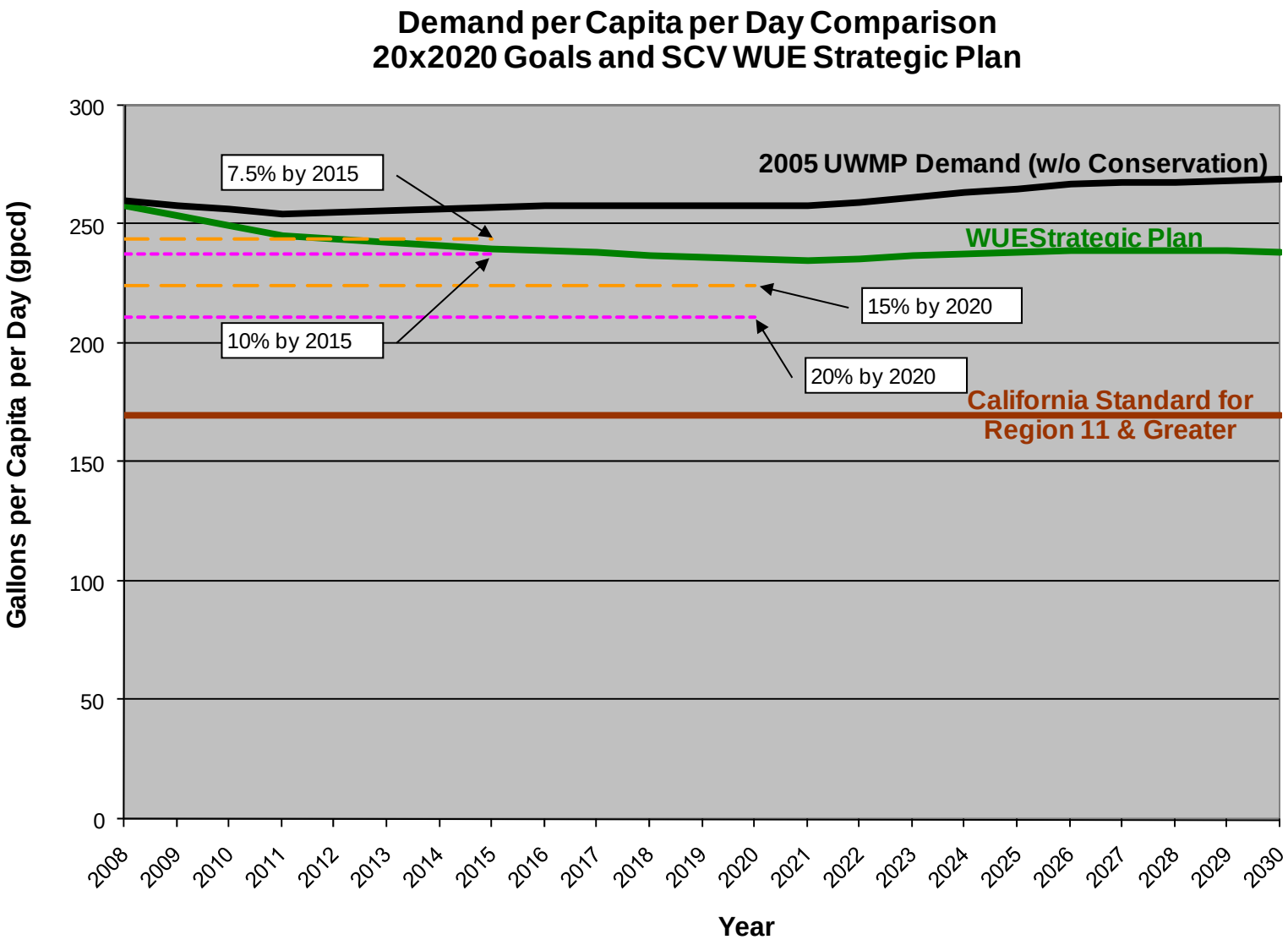

Figure E.4 Demand per Capita per Day Comparison

Notes:

- If the SCV is required to reduce by 15 percent by implementing the listed conservation measures, then the WUE Strategic Plan will meet their goal in 2015, but does not meet the goal in 2020. In 2020, an additional 11 gpcd or 4.3 percent from the UWMP forecast would need to be conserved to meet the goal.
- If conservation pricing were implemented, then there would be additional savings due to the stronger price effects. Thus, implementing conservation pricing would have the double advantages of a) allowing the Valley to meet the 15% standard rather than 20% and b) yielding additional savings. Since empirical studies have shown that water budget based rates can save nearly 20%, it is not unreasonable to assume that a good deal of the 4.3 percent gap could be closed, if not more. (Caveat: By 2020, the Valley is going to have a higher saturation rate of conservation measures than during the period when the water budget based savings estimates were made, so we need to extrapolate savings figures with care.)
- If 20 percent reduction is required, then an additional 24 gpcd or 9.5 percent would need to be reduced.

Alternatives for Meeting a 20X2020 Goal

Given that more than one interpretation is possible for the meaning of "20X2020" and that additional demand modeling would be needed to make any one interpretation more concrete, what WUE alternatives are available to meet a more aggressive goal?

1. Fund more Active Conservation Programs – Appendix A.2 outlines some more aggressive programs. Other existing programs could be expanded in scope. Doing so would require large cash expenditures and would have limited yield. Additional market penetration of WUE devices and practices requires more intensive and more expensive marketing efforts. Given that least cost planning principles were used to select the existing set of proposed programs in this WUE Strategic Plan, additional conserved water through active conservation programs can be expected to be more costly.
2. Retrofit on Resale Legislation – Legislative requirements for retrofit of water efficient fixtures when residences are sold has been proposed in other areas. It is possible that this alternative could be implemented to help attain more aggressive conservation goals.
3. New Construction Ordinances – The current WUE Strategic Plan includes aggressive standards for new construction (See page 101.) This is not to say that more aggressive standards are not possible.
4. More Aggressive Recycled Water Program – According to AB 2175 as it stands, recycled water entering the system is excluded from "gross water use." Since "daily per capita water use" is based on "gross water use," increasing the use of recycled water would help achieve the aggressive conservation goals by reducing daily per capita water use.
5. Water Rate Reform – Appendix D discusses water rates and conservation, including alternatives for water rate reform. Reforming water rates to be more conservation-oriented has the potential to reduce water demand at low direct cost to SCV water

purveyors. Since changing water rates is intrinsically political, depending on board approval and customer acceptance, water rate reform is necessarily uncertain.

6. Water Budget-Based Rates –Water Budget-based Rates combine customer outreach, rate structures, and a scientifically-defensible definition of efficient levels of water use. They have been documented to have produced water savings levels at a 20 percent level or higher[20]. Water budgets can require both time and money to establish. Embedding a water budget into a rate structure requires addressing the same implementation challenges as any other water rate reform and additional training and reworking of billing systems and billing statements. Recent research on the topic is available from the Awwa Research Foundation.[21]

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[20] See Chesnutt, et. all, *Evaluation of the Landscape Performance Certification Program*, December 2003.

[21] See Mayer P., et al. *Water Budgets and Rates Structures: Innovative Management Tools*, Awwa Research Foundation, March 2008.

Flow Science Incorporated
723 E. Green Street, Pasadena CA 91101
(626) 304-1134 • Fax (626) 304-9427

SANTA CLARA VALLEY PIPELINE CLWA-01 SERVICE CONNECTION PRESSURE SURGE ANALYSIS

Prepared for
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350-2173

Prepared By
R. Scott Foster, P.E.
Vice President

Reviewed By
E. John List, Ph.D., P.E.
Principal Consultant

FSI 091048
August 17, 2009

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SUMMARY

Castaic Lake Water Agency (CLWA) is in the process of upgrading the Rio Vista Water Pump Station and Santa Clara Valley Pipeline (SCVP) Turnout CLWA-01. The capacity of the pump station will be increased to 140 cfs. The new turnout consisting of a 36-inch plug valve and check valve will replace an existing turnout. Flow is provided to the pump station from MWD's Foothill Feeder and is pumped along the 102-inch pipeline to the Rio Vista Water Treatment Plant (WTP).

A previous report prepared by Flow Science Incorporated dated May 12, 1992 analyzed the system for flows from 42 mgd up to 260 mgd. At the time, it was recommended that vacuum relief valves be installed at three locations upstream of the WTP and that the butterfly pump control valves be timed to close in no less than 10 seconds to minimize the maximum pressures in the system. For this current analysis, the vacuum valves were installed as shown on the plans and the pump control valves (one ball valve and three butterfly valves) were assumed to close in 10 seconds.

Upon the loss of power to the pump station and closure of the pump control valves in 10 seconds, a pressure drop wave propagates out from the discharge side of the pump station into the SCVP towards the WTP. This pressure drop wave is predicted to reduce the pressure in the pipeline to vapor pressure for less than half a second. While the duration of the vapor pressure condition is likely not long enough for a vapor cavity to form, it would be prudent to eliminate the vapor pressure condition in the pipeline. To eliminate the vapor pressure condition and any possibility of vapor cavity formation, it is recommended that a minimum 10-inch vacuum relief valve with a controlled venting/slow closing feature be installed at STA 21+41, upstream of the WTP. The installation of this vacuum valve will prevent the pressure head from falling lower than -17 ft.

The loss of power to the pump station will also create an upsurge pressure wave that will propagate upstream from the pump station to the new turnout and into the Foothill Feeder. The presence of the check valve will help to reduce the magnitude of the upsurge wave that reaches the Foothill Feeder sufficiently that pressures in the Foothill Feeder remain positive throughout its length. An analysis was performed with the check valve removed and this predicted negative pipeline pressure heads as low as -11 ft near the Magazine Canyon Shaft at the downstream end of the Foothill Feeder. Therefore, installation of the check valve is recommended for the turnout.

Maximum hydraulic grade line (HGL) elevations in the Foothill Feeder are predicted to not exceed the steady state HGL by no more than approximately 25 ft. This should be well within the allowable HGL elevation for the Foothill Feeder.

The 36-inch plug valve should only be closed once the pump station has been shutdown. The closing of this valve prior to the shutdown of the pump station will result in the "starving" of the pump and the possibility of creating a significant vacuum in the SCVP between the turnout and the pump station. It may also lead to pump cavitation.

In addition, any isolation or control valve located in the SCVP should only be closed once the pump station is shut down. If it is closed prior to shutdown, the pumps will run up toward shutoff head, which could lead to overpressurization of the SCVP.

When starting the pumps, it is recommended that a minimum 10 second lag occur between each pump start, preferably starting with the smallest pump and progressing to the largest pump.

INTRODUCTION

Castaic Lake Water Agency (CLWA) is in the process of upgrading the Rio Vista Water Pump Station (RVWPS) and Santa Clara Valley Pipeline (SCVP) Turnout CLWA-01. The capacity of the pump station will be increased to 140 cfs. The new turnout consisting of a 36-inch plug valve and check valve will replace an existing turnout. Flow is provided to the pump station from MWD's Foothill Feeder and is pumped along the 102-inch pipeline to the Rio Vista Water Treatment Plant (WTP).

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This report addresses the possible pressure surges that may occur in the system as a result of the operation of the pump station following pump power failure. The report begins with a general discussion of the types of surge and waterhammer problems that can occur during the operation of pumps and pipeline systems. It also describes the methods of analysis, the results obtained, and surge protection design recommendations derived from the analysis.

The report was prepared by Flow Science Incorporated of Pasadena, California, acting under an agreement with the Castaic Lake Water Agency of Santa Clarita, California.

WATERHAMMER AND PRESSURE SURGES

Waterhammer and pressure surges in piping systems are created when a change in the pipeline flow rate occurs. The source of the change in flow rate may be normal operations, such as the starting or stopping of a pump, or the opening or closing of a valve. In addition, sudden and unplanned changes in flow can occur as a consequence of loss of power to pumps or a pipeline break.

When a pumping system is shut down as part of normal operations, or by power failure, the hydraulic grade line (HGL) downstream of the pump station falls very rapidly. The rapidity of the pressure drop is controlled primarily by the polar moment of inertia of the pump/motor system. If the inertia is high the HGL falls slowly, but for most small pumping units it drops to the suction water elevation, or below, in a second or so. For in-line pumps, the fall in downstream HGL is generally mitigated by a concomitant rise in the upstream HGL as the upstream flow is brought to rest. The rapid pressure drop

(created by loss of power to the pump) travels out along the downstream pipeline as a pressure drop wave (i.e., low pressure wave) moving at a speed of 500-4500 ft/sec, depending upon the pipe material and dimensions and the fluid being pumped.

Since the steady flow HGL slopes down toward the pipeline discharge point, and in many cases the pipeline profile rises toward the discharge point, at some location along the profile the dropping HGL may fall below the invert of the pipe, thereby creating a vacuum in the pipe. If the HGL falls one atmospheric pressure head below the pipe crown, the pressure in the pipeline will be less than the vapor pressure (-32 ft) of the fluid and it will begin to boil at ambient temperature. Once boiling occurs a vapor cavity will form at the crown of the pipe and the pressure downsurge wave will continue propagating along the pipeline leaving behind a pipeline under vacuum and filled with boiling water. When the downsurge wave reaches the discharge point, or other constant pressure point, it is reflected as a re-pressurization wave. This wave travels back up the pipe, removing the vacuum and stopping the boiling. When there is an extensive vapor cavity it will tend to accumulate at some point in the pipeline (usually at a break in the slope or local high point) and collapse explosively. The net result is a localized region in the pipe that is subjected to an extremely high impulsive pressure—a waterhammer. As the re-pressurization wave finally returns to the pump station it may close the pump check valve suddenly and create an additional waterhammer. If pump control valves are installed the reverse flow may accelerate through these valves and lead to high water hammer pressures as the valves close on the reverse flow.

There are therefore two sources of waterhammer associated with power failure to pumps—one from vapor cavity formation, the other from the return flow reaching the pump check valve or flow control valve. Maximum pressures generated by the first mechanism (vapor cavity collapse) cannot be predicted for two reasons. First, it is almost impossible to predict where the vapor cavity collapse will occur and second, the speed of collapse cannot be accurately predicted. Waterhammer resulting from pump check valves closing can be predicted quite accurately provided vapor cavity formation does not occur in the pipeline. Accurate predictions for the closing of pump flow control valves are dependent on knowing both the exact closing time for the valves and the valve characteristics.

Another major source of waterhammer in pipelines is valve operations. If a controlled valve is opened too quickly, the pipeline pressure will drop suddenly. The sudden pressure drop propagates upstream from the valve site as a pressure downsurge wave that may cause the HGL to drop below the pipeline crown and form a vapor cavity, just as for pump failure pressure loss. On the other hand, closing an open valve too quickly can create a sudden pressure rise as the flow kinetic energy is converted to pressure energy, just as the flow reversal at a pump station can cause a waterhammer at the flow control valve.

Control of waterhammer induced by valve operations is simple—the rate of valve motion is adjusted to an appropriate speed. Prevention of inadvertent rapid control valve motion is attained by using gear-operated valve mechanisms. In addition, pressure relief valves may be installed to release any untoward rise in pressure.

Combination air release and vacuum relief valves (CAV) and air/vacuum valves are also installed on pipelines to provide for air release and vacuum relief while filling and draining a pipeline. Such valves let air into the pipeline during vacuum relief so restarting of the pumps must be done very carefully to prevent rapid flow acceleration and a resulting line-fill slam when all of the air is vented. More specifically, the capacity of large diameter air release valves allows high-speed air flow, which permits high water flow velocities in the pipeline if air is vented at high capacity. At the time all of the air is vented and the air release valve closes the corresponding water flow is rapidly halted and may create a waterhammer. For this reason, vacuum relief/air release valves should be equipped either with controlled venting or a surge check feature that allows slow closing of the valve when water begins to flow through the valve.

ANALYSIS OF WATERHAMMER AND PRESSURE SURGES

The pressures created by changing flow conditions in piping systems can be determined quite accurately by the application of Newton's Laws of Motion up to the condition where a vapor cavity forms in the pipeline. Flow Science has developed a set of computer programs that solve the waterhammer wave equations (Newton's Laws) for situations involving pump power failure and valve operations. These computer codes, which use the method-of-characteristics solution technique for the appropriate equations, allow computation of the pressure and flow at any point in a distribution network at prescribed times after power failure or valve operation. The codes have been developed over a period of 35 years and have been extensively tested and validated in field testing.

PHYSICAL FACILITIES

Figure 1 contains a schematic of the conveyance system as analyzed. The RVWPS is supplied water from MWD's Foothill Feeder via the CLWA-01 turnout. The Foothill Feeder consists of multiple segments of large diameter tunnel and pipeline with the design capacity to deliver 3020 cfs to downstream purveyors. Approximately 3700 ft upstream of the turnout is the Santa Clara Rejection Tower with a overflow elevation of 1367 ft.

The new CLWA-01 turnout will contain a 36-inch plug valve and a 36-inch check valve to prevent backflow from the CLWA system to MWD's system. Part of this analysis will be to determine if the check valve provides any protection to MWD's system during a surge event.

The turnout connects to the 102-inch diameter SCVP, which extends downstream for approximately 1800 ft to the RVWPS. From the pump station, the SCVP continues another approximately 9900 ft to the WTP, with an HGL elevation of 1459 ft. Table 1 summarizes the pipeline information used in the analysis.

Table 1 – Pipeline parameters

	Foothill Feeder	RVWPL
D-W Friction Factor, f	.010	.011
Wavespeed, ft/s	3500	3500

Based on the record drawings of the SCVP, there is an existing 12-inch air vacuum/air release (AVAR) valve installed at the connection of the turnout to the SCVP (STA 5+00) and a 8-inch AVAR at STA 11+47 and a 12-inch AVAR at STA 153+70. Note that the stationing changes multiple times along the pipeline.

New pumps are being added to the pump station to increase the total capacity of the station to 140 cfs. The details of the pumps used in the analysis, as provided by CLWA, are contained in Table 2. The total polar moment of inertia, WR^2, for each pump/motor combination was estimated from catalog information for similarly-sized equipment.

Table 2 – Rio Vista Water Pump Station Pump Rated Characteristics

Make	Floway	Floway	Weir
Model	20MKL	28MKM	37TKM
# Pumps	1	3	1
Rated Flow (cfs)	13.9	27.6	55.7
Rated Head (ft)	160	155	142.5
# Stages	1	2	2
Rated Speed (rpm)	1780	1190	710
Rated Efficiency (%)	86	84	84
Motor Horsepower	300	600	1250
Total WR^2/pump (lb-ft^2)	70	400	3300
Pump control valve type	14" Ball	30" Butterfly	36" Butterfly
C_v (cfs/√ft)	38.5	62.1	89.5

As a result of the previous analysis performed by Flow Science Incorporated, each of the pump control valves were assumed to open and close in 10 seconds during pump startup and upon a loss of power to the pump station.

The steady state results show that for the pump station to deliver 140 cfs under the conditions described above, a pump station suction side HGL elevation of approximately 1304 ft is required. To achieve this, an HGL elevation of 1310 ft is needed at the turnout

off the Foothill Feeder, which corresponds to an HGL elevation of 1325 ft at the MWD delivery point and 1300 ft at the Magazine Canyon Shaft. This equates to a flow in the Foothill Feeder of approximately 1680 cfs upstream of the turnout and 1540 cfs downstream of the turnout.

TRANSIENT ANALYSIS AND RECOMMENDATIONS

The steady state flow conditions together with the system geometry, all of which are summarized above, form the basis for the pressure surge analysis of the system. The system was analyzed both with and without the check valve at the turnout to determine the effect it would have on the pressure surges created by the pump station.

Check Valve Installed

Upon the loss of power to the pump station and the simultaneous closure of the pump control valves in 10 seconds, a pressure drop wave propagates out from the discharge side of the pump station into the SCVP towards the WTP. This pressure drop wave is predicted to reduce the pressure in the pipeline to vapor pressure for less than half a second at the downstream end of the SCVP near the WTP, as shown in Figure 2. While the duration of the vapor pressure condition is likely not long enough for a vapor cavity to form, it would be prudent to eliminate the vapor pressure condition in the pipeline.

At the same time the pressure drop wave is propagating out from the discharge side of the pump station, a pressure upsurge wave is created on the suction side of the pump station that propagates upstream through the turnout and into the Foothill Feeder. Figure 3 shows that the maximum HGL elevation is predicted to exceed the steady state HGL elevation by only 25 ft. Also of note is that the minimum HGL elevation is predicted to remain above the crown of the Foothill Feeder.

Check Valve Removed

With the check valve removed, the results along the SCVP shown in Figure 4 are very similar to those shown in Figure 2. However, Figure 5 shows that in the Foothill Feeder, negative pressure heads as low as -11 ft are predicted near the Magazine Canyon Shaft. For comparison, Figure 6 shows the predicted HGL elevation records versus time on the Foothill Feeder at the CLWA-01 turnout. This figure shows that the oscillations are much more pronounced without the check valve installed. Even though the magnitude of the pressure oscillations are relative low, they are sufficient to reduce the pressure in the Foothill Feeder to below atmospheric. Part of the reason for this lies with the steady state pressure head at the downstream end being only 10-15 ft, meaning that pressure head oscillations larger than this will create a vacuum condition in the pipeline.

Based on these results, it is recommended that the check valve remain at the turnout.

Install Additional Vacuum Valve

To eliminate the vapor pressure condition and any possibility of vapor cavity formation, it is recommended that a minimum 10-inch diameter vacuum relief valve with a controlled venting/slow closing feature be installed at STA 21+41, upstream of the WTP. Figure 7 shows that the installation of this vacuum valve will prevent the pressure head in the RVWPL from falling lower than -17 ft. Figure 8 shows that the pressures following pump power failure remain positive throughout the modeled length of the Foothill Feeder.

Controlled venting at the vacuum relief/air release valve prevents rapid air discharge and the possibility of slamming the valve closed, which could create additional waterhammers, together with possible damage to the valve. A vacuum relief/air inlet valve in combination with a small orifice air release valve (e.g., APCO S-1500C, or equivalent), or a single body valve that slowly vents the air from the system (such as a Vent-O-Mat RBX) will accomplish this. If a standard air and vacuum valve is to be used, it should be fitted with a surge check feature that will prevent the valve slamming closed once all the air has been vented. The final sizing of the valve should be verified with the selected manufacturer since each has its own sizing criteria. The vacuum relief valve should be duplicated to provide for redundancy in case of valve failure, delayed opening or removal for service, and a detailed and sustained maintenance program should be implemented to ensure that the valve is always in good working order.

Turnout Plug Valve Operation

To prevent possible damage to the pumps and the creation of vacuum conditions in the SCVP upstream of the pump station, the 36-inch plug valve to be installed as part of the new turnout facility should not be closed unless the pump station is already shut down. Once the pump station is shut down, there will be no water flowing through the turnout and the plug valve can be closed in any time.

In addition, any valves in the SCVP should also not be closed until the pump station is shut down. Closing a valve while the pump station is running will cause the pumps to run up toward shutoff head, which will increase the pressure in the pipeline.

Pump Start Up

To avoid creating negative pressures in the Foothill Feeder or the SCVP, there should be a lag of at least 10 seconds between each pump start. Preferably the smallest pump should be started first.

CONCLUSIONS

To protect the Santa Clara Valley Pipeline and Foothill Feeder from adverse pressure surges created by the loss of power and start up of the Rio Vista Water Pump Station, the following recommendations are made:

1. Install a minimum 10-inch vacuum relief valve with a controlled venting/slow closing feature at STA 21+41 on the Santa Clara Valley Pipeline.
2. The proposed check valve at the CLWA-01 turnout should remain installed as designed.
3. Upon pump station start up, there should be a minimum 10 second lag between each pump start.

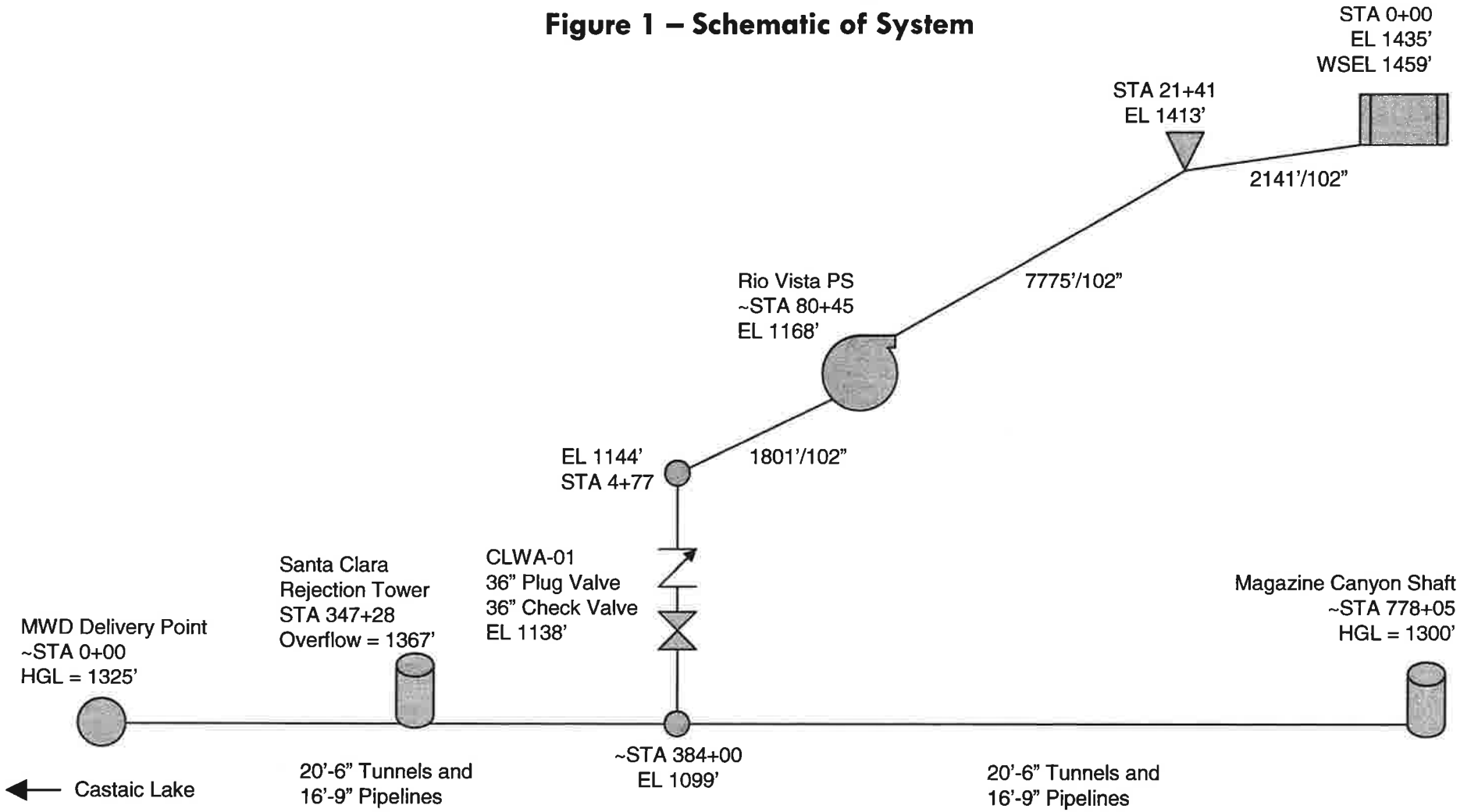
When closing or opening the 36-inch plug valve at the CLWA-01 turnout, the pump station should already be shut down before the valve is operated to avoid creating adverse pressure surges in the system. The same recommendation applies to any in-line valves along the Santa Clara Valley Pipeline.

APPENDIX

figures & supporting documents

Castaic Lake Water Agency - 01 Turnout

Figure 1 – Schematic of System



091048 August 17, 2009

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Castaic Lake Water Agency - 01 Turnout

Figure 2 - HGL elevations following loss of power to PS with no additional surge protection - with check valve at turnout

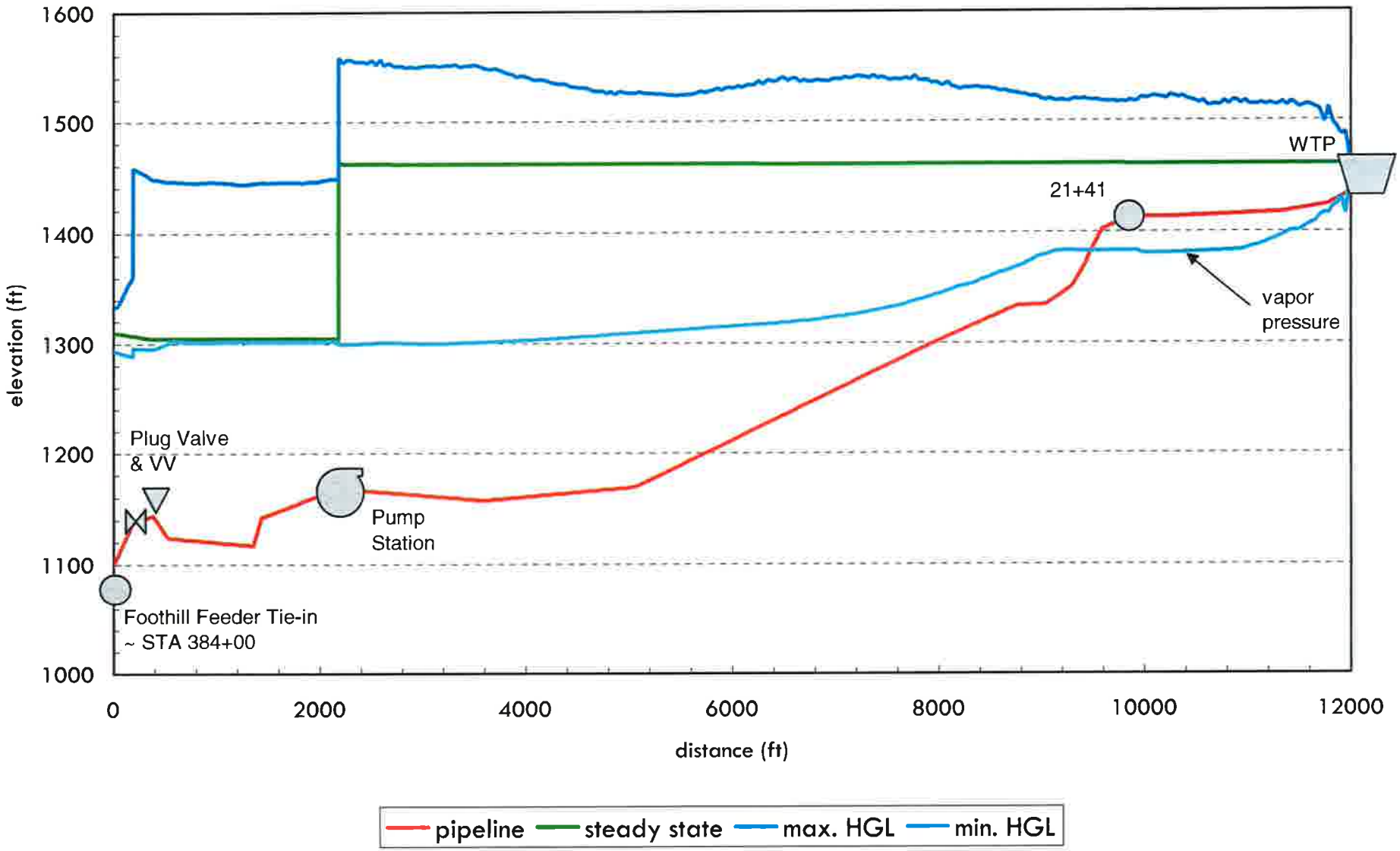

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Figure 3 - HGL elevations on Foothill Feeder following loss of power to PS with no additional surge protection - with check valve at turnout

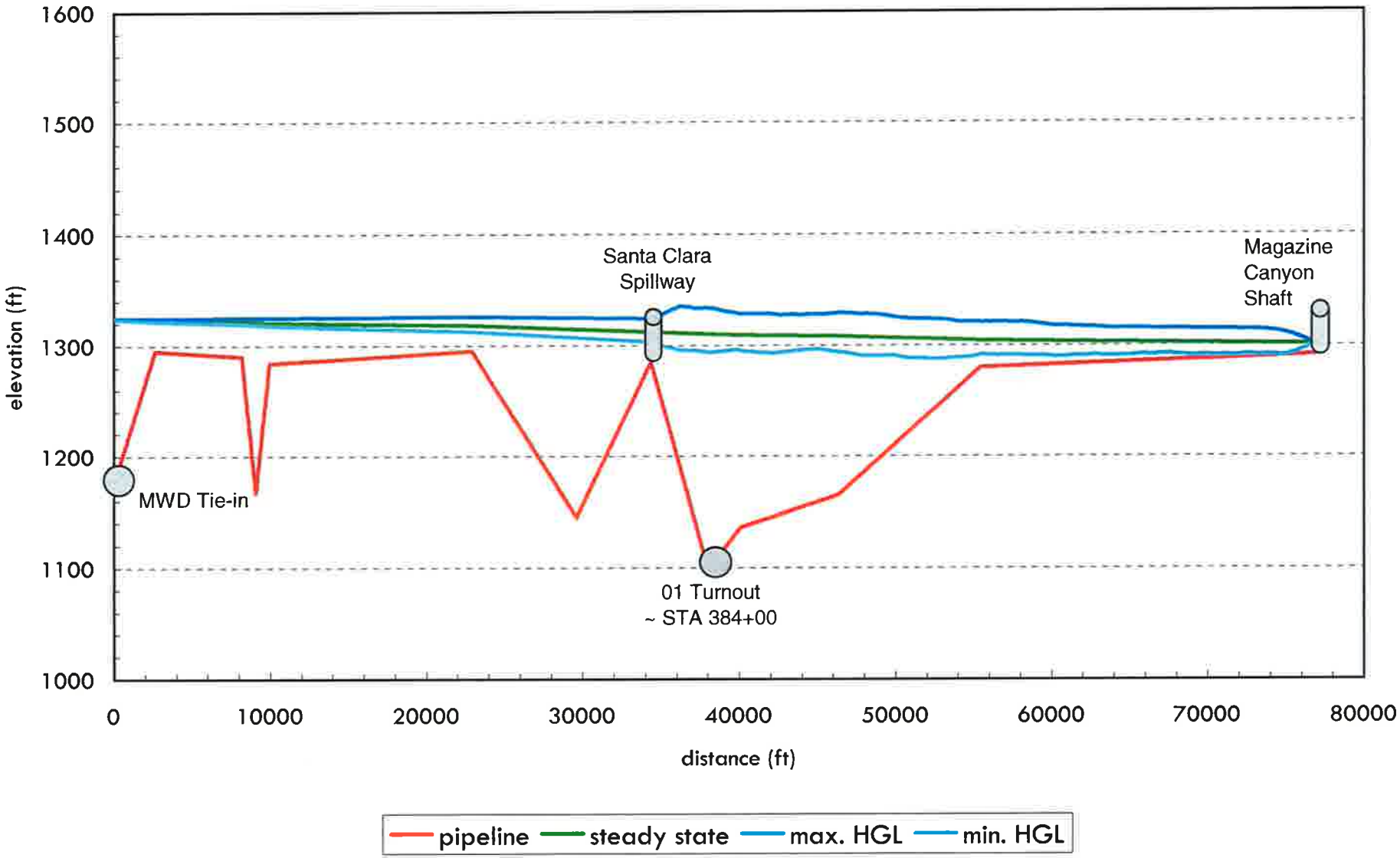

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Figure 4 - HGL elevations following loss of power to PS with no additional surge protection - without check valve at turnout

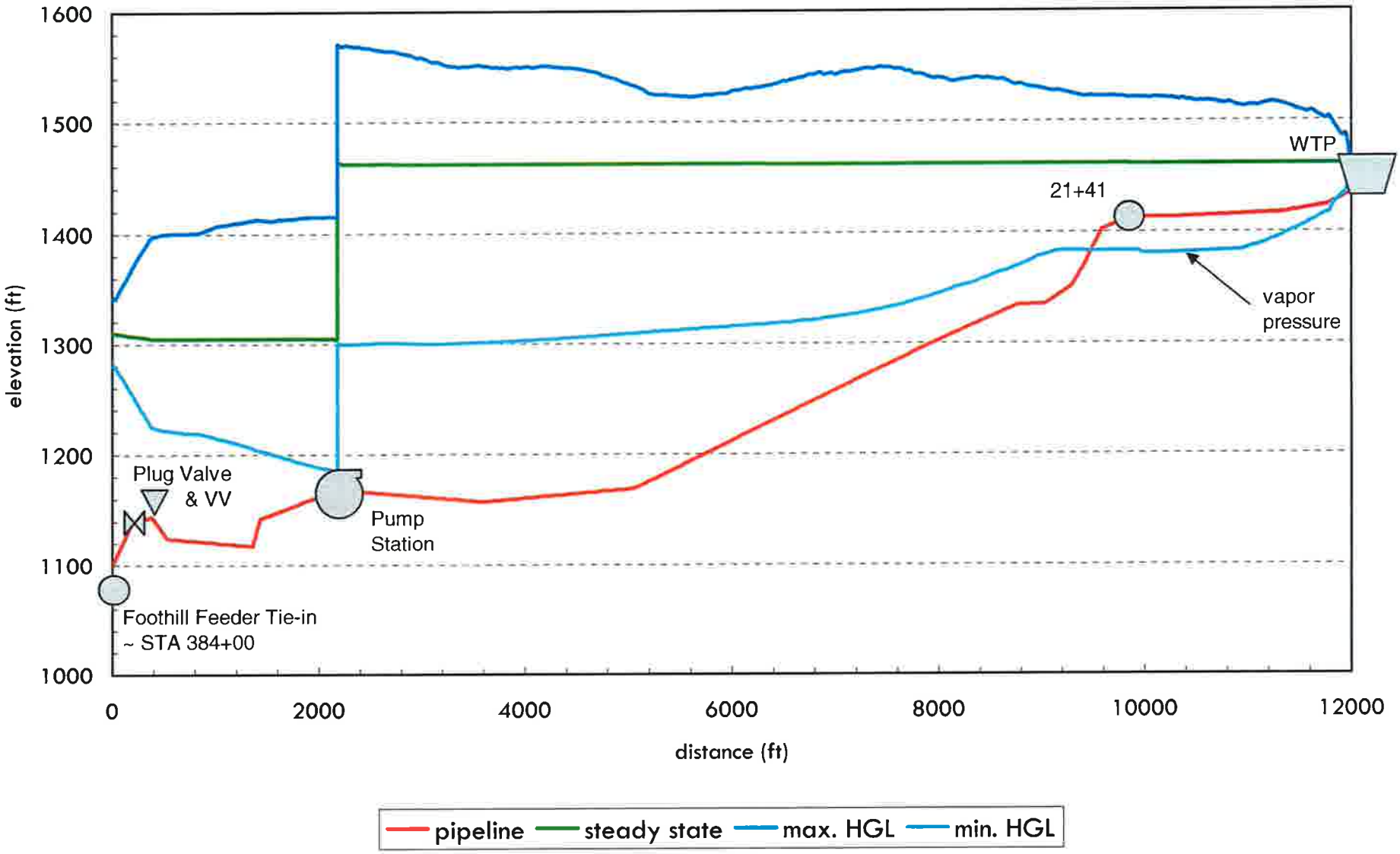

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Figure 5 - HGL elevations on Foothill Feeder following loss of power to PS with no additional surge protection - without check valve at turnout

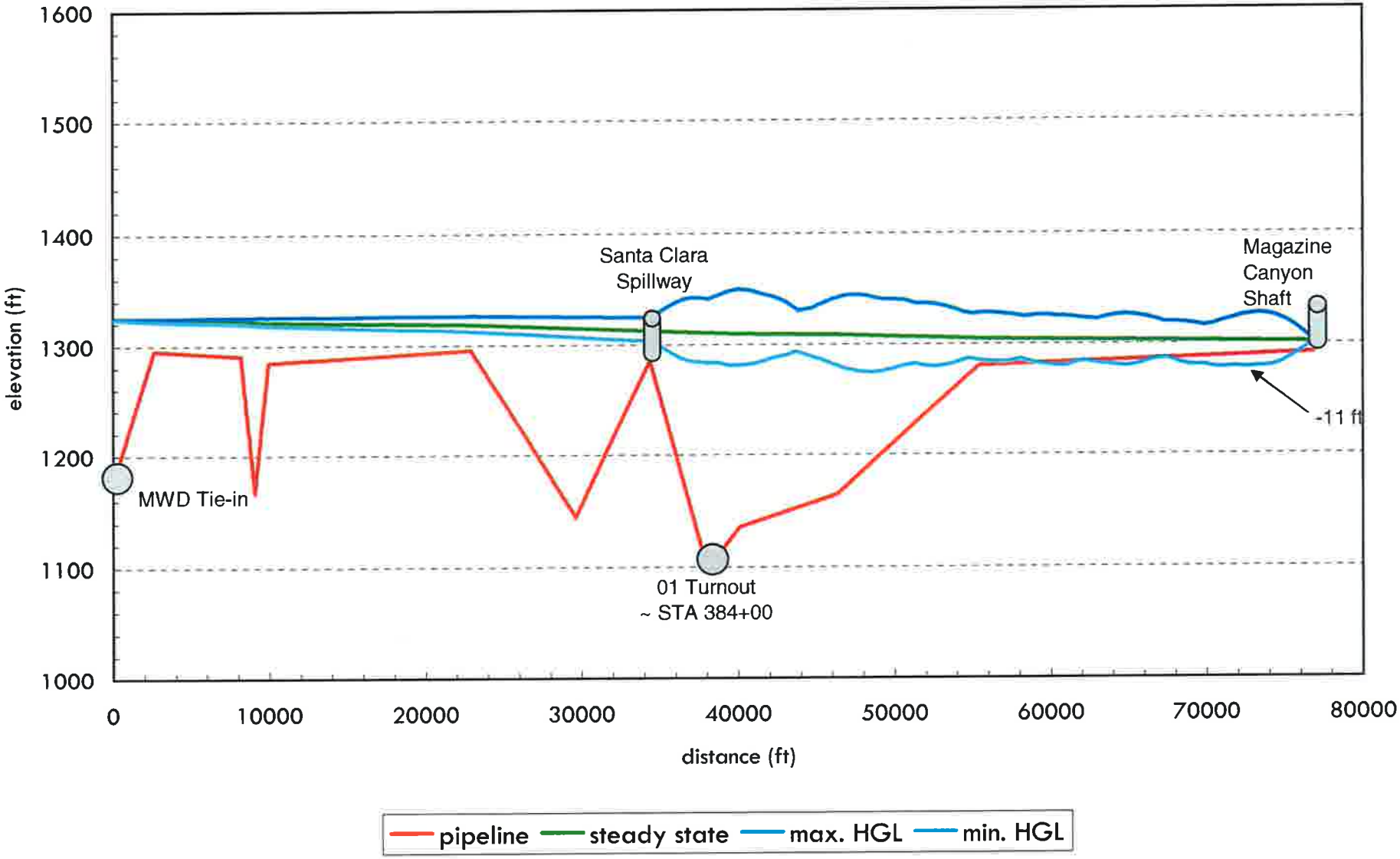

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Figure 6 - HGL elevation record at STA 384+00 following loss of power to PS with no additional surge protection

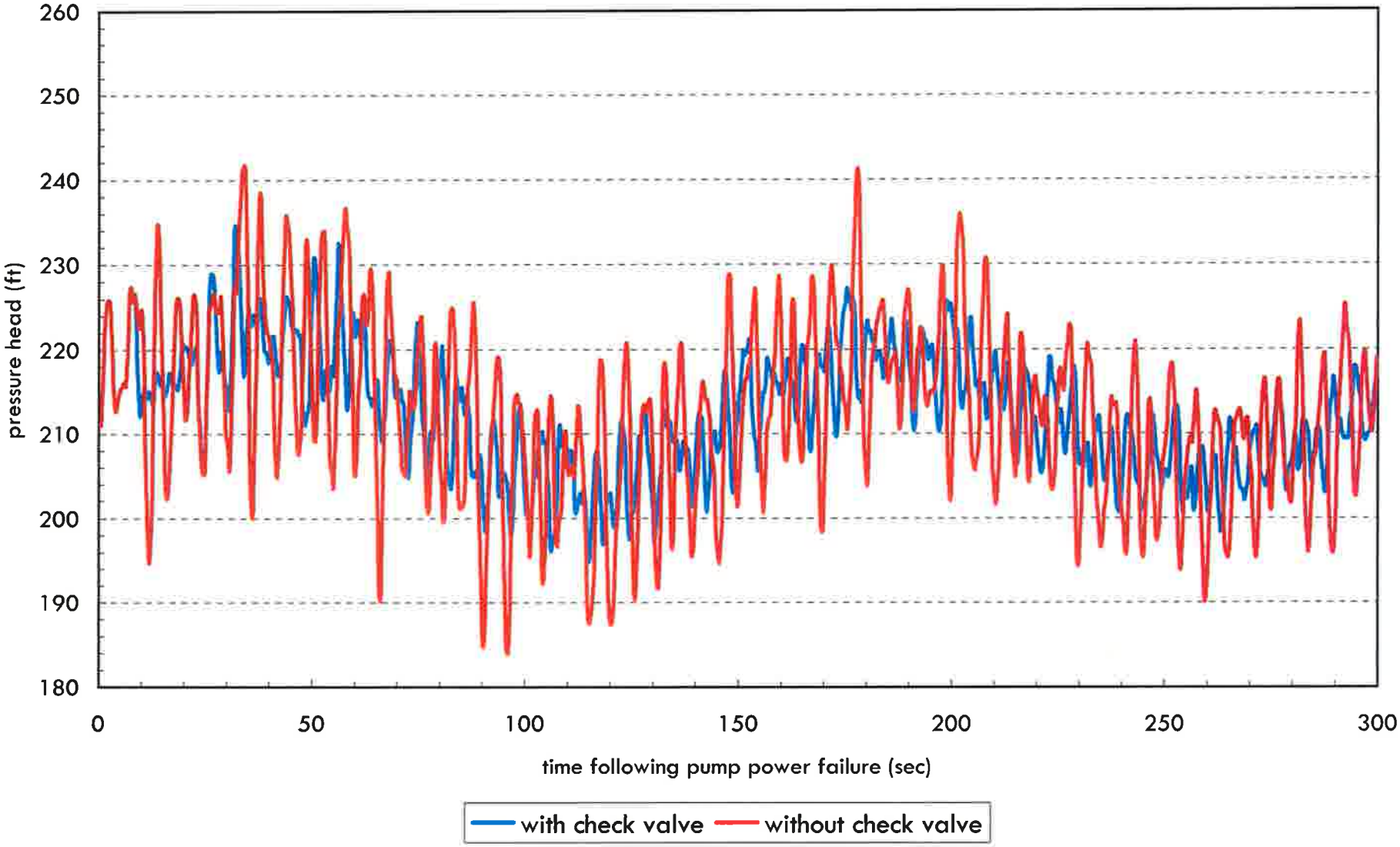

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Figure 7 - HGL elevations following loss of power to PS with added vacuum valve at STA 21+41 - with check valve at turnout

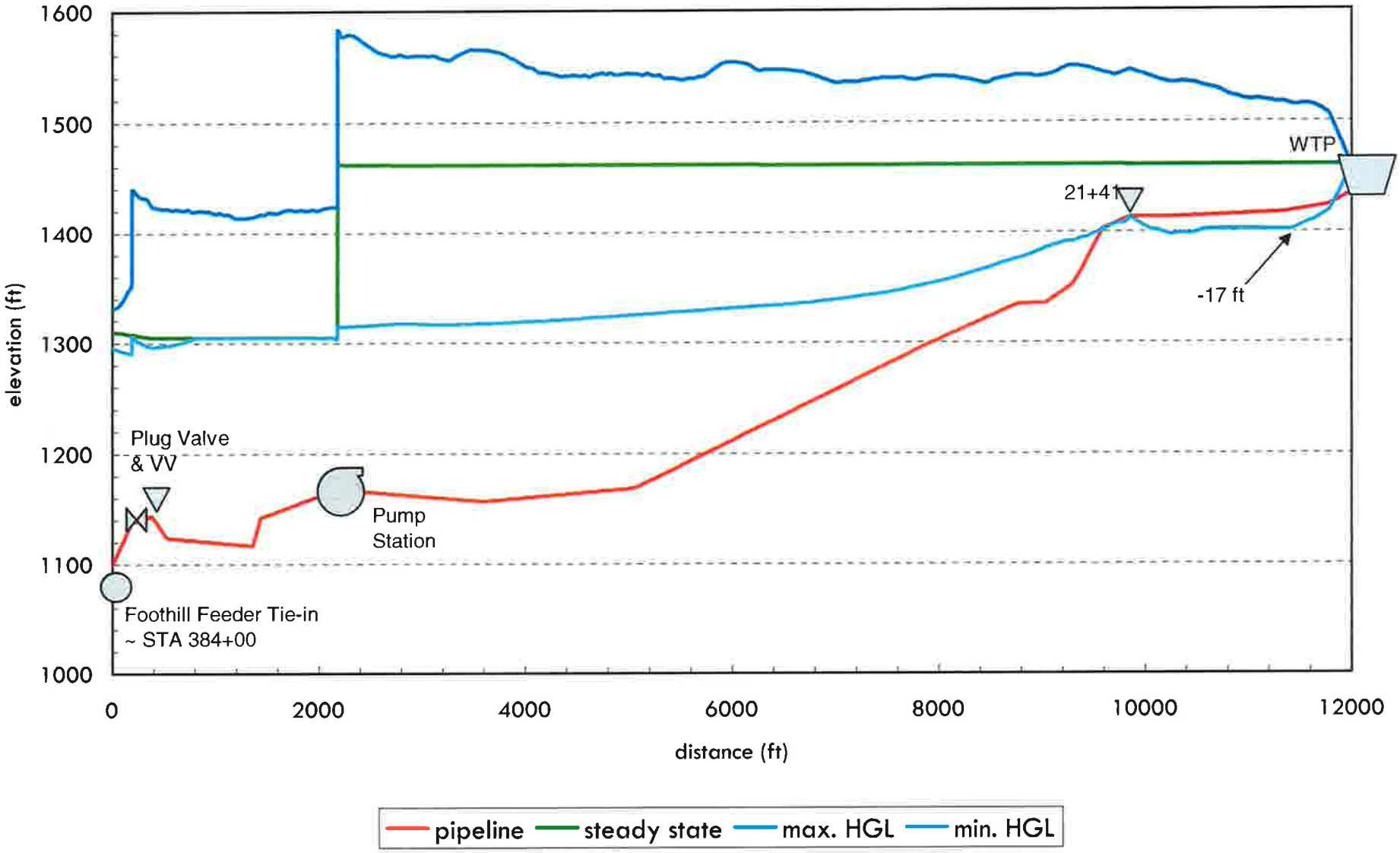

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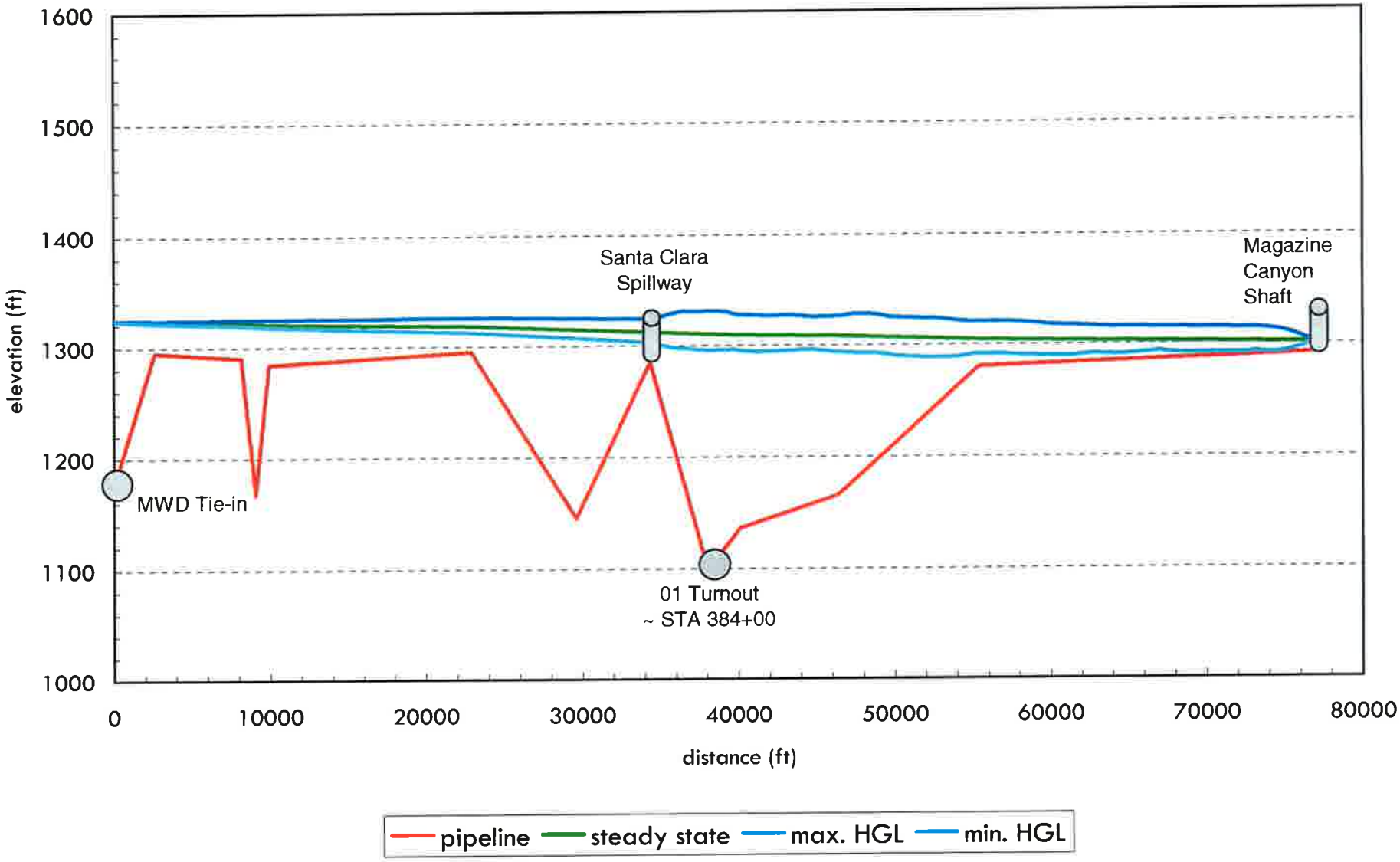
Figure 8 - HGL elevations on Foothill Feeder following loss of power to PS with added vacuum valve at STA 21+41 - with check valve at turnout



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091048 August 17, 2009

FINAL

Environmental Impact Report

California State Clearinghouse No. 2005091138

Castaic Lake Water Agency Rio Vista Water Treatment Plant Expansion Project

CASTAIC LAKE WATER AGENCY

August 2006

FINAL

Environmental Impact Report

California State Clearinghouse No. 2005091138

Castaic Lake Water Agency Rio Vista Water Treatment Plant Expansion Project

Prepared for

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Prepared by

Science Applications International Corporation
An Employee-Owned Company
525 Anacapa Street, Santa Barbara, California 93101

August 2006

1.0 INTRODUCTION

The Final Environmental Impact Report (FEIR) for the Castaic Lake Water Agency (CLWA) Rio Vista Water Treatment Plant Expansion project (Project) contains two volumes. The first volume of the FEIR, incorporated herein by reference, comprises the Draft EIR (DEIR), published in May 2006. The second volume of the FEIR (this volume) contains public comments received on the DEIR during the public review period (May 22 to July 10, 2006), responses to the public comments, and changes to the text of the DEIR.

BOTH VOLUMES OF THE EIR MUST BE READ TOGETHER. THE SECOND VOLUME DOES NOT REPEAT THE INFORMATION INCLUDED IN THE FIRST VOLUME.

This second volume contains the following information:

Section 1—Introduction

Section 2—Public Comments contains the list of agencies and individuals that submitted comment letters on the DEIR and copies of those letters, as well as individuals who submitted oral comments at the public hearing on the DEIR (held June 28, 2006) and copies of the public hearing transcripts. Each substantive comment is numbered.

Section 3—Responses to Comments contains a matrix including each of the public comments received and individual responses to those comments. The comments in the matrix were excerpted directly from the comment letters or public hearing transcripts.

Section 4—Changes to the Text of the EIR presents text changes since publication of the DEIR.

Copies of the second volume of the EIR were mailed to public agencies that provided comments on the DEIR.

Copies of both volumes of the FEIR are available at CLWA or can be purchased by contacting Mr. Ken Petersen, Engineering and Operations Manager, 27234 Bouquet Canyon Road, Santa Clarita, California 93150-2173 or by calling (661) 297-1600. Both volumes of the FEIR also are available at the following local public libraries:

Los Angeles County Library
7400 East Imperial Highway
Downey, CA 90241-7011

Los Angeles County Library
Canyon Country Jo Anne Darcy Library
18601 Soledad Canyon Road
Canyon Country, CA 91351

Los Angeles County Library, Valencia
23743 West Valencia Boulevard
Valencia, CA 91355

Los Angeles County Library, Newhall
22704 West 9th Street
Newhall, CA 91321

Ventura County Library
Administrative Building
646 County Square Drive, #150
Ventura, CA 93003

OTHER CEQA ACTIONS RELATED TO THIS EIR

As required by Public Resources Code (PRC), Division 13, section 21092.5, CLWA is to provide a proposed written response to public agencies that commented on the DEIR at least 10 days prior to certifying the FEIR. Those proposed responses are contained in Section 3 of this second volume of the FEIR.

If the CLWA Board of Directors acts to certify the FEIR and approves the Project, a Notice of Determination will be filed with Los Angeles County, Ventura County, and the California State Clearinghouse.

2.0 PUBLIC COMMENTS

LIST OF COMMENTING INDIVIDUALS AND AGENCIES

The following individuals and agencies submitted comment letters or oral comments on the DEIR during the public review period. The comment letters and public hearing transcripts are presented on the following pages.

Comment Letters

- Cheryl J. Powell, IGR/CEQA Program Manager, California Department of Transportation, District 7, letter dated June 23, 2006

- Brian Wallace, Associate Regional Planner, Intergovernmental Review, Southern California Association of Governments, letter dated July 10, 2006

Public Hearing Transcripts

- Ed Dunn, oral comment, June 28, 2006 public hearing

- Laura Schultz, oral comment, June 28, 2006 public hearing

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, OFFICE OF PUBLIC
TRANSPORTATION AND REGIONAL PLANNING
IGR/CEQA BRANCH
100 SOUTH MAIN STREET
LOS ANGELES, CA 90012
PHONE (213) 897-3747
FAX (213) 897-1337

Flex your power!
Be energy efficient!

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June 23, 2006

Mr. Ken Petersen
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Re: ***Expansion of Rio Vista Water Treatment Plant***
Draft Environmental Impact Report
IGR/CEQA 060545/EA

Dear Mr. Petersen

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the proposed project to expand Rio Vista Water Treatment Plant. The project would increase the plant's water treatment capacity from 30 to 60 million gallons per day.

We note that construction activities as well as plant operations will generate considerable truck traffic to surrounding roadway network (Table ES-3). We request the City make a conscious effort to schedule truck trips off peak commuting periods. 1

Also we remind you that transportation of heavy construction equipment and/or materials which requires the use of oversized-transport vehicles on State highways will need a Caltrans transportation permit. We request the lead agency include a condition that requires construction trucks to obtain all required permits from this Department. 2

If you have any questions, you may reach me at (213) 897-3747 and refer to IGR/CEQA record number 060545/EA.

Sincerely,

Cheryl J Powell

CHERYL J. POWELL
IGR/CEQA Program Manager
Caltrans, District 7

Cc: Scott Morgan, State Clearinghouse

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

Main Office

818 West Seventh Street

12th Floor

Los Angeles, California

90017-3435

t (213) 236-1800

f (213) 236-1825

www.scag.ca.gov

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Imperial County: Victor Carrillo, Imperial County • Jon Edney, El Centro

Los Angeles County: Yvonne B. Burke, Los Angeles County • Zev Yaroslavsky, Los Angeles County • Jim Aldinger, Manhattan Beach • Harry Baldwin, San Gabriel • Paul Bowlen, Cerritos • Todd Campbell, Burbank • Tony Cardenas, Los Angeles • Stan Carroll, La Habra Heights • Margaret Clark, Rosemead • Gene Daniels, Paramount • Mike Dispenza, Palmdale • Judy Dunlap, Inglewood • Rae Gabelich, Long Beach • David Gafin, Downey • Eric Garcetti, Los Angeles • Wendy Greuel, Los Angeles • Frank Gurulé, Cudahy • Janice Hahn, Los Angeles • Isadore Hall, Compton • Keith W. Hanks, Azusa • José Huizar, Los Angeles • Tom LaBonge, Los Angeles • Paula Lantz, Pomona • Paul Nowatka, Torrance • Pam O'Connor, Santa Monica • Alex Padilla, Los Angeles • Bernard Parks, Los Angeles • Jan Perry, Los Angeles • Ed Reyes, Los Angeles • Bill Rosendahl, Los Angeles • Greig Smith, Los Angeles • Tom Sykes, Walnut • Paul Talbot, Alhambra • Mike Ten, South Pasadena • Tonia Reyes Uranga, Long Beach • Antonio Villaraigosa, Los Angeles • Dennis Washburn, Calabasas • Jack Weiss, Los Angeles • Herb J. Wesson, Jr., Los Angeles • Dennis Zine, Los Angeles

Orange County: Chris Norby, Orange County • Christine Barnes, La Palma • John Beauman, Brea • Lou Bone, Tustin • Art Brown, Buena Park • Richard Chavez, Anaheim • Debbie Cook, Huntington Beach • Leslie Daigle, Newport Beach • Richard Dixon, Lake Forest • Paul Glaab, Laguna Niguel • Marilynn Poe, Los Alamitos

Riverside County: Jeff Stone, Riverside County • Thomas Buckley, Lake Elsinore • Bonnie Flickinger, Moreno Valley • Ron Loveridge, Riverside • Greg Pettis, Cathedral City • Ron Roberts, Temecula

San Bernardino County: Gary Ovitt, San Bernardino County • Lawrence Dale, Barstow • Paul Eaton, Montclair • Lee Ann Garcia, Grand Terrace • Tim Jasper, Town of Apple Valley • Larry McCallon, Highland • Deborah Robertson, Rialto • Alan Wapner, Ontario

Ventura County: Judy Mikels, Ventura County • Glen Becerra, Simi Valley • Carl Morehouse, San Buenaventura • Toni Young, Port Hueneme

Orange County Transportation Authority: Lou Correa, County of Orange

Riverside County Transportation Commission: Robin Lowe, Hemet

Ventura County Transportation Commission: Keith Millhouse, Moorpark

Printed on Recycled Paper 559 05.09.06

10 July 2006

Mr. Ken Petersen
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

RE: **Comments on the Notice of Availability of a Draft Environmental Impact Report for the Rio Vista Water Treatment Plan Expansion Project**
SCAG No. I20060346

Dear Mr. Petersen:

Thank you for submitting the Draft Environmental Report for the above-mentioned project to SCAG for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects, and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

SCAG has no new comments at this time. A description of the proposed project was published in the May 15-31, 2006 Intergovernmental Review Clearinghouse Report for public review and comment. 1

If you have any questions, please contact me at (213) 236-1851. Thank you.

Sincerely,

Brian Wallace
Associate Regional Planner
Intergovernmental Review

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JUL 12 2006
CLWA ENGINEERING

DOCS # 124325

1
2
3
4 ITEM 4.1 PUBLIC HEARING ON THE)
5 RIO VISTA WATER TREATMENT PLANT)
6 EXPANSION DRAFT EIR,)
7)
8
9
10
11 Item 4.1 Public Hearing on the Rio Vista
12 Water Treatment Plant Expansion Draft EIR
13 taken at 27234 Bouquet Canyon Road, Santa
14 Clarita, California, commencing at 7:10 p.m.,
15 Wednesday, June 28, 2006, before Laurie A.
16 Schmidt, Certified Shorthand Reporter
17 No. 12719.
18
19
20
21
22
23
24
25

1 SANTA CLARITA, CALIFORNIA

2 WEDNESDAY, JUNE 28, 2006; 7:10 P.M.

3

4 PRESIDENT PECSI: The next item on the Agenda
5 is 4.1 Public Hearing on the Rio Vista Water Treatment
6 Plant Expansion Draft EIR. If there are any members of
7 the public that wish to comment on this subject, please
8 fill out a comment card and give it to the Board
9 Secretary, April Jacobs, who will hand the cards to me
10 and I will be calling on you for your comments at the
11 proper time during -- or after the staff presentation.
12 I would like to again say thank you and welcome. And I
13 would like to open the public hearing on this matter.
14 Mr. Behrens, our General Counsel will explain
15 the hearing process and the order of the presentation.
16 Mr. Behrens.
17 MR. BEHRENS: Thank you Mr. Chairman and
18 Members of the Board.
19 Tonight is the consideration of public
20 comments on the Rio Vista Water Treatment Plant
21 Expansion Project. This project has been in process in
22 terms of analysis for some time now. The comment
23 period for the public to make their comments known on
24 the Water Treatment Plant Expansion is due July 10th.
25 That's when the comment period closes.

1 We elected to go beyond the requirements of
2 CEQA and have a public hearing tonight just to expand
3 the public involvement process in this EIR. And so
4 that is the purpose of the hearing tonight.
5 Also what you should consider tonight is
6 tonight is your night to listen. There is no need for
7 the Board or the staff to respond to comments. What
8 the purpose is is to if possible augment public input
9 so that in our responses to comments that we will
10 prepare after the comment period closes on July 10th we
11 will be able to expand our responses depending upon
12 what information comes in tonight to assist us.
13 So with that in mind then I would like to
14 briefly describe what we are going to be doing here.
15 Ken Petersen is going to discuss the project after I go
16 through the procedure a little bit, and then Monica
17 Hood and Meredith Clement from SAIC, our environmental
18 consultants, are here to assist us in analyzing the
19 impacts and giving you an idea of the analysis that we
20 conducted on the expansion of the plan.
21 So at this time we just want to go through
22 here very quickly. You know, we're proceeding
23 according to the California Environmental Quality Act.
24 We're the lead agency. We've gone through the public
25 notice process. The publication of this hearing

1 tonight was published in the Signal on the 22nd of May
2 2006. I would like to give a copy of that. I think
3 the court reporter now has a copy of that notice that
4 was published in the newspaper of this hearing.
5 So at this time we are now ready to go to
6 slide four which involves us considering all of the
7 comments. And as I said before we will take the
8 comments we hear tonight into consideration in our
9 responses to comments after July the 10th.
10 Next I would like to call on Ken Petersen to
11 describe the project, its objective, and location.
12 Ken.
13 KEN PETERSEN: Thank you, Mr. Behrens.
14 The project objectives include the following:
15 Design and construct facilities to accommodate a 30
16 mgd increase in the water treatment capacity in order
17 to provide a greater degree of redundancy as required
18 by the California Department of Health Services
19 mandated, that is, and also to provide more reliability
20 to our treatment capabilities in an emergency, and also
21 to meet existing summer peak demand. And of course,
22 serve planned future use demands in the valley.
23 The project includes expanded raw water
24 delivery capacity and overall raw water supply
25 reliability consistent with the expanded treatment

1 capacity.

2 And the modifications would be completed to

3 the Rio Vista Water Treatment Plant to achieve

4 compliance with current, existing, and new water

5 quality regulations that are pending; that may be

6 pending that is.

7 Slide 6, thanks.

8 The project location, the project sites,

9 there's three sites in the City of Santa Clarita which

10 of course is located in northern Los Angeles County.

11 Those site's components would occur in three locations

12 in the pipeline. The first one is the pipeline

13 location and Meter Structure Site which is located

14 right here, this is the place. The second location is

15 located at the Intake Pump Station which is located

16 right here. And, of course, the expansion itself is

17 located at this site that we are having this hearing

18 tonight, the Rio Vista Treatment Plant.

19 To give you some more, a little bit more

20 information about the sites themselves. This is

21 located in the Bridgeport area of Valencia. This site,

22 the Intake Pump Station site is of course right next to

23 the commercial center of Lowe's and In-&-Out Burger.

24 And as we all know where we're here tonight, we are at

25 Rio Vista Treatment Plant.

1 The project, the Pipeline Meter Structure Site
2 is really kind of near the Santa Clara River. And it's
3 200 feet west of the southwest intersection of Parkwood
4 Lane and Bridgeport Lane, again right here. And then
5 approximately .5 miles east of that is the Intake Pump
6 Station which is also located adjacent to the Santa
7 Clara River, and southwest of the intersection of
8 Bouquet Canyon and Newhall Ranch Road on the property
9 owned by CLWA.
10 The Meter Intake Structure is within the
11 easements existing for the agency, and for MWD of
12 Southern California.
13 The map on the slide may be found on page ES-4
14 of the Draft Environmental document which has been
15 previously disputed to the Board.
16 The project, the proposed project would
17 include expanding the existing Rio Vista Water
18 Treatment Plant capacity from 30 million gallons per
19 day, or as we call it mgd, to 60 mgd in response to
20 current and new water quality standards and improve the
21 reliability to meet existing customer demands and
22 planned future demand. This would include a new
23 Clarifier-Filter Building. Ozone improvements will
24 also be completed at the Rio Vista Plant to accomplish,
25 this expansion. Modifying the Intake Pump Station

1 again near the home improvement center area, is to
2 increase the capacity of the pump station to 60 mgd
3 which will include one new pump and replacing the
4 existing pump with a larger pump to increase the
5 capacity to 60 mgd. We will also add a new standby
6 generator set in addition to the one that is there
7 existing today.
8 The parallel pineline connection that is off
9 of the -- that would be connected -- it will be an
10 existing -- it will be connected to the existing
11 42-inch connection at MWD 201-inch Foothill Feeder
12 which will include a new MWD 48-inch value. And that
13 is located in the Bridgeport area of Valencia, right
14 here. There will be also 200 feet of 40 inch --
15 48-inch underground pipeline, and the associated meter
16 structure for design criteria that's set fourth by MWD.
17 All buried structures in that area.
18 With that, I'm going to move on and let Monica
19 Hood come up and talk about the impact analysis and the
20 EIR.
21 MONICA L. HOOD: Thank you.
22 As Ken mentioned I'm going to provide an
23 overview of the environmental documentation that's been
24 completed for the project. And by way of background,
25 the initial study was previously completed for the

1 project which analyzed the construction and operation
2 of impact associated with the three project sites, and
3 concluded that direct impact to aesthetics,
4 agricultural resources, air quality, biological
5 resources, cultural resources, geology and soils,
6 hydrology and water quality, land use and planning,
7 mineral resources, public services, recreation, and
8 utilities and service systems would not be potentially
9 significant. Therefore a direct impact to these
10 resource areas are not discussed in detail in the EIR.
11 So the remaining resources, the EIR analysis identified
12 that the project could have significant but mitigable
13 direct impact to hazards and hazardous materials,
14 including that the project construction at the pipeline
15 and meter structure site could impair the
16 implementation of, or physically interfere with an
17 adopted emergency response plan or an emergency
18 evacuation plan.
19 Now the operation of the Rio Vista Water
20 Treatment Plant will result in the increase in hazards
21 to the public or to the environment through the
22 increase routine transport and use of hazardous
23 materials and the reasonably foreseeable upset and
24 accident conditions involving the release of hazardous
25 materials into the environment.

1 In addition, there will the associated impact
2 of the possible increase risk of wildland fires. The
3 analysis in the EIR also identified that the project
4 could have a significant but mitigable direct impact in
5 transportation and traffic, specifically private
6 construction at the pineline and meter structure site
7 could result in inadequate emergency access when it's
8 related to the previously mentioned hazards impacting
9 the pipeline and meter structure site.
10 The project would also have significant and
11 unavoidable direct noise impact that that noise, the
12 construction noise would cause a temporary increase in
13 ambient noise levels to sensitive centers located to
14 the north, east and west of the pineline and new
15 construction site. And local noise standards could be
16 exceeded.
17 The project would also have significant
18 indirect growth-related impact to all resource areas,
19 including significant and unavoidable growth-related
20 impacts to aesthetics, air quality, biological
21 resources, transportation and traffic, and utilities
22 and service systems.
23 The potential cumulative impacts of the
24 project are also discussed in the EIR and individual
25 projects were evaluated for cumulative impact in

1 combination with the direct impact of the project as
2 well as the indirect growth-related effects of the
3 project.
4 A significant but mitigable direct cumulative
5 impact to hazards, and transportation and traffic, and
6 significant and unavoidable direct cumulative noise
7 impacts were identified.
8 In addition, there would be significant
9 growth-related cumulative impacts all referring -- and
10 including significant and unavoidable impacts to
11 aesthetics, air quality, biological resources,
12 transportation and traffic, and utilities and service
13 systems.
14 Finally, the EIR includes the discussion of
15 alternatives to the project. And the alternatives that
16 were carried forward include those shown here on the
17 slides. The no project alternative and four others to
18 meet the capacity increased project objectives
19 including increasing the capacity of the Earl Schmidt
20 Filtration Plant, taking delivery of desalted water
21 from a facility in Ventura County, receiving treated
22 water in exchange for desalted water from another
23 regional water supply agency, and increasing local
24 groundwater production.
25 And the project was identified as an

1 environmentally superior alternative that meets project
2 objectives.
3 That concludes my overview of the
4 environmental documentation.
5 Thank you.
6 And if there are any comments we will receive
7 them now.
8 MR. BEHRENS: Mr. Chairman, it would be
9 appropriate at this time to see if there are any
10 members of the public that would like to make comments
11 on the presentation of the project.
12 PRESIDENT PECSI: Are there any members of the
13 public who wish to turn in a public comment card and
14 speak to, or comment on the issues?
15 ED DUNN: I didn't turn in a card.
16 PRESIDENT PECSI: Mr. Dunn.
17 ED DUNN: I just had a quick question, because 1
18 when the original pump station was built, the public
19 and anybody that was attending any of the CLWA meetings
20 were not made aware of the fact that that facility was
21 built to handle 120 million gallons per day. And we
22 were made aware that it was going to be a
23 30-million-gallon-per-day pump station for this plant.
24 Later on some of you that weren't directors here at the 2
25 time, the Board was thinking of teaming up with the

1 Metropolitan Water District in order to expand this
2 plant and put a treated water pineline down the 126
3 into Ventura County. At that time they mentioned that
4 MWD would do the EIR necessary to expand the plant for
5 the next 30 million gallons per day, etcetera. And
6 there was nothing said about a pump station. But they
7 always said that the EIR would be done later in the
8 steps when the expansions were taking place.
9 So my question is, this pump station that was
10 built for 30 million gallons per day is now going to be
11 expanded another 30, and it will go on and on and on
12 until it reaches 120. Is that in this EIR, or is that
13 being overlooked? I just haven't seen the direct EIR,
14 so I don't know. So I would imagine the EIR for the
15 pump station has to be done also, because it supposedly
16 has only been done to 30 million gallons per day.
17 PRESIDENT PECSI: We will take that comment
18 under consideration, Mr. Dunn.
19 Mr. Behrens, what is your recommendation?
20 MR. BEHRENS: Mr. Chairman, apparently there
21 is no other comments to be made by the public. I will
22 recommend that --
23 PRESIDENT PECSI: Hold on.
24 MR. BEHRENS: Excuse me?
25 LAURA SCHULTZ: Just a question. I'm fully

1 uninformed here. I just got the letter. I'm in
2 Bridgeport. I'm right next to the -- I didn't even
3 know there was a meter there. But my biggest concern
4 is just the significant effects of the hazardous gasses
5 and the stuff they're talking about, just because it's
6 across from a school, and my home, and the park. Is
7 there any clarification that I can get? I'm just --
8 MR. BEHRENS: No, there is. There is
9 clarification we can give at this time. Ken.
10 KEN PETERSEN: I've talked to some of your
11 neighbors already about this; the significant impacts.
12 The gaseous materials that we have, that we talk about
13 in the document and the environmental impact is related
14 to using chlorine gas for disinfection of our treated
15 water. And all that gas is actually an ammonia also as
16 a component to that. Those chemicals are stored at
17 this site, at the Rio Vista site, and used here at the
18 site. But they are transported on the highways as it
19 is to other facilities of a similar nature. But those
20 facilities -- those type of gasses and chemicals are
21 being used at this site, and there will be expanded use
22 of those types of materials. Therefore that's why we
23 have to address it as an effect of the project. But
24 there is no gas located near your home in Bridgeport.
25 LAURA SCHULTZ: Would you live there?

1 KEN PETERSEN: Yes. Actually I made a deal on
2 a house there once.
3 LAURA SCHULTZ: It just seems very scary. I'm 3
4 like, what is this, you know.
5 KEN PETERSEN: Can we have your name and
6 address?
7 LAURA SCHULTZ: I'm Laura Schultz. I'm right
8 in Stoney Point Bridgeport.
9 KEN PETERSEN: Okay. We need to get your
10 address and everything so we can add that comment.
11 LAURA SCHULTZ: And you will address it?
12 KEN PETERSEN: We will address it.
13 PRESIDENT PECSI: Yes, if you would just
14 please fill out one of the comment cards and give it to
15 the Board secretary, April Jacobs who is here, we would
16 very much appreciate it.
17 So are there any other comments by the public
18 for the Board to consider as part of the hearing?
19 All right. Seeing none, I will close the
20 hearing on the Rio Vista Water Treatment Plant
21 Expansion Draft EIR.
22 (End of Item 4.1 Public Hearing on the Rio Vista
23 Water Treatment Plant Expansion Draft EIR at 7:30)
24
25

3.0 RESPONSES TO COMMENTS

This section includes excerpted comments from the letters and public hearing transcripts included in section 2 and corresponding responses in tabular format.

Matrix of Comments on DEIR and Responses
CLWA – Rio Vista Water Treatment Plant Expansion Project

Comments Received From:

Name	Agency	Date
Cheryl J. Powell, IGR/CEQA Program Manager	California Department of Transportation, District 7	June 23, 2006
Brian Wallace, Associate Regional Planner, Intergovernmental Review	Southern California Association of Governments	July 10, 2006
Ed Dunn	N/A	June 28, 2006 Public Hearing
Laura Schultz	N/A	June 28, 2006 Public Hearing

Comments and Responses Matrix:

Commenter	Comment No.	Comment	Response
California Department of Transportation, District 7	1	We note that construction activities as well as plant operations will generate considerable truck traffic to surrounding roadway network (Table ES-3). We request the City make a conscious effort to schedule truck trips off peak commuting periods.	The increase in daily truck traffic due to the Project is considered less than significant (refer to the Initial Study found in Appendix A of the DEIR, page 38, Transportation and Traffic Impacts, a-b). Also, comment requests action by the City which is outside the jurisdiction of CLWA. However, it is assumed that contractors would schedule truck trips during off peak commuting periods and the Project Description now reflects that contractors would be requested to make a conscious effort to do so (refer to section 4 of this document).

Commenter	Comment No.	Comment	Response
California Department of Transportation, District 7	2	Also, we remind you that transportation of heavy construction equipment and/or materials that requires the use of oversized-transport vehicles on State highways will need a Caltrans transportation permit. We request the lead agency include a condition that requires construction trucks to obtain all required permits from this Department.	The EIR has been modified in response to this comment and now includes this permit requirement (refer to section 4 of this document).
Southern California Association of Governments	1	SCAG has no new comments at this time. A description of the proposed project was published in the May 15-31, 2006 Intergovernmental Review Clearinghouse Report for public review and comment.	Comment noted.
Ed Dunn	1	I just had a quick question, because when the original pump station was built, the public and anybody attending any of the CLWA meetings were not made aware of the fact that that [sic] facility was built to handle 120 million gallons per day. And we were made aware that it was going to be a 30-million-gallon-per-day pump station for this plant.	As discussed on page 7-3 of the DEIR (lines 13 through 17), the proposed modifications at the RVWTP and the IPS were planned based on adding a reliable 30 million gallon per day (mgd) treatment increment. The original planning and design of the current RVWTP and IPS facilities provide for efficient incremental additions to the pumping and treatment systems in 30 mgd modules.
Ed Dunn	2	Later on some of you that weren't directors here at the time, the Board was thinking of teaming up with the Metropolitan Water District in order to expand this plant and put a treated water pipeline down the 126 into Ventura County. At that time they mentioned that MWD would do the EIR necessary to expand the plant for the next 30 million gallons per day, etcetera. But they always said that the EIR would be done later in the steps when the expansions were taking place.	Comment noted. See response to Comment No. 3 below.

Commenter	Comment No.	Comment	Response
Ed Dunn	3	So my question is, this pump station that was built for 30 million gallons per day is now going to be expanded another 30, and it will go on and on and on until it reaches 120. Is that in this EIR, or is that being overlooked? I just haven't seen the direct EIR, so I don't know. So I would imagine the EIR for the pump station has to be done also, because it supposedly has only been done to 30 million gallons per day.	The EIR addresses the expansion of the IPS to 60 mgd. Future expansions, as needed, of the IPS would undergo additional environmental review.
Laura Schultz	1	Just a question. I'm fully uninformed here. I just got the letter. I'm in Bridgeport. I'm right next to the -- I didn't even know there was a meter there. But my biggest concern is just the significant effects of the hazardous gasses [sic] and the stuff they're talking about, just because it's across from a school, and my home, and the park. Is there any clarification that I can get? I'm just --.	The hazardous materials impacts referenced in the comment would not occur at the pipeline and meter structure site near the Bridgeport development. The impacts would occur at the RVWTP site, which is approximately 1.5 miles distant from the Bridgeport community.
Laura Schultz	2	Would you live there?	See response to Comment No. 1 above. The impacts set forth in the commenter's concern are not present at the pipeline and meter structure site.
Laura Schultz	3	It just seems very scary. I'm like, what is this, you know.	Comment noted. See response to Comment No. 1 above.

4.0 CHANGES TO THE DEIR TEXT

Executive Summary and Chapter 2, Project Description

The following text should be added to the Executive Summary of the DEIR, page ES-6 immediately following line 7. The text should also be added to Chapter 2 of the DEIR on page 2-2 immediately following line 17.

- The replacement of the valve at the connection to the Foothill Feeder would require the dewatering of the Foothill Feeder. The impacts of the dewatering were addressed in MWD's Foothill Feeder Repair and Future Inspections Project EIR SCH# 2005071082. The service agreement between CLWA and MWD would need to be modified to reflect the new valve/connection.

The following text should be added to the Executive Summary of the DEIR, page ES-11 immediately following line 40. The text should also be added to Chapter 2 of the DEIR on page 2-13 immediately following line 2.

- It is assumed that contractors would schedule truck trips off peak commuting periods and would be requested to make a conscious effort to do so.

Executive Summary and Chapter 1, Introduction

The following text should be added to the Executive Summary (Permits and Other Approvals to Implement the Project section, DEIR page ES-15) immediately following line 27 of page ES-15. The text should also be added to Chapter 1 of the DEIR (section 1.4, Permits and Other Approvals Required to Implement the Project) on page 1-3 immediately following line 8.

- A transportation permit from Caltrans for the transportation of heavy construction equipment and/or materials which requires the use of oversized-transport vehicles on State highways.

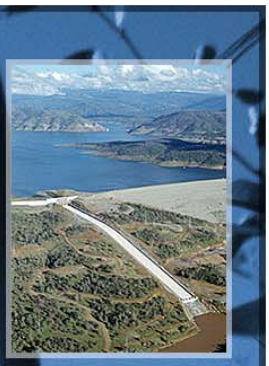
- The service agreement between CLWA and MWD would need to be modified to reflect the new valve/connection.

The State Water Project

Final Delivery Reliability Report 2011

June 2012

State of California
Natural Resources Agency
Department of Water Resources



State of California
Edmund G. Brown Jr., Governor

California Natural Resources Agency
John Laird, Secretary for Natural Resources

Department of Water Resources
Mark W. Cowin, Director

Susan Sims
Chief Deputy Director

Kasey Schimke
Asst. Director, Legislative Affairs

Sandy Cooney
Asst. Director, Public Affairs

Cathy Crothers
Chief Counsel

Gary Bardini
Deputy Director

Dale Hoffman-Floerke
Deputy Director

John Pacheco
Deputy Director

Carl Torgerson
Deputy Director, Acting

Assistant Deputy Directors, Integrated Water Management

Rodney Mayer
FloodSAFE

John Andrew
Climate Change

Bay-Delta Office
Katherine Kelly, Chief

Modeling Support Branch
Francis Chung, Principal Engineer

Individuals contributing to the development of the report

John Leahigh, Principal Engineer, Division of Operations and Maintenance
Sushil Arora, Supervising Engineer, Bay-Delta Office
Dustin Jones, Senior Engineer, Bay-Delta Office
Aaron Miller, Senior Engineer, Division of Operations and Maintenance
Erik Reyes, Senior Engineer, Bay-Delta Office
Sina Darabzand, Senior Engineer, Bay-Delta Office
Alan Olson, Engineer, Bay-Delta Office
Christopher Quan, Engineer, Bay-Delta Office
Daniel Teixeira, Staff Services Analyst, Administrative and Executive Services Office

Prepared by AECOM

Director's Message

The *State Water Project Delivery Reliability Report 2011* (2011 Report) is the latest update to a biannual report that describes the existing and future conditions for State Water Project (SWP) water supply that are expected if no significant improvements are made to convey water past the Sacramento–San Joaquin Delta (Delta) or to store the more variable runoff that is expected with climate change.

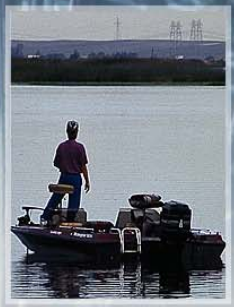
This report is presented in a different format than previous versions. The four previous reports were written for a dual audience—both the general public and those interested in a greater level of technical detail, such as the SWP contractors. By contrast, this report is written primarily with the public in mind. As a result, it not only provides updated information about the SWP's water delivery reliability, but is also designed to educate Californians about the SWP and its operations. This report presents a concise description of the historical events leading to the construction of the SWP and describes the SWP's facilities and operations. It then defines and explains the concept of water delivery reliability and the types of SWP water available to contractors, and describes various factors that affect the reliability of water deliveries. Because of the public interest in water project pumping from the Delta and the dependence of SWP water supply on Delta pumping, a new chapter has been added that focuses specifically on SWP pumping (exports) at the Harvey O. Banks Pumping Plant in the Delta.

The 2011 Report shows that the SWP continues to be subject to reductions in deliveries similar to those contained in the *State Water Project Delivery Reliability Report 2009* (2009 Report), caused by the operational restrictions of biological opinions (BOs) issued in December 2008 and June 2009 by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to govern SWP and Central Valley Project operations. Federal court decisions have remanded the BOs to USFWS and NMFS for further review and analysis. We expect that the current BOs will be replaced sometime in the future. The operational rules defined in the 2008 and 2009 BOs, however, continue to be legally required and are the rules used for the analyses supporting the 2011 Report.

The following "Summary" includes key findings of the analyses in the 2011 Report. A technical addendum is also available which provides detail on the assumptions of the analyses and the results for the 2011 Report. The results of the studies, as presented in this report and the technical addendum, are designed to assist water planners and managers in updating their water management and infrastructure development plans. These results emphasize the need for local agencies to develop a resilient and robust water supply, and a distribution and management system to maximize the efficient use of our variable supply. They also illustrate the urgent need to improve the method of conveying water past the Delta in a more sustainable manner that meets the dual goals of increasing water delivery reliability and improving conditions for endangered and threatened fish species.

Mark Cowin
Director
California Department of Water Resources
June 2012

Summary



This report is intended to inform the public about key factors important to the operation of the SWP and the reliability of its water deliveries.

California faces a future of increased population growth coupled with the potential for water shortages and pressures on the Delta. For many SWP water contractors, water provided by the SWP is a major component of all the water supplies available to them. SWP contractors include cities, counties, urban water agencies, and agricultural irrigation districts. These local utilities and other public and private entities provide the water that Californians use at home and work every day and that helps to nourish the state's bountiful crops. Thus, the availability of water to the SWP becomes a planning issue that ultimately affects the amount of water that local residents and communities can use.

The availability of these water supplies may be highly variable. A wet water year may be followed by a dry or even critical year. Knowing the probability that they will receive a certain amount of SWP water in a given year—whether it be a wet water year, a critical year, or somewhere in between—gives contractors a better sense of the degree to which they may need to implement increased conservation measures or plan for new facilities.

The Delta is the key to the SWP's ability to deliver water to its agricultural and urban contractors. All but three of the 29 SWP contractors receive water deliveries from the Delta (pumped by either the Harvey O. Banks or Barker Slough Pumping Plant).

Yet the Delta faces numerous challenges to its long-term sustainability. Among these are continued subsidence of Delta islands, many of which are already below sea level, and the related threat of a catastrophic levee failure as water pressure increases on fragile levees. Climate change poses the threat of increased variability in floods and droughts, and sea level rise complicates efforts to manage salinity levels and preserve water quality in the Delta so that the water remains suitable for urban and agricultural uses.

Protection of endangered and threatened fish species, such as the delta smelt, is also an important factor of concern for the

Delta. Ongoing regulatory restrictions, such as those imposed by federal biological opinions on the effects of SWP and CVP operations on these species, also contribute to the challenge of determining the SWP's water delivery reliability.

The analyses in this report factor in all of the regulations governing SWP operations in the Delta and upstream, and assumptions about water uses in the upstream watersheds.

Modeling was conducted that considered the amounts of water that SWP contractors use and the amounts of water they choose to hold for use in a subsequent year.

Many of the same specific challenges to SWP operations described in the *State Water Project Delivery Reliability Report 2009* (2009 Report) remain in 2011. Most notably, the effects on SWP pumping caused by issuance of the 2008 and 2009 federal biological opinions, which were reflected in the 2009 Report, continue to affect SWP delivery reliability today. The analyses in this report factor in climate change and the effects of sea level rise on water quality, but do not incorporate the probability of catastrophic levee failure. The resulting differences between the 2009 and 2011 Reports can be attributed primarily to updates in the modeling assumptions and inputs.

As noted in the discussion of SWP exports in Chapter 5 of this report, Delta exports (that is, SWP water of various types pumped by and transferred to contractors from the Banks Pumping Plant) have decreased since 2005, although the bulk of the change occurred by 2009 as the federal BOs went into effect, restricting operations. These effects are also reflected in the SWP delivery estimates provided in Chapters 6 and 7 of this report. Chapters 6 and 7 characterize the SWP's water delivery reliability under existing conditions and future conditions, respectively. The following are a few of the key points from Chapters 5, 6, and 7:

- Estimates of average annual SWP exports under conditions that exist for 2011 are 2,607 thousand acre-feet (taf), 350 taf or 12% less than the estimate under 2005 conditions.
- The estimated average annual SWP exports decrease from 2,607 taf/year to 2,521 taf/year (86 taf/year or about 3%) between the existing- and future-conditions scenarios.
- The estimates in this report for Table A water supply deliveries are not significantly different from those in the 2009 Report. The average annual delivery estimated for existing conditions (2,524 taf/year) is 2% greater, and the estimated amount for future conditions (2,466 taf/year) is 1% less than the corresponding estimates in the 2009 Report.
- The likelihood of SWP Article 21 deliveries (supplemental deliveries to Table A water) being equal to or less than 20 taf/year has increased relative to that estimated in the 2009 Report. However, both this report and the 2009 Report show a high likelihood that Article 21 water deliveries will be equal to or less than 20 taf/year, ranging between 71% and 78% for both existing and future conditions.

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Chapter 1

Water Delivery Reliability: A Concern for Californians

California's water supplies are crucial to maintaining a high quality of life for the state's residents. The State Water Project (SWP), operated by the California Department of Water Resources (DWR), is an integral part of the effort to ensure that business and industry, urban and suburban residents, and farmers throughout much of California have sufficient water at all times. This *State Water Project Delivery Reliability Report 2011* describes the expected existing and future SWP water deliveries.

The term "water delivery reliability," as used in this report, is defined as the annual amount of SWP water that can be expected to be delivered with a certain frequency. To put this another way: What is the likelihood, or probability, that a certain amount of water will be delivered by the SWP in a year?

Reasons to Assess SWP Water Delivery Reliability

Let's look at two important factors that underscore the importance of assessing the SWP's water delivery reliability: the effects of population growth on California's water supply, and State legislation intended to help maintain a reliable water supply.

Population Growth, Land Use, and Water Supply

Water and development have had a close yet complex relationship since California's early days. Indeed, the SWP was established in the wake of a second economic "gold rush" that began after the end of World War II. Increased statewide population and commerce made it clear to water managers that local water supplies (including groundwater) would not be sufficient to meet their communities' future needs.

Population growth and resulting development in California since World War II have been substantial, fueling the need for increased water supply.

California's population has grown rapidly in recent years, with resulting changes in land use. This growth is expected to continue. From 1990 to 2005, California's population increased from about 30 million

to about 36.5 million. Based on this trend, California's population has been projected to be more than 47.5 million by 2020. The "current trends" scenario depicted in the *California Water Plan 2009* for year-2050 conditions assumed a population of nearly 60 million—double the 1990 population.

The amount of water available in California—or in different parts of the state—can vary greatly from year to year. Some areas may receive 2 inches of rain a year, while others are deluged with 100 inches or more. As land uses have changed, population centers have grown up in many locations where there is not a sufficient local water supply. Thus, Californians have always been faced with the problem of how best to conserve, control, and move water from areas of abundant water to areas of water need and use.

To help assure that their water supply is sufficient to meet their demands, water districts develop "water management portfolios" that reflect diversity in water sources and locations. Components of a sustainable water portfolio include conservation, improved efficiency in use, rainwater and runoff capture, use of groundwater aquifers for storage and treatment, improved water treatment, desalination, and a water recycling program.

Legislation on Ensuring a Reliable Water Supply

The laws described below impose specific requirements on both urban and agricultural water suppliers. These laws increase the importance to water suppliers of estimates of SWP water delivery reliability.

California Urban Water Management Planning Act

The California Urban Water Management Planning Act was enacted in 1983. As amended, this law (California Water Code, Sections 10610–10656) requires urban water suppliers to adopt water management plans every 5 years and submit those plans to DWR. Adoption of the most recent (2010) round of urban water management plans was required by July 1, 2011; the plans were due to DWR by August 1, 2011.

In their water management plans, urban water suppliers must assess whether their current and planned water supplies will be enough to meet the water demands expected during the next 20 years. The plans also consider various drought scenarios and the proper ways to respond in case of an unexpected water shortage.

DWR is required to review local water management plans and report on the status of these plans. DWR published a guidebook to preparing urban water management plans in March 2011. Guidance documents are available at http://www.water.ca.gov/urbanwatermanagement.

Water Conservation Act

The Water Conservation Act of 2009 (Senate Bill X7.7, Steinberg), enacted in November 2009, includes distinct requirements related to both urban and agricultural water use.

This law requires that the State of California reduce urban per capita water use statewide by 10% by the end of 2015 and 20% by the end of 2020. DWR is required to report on progress toward meeting these urban per capita water use goals.

In addition, agricultural water suppliers must adopt agricultural water management plans by the end of 2012, then update the plans by the end of 2015 and every 5 years thereafter.

Through its Agricultural Water Management Planning & Implementation Program (http://www.water.ca.gov/wateruseefficiency/agricultural/agmgmt.cfm), DWR helps water districts develop agricultural water management plans and implement cost-effective, efficient water management practices. DWR is currently preparing a guidebook for developing agricultural water management plans.

Background of This Report

This *State Water Project Delivery Reliability Report 2011* is the fifth in a series of reports on the SWP's water delivery reliability. DWR is legally required to prepare and distribute this report every 2 years to all SWP contractors (recipients of SWP water), city and county planning departments, and regional and metropolitan planning departments in the SWP's service area. Reports were previously produced for 2002, 2005, 2007, and 2009.

The requirement for a biennial water delivery reliability report was established in a settlement agreement among the Planning and Conservation League, DWR, SWP contractors, and others that was approved by the 3rd Circuit Court of Appeals in May 2003. The settlement agreement was reached in the aftermath of the "Monterey Amendments" case, which resolved a dispute about the environmental analysis of amendments to the long-term water supply contracts for the SWP that were entered into by DWR and most of the SWP contractors in the 1990s. The terms of the SWP contracts were amended after water shortages during the 1987–1992 drought drastically reduced SWP water deliveries to SWP contractors in the San Joaquin Valley and Southern California.

Attachment B to the settlement agreement specifies that each SWP delivery reliability report must include all of the following information:

- the overall water delivery capacity of the SWP facilities at the time of the report;
- the allocation of that SWP water to each SWP contractor;
- a discussion of the range of hydrologic conditions, which must include the historic extended dry cycle and long-term average; and
- the total amount of SWP water delivered to all contractors and the amount of SWP water delivered to each contractor during each of the 10 years immediately preceding the report.

DWR's water delivery reliability reports are used by various entities for water planning purposes. The reports must be presented in a format understandable by the public. The information presented in the reports is intended to help local agencies, cities, and counties that use SWP water to develop adequate, affordable water supplies for their communities.

Contents and Use of This Report

The following topics are addressed in this *State Water Project Delivery Reliability Report 2011*:

- The Summary at the front of this report briefly summarizes the updated findings on water delivery reliability detailed in previous chapters.
- Chapter 1, "Water Delivery Reliability: A Concern for Californians," summarizes important issues (including selected State legislation) that underlie the need to assess the SWP's water delivery reliability, provides background on DWR's water delivery reliability reports, and defines key terms.
- Chapter 2, "A Closer Look at the State Water Project," describes the SWP's purpose, background, and facilities. This chapter also introduces factors that interact in the Sacramento–San Joaquin Delta (Delta) to affect SWP operations: precipitation and snowmelt patterns, variable river inflows, operations of the federal Central Valley Project (CVP), Delta water quality concerns, regulatory requirements, and the Delta's physical conditions.
- Chapter 3, "SWP Contractors and Water Contracts," lists the SWP water contractors and shows where they are located, and describes the different types of SWP water allocations.
- Chapter 4, "Factors that Affect Water Delivery Reliability," explains generally how water delivery reliability is calculated. The chapter then describes a variety of factors that make forecasting water delivery

reliability inherently challenging. Among these complicating factors are climate change, environmental and policy planning efforts pertaining to the Delta, and the potential for levee breaches in the Delta.

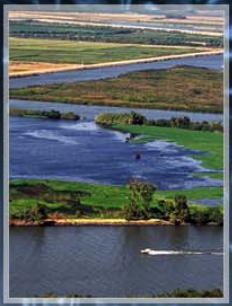
- Chapter 5, "SWP Delta Exports," discusses how the delivery estimates for the SWP have been reduced as a result of more restrictive operational rules. This chapter also presents the results of DWR's modeling of SWP exports from the Harvey O. Banks Pumping Plant for existing conditions (2011) and future conditions (2031).
- Chapter 6, "Existing SWP Water Delivery Reliability (2011)," estimates the SWP's delivery reliability for existing conditions (2011) and compares these estimates with the existing-condition results presented in the *State Water Project Delivery Reliability Report 2009*.
- Chapter 7, "Future SWP Water Delivery Reliability (2031)," estimates the SWP's delivery reliability for conditions 20 years in the future (2031), reflecting potential hydrologic changes that could result from climate change. This chapter also compares these estimates with the future-condition results presented in the *State Water Project Delivery Reliability Report 2009*.
- Appendix A, "Historical SWP Delivery Tables for 2001–2010," presents the historical deliveries for SWP contractors over the last 10 years.

In addition, a technical addendum has been prepared for this report and includes more specific details of the technical analyses and results. Urban and agricultural water suppliers can use the information in this report and the technical addendum when they prepare or amend their water management plans. These details will help them decide whether they need new facilities or programs to meet future water demands. The technical addendum is available upon request and is posted online, along with this report, at http://baydeltaoffice.water.ca.gov.

Urban water suppliers can also use this information when, as required by the California Environmental Quality Act, they analyze whether enough water is available for proposed subdivisions or development projects.

Chapter 2

A Closer Look at the State Water Project



Northern California typically receives abundant rainfall and runoff from mountain snowpack. However, a larger percentage of California's population lives in Southern California and most irrigated farmland lies in Central California. These regions are mostly arid, and local water suppliers cannot fully meet the needs of many of their communities. These areas rely on additional imported water, especially to meet shortages during dry years and the demands of increasing populations. The SWP was constructed to help meet these needs.

Purpose and Background of the SWP

The SWP is the largest state-built, multipurpose, user-financed water project in the United States. More than two-thirds of California's residents—25 million people—receive at least part of their water from the SWP. Project water also supplies thousands of industries and irrigates about 750,000 acres of California farmland. Of the SWP's contracted water supply, 70% goes to urban users and 30% goes to agricultural users.

The primary purpose of the SWP is to provide a water supply—that is, to divert and store water during wet periods in Northern and Central California and distribute it to areas of need in Northern California, the San Francisco Bay area, the San Joaquin Valley, the Central Coast, and Southern California. Other SWP purposes include flood control, power generation, recreation, fish and wildlife enhancement, and water quality improvement in the Delta.

These purposes have been discussed at length for many decades. The concept of a statewide water development project was first raised in 1919 when Lt. Robert B. Marshall of the U.S. Geological Survey proposed transporting water from the Sacramento River system to the San Joaquin Valley, then moving it over the Tehachapi Mountains into Southern California.

In the 1930s, State Engineer Edward Hyatt proposed the "State Water Plan," which identified the facilities needed and economic means to transfer water from

north to south. The California Legislature authorized the project in the Central Valley Act of 1933, and a $170 million bond act was approved by California voters in December 1933. However, the Great Depression precluded the State from obtaining the necessary funding. The U.S. government funded the construction of major components of the plan, which became the federal CVP. (See "The Central Valley Project and Its Relationship to the SWP" later in this chapter.)

As California's population grew after World War II, investigations of statewide water resources resumed. In 1945, DWR's predecessor, the Division of Water Resources of the Department of Public Works, conducted a variety of studies that culminated in the Feather River Project, presented to the State Legislature in 1951 by State Engineer A. D. Edmonston. A revised project proposal was presented in 1955. The Legislature appropriated funds for detailed studies of the Feather River Project, which evolved to become the SWP.

In 1959, the Legislature passed the California Water Resources Development Bond Act. This law, also known as the Burns-Porter Act, authorized $1.75 billion in bonds to build the SWP's initial facilities, contingent on voter approval. After California voters approved the Burns-Porter Act in November 1960, construction of the SWP by DWR began in the early 1960s, with water deliveries following.

SWP Facilities

Today, the SWP includes 33 storage facilities, 21 reservoirs and lakes, 20 pumping plants, four pumping-generating plants, five hydroelectric power plants, and about 700 miles of canals and pipelines. Figure 2-1 shows the primary SWP facilities.

Facilities North of the Delta

The SWP's watershed encompasses the mountains and waterways around the Feather River in Plumas County. Rain and melting snow run off mountainsides and into waterways that flow into Lake Oroville, where the SWP officially begins. With a capacity of about 3.5 million acre-feet, Lake Oroville is the SWP's largest storage facility. The water management facilities of Lake Oroville are designed to maximize energy production and include six power generating units and six pumping/generating units. Three hydroelectric power plants operate at Oroville.

Oroville Dam.

When water is needed, Oroville Dam releases water into the Feather River, which converges with the Sacramento River north of the city of Sacramento. Releases from Shasta and Folsom Reservoirs, facilities of the federal CVP, also flow into the Sacramento River. The Sacramento River flows into the Delta, where it mixes with water from the San Francisco Bay and is influenced by the tides. From the Delta, some of this water is pumped by the Barker Slough Pumping Plant into the North Bay Aqueduct for municipal use by Napa and Solano Counties.

Figure 2-1. Primary State Water Project Facilities

Facilities in the Delta and Central California

The SWP's primary pumping plant, the Harvey O. Banks Pumping Plant, is located in the south Delta in Alameda County. The pumps at the Banks Pumping Plant lift Delta water stored in the Clifton Court Forebay into the California Aqueduct, which at 444 miles long is the longest water conveyance system in California. At Bethany Reservoir, some SWP water is diverted from the California Aqueduct into the South Bay Aqueduct, which serves urban and agricultural uses in Alameda and Santa Clara Counties.

Harvey O. Banks Pumping Plant.

Water in the California Aqueduct flows into the San Luis Joint-Use Complex located in Merced County, which is jointly owned by the SWP and the CVP. Among the facilities at the complex is San Luis Reservoir, which is the world's largest offstream reservoir, with storage space for more than 2 million acre-feet of water. (An "offstream reservoir" is a water body that does not impede and store natural flows directly within a stream course, but instead is located "offstream"; stored water is diverted elsewhere and conveyed to the offstream reservoir by a pipeline or aqueduct.) Generally, water is pumped into San Luis Reservoir from late fall through early spring and is stored temporarily before being released back to the California Aqueduct to meet the higher summertime water demands of SWP (and CVP) contractors.

Facilities in the San Joaquin Valley and Southern California

After leaving the San Luis Joint-Use Complex, water travels through the central San Joaquin Valley via a jointly owned federal/State portion of the California Aqueduct. Along the way, deliveries are made to San Joaquin Valley contractors of both the SWP and the CVP. Near Kettleman City in Kings County, the SWP's Coastal Branch Aqueduct branches off to serve SWP contractors in San Luis Obispo and Santa Barbara Counties. The California Aqueduct continues southeast until, at the base of the Tehachapi Mountains, it reaches the A. D. Edmonston Pumping Plant, the SWP's largest pumping station.

A. D. Edmonston Pumping Plant.

The Edmonston Pumping Plant, located in Kern County, is an engineering marvel. It is the highest single-lift pumping plant in the world. The 14 pumps at this facility, each weighing

more than 400 tons and powered by 80,000-horsepower motors, raise water from the California Aqueduct 1,926 feet—more than one and one-half times the height of New York's Empire State Building—to enter 10 miles of tunnels and siphons that cross the Tehachapi Mountains.

After crossing the mountains, the water splits into two branches, the West Branch and East Branch, and is delivered to SWP contractors in Southern California. The southernmost SWP facility, located at the end of the East Branch, is Lake Perris in Riverside County.

The Delta and Factors Affecting SWP Operations and Deliveries

The Delta forms the eastern portion of the San Francisco estuary. It is composed of 738,000 acres of land interlaced with hundreds of miles of waterways that receive runoff from about 40% of the state's land area. The Delta is one of the few estuaries in the world that is used as a major source of drinking water supply. The Delta is important not only to SWP operations, but to California's economy. About $400 billion of California's $1.5 trillion economy is supported by water from the Delta, as noted by DWR and the California Department of Fish and Game (DFG) in the 2008 report, *Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento/San Joaquin Delta*.

Numerous competing demands converge in the Delta—especially the need to provide water for both agricultural and urban uses and the desire to protect habitat for endangered species.

In the SWP conveyance system, the Delta is the critical link between the water supplies in the Sacramento Valley and the water demands of, and deliveries to, the rest of the Central Valley and Southern California. Physically, the Delta is the focal point for water distribution in California because most of the SWP contractors are located at points south of the Delta.

However, the Delta has long been an area of numerous competing demands; for example, the Delta provides water for millions of Californians, but also serves as important habitat for hundreds of animal, plant, and fish species, some of which are listed under the federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA) as threatened or endangered. It also supports a local population of more than 500,000 and millions of visitors who use the Delta's recreational areas, navigable waterways, and marinas. Further, not only do SWP and CVP contractors use Delta water for agriculture, but local farmers within the Delta itself use its water to irrigate their crops planted on the numerous Delta islands.

The SWP's ability to pump water from the Delta is not affected only by the physical size and capacity of the pumps at the Banks Pumping Plant. As described below, the Delta is affected by numerous factors that interact to affect SWP operations and water deliveries:

- Delta inflows (i.e., the combined total of water flowing into the Delta from the Sacramento River, San Joaquin River, and other rivers and waterways),
- beneficial uses and water rights,
- Delta water quality standards,
- regulatory requirements,
- concurrent CVP operations and pumping, and
- physical factors.

Delta Inflows

Delta inflow varies considerably from year to year. Levels of development upstream of the Delta along the rivers and their watersheds—in the areas from which the water originates—affect Delta inflows. For example, in an above-normal year, nearly 85% of the total Delta inflow comes from the Sacramento River, more than 10% comes from the San Joaquin River, and the rest comes from three eastside streams (the Mokelumne, Cosumnes, and Calaveras Rivers) (Figure 2-2).

The type of water year is also an important factor affecting the volume of Delta inflows. When hydrology is analyzed, water years are designated by DWR as "wet," "above normal," "below normal," "dry," or "critical" based on the amount of rain and snow that fell during the preceding period of October 1–September 30. DWR hydrologists and meteorologists measure snowpack in the northern Sierra Nevada on or about the first of January, February, March, April, and May, in the watersheds where most of the state's water supply originates, to forecast snowmelt runoff—and thus available water supply—for the coming spring and summer.

All other factors (such as upstream development) being equal, much less water will flow into the Delta during a dry or critical water year—that is, during a drought—than during a wet or above normal water year. Fluctuations in inflows are a substantial overall concern for the Delta, and a specific concern for the SWP; such fluctuations affect Delta water quality and fish habitat, which in turn trigger regulatory requirements that constrain SWP Delta pumping. For example:

- As discussed below under "Delta Water Quality Standards," lower inflows can cause Delta water to become increasingly saline and trigger additional upstream reservoir releases and/or reduced Delta pumping to meet regulatory requirements.
- Conditions for fish in the Delta are less suitable in drier years, as seen during California's 1987–1992 drought, which can also trigger regulatory requirements that reduce SWP pumping.

Delta inflows will also vary by time of year because the amount of precipitation varies by season. About 80% of annual precipitation occurs between November and March, and very little rain typically falls from June through September. A seasonal mismatch of water supply and demand typically exists; runoff is greatest in winter and spring, but water demands peak in summer. Upstream reservoirs dampen this variability by reducing flood flows and storing water to be released later in the year to meet water demands and flow and water quality requirements.

Delta Water Quality Standards

Water quality standards for the Delta also affect SWP operations. The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) defines "beneficial uses" of waters of the State (both surface water and groundwater) that must be protected against quality degradation. These beneficial uses include domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. The criteria based on those uses, called "water quality objectives," are found in the water quality control plans adopted by the State Water Resources Control Board and the nine regional water quality control boards. The SWP and CVP must meet specific criteria for salinity during certain times of the year at various locations in the Delta, as described further under "Factors that Can Influence the SWP's Water Delivery Reliability" in Chapter 4.

Salinity levels can be affected by the water year type: Inflows into the Delta decline in dry and

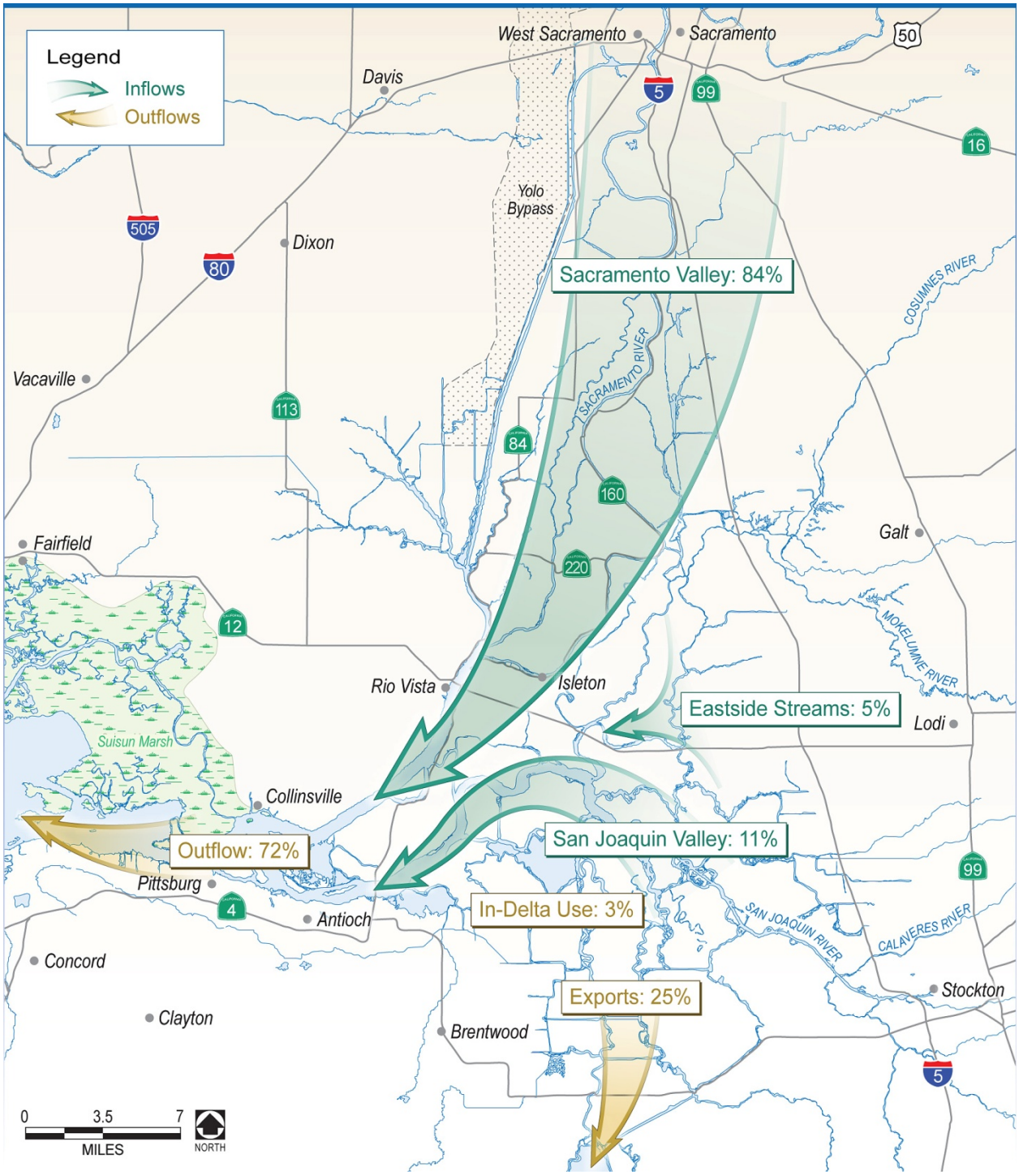


Figure 2-2. Water Year 2000 (Above-Normal) Delta Water Balance (Percent of Total)

critical water years, but daily tidal inflow of salty water into the Delta from the Pacific Ocean remains generally the same, thus increasing Delta salinity. Excessive salinity may adversely affect crop yields and require more water for salt leaching, may require additional municipal and industrial treatment, may increase salinity levels in agricultural soils and groundwater, and is the primary water quality constraint to recycling wastewater. Salty water is both undrinkable and unusable for irrigation (and thus unsuitable for SWP and CVP contractors and farmers in the Delta), and is harmful to fish inhabiting the Delta, including endangered and threatened species. Climate change is also causing sea level rise, which is projected to substantially increase Delta salinities. Generally, Delta water quality is best during winter and spring and poorer through the summer irrigation season and early fall.

SWP operations are closely regulated by the water quality standards contained in State Water Resources Control Board Water Right Decision 1641 (D-1641). D-1641 was issued in December 1999 (with a revised version issued in March 2000) to implement the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta* (1995 WQCP). The 1995 WQCP established beneficial uses of Delta water, associated water quality objectives for the reasonable protection of beneficial uses, and an implementation program to achieve the water quality objectives.

D-1641 assigned primary responsibility for meeting many of the water quality objectives established in the 1995 WQCP to the SWP (thus, to DWR) and the CVP (thus, to Reclamation). To meet these objectives, D-1641 limits or curtails SWP and CVP pumping operations in certain parts of the year. For example, D-1641 imposed limits on the ratio of SWP and CVP exports to total inflow into the Delta. This "export-inflow ratio" varies by time of year.

Regulatory Requirements

The Delta provides important habitat for fish species listed as threatened or endangered under either the federal ESA or the CESA, or both. Several resource agencies have taken actions under their authorities to protect these species. Regulatory requirements based on recent biological opinions (BOs) issued by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for CVP and SWP operations are a particularly important factor affecting SWP operations. DFG also regulates the protection of species under the CESA, and has issued consistency determinations in the past when it has found federal BOs to be consistent with CESA for State-listed species.

Delta smelt.

A BO is a determination by USFWS or NMFS on whether a proposed federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. If jeopardy is determined, certain actions are required to protect species of concern. Usually BOs apply specifically to federal actions, but DWR coordinates with Reclamation in the agencies' operation of the SWP and federal CVP. Since the passage of the federal ESA in 1973, various BOs have been issued by USFWS and NMFS for the effects on federally listed endangered species of these coordinated operations.

NMFS administers the ESA for marine fish species, including anadromous salmonids (those that spend a part of their life cycle in the sea and return to freshwater streams to spawn), such as

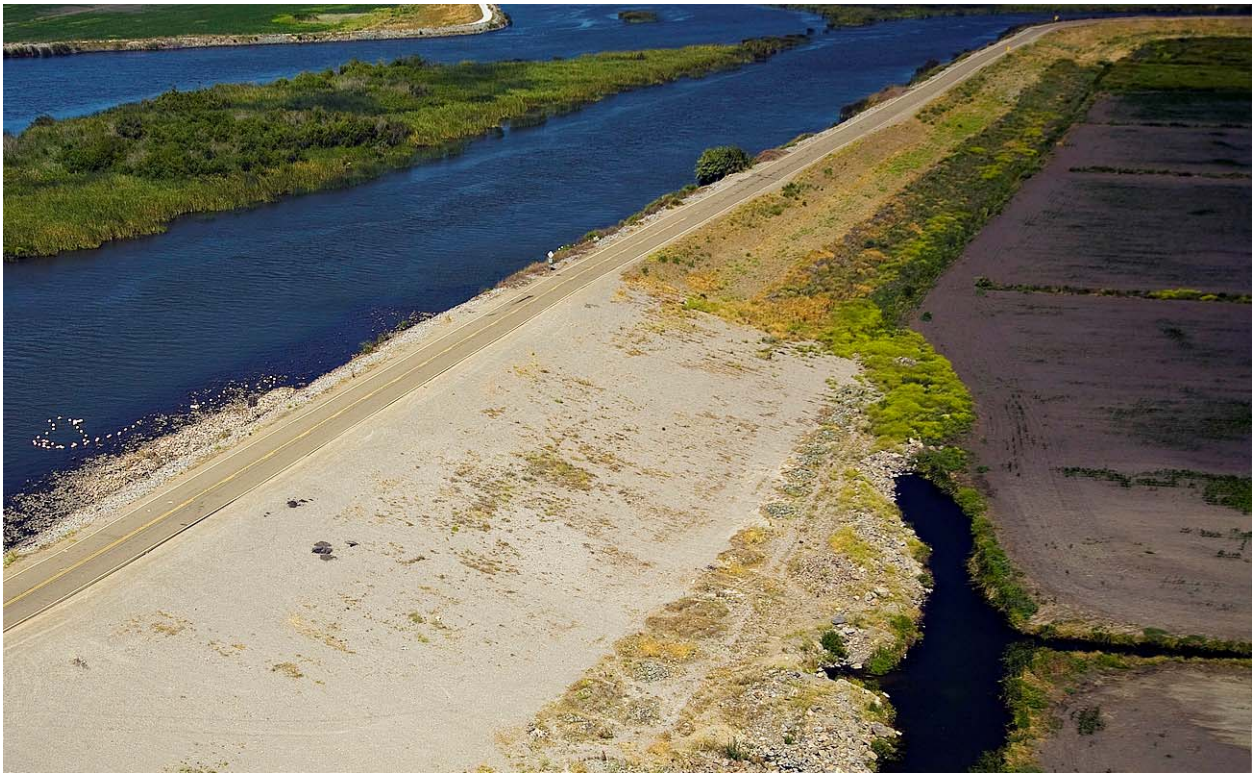
Central Valley steelhead, winter-run and spring-run Chinook salmon, and green sturgeon. USFWS administers the ESA for nonanadromous and nonmarine fish species, such as delta smelt and longfin smelt. Both anadromous and nonanadromous fish species are found in the Delta and are federally listed under the ESA.

If USFWS or NMFS finds that a proposed action is likely to jeopardize a listed species or adversely modify its critical habitat, the agency is required to identify "reasonable and prudent alternatives" (defined in Title 50, Section 402.02 of the Code of Federal Regulations) that it has determined would enable the project to go forward in compliance with the ESA.

Especially important to the SWP are the BOs issued by USFWS and NMFS in 2008 and 2009, respectively, for the coordinated operations of the CVP and SWP. Both of these BOs, which DFG found consistent with the CESA for State-listed species, have directly and substantially affected SWP operations and pumping levels in recent years: They incorporate terms that directly or indirectly limit the amount of CVP and SWP Delta pumping under certain conditions. Relative to prior years, SWP water deliveries estimated in the *State Water Project Delivery Reliability Report 2009*—the last edition of this report—were, in general, reduced by the operational restrictions of these BOs.

Concurrent Central Valley Project Operations and Pumping

CVP operations also affect the Delta as Reclamation diverts water for agricultural and urban uses. To make the most efficient use of the common water supply available to the CVP and SWP, Reclamation and DWR must work as closely as possible to coordinate their respective reservoir releases and Delta pumping operations. The CVP and SWP operate in conjunction according to the Coordinated Operation Agreement signed in 1986 by the two agencies.



Subsidence (sinking) of islands in the Delta places even more pressure on already fragile Delta levees.

The two projects share some of their facilities in the San Joaquin Valley—most notably the San Luis Unit, for which the major storage reservoir is San Luis Reservoir, and more than 100 miles of the California Aqueduct. In addition, the CVP and SWP are allowed to use each other's export pumping facilities in the south Delta—to pump water for each other—when operation of one set of pumps is affected by facility maintenance, capacity limitations, or fish protection requirements. Use of this "joint point of diversion" is subject to an operations plan that protects fish and wildlife and other legal users of water.

Physical Factors

The stability and reliability of SWP water deliveries can be threatened by physical factors affecting facilities or water quality anywhere in the SWP system. The Delta is particularly vulnerable. Delta islands have been subsiding and in some places the land has sunk to 20 feet below sea level. This places extra pressure on the Delta's levees because it means they must hold back water constantly rather than only during peak-flow periods.

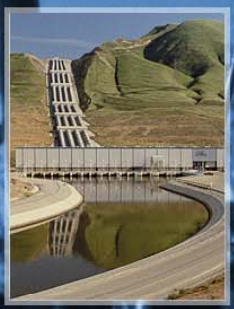
Climate change is causing sea level to rise, increasing pressure on Delta levees even further. Delta levees are also vulnerable because they were built 150 years ago and could be affected if an earthquake were to strike anywhere near the Delta.

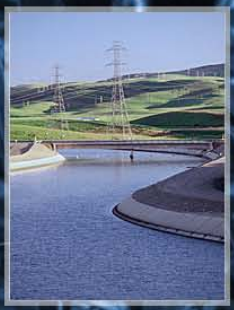
THE CENTRAL VALLEY PROJECT AND ITS RELATIONSHIP TO THE SWP

The federal Central Valley Project, operated by the U.S. Bureau of Reclamation, was originally conceived as a State of California project to protect the Central Valley from water shortages and floods. During the Great Depression, however, the State was unable to sell bonds to finance project construction, and beginning in the late 1930s, the U.S. government constructed the CVP as a public works project.

The CVP operates 18 dams and reservoirs, 11 powerplants, and 500 miles of canals and other facilities between the Cascade Range near Redding and the Tehachapi Mountains near Bakersfield. It serves agricultural, municipal, and industrial needs in the Central Valley and urban centers in parts of the San Francisco Bay Area, and is the primary water source for many Central Valley wildlife refuges. In an average year the CVP delivers about 7 million acre-feet of water for agriculture, urban, and wildlife use, irrigating about one-third (3 million acres) of California's agricultural lands and supplying water for nearly 1 million households (Reclamation 2009).

The CVP and SWP share some of their facilities, especially the San Luis Unit, and their respective operations staffs work closely together. The Coordinated Operations Agreement between the CVP and SWP, signed in 1986, outlines the shared responsibilities of each project to meet Delta water quality and flow objectives and provides for equitable sharing of surplus water that enters the Delta.





Chapter 3

SWP Contractors and Water Contracts

During the 1960s, as the SWP was created, long-term contracts were signed by DWR and 29 urban and agricultural water suppliers in various locations within California. The contracts are essentially uniform and will expire in 2035. These urban and agricultural water suppliers are referred to in this report as the "SWP contractors" or "contractors." This chapter introduces the SWP contractors, explains the basics of SWP water contracts, and describes the various types of project water, especially "Table A" water. The discussion also outlines some of the factors that influence delivery of Table A water.

About the SWP Contractors

The SWP contractors are located along the Feather River north of the Delta, in the north and south San Francisco Bay Area, along the Central Coast, in the San Joaquin Valley, and in Southern California. They include cities, counties, urban water agencies, and agricultural irrigation districts. Most contractors use the project water they receive for municipal purposes; several use the water for agriculture. The SWP contractors mostly use project water to supplement local supplies, including groundwater, or other imported water. The 29 SWP contractors are listed below and their locations are shown in Figure 3-1.

Feather River Area Contractors

- Butte County
- Yuba City
- Plumas County Flood Control and Water Conservation District

North Bay Area Contractors

- Napa County Flood Control and Water Conservation District
- Solano County Water Agency

South Bay Area Contractors

- Alameda County Flood Control and Water Conservation District, Zone 7
- Alameda County Water District
- Santa Clara Valley Water District

San Joaquin Valley Area Contractors

- Dudley Ridge Water District
- Empire West Side Irrigation District
- Kern County Water Agency
- Kings County
- Oak Flat Water District
- Tulare Lake Basin Water Storage District

Figure 3-1. State Water Project Contractors

Central Coastal Area Contractors

- San Luis Obispo County Flood Control and Water Conservation District
- Santa Barbara County Flood Control and Water Conservation District

Southern California Area Contractors

- Antelope Valley–East Kern Water Agency
- Castaic Lake Water Agency
- Coachella Valley Water District
- Crestline–Lake Arrowhead Water Agency
- Desert Water Agency
- Littlerock Creek Irrigation District
- Metropolitan Water District of Southern California
- Mojave Water Agency
- Palmdale Water District
- San Bernardino Valley Municipal Water District
- San Gabriel Valley Municipal Water District
- San Gorgonio Pass Water Agency
- Ventura County Watershed Protection District

How Water Contracts Work

Under the terms of their long-term water supply contracts with DWR, the 29 SWP contractors receive specified amounts of water from the SWP each year, called "annual allocations."

The SWP's long-term water supply contracts define the terms and conditions governing water delivery and repayment of project costs. In return for the allocated water, the SWP contractors repay principal and interest on both the bonds that initially funded construction of the SWP and the bonds that paid for additional facilities. The contractors also pay all costs, including labor and power, to maintain and operate project facilities. They also pay transportation charges based on the distance between the Delta and each contractor's water delivery point.

The contractors also contribute mitigation costs for any environmental impacts of SWP operations on fish and wildlife.

"Table A" Water

Table A is an exhibit to the SWP's water supply contracts. This section explains Table A water and outlines the primary factors that influence the amount of such water actually delivered to SWP contractors.

What Is Table A Water?

The water supply–related costs of the SWP are paid for by SWP contractors. All water contracts signed in the 1960s included an estimate of the date that SWP water would first be delivered and a schedule of the amount of water the contractor could expect to be delivered annually. That amount of water, known as the contractor's annual Table A amount, was designed to increase gradually until the designated maximum for that SWP contractor was reached.

The total combined maximum Table A amount for all SWP contractors was initially 4,230 thousand acre-feet per year (taf/year), assuming full development of the SWP. At that time, this amount was referred to as the "maximum project yield." As a result of amendments to the water supply contracts in the 1990s, the current combined maximum Table A amount is 4,172 taf/year. Of this amount, 4,133 taf/year is the maximum Table A water available for delivery from the Delta. It is recognized that deliveries will be less than the established maximum Table A amount in some years and more than this amount in other years.

The maximum Table A amount is the basis for apportioning water supply and costs to the SWP contractors. Once the total amount of water to be delivered is determined for the year, all available water is allocated in proportion to each contractor's annual maximum SWP Table A amount. To reiterate, however, in some years the SWP cannot deliver the maximum amount

of 4,172 taf, but in other years, project supply exceeds that amount. Additionally, in some years contractors receive other classifications of water from the SWP, such as Article 21 water and turnback pool water. (See "Other Types of SWP Water" later in this chapter.)

The established maximum Table A amounts for the 29 SWP contractors vary widely (Table 3-1). The median is 42 taf; thus, the maximum allocations of Table A water for half of the SWP contractors exceed this amount, and for the other half they are less. As shown in Table 3-1, the largest Table A amount is held by the Metropolitan Water District of Southern California at 1,911,500 acre-feet; the smallest is held by the Littlerock Creek Irrigation District at 2,300 acre-feet.

The Table A amounts determine the maximum water a contractor may request each year from DWR. Table A amounts may also be used as a factor to allocate other available water supplies to each contractor. "Table A" or "Table A water" represents a portion or all of the annual Table A requested by the SWP water contractors and approved for delivery by DWR, based on hydrologic conditions, current reservoir storage, and combined requests from the SWP water contractors. DWR is not always able to deliver the quantity of water requested by contractors. In these cases, and under certain conditions, a lesser amount is allocated and delivered according to the long-term water supply contracts by prorating the amount in proportion to each SWP water contractor's maximum Table A amount.

As discussed below, the water year type and the contractors' demand levels are among the factors involved in determining the amount of Table A water that will be delivered by DWR to each contractor. At various times of the year, DWR issues projections of anticipated Table A allocations based on then-current conditions, and updates those projections as warranted. The deliveries of Table A water to each of the SWP contractors in the last 10 years are shown in Appendix A.

Factors Influencing Percentages of Table A Water Delivery Amounts

The percentage of its maximum Table A amount that an SWP contractor will receive in any given year will vary depending on a variety of factors. The discussion below presents basic questions underlying these factors, which are described in greater detail later in this report.

Winter snowpack is an important factor determining annual Table A water deliveries.

Physical Availability of Water from Precipitation and Runoff

The amount and timing of precipitation and ensuing runoff to streams are important in determining how much water will be physically available to the SWP to pump and export from the Delta. The type of precipitation matters as well, along with anticipated patterns of use and consumption of the source water by entities other than the SWP.

The answers to the following questions influence the amount of water delivered to contractors each year:

- How much rain and snow fell within the last year?
- Which parts of California received the precipitation, and how much runoff resulted?

Table 3-1. Maximum Annual SWP Table A Water Delivery Amounts for SWP Contractors	
Contractor	Maximum Table A Delivery Amounts (acre-feet)
Feather River Area Contractors	
Butte County	27,500
Yuba City	9,600
Plumas County Flood Control and Water Conservation District	2,700
Subtotal	**39,800**
North Bay Area Contractors	
Napa County Flood Control and Water Conservation District	29,025
Solano County Water Agency	47,506
Subtotal	**76,531**
South Bay Area Contractors	
Alameda County Flood Control and Water Conservation District, Zone 7	80,619
Alameda County Water District	42,000
Santa Clara Valley Water District	100,000
Subtotal	**222,619**
San Joaquin Valley Area Contractors	
Dudley Ridge Water District	50,343
Empire West Side Irrigation District	2,000
Kern County Water Agency	982,730
Kings County	9,305
Oak Flat Water District	5,700
Tulare Lake Basin Water Storage District	88,922
Subtotal	**1,139,000**
Central Coastal Area Contractors	
San Luis Obispo County Flood Control and Water Conservation District	25,000
Santa Barbara County Flood Control and Water Conservation District	45,486
Subtotal	**70,486**
Southern California Area Contractors	
Antelope Valley–East Kern Water Agency	141,400
Castaic Lake Water Agency	95,200
Coachella Valley Water District	138,350
Crestline–Lake Arrowhead Water Agency	5,800
Desert Water Agency	55,750
Littlerock Creek Irrigation District	2,300
Metropolitan Water District of Southern California	1,911,500
Mojave Water Agency	82,800
Palmdale Water District	21,300
San Bernardino Valley Municipal Water District	102,600
San Gabriel Valley Municipal Water District	28,800
San Gorgonio Pass Water Agency	17,300
Ventura County Watershed Protection District	20,000
Subtotal	**2,623,100**
TOTAL TABLE A AMOUNTS	**4,171,536**

- Did rain come as a short intense storm or a long wet spell?
- Did more of the precipitation occur as snow in colder storms, or were storms warmer, resulting in more rain that produced higher peak runoff?
- Was snowmelt fast or gradual, and when did the bulk of the runoff occur?

For example, if substantial snowfall occurs late in the wet season, Sierra Nevada rivers can be full of melting snow later than usual in the year, as occurred in 2011. This allows the SWP's Delta pumping to continue at or near capacity for an extended duration, increasing the percentage of Table A water delivered. Conversely, if rain falls on snow early in the year, the resulting early snowmelt results in less water available for Delta pumping later in the year. Other factors affecting SWP delivery reliability are discussed in Chapter 4.

Local Facilities and Demands

A contractor's local diversion, storage, and conveyance facilities are important considerations in receiving water and in storing the water it receives. A contractor's water demands can also be affected by local weather patterns and water conservation measures. In some years, some contractors may rely more on water from sources such as groundwater or the Colorado River, while in other years they may rely more on the SWP.

The pattern of water demand on a water system can greatly affect the system's reliability. For example, if the demand occurs for only 3 months in summer, a water system with sufficient annual supply but insufficient water storage may not be able to reliably meet its customers' demands. If, however, the demand is distributed over the year, the system can more easily meet the demand because the need for water storage is reduced or storage could be increased.

Other Types of SWP Water

Regardless of water year type, Table A water is given first priority for delivery over other types of SWP water. Contractors have several options for what to do with the water that is allocated to them: use it, store it for later use, or transfer it to another contractor. Each long-term water contract describes several types of SWP water that are available to SWP contractors to supplement Table A water: "Article 21" water, carryover water, and turnback pool water. These other types of project water are discussed below and the related deliveries that occurred in each of the last 10 years are shown in Appendix A.

Article 21 Water

Article 21 water (so named because it is described in Article 21 of the water contracts) is water that SWP contractors may receive on a short-term basis in addition to their Table A water, if they request it. Because most SWP contactors often cannot meet their full demands with Table A water, Article 21 water should not be viewed as "surplus" or "extra" water. In fact, Article 21 water is used by many SWP contractors to help meet demands when allocations are less than 100%. Article 21 water is available to an SWP contractor only if the following conditions are met:

- "Excess water" is flowing through the Delta—that is, when releases from SWP and CVP reservoirs and unregulated flows into the Delta exceed Sacramento Valley water diversions, Delta exports, and flows needed to meet Delta water quality and flow requirements. If this scenario occurs, it is usually during December through May.
- The contractor is able to use the surplus water, such as by offsetting the use of groundwater that would otherwise occur, or can store it in its own system. (That is, the water will not be stored in an SWP facility, such as San Luis Reservoir.)

- Delivering this water would not interfere with Table A allocations, other SWP deliveries, or SWP operations.

SWP contractors requesting Article 21 water receive this water in the same proportion as their Table A water. Article 21 water becomes available only during wet months of the year, generally December through March. Unless the SWP contractor has facilities to routinely store or manage the Article 21 water it receives, such water is not likely to contribute significantly to local water supply reliability.

Carryover Water

"Carryover water" is SWP water that is allocated to an SWP contractor and approved for delivery to that contractor in a given year, but not used by the end of the year. (Note that SWP water deliveries are managed by calendar year, January 1–December 31, while hydrology is measured by water year, October 1–September 30.) This water is exported from the Banks Pumping Plant, but instead of being delivered to the contractor, it is stored in the SWP's share of San Luis Reservoir, when space is available, for the contractor to use in the following year.

Carryover water is like a water savings account that allows water managers flexibility in tough times—such as if the next year is a drought year and the contractor's allocation of SWP water is small. Carryover water was designed to encourage the most effective and beneficial use of water and to avoid obligating the contractors to use or lose the water by December 31 of each year.

With advance notice, SWP contractors can carry over water when they submit their initial request for Table A water, or within the last 3 months of the delivery year. They might do this for various reasons, such as local wet conditions or exchange and transfer arrangements. Storage for carryover water no longer becomes available to the contractors if it interferes with storage of SWP water for project needs.

Carryover water is stored in San Luis Reservoir.

Turnback Pool Water

SWP contractors may offer the portion of their allocated Table A water within the current year that exceeds their needs in a "turnback pool," where another contractor may purchase this water. DWR sets the price for water offered in turnback pools, which are established in February and March. Contractors that sell their extra Table A water in a turnback pool receive payments from contractors that buy water through the turnback pool.

Historical SWP Deliveries (2001–2010)

Please see Appendix A for tables listing annual historical deliveries from the Delta by various water classifications for each SWP contractor for 2001–2010. Similar delivery tables for years 1999–2008 are included in the 2009 Report.

Figure 3-2 shows that deliveries of SWP Table A water from the Delta for 2001–2010 range from an annual minimum of 1,049 taf to a maximum of 2,963 taf, with an average of 2,087 taf. Historical deliveries of SWP Table A water from the Delta over this 10-year period are less than the maximum of 4,133 taf/year.

Total historical SWP deliveries from the Delta, including Table A, Article 21, turnback pool, and carryover water, range from 1,236 to 3,727 taf/year, with an average of 2,524 taf/year for the period of 2001–2010 (Figure 3-3).

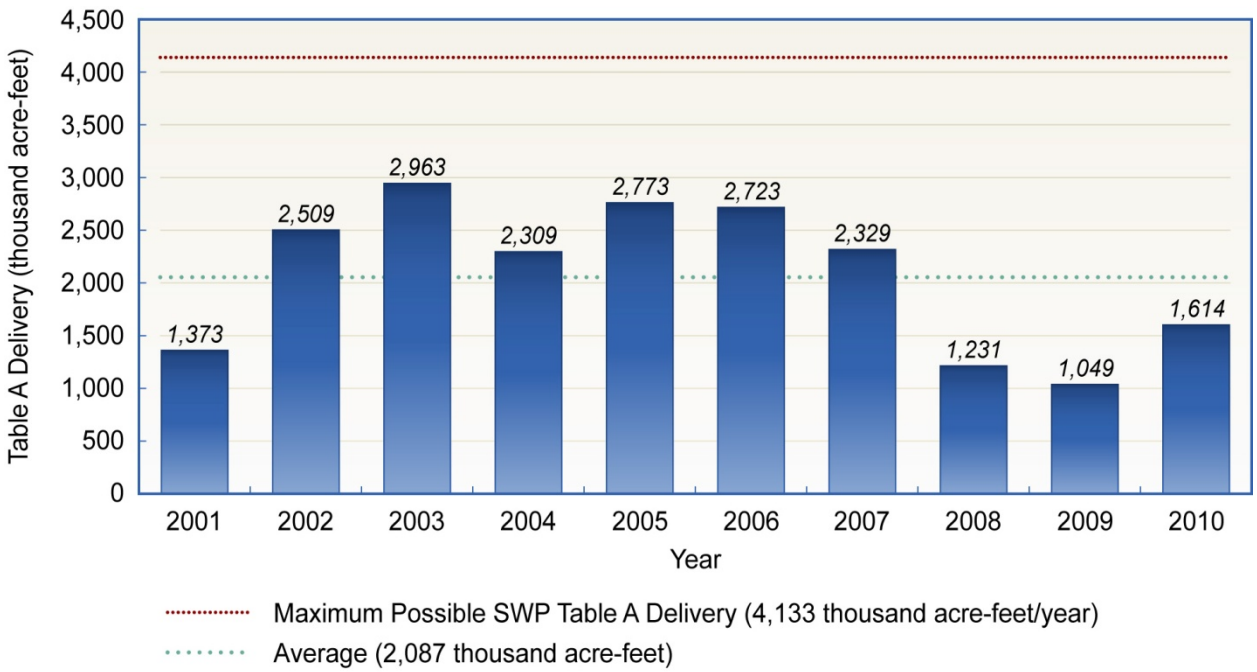
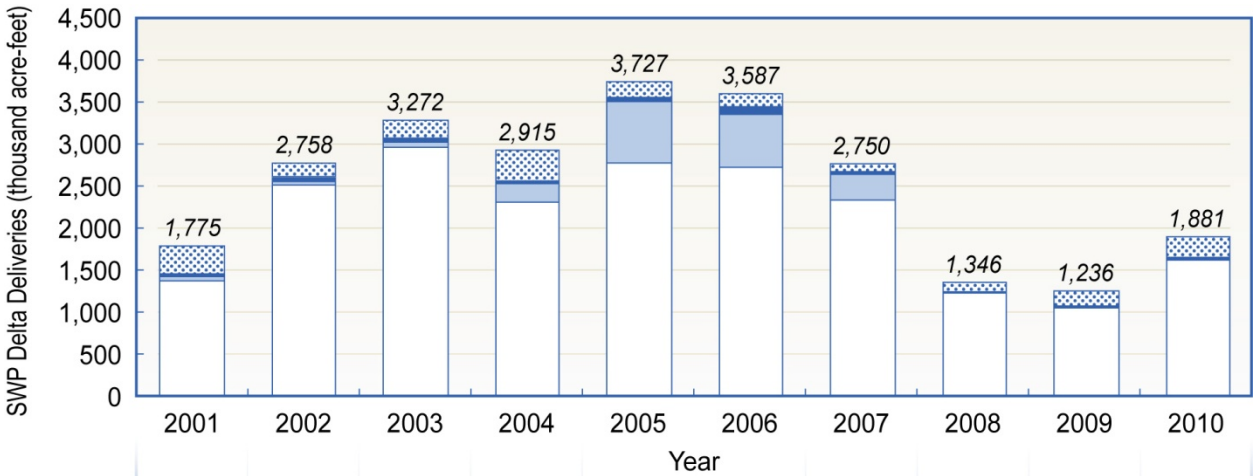


Figure 3-2. Historical Deliveries of SWP Table A Water from the Delta, 2001–2010



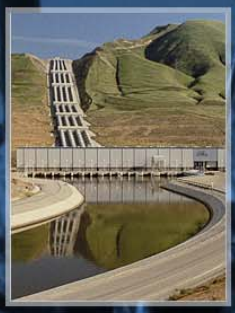
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Carryover	335	161	220	370	185	160	94	110	180	248
Turnback	18	45	30	17	38	73	16	3	2	11
Article 21	48	43	60	218	731	631	310	3	6	8
Table A	1,373	2,509	2,963	2,309	2,773	2,723	2,329	1,230	1,049	1,614

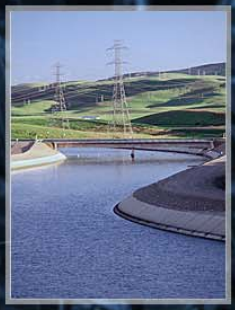
Note: Due to rounding, the total delivery may not equal the sum of individual delivery type line items.

Figure 3-3. Total Historical SWP Deliveries from the Delta, 2001–2010 (by Delivery Type)

Chapter 4

Factors that Affect Water Delivery Reliability





This chapter explains the concept of SWP water delivery reliability and how it is calculated by DWR. Some of the factors that influence the percentages of SWP Table A deliveries were introduced in Chapter 3, "SWP Contractors and Water Contracts." This chapter builds on that discussion, describing the most important factors that combine to affect SWP water delivery reliability. Among these natural and human-created factors are the availability of source water, regulatory restrictions on SWP operations, and the effects of climate change.

Uncertainty also exists because of the potential for an emergency such as an earthquake striking in or near the Delta, which, if substantial enough, could interrupt SWP exports from the Delta. This chapter describes various statewide efforts by DWR and other agencies to reduce risks to the Delta and enhance emergency response capabilities.

What Water Delivery Reliability Means to SWP Contractors

Water delivery reliability is the annual amount of SWP water that can be expected to be delivered to SWP contractors with a certain frequency. But what does that actually mean in practice?

In essence, it is a matter of probability—specifically, the likelihood that a contractor will receive a certain amount of water from the SWP in a particular year. From the contractor's perspective, water delivery reliability indicates an acceptable or desirable level of dependability of water deliveries to the people receiving the water. This information is vitally important to SWP contractors for their long-term water planning and operations. Will farmers have the amount of water they will need to plant permanent crops? Will urban and suburban water districts have sufficient water to serve planned development, or will they need to call for greater conservation measures by residents and businesses? These are examples of critical questions to which SWP contractors must have answers to serve their customers.

Usually, a local water agency, in coordination with the public it serves, determines the level of water delivery reliability that it considers acceptable. The water agency then plans for new facilities,

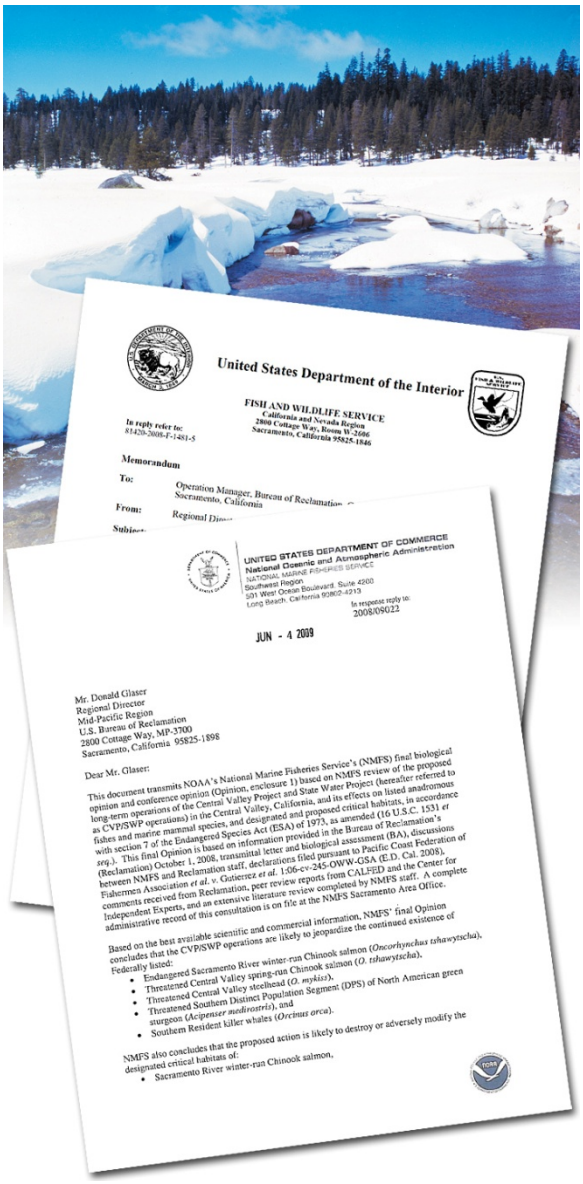
programs, or additional sources of water to meet or maintain this level of reliability.

Calculating SWP Water Delivery Reliability

DWR calculates the water delivery reliability of the SWP using the CalSim-II computer model, which simulates existing and future operations of the SWP. No model or tool can predict what actual, natural water supplies will be for any year or years, but a system of probability can be used to calculate water delivery reliability. The analyses of SWP delivery reliability contained in Chapters 6 and 7 of this report are based on modeling conducted using 82 years of historical data (water years 1922–2003) for rainfall and runoff. Those data were adjusted to reflect current and future levels of development in the source areas. The resulting data were then used to forecast the amount of water available to the SWP under current and future conditions (with the effects of climate change factored into the modeling for future conditions). The annual amounts of estimated SWP water deliveries are ranked from smallest to largest and the probability that various quantities of SWP Table A water will be delivered to each SWP contractor is estimated.

Factors that Can Influence the SWP's Water Delivery Reliability

Forecasting water delivery reliability is a difficult task because California is such a large state with numerous microclimates. In a typical year, some areas receive as little as 2 inches of rain, while others receive more than 100 inches. In addition, the determinants of water delivery for a specific water supply system continually change over time and can be difficult to determine and/or model. For example, water use in Sacramento River watersheds has increased over time. The historical data upon which a water supply forecast is based must be adjusted to reflect the current and, if necessary, future use in these watersheds.



Natural factors such as snowmelt and human influences such as federal biological opinions can both influence the SWP's water delivery reliability.

The following factors affect the ability to estimate existing and especially future water delivery reliability:

- water availability at the source,
- water rights with priority over the SWP,
- regulatory restrictions on SWP Delta exports (imposed by federal biological opinions [BOs] and State water quality plans),
- climate change,

- ongoing environmental and policy planning efforts, and
- Delta levee failure.

Water Availability at the Source

This factor affects the SWP's water delivery reliability because it is inherently variable; availability of water at the source depends on the amount and timing of rain and snow that fall in any given year, the amount and timing of runoff, and the level of development (that is, the use of water) in the SWP's source areas. The location, amount, and form of precipitation in California in any given year cannot be accurately predicted, introducing the greatest uncertainty to the availability of future SWP source water and hence future SWP deliveries.

Generally, during a single dry year or two, surface water and groundwater storage can supply most water deliveries, but dry years can result in critically low water reserves.

DWR measures the water content of snowpack in the northern Sierra Nevada to forecast snowmelt runoff.

Greater reliance on groundwater during dry years results in high costs for many users and increases groundwater overdraft. Further, the ability of some contractors to use local groundwater may be limited; some groundwater basins may be contaminated by toxins such as methyl tertiary butyl ether (commonly known as MBTE), an ingredient in gasoline, and other aquifers may be too deep to reach economically. This makes the availability of the SWP's surface water to contractors especially important.

DWR manually measures snowpack in the northern Sierra Nevada monthly between early January and early May to forecast snowmelt runoff. These surveys and real-time electronic measurements taken throughout the winter measure the snowpack's water content. The size of the snowpack in the Feather River watershed on April 1—when snowpack water content normally is at its peak before the spring runoff—and the storage in Lake Oroville are key components of the SWP's delivery capabilities from April through September.

However, in some years, even measurements taken in the northern Sierra Nevada earlier in the year can demonstrate an apparent trend in water delivery reliability for the rest of the year (assuming that the weather follows typical patterns in spring). For example, manual readings conducted by DWR on December 28, 2010, off U.S. Highway 50 near Echo Summit showed snow-water equivalents in the state's northern mountains at 169% of normal for that date and 57% of the normal value for April 1. By contrast, the readings taken on the same date in 2009 had indicated snow-water equivalents in the northern mountains at 77% of normal for the date and 26% of the normal value for April 1. These findings indicated the potential for SWP deliveries in 2011 to increase relative to deliveries that occurred in 2010, a below-normal water year.

Water Rights with Priority Over the SWP

California's water rights system affects the SWP indirectly. There are two types of legally protected rights to surface water in California:

- *Appropriative* water rights allow the user to divert surface water for beneficial use. The user must first have obtained a permit from the State Water Resources Control Board (State Water Board), unless the appropriative water right predates 1914. Appropriative water rights may be lost if the water has gone unused for 5 years. The SWP diverts water from the Delta under appropriative water rights.
- *Riparian* water rights apply to lands traversed by or bordering on a natural watercourse. No permit is required to use this water, which must be used on riparian (adjacent) land and cannot be stored for later use.

Generally, the priority of an appropriative water right in California is "first in time, first in right"; therefore, an appropriative water right is subordinate to all prior water rights, whether appropriative or riparian. This means that if another entity with a prior water right increases its use of one of the SWP's sources of water supply—the Delta, the upstream Sacramento or San Joaquin River, or a tributary to either river—the overall amount of water available to the SWP will decrease. Thus, water users with prior water rights are assigned top priority for water in DWR's modeling of the SWP's water delivery reliability, even ahead of SWP Table A water deliveries.

Regulatory Restrictions on SWP Delta Exports

Multiple needs converge in the Delta: the need to protect a fragile ecosystem, to support Delta recreation and farming, and to provide water for agricultural and urban needs throughout much of California. Various regulatory requirements are placed on the SWP's Delta operations to protect special-status species such as delta smelt and spring- and winter-run Chinook salmon. As a result, as described below, restrictions on SWP operations imposed by State and federal agencies contribute substantially to the challenge of accurately determining the SWP's water delivery reliability in any given year.

Biological Opinions on Effects of Coordinated SWP and CVP Operations

Several fish species listed under the federal Endangered Species Act (ESA) as endangered or threatened are found in the Delta. The continued viability of populations of these species in the Delta depends in part on Delta flow levels. For this reason, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have issued several BOs since the 1990s on the effects of coordinated SWP/CVP operations on several species.

These BOs affect the SWP's water delivery reliability for two reasons. Most obviously, they include terms that specifically restrict SWP pumping levels in the Delta at certain times under certain conditions. In addition, the BOs' requirements are based on physical and biological phenomena that occur daily while DWR's water supply models are based on monthly data.

The first BOs on the effects of SWP (and CVP) operations were issued in February 1993 (NMFS BO on effects of project operations on winter-run Chinook salmon) and March 1995 (USFWS BO on project effects on delta smelt and splittail). Among other things, the BOs contained requirements for Delta inflow, Delta outflow, and reduced export pumping to meet specified incidental take limits. These fish protection requirements imposed substantial constraints on Delta water supply operations. Many were incorporated into the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta* (1995 WQCP), as described in the "Water Quality Objectives" section later in this chapter.

The terms of the USFWS and NMFS BOs have become increasingly restrictive in recent years. In December 2008, USFWS issued a new BO

covering effects of the SWP and CVP on delta smelt, and in June 2009, NMFS issued a BO covering effects on winter-run and spring-run Chinook salmon, steelhead, green sturgeon, and killer whales. These BOs replaced BOs issued earlier by the federal agencies.

The USFWS BO includes additional requirements in all but 2 months of the year. The BO calls for "adaptively managed" (adjusted as necessary based on the results of monitoring) flow restrictions in the Delta intended to protect delta smelt at various life stages. USFWS determines the required target flow, with the reductions accomplished primarily by reducing SWP and CVP exports. Because this flow restriction is determined based on fish location and decisions by USFWS staff, predicting the flow restriction and corresponding effects on export pumping with any great certainty poses a challenge. The USFWS BO also includes an additional salinity requirement in the Delta for September and October in wet and above-normal water years, calling for increased releases from SWP and CVP reservoirs to reduce salinity. Among other provisions included in the NMFS BO, limits on total Delta exports have been established for the months of April and May. These limits are mandated for all but extremely wet years.

The 2008 and 2009 BOs were issued shortly before and shortly after the Governor proclaimed a statewide water shortage state of emergency in February 2009, amid the threat of a third consecutive dry year. NMFS calculated that implementing its BO would reduce SWP and CVP Delta exports by a combined 5% to 7%, but DWR's initial estimates showed an impact on exports closer to 10% in average years, combined with the effects of pumping restrictions imposed by BOs to protect delta smelt and other species. The 2008 USFWS and 2009 NMFS BOs have been subject to considerable litigation. Recent decisions by U.S. District Judge Oliver Wanger changed specific operational rules for the fall/winter of 2011–2012, and both the USFWS BO and NMFS BO have been remanded to the agencies for further review and analysis. However, the operational rules specified in the 2008 and 2009 BOs continue to be legally required and are the rules used in the analyses presented in Chapters 5, 6, and 7 of this report. Chapter 5 presents a comparison of monthly Delta exports as estimated for this 2011 Report with those estimated for the 2005 Report, illustrating how the 2008 and 2009 BOs have affected export levels from the Delta.

The California Department of Fish and Game (DFG) issued consistency determinations for both BOs under Section 2080.1 of the California Fish and Game Code. The consistency determinations stated that the USFWS BO and the NMFS BO would be consistent with the California Endangered Species Act (CESA). Thus, DFG allowed incidental take of species listed under both the federal ESA and CESA to occur during SWP and CVP operations without requiring DWR or the U.S. Bureau of Reclamation to obtain a separate State-issued permit.

Specific restrictions on Delta exports associated with the USFWS and NMFS BOs and their effects on SWP pumping levels are described further in Chapter 5, "SWP Delta Exports," of this report.

Water Quality Objectives

Because the Delta is an estuary, salinity is a particular concern. In the 1995 WQCP, the State Water Board set water quality objectives to protect beneficial uses of water in the Delta and Suisun Bay. The objectives must be met by the SWP (and federal CVP), as specified in the water right permits issued to DWR and the U.S. Bureau of Reclamation. Those objectives—minimum Delta outflows, limits on SWP and CVP Delta exports, and maximum allowable salinity levels—are enforced through the provisions of the State Water Board's Water Right Decision 1641 (D-1641), issued in December 1999 and updated in March 2000.

DWR and Reclamation must monitor the effects of diversions and SWP and CVP operations to ensure compliance with existing water quality standards. Monitoring stations are shown in Figure 4-1.

Among the objectives established in the 1995 WQCP and D-1641 are the "X2" objectives. D-1641 mandates the X2 objectives so that the State Water Board can regulate the locations of the Delta estuary's salinity gradient during the months of February–June. X2 is the position in the Delta where the electrical conductivity (EC) level, or salinity, of Delta water is 2 parts per thousand. The location of X2 is used as a surrogate measure of Delta ecosystem health. For the X2 objective to be achieved, the X2 position must remain downstream of Collinsville in the Delta (shown in Figure 4-1) for the entire 5-month period, and downstream of other specific locations in the Delta on a certain number of days each month from February through June. This means that Delta outflow must be at certain specified levels at certain times—which can limit the amount of water the SWP may pump at those times at its Harvey O. Banks Pumping Plant in the Delta. Because of the relationship between seawater intrusion and interior-Delta water quality, meeting the X2 objective also improves water quality at Delta drinking-water intakes; however, meeting the X2 objectives can require a relatively large volume of water for outflow during dry months that follow months with large storms.

The 1995 WQCP and D-1641 also established an export/inflow (E/I) ratio. The E/I ratio, presented in Table 3 of the 1995 WQCP (SWRCB 1995:18–22), is designed to provide protection for the fish and wildlife beneficial uses in the Bay-Delta estuary (SWRCB 1995:15). The E/I ratio limits the fraction of Delta inflows that are exported. When other restrictions are not controlling, Delta exports are limited to 35% of total Delta inflow from February through June and 65% of inflow from July through January.

Climate Change

The *California Water Plan Update 2009* identified climate change as a key consideration in planning for the State's water management. California's reservoirs and water delivery systems were developed based on historical hydrology; future weather patterns have long been assumed to be similar to those in the past. However, as climate change continues to affect California, past hydrology is no longer a reliable guide to future conditions. This section discusses effects on the SWP that could result from specific aspects of climate change.

Decreased Water Availability with Reduced Snowpack

As the effects of climate change continue, mean temperatures are predicted to increase, both globally and regionally. Climate projections used to assess the reliability of California's future water supply forecast average air temperature increases for the Sacramento region of 1.3 to 4.0 degrees Fahrenheit by the middle of the 21st century and 2.7 to 8.1 degrees by the end of the century (California Climate Change Center 2009a:8). Climate change is anticipated to bring warmer storms that result in less snowfall at lower elevations, reducing total snowpack. Loss of snowpack is projected to be greater in the northern Sierra Nevada—and thus closer to the Feather River watershed, the origin of SWP water—than in the southern Sierra Nevada because of the relative proportions of land at low and middle elevations.

Snowmelt provides an average of 15 million acre-feet of water for California per year, slowly released from about April to July each year (DWR 2006:2-22). Much of the state's water infrastructure, including the SWP, was designed to capture slow spring runoff and deliver it during the drier summer and fall months. However, during the 20th century, the average early-spring

Figure 4-1. Delta Salinity Monitoring Locations of Importance to the SWP

snowpack in the Sierra Nevada decreased by about 10%, resulting in the loss of 1.5 million acre-feet of snowpack storage (DWR 2008:3). Using historical data and modeling, DWR projects that by 2050 the Sierra snowpack will be reduced from its historical average by 25% to 40% (DWR 2008:4). Increased precipitation falling as rain instead of snow during winter could result in a larger number of "rain-on-snow" events. This would cause the snow to melt earlier in the year and over fewer days than historically, thus adversely affecting availability of water for pumping by the SWP during summer.

Such reductions in snowpack could have dire consequences. Under climate change and in some years, water levels in Lake Oroville, the SWP's main supply reservoir, could fall below the lowest release outlets, making the system vulnerable to operational interruption. DWR expects that a water shortage worse than the one during the 1977 drought could occur in 1 out of every 6–8 years by the middle of the 21st century and in 1 out of every 3–4 years at the end of the century (California Climate Change Center 2009a:46). In those years, it is estimated that an additional 575,000–850,000 acre-feet per year of water would be needed to meet current regulatory requirements and to maintain minimum system operations. This could preclude the SWP from pumping as much water as it would otherwise.

Climate change is also expected to reduce the SWP's median reservoir carryover storage. Carryover water is like a water savings account for water managers to use during shortage periods. Thus, a climate change–generated reduction in the amount of carryover water available to SWP contractors would reduce the system's flexibility during dry and critical water years.

Increased SWP Water Demands

Even as water shortages may result from reduced snowpack, climate change may also cause water demand by SWP contractors to increase. Warmer temperatures may increase rates of evapotranspiration (loss of water from soil by evaporation and plant transpiration) and may extend growing seasons. A larger amount of water may be needed for irrigation of certain crops, urban landscaping, and environmental needs. Warmer temperatures will also increase evaporation from surface reservoirs. Reduced soil moisture and surface flow will disproportionately affect the environment and other water users that rely heavily on annual rainfall such as rainfed agriculture, livestock grazing on nonirrigated rangeland, and recreation.

Sea Level Rise

During the last century, sea level rose 7 inches along California's coast. Estimates of future sea level rise range from 4 to 16 inches by the middle of the 21st century and 7–55 inches by 2100 (DWR 2009b:4-37). The increases in sea level that are expected to continue could affect SWP water delivery reliability in several ways:

- Most of the land in the Delta is below sea level—by as much as 20 feet—as a consequence of ongoing subsidence (Figure 4-2). Increases in sea level could place more pressure on the Delta's already fragile levee system and, as a consequence, cause levee breaches that could threaten SWP Delta exports.
- As salty water from the Pacific Ocean moves farther upstream into the Delta, DWR could be required to increase the amounts of freshwater released from Lake Oroville to maintain compliance with Delta water quality standards.
- Sea level rise is expected to cause salt water to flow farther inland. The resulting increase in saltwater intrusion into coastal aquifers would make increasing amounts of groundwater unsuitable for water supply or irrigation (California Climate Change Center 2009b:80–81). The reduced availability of groundwater would likely contribute to further increases in demands for surface water from the SWP, especially by the coastal SWP contractors.

Source: DWR 1995:28

Figure 4-2. Areas of the Delta that Have Subsided to Below Sea Level

Adapting to Climate Change Effects in Forecasting Water Delivery Reliability

Chapter 7, "Future SWP Water Delivery Reliability (2031)," of this report estimates the SWP's delivery reliability for conditions 20 years in the future (2031), reflecting potential hydrologic changes that could result from climate change. Further details on these future projections are included in a technical addendum to this report (posted on the Internet and available upon request).

For purposes of this report and the technical addendum, the 2031 delivery estimates are based on a single median-impact future climate projection. To identify this projection, DWR analyzed the 12 climate projections for midcentury that were used in *Using Future Climate Projections to Support Water Resources Decision Making in California* (California Climate Change Center 2009a). The resulting water supply effects were examined to determine which one most closely represented the "central" or "median" projection. The analysis examined the following projected climate and hydrology variables and their effects on SWP exports: temperature, precipitation, total inflow to major reservoirs, shifts in timing of runoff, and Delta exports.

Ongoing Environmental and Policy Planning Efforts

As discussed earlier, the Delta is an essential part of the conveyance system for the SWP. SWP pumping at the Banks Pumping Plant is regulated to protect the many uses of the Delta. However, today's uses in the Delta are not sustainable over the long term under current management practices and regulatory requirements. As discussed below, two large-scale plans for the Delta that are in development could affect SWP water delivery reliability: the Delta Plan and the Bay Delta Conservation Plan (BDCP).

Delta Plan

After years of concern about the Delta amid rising water demand and habitat degradation, the Delta Stewardship Council was created in legislation to achieve State-mandated coequal goals for the Delta. As specified in Section 85054 of the California Water Code:

> "Coequal goals" means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

The draft Delta Plan seeks to reduce reliance on Delta water supplies. In a series of policies and recommendations, the draft plan aims to encourage farms and cities to increase conservation and become more self-sufficient, particularly in the event of a disaster in the Delta. It calls for agricultural water agencies to change pricing to encourage conservation. It also urges the State Water Board to set enforceable flow objectives for the Delta and its tributaries that take into account wildlife and habitat needs. In the future, government projects in the Delta must prove they are consistent with the Delta Plan.

The Delta Stewardship Council is preparing the draft Delta Plan and environmental impact report. Scheduled for adoption and implementation in 2012, the Delta Plan is intended to serve as California's guiding policy document for the Delta and Suisun Marsh for the next 88 years (that is, through the year 2099), with frequent updates.

Bay Delta Conservation Plan

The BDCP is being prepared by a group of local water agencies, environmental and conservation organizations, State and federal agencies, and other interest groups. An outgrowth of the CALFED Bay-Delta Plan's Ecosystem Restoration Program Conservation Strategy, the BDCP has been in development since 2006. The heart of the BDCP is a long-term conservation strategy that sets forth actions needed for a healthy Delta. The BDCP would do all of the following:

- identify conservation strategies to improve the overall ecological health of the Delta;
- identify ecologically friendly ways to move freshwater through and/or around the Delta;
- address toxic pollutants, invasive species, and impairments to water quality; and
- establish a framework and funding to implement the plan over time.

A draft environmental impact report is planned to be released for public review in mid-2012. The report is targeted to be final in 2013, after which a decision to proceed with the program would be made. Upon adoption, the BDCP would provide the basis for issuance of endangered species permits for the continued operation of the SWP and CVP. The plan would be implemented over a 50-year period.

Delta Levee Failure

The fragile Delta faces a multitude of risks that could affect millions of Californians. Foremost among those risks, as they could affect the SWP's water delivery reliability, are the potential for levee failure and the ensuing flooding and water quality issues.

The Delta Risk Management Strategy (DRMS) was initiated in response to Assembly Bill 1200 (2005), which directed DWR to use 50-, 100-, and 200-year projections to evaluate the potential impacts on Delta water supplies associated with continued land subsidence, earthquakes, floods, and climate change. The discussions below describe DRMS Phase 1, which evaluated the risks, and DRMS Phase 2, which is proposing various solutions. Also discussed are other efforts currently being undertaken by DWR and other agencies to reduce risks to the Delta, enhance emergency response capabilities, and reduce the risk of interruption of Delta water exports by the SWP and CVP.

Effects of Emergencies on Water Supplies: Delta Risk Management Strategy, Phase 1

Phase 1 of the DRMS, completed in 2008, assessed the performance of Delta and Suisun Marsh levees under various stressors and hazards and evaluated the consequences of levee failures to California as a whole.

The Delta is protected by levees built about 150 years ago. The levees are vulnerable to failure because most original levees were simply built with soils dredged from nearby channels, and were never engineered. Most islands in the Delta have flooded at least once over the past 100 years. For example, on June 3, 2004, a huge dry-weather levee failure occurred without warning on Upper Jones Tract in the south Delta, inundating 12,000 acres of farmland with about 160,000 acre-feet of water. Because many Delta islands are below sea level, deep and prolonged flooding could occur during a levee failure event, which could disrupt the quality and use of Delta water.

Levee failure can result from the combination of high river inflows, high tide, and high winds; however, levees can also fail in fair weather—even in the absence of a flood or seismic event—in a so-called "sunny day event." Damage caused by rodents, piping (in which a pipe-like opening develops below the base of the levee), or foundation movement could cause sunny-day levee breaches.

Many vulnerable Delta levees require installation of rock revetments, riprap, or other engineered structures along eroding banks to reduce erosion and protect levee foundations.

A breach of one or more levees and island flooding may affect Delta water quality and SWP operations. Depending on the hydrology and the size and locations of the breaches and flooded islands, a large amount of salt water may be pulled into the interior Delta from Suisun and San Pablo Bays. When islands are flooded, DWR may need to drastically decrease or even cease SWP Delta exports to evaluate the distribution of salinity in the Delta and avoid drawing saltier water toward the pumps.

Delta levees are prone to failure, increasing risks to State water supplies.

An earthquake could also put Delta levees, and thus SWP water supplies, at risk. In 2008, the 2007 Working Group on California Earthquake Probabilities estimated a probability of 63% that a magnitude 6.7 or greater earthquake would strike the San Francisco Bay Area in the next 30 years (Working Group 2008:6). An earthquake could severely damage Delta levees, causing islands to flood with salty water. The locations most likely to be affected by an earthquake are the west and southwest portions of the Delta because these areas are closer to potential earthquake sources. Flooding of the west and southwest Delta is also more likely to interfere with conveyance of freshwater to export pumps (DWR 2007:17).

Modeling of the effects of earthquakes on Delta islands was conducted by DWR for the DRMS Phase 1 report. Described in the *California Water Plan Update 2009*, the assessment found a 40% probability that a major earthquake occurring between 2030 and 2050 would cause 27 or more islands to flood at the same time. If 20 islands were flooded as a result of a major earthquake, the export of freshwater from the Delta could be interrupted by about a year and a half (DWR 2009b:5-15). Water supply losses of up to 8 million acre-feet would be incurred by SWP (and CVP) contractors and local water districts.

Managing and Reducing Risks: Delta Risk Management Strategy, Phase 2

The Phase 2 report for the DRMS, issued in June 2011, evaluates alternatives to reduce the risk to the Delta and the state from adverse consequences of levee failure (DWR 2011b). "Building blocks" (individual improvements or projects, such as improving levees or raising highways) and trial scenarios (various combinations of building blocks) were developed for the DRMS Phase 2 report. The building blocks fall into three main categories:

- conveyance improvements/ flood risk reduction and life safety,
- infrastructure risk reduction, and
- environmental risk mitigation.

The first of these categories is most relevant to the SWP in terms of reducing the risk of disruption of SWP Delta exports, but the environmental risk mitigation category includes a building block (Building Block 3.6) calling for reduction of water exports from the Delta.

Four trial scenarios were developed to represent a range of possible risk reduction strategies:

- *Trial Scenario 1—Improved Levees:* Improve the reliability of Delta levees against flood-induced failures by providing up to 100-year flood protection.
- *Trial Scenario 2—Armored Pathway (Through-Delta Conveyance):* Improve the reliability of water conveyance by creating a route through the Delta that has high reliability and the ability to minimize saltwater intrusion into the south Delta.
- *Trial Scenario 3—Isolated Conveyance Facility:* Provide high reliability for conveyance of export water by building an isolated conveyance facility on the east side of the Delta.
- *Trial Scenario 4—Dual Conveyance:* Improve reliability and flexibility for conveyance of export water by constructing an isolated conveyance facility and a through-Delta conveyance. (This scenario would be much like a combination of Trial Scenarios 2 and 3.)

The findings of the DRMS Phase 2 report on these scenarios, as they apply to seismic risk and potential for disruption of SWP Delta exports, are as follows:

- Trial Scenario 1 (Improved Levees) would not reduce the risk of potential water export interruptions, nor would it change the seismic risk of most levees.
- Trial Scenario 2 (Armored Pathway [Through-Delta Conveyance]) would have the joint benefit of reducing the likelihood of levee failures from flood events and earthquakes and of significantly reducing the likelihood of export disruptions.
- The effects of Trial Scenario 3 (Isolated Conveyance) would be similar to those for the Armored Pathway scenario, but Trial Scenario 3 would not reduce the seismic risk of levee failure on islands that are not part of the isolated conveyance facility.
- Trial Scenario 4 (Dual Conveyance) would avoid the vulnerability of water exports associated with Delta levee vulnerability and would offer flexibility in water exports from the Delta and/or the isolated conveyance facility. However, seismic risk would not be reduced on islands not part of the export conveyance system or infrastructure pathway.

As noted in the discussion of the "enhanced emergency preparedness/response" building block in the DRMS Phase 2 report, analyses on resuming water exports after a levee failure were conducted by the Metropolitan Water District of Southern California, an SWP contractor. The studies found that a promising way to resume water exports would be to place structural barriers at selected channel locations in the Delta and complete strategic levee repairs, thus isolating an emergency freshwater conveyance "pathway" through channels that may be surrounded by islands flooded with saline water (Moffatt and Nichol 2007, cited in DWR 2011b:5-1).

Delta Flood Emergency Preparedness, Response, and Recovery Program and Delta Multi-Hazard Coordination Task Force

In the last 5 years, DWR has worked to improve its ability to respond quickly and effectively to simultaneous levee failures on multiple islands within the Delta. The *Delta Emergency Operations Plan Concept Paper* released in April 2007 (DWR 2007) was the initial product of this effort. To enhance the State's ability to prepare for, respond to, and recover from a catastrophic Delta levee failure, DWR subsequently began development of the Delta Flood Emergency Preparedness, Response, and Recovery Program. This program is intended to supplement DWR's emergency operations plan. The goal is to protect lives, property, and critical infrastructure in the Delta while minimizing impacts on the ecosystem. The program consists of three components:

- develop DWR's Delta response and recovery plan,
- coordinate DWR's plan with other Delta flood emergency response agencies, and

- design and implement flood emergency response facilities within the Delta.

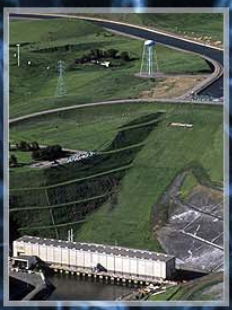
The flood emergency response plan for the Delta will describe the actions DWR will take before, during, and after a levee-endangering event or levee failure in the Delta. The Delta Flood Emergency Preparedness, Response, and Recovery Program is conducting an extensive effort to model water quality implications of levee failure and salinity changes associated with different levee repair strategies. DWR is coordinating this effort with the U.S. Army Corps of Engineers and expects to reach out to the five Delta counties during plan development.

DWR is also a member of the Sacramento–San Joaquin Delta Multi-Hazard Coordination Task Force, which was created in 2008 in the wake of passage of the Sacramento–San Joaquin Delta Emergency Preparedness Act of 2008. The task force is led by the California Emergency Management Agency (CalEMA); in addition to DWR, the Delta Protection Commission and representatives from each of the five Delta counties also participate in task force activities. An Emergency Preparedness and Response White Paper was prepared for the Delta Stewardship Council on November 8, 2010, describing the operations of this task force.

The Sacramento–San Joaquin Delta Multi-Hazard Coordination Task Force was created to make recommendations to CalEMA on creating a framework for an interagency unified command system, coordinate the development of a draft emergency preparedness and response strategy for the Delta region, and develop and conduct an all-hazards emergency response exercise in the Delta. The task force's draft emergency preparedness and response strategy includes a process for allocating scarce resources and a statement of priorities agreed to by the members of the task force. The original deadline for the task force's report has been legislatively extended to January 1, 2013.

Chapter 5

SWP Delta Exports



The purpose of this chapter is to illustrate the effects of factors described in Chapter 4, "Factors that Affect Water Delivery Reliability," on SWP water supplies transferred through the Delta and pumped at the Harvey O. Banks Pumping Plant in the south Delta. These supplies are referred to as "Delta exports." Past SWP delivery reliability reports characterized SWP deliveries in their entirety but did not focus specifically on Delta exports. This chapter describes SWP Delta exports to illustrate how regulatory requirements and climate change have affected or will affect the SWP's Delta water supplies, and to describe the general pattern of monthly SWP exports from the Delta.

This chapter focuses only on Delta exports that are associated with the SWP, not on CVP water that may have been exported through the Banks Pumping Plant via the CVP/SWP joint point of diversion.

This chapter briefly explains the difference between Delta exports and SWP deliveries, then describes trends in projected average annual exports and SWP Table A water deliveries under various recent existing-conditions scenarios. In addition, monthly exports estimated for this *State Water Project Delivery Reliability Report 2011* (2011 Report) are compared with those estimated for the *State Water Project Delivery Reliability Report 2005* (2005 Report) to illustrate the effect of regulatory restrictions.

This chapter also summarizes the primary factors influencing the SWP's Delta export operations and deliveries, presents estimates of exports for the existing-conditions and future-conditions scenarios, and characterizes the likelihood of such exports. Estimated SWP Delta exports by water year type are depicted relative to exports that were estimated for the existing-conditions and future-conditions scenarios in the *State Water Project Delivery Reliability Report 2009* (2009 Report).

SWP Delta Exports versus SWP Deliveries

SWP Delta exports and SWP deliveries are characterized in separate chapters (this chapter for Delta exports, Chapters 6 and 7 for SWP deliveries) because these two terms are not one and the same.

Water pumped from the Delta is the primary source of SWP supply for 24 of the

29 SWP water contractors listed in Chapter 3, "SWP Contractors and Water Contracts." (Occasionally, during very wet periods, flood flows can enter the aqueduct and contribute to SWP supply south of the Delta.) As used in this report, "Delta exports" are the water supplies that are transferred ("exported") directly to SWP contractors or to San Luis Reservoir storage via the Banks Pumping Plant.

SWP Delta exports do not include deliveries of SWP water to the two North Bay Area contractors, which receive SWP water pumped by the Barker Slough Pumping Plant and conveyed by the North Bay Aqueduct. (Water conveyed to the SWP's three Feather River Area contractors is not transferred through the Delta and is not the focus of this chapter or of Chapters 6 and 7.)

By contrast, SWP Table A water deliveries from the Delta include both water pumped by the Banks Pumping Plant and conveyed by the California Aqueduct and water pumped by the Barker Slough Pumping Plant and conveyed by the North Bay Aqueduct. Thus, Table A water deliveries, as described in Chapters 6 and 7, also include deliveries to the two North Bay Area contractors, for a total of 26 SWP contractors.

SWP Delta exports include nearly all types of SWP water, not merely Table A water (see the explanation of SWP water types in Chapter 3). As allowed under the SWP's water supply contracts, the amount pumped from the Delta can be exported in the same year as Table A water, or can be exported as Article 21 water if available. A contractor can opt to have exported Table A water held in San Luis Reservoir as carryover water—that is, as part of the contractor's supply for a subsequent year or made available to another SWP contractor as turnback pool water. Article 21 water must be delivered immediately to SWP contractors when exported and cannot be stored in SWP facilities.

Recent Trends in SWP Delta Exports and Table A Deliveries

SWP Delta exports and Table A deliveries estimated for this 2011 Report are reduced by the operational restrictions imposed on the SWP by the biological opinions (BOs) issued by the U.S. Fish and Wildlife Service (USFWS) in December 2008 and the National Marine Fisheries Service (NMFS) in June 2009. This same scenario occurred in the 2009 Report. By contrast, the *State Water Project Delivery Reliability Report 2007* (2007 Report) incorporated interim, less restrictive operational rules established by U.S. District Judge Oliver Wanger in December 2007 while the USFWS and NMFS BOs were rewritten. The 2005 Report was based on much less restrictive operational rules contained in the BOs that had been issued in late 2004 and 2005.

Overall trends in both SWP Delta exports and Table A deliveries under existing conditions are summarized below. (For further detail on estimated SWP Table A deliveries for the existing-conditions and future-conditions scenarios, respectively, see Chapters 6 and 7.)

Annual Exports and Table A Deliveries—2005–2011 Scenarios

Figure 5-1 illustrates the effect of the operational restrictions imposed by the USFWS and NMFS BOs on estimated average annual Delta exports and Table A water deliveries. The figure depicts the average values estimated for existing conditions in the 2005, 2007, 2009, and 2011 Reports.

As shown in Figure 5-1, estimated average annual Delta exports and SWP Table A water deliveries have generally decreased since 2005, when rules affecting SWP pumping operations began to become more restrictive. Under existing conditions, average annual Delta exports have decreased since 2005 from 2,958 thousand acre-feet per year (taf/year) to 2,607 taf/year in 2011, a decrease of 351 taf or 11.9%; average annual Table A deliveries have decreased since 2005 from 2,818 taf/year to

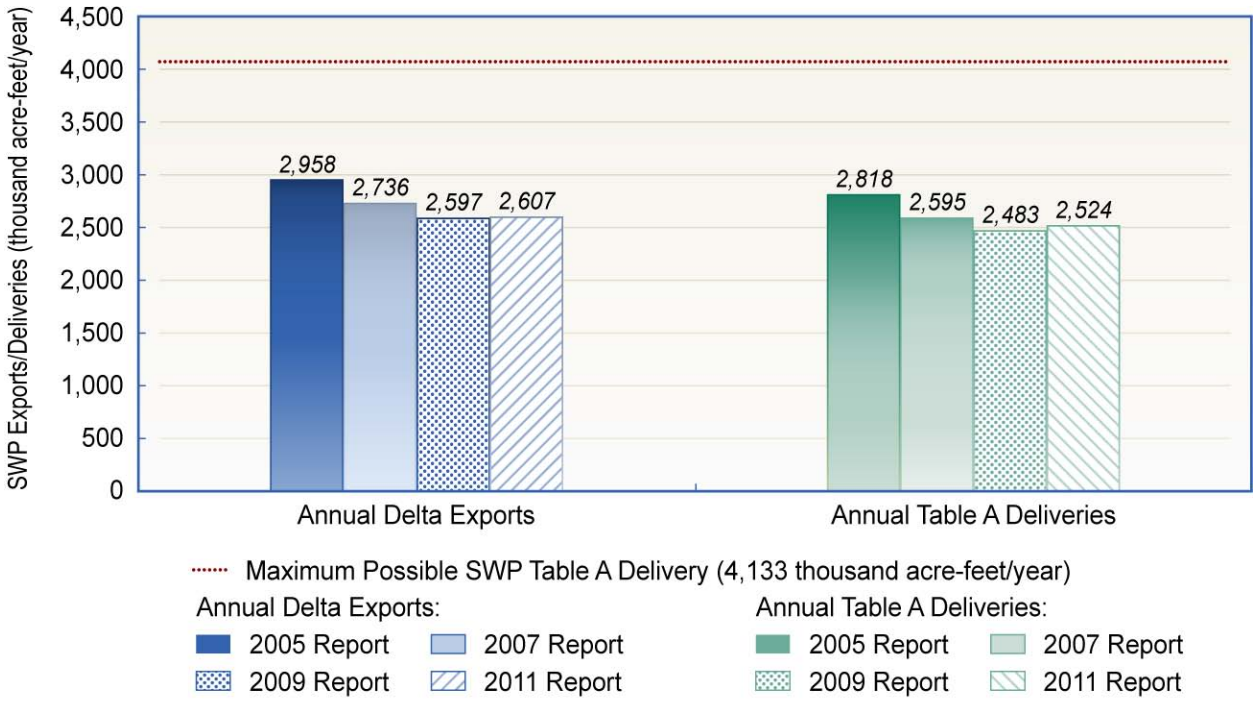


Figure 5-1. Trends in Estimated Average Annual Delta Exports and SWP Table A Water Deliveries (Existing Conditions)

2,524 taf/year in 2011, a decrease of 294 taf or 10.4%. The reasons for these decreases are described under "Primary Factors Affecting SWP Delta Export Operations and Table A Water Deliveries," below.

Monthly Delta Exports—2011 Scenario versus 2005 Scenario

Figure 5-2 illustrates the effects of the operational restrictions imposed by the BOs on SWP Delta exports since 2005 by comparing monthly existing-conditions exports estimated for this 2011 Report with those estimated for the 2005 Report. The bar charts show the average exports for each month under each scenario estimated for both reports.

As shown in Figure 5-2, average monthly SWP Delta exports estimated for the 2011 Report are lower than those estimated for the 2005 Report both in the first half of the year and from October through December. The reductions in exports for January through June are substantial, ranging from 22% in June to 58% in April. Exports for July and August as estimated for the 2011 Report exceed those estimated for the 2005 Report, but the increases (17% in August and approximately 45% in July) are generally smaller than the reductions seen earlier in the year.

Compiling the monthly average values for exports for the entire year under each scenario reveals that, as indicated previously in the description of annual exports, the average annual exports estimated for the 2011 Report are 11.9% less than those estimated for the 2005 Report.

Primary Factors Affecting SWP Delta Export Operations and Table A Water Deliveries

Under current operational constraints on the SWP, maximum exports from the Banks Pumping Plant are generally limited to 6,680 cubic feet per second, except between December 15 and March 15, when exports can be increased by one-third of the San Joaquin River

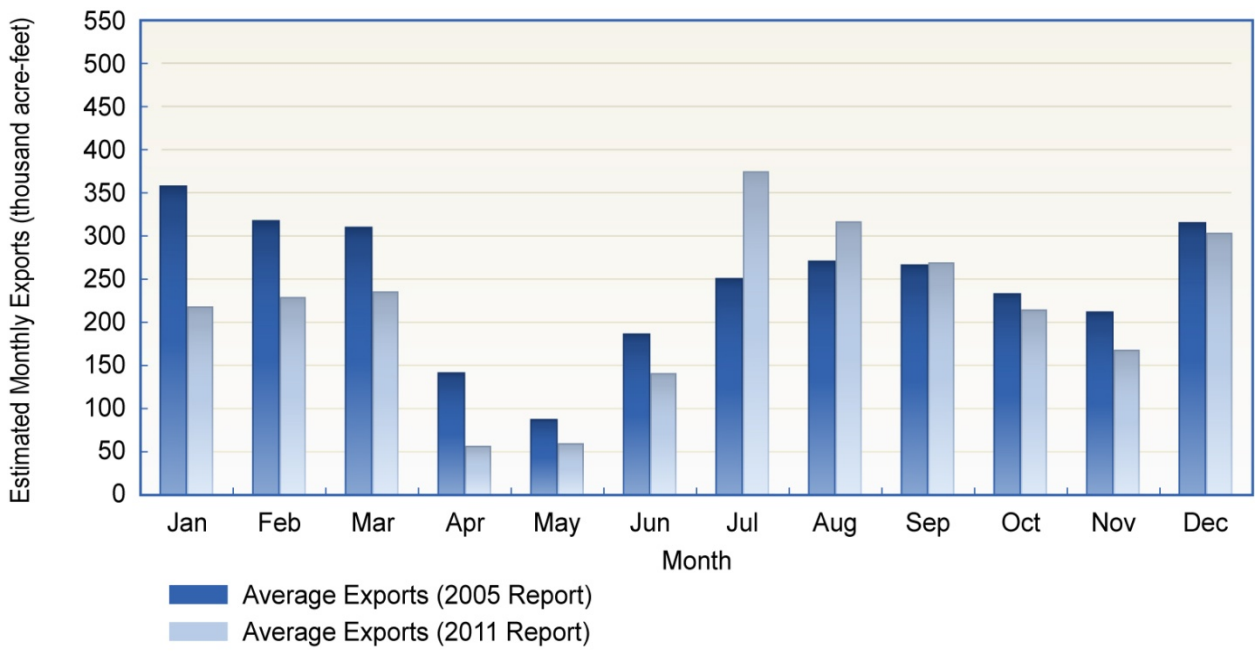


Figure 5-2. Estimated Monthly SWP Delta Exports (Existing Conditions), 2011 Scenario versus 2005 Scenario

flow at the Vernalis gauge (when the Vernalis flow is greater than 1,000 cubic feet per second). As explained previously in Chapter 4, regulatory restrictions on the SWP's Delta operations have been among the major factors affecting SWP water delivery reliability. Several of those influence SWP exports from the Banks Pumping Plant and, at times, impose particular limitations on exports. These limits are summarized here to illustrate how they affect the values shown in Figure 5-2:

- *2008 USFWS and 2009 NMFS BOs:* These BOs are much more restrictive than the BOs they replaced. The USFWS BO includes flow restrictions to protect delta smelt, with requirements in all but 2 months of the year. The NMFS BO contains similar limits for January through mid-June, but the greatest restriction imposes limits on total Delta exports in the months of April and May in most years to protect salmon and steelhead.
- *X2:* The "X2" objective mandated by the State Water Resources Control Board (State Water Board) regulates Delta salinity levels in the months of February–June. For the X2 position to be located in the appropriate location to achieve the State Water Board's salinity objective, Delta outflow must be at certain specified levels at certain times between February and June—which can constrain SWP pumping at the Banks Pumping Plant at those times.
- *Export/inflow ratio:* The 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta* and State Water Board Decision 1641 (D-1641) limits Delta exports to 35% of total Delta inflow from February through June. Thus, even if substantial runoff occurs during those months (such as during a year with considerable rain-on-snow events, projected to be more likely as the effects of climate change increase), the SWP is limited in its ability to benefit from the availability of that extra water in the Delta by increasing its pumping beyond this limit. Allowable exports increase to 65% of inflow from July through January.
- *Spring Export Limitations:* Spring is an important time in the life cycles of fish

protected by the USFWS and NMFS BOs. As a result, requirements for Delta exports exist in several places. D-1641 limits SWP and CVP exports to 100% of the base flow of the San Joaquin River for 31 days during the April/May period. The NMFS BO limits the combined exports during all of April and May to a given percentage of the flow: 25% during above-normal and wet years to 100% in critical years. Finally, the previously mentioned flow requirements contained in the USFWS BO to protect delta smelt can also restrict exports during this time.

Figure 5-2 shows reductions in the values estimated for the 2011 Report during January through June and October through December that result from these restrictions. The period of July through September is the time when exports are less restricted. As a result—and to recover some of the water supply lost during the other months—the exports estimated for the 2011 Report for July–September are higher than those estimated for the 2005 Report.

Another factor described in Chapter 4, climate change, is expected to affect the Delta—and SWP exports from the Banks Pumping Plant—under future conditions. The effects of climate change on SWP operations have been factored into DWR's modeling for future conditions.

Estimated SWP Export Amounts—Existing Conditions and Future Conditions

This section provides estimates of average, maximum, and minimum annual Delta exports for both existing (2011) and future (2031) conditions. (Discussions of the assumptions used to develop both existing and future scenarios for this report are included in Chapters 6 and 7, respectively.) This section also summarizes SWP Delta exports by month and by water year type, demonstrating the effects of the USFWS and NMFS BOs and other factors influencing SWP Delta exports.

Average, Maximum, and Minimum Annual Delta Exports

Table 5-1 presents the estimated average, maximum, and minimum annual SWP Delta exports for the existing-conditions and future-conditions scenarios.

Table 5-1. Estimated Average, Maximum, and Minimum Annual SWP Exports (Existing and Future Conditions)

	Existing	Future
Average	2,607	2,521
Maximum	4,066	4,106
Minimum	876	810

Table 5-2. Average Estimated SWP Exports by Month (Existing and Future Conditions)

Month	Estimated SWP Exports (thousand acre-feet)		Difference, Existing vs. Future Conditions (thousand acre-feet and %)
	Existing	Future	
January	214	217	+4 (+2%)
February	228	217	-10 (-5%)
March	232	228	-5 (-2%)
April	60	65	+5 (+8%)
May	65	67	+2 (+4%)
June	145	131	-14 (-9%)
July	365	352	-12 (-3%)
August	316	311	-6 (-2%)
September	268	271	+3 (+1%)
October	223	186	-37 (-16%)
November	174	169	-5 (-3%)
December	317	305	-12 (-4%)

Exports by Month

Table 5-2, above, shows the average estimated SWP exports from the Delta by month under existing and future conditions. As shown in the table, in most months, the average estimated monthly SWP exports for future conditions are generally similar to or slightly lower than the estimated monthly exports for existing conditions. The most notable exceptions are in

April and May. Under both existing and future conditions, the values for those months are essentially the same, reflecting the regulations in place during that time of the year.

Figure 5-3 depicts the annual pattern of the monthly values for existing conditions as well as the maximum and minimum estimated exports for each month. The pattern and ranges of the monthly values under future conditions are very similar to those shown in Figure 5-3.

As shown in Figure 5-3 and Table 5-2, estimated SWP exports are highest on average in July, averaging 365 taf under existing conditions and 352 taf under future conditions. Exports are consistently lowest in April and May, averaging 60 taf in April and 65 taf in May for 2011, and 65 taf in April and 67 taf in May for 2031.

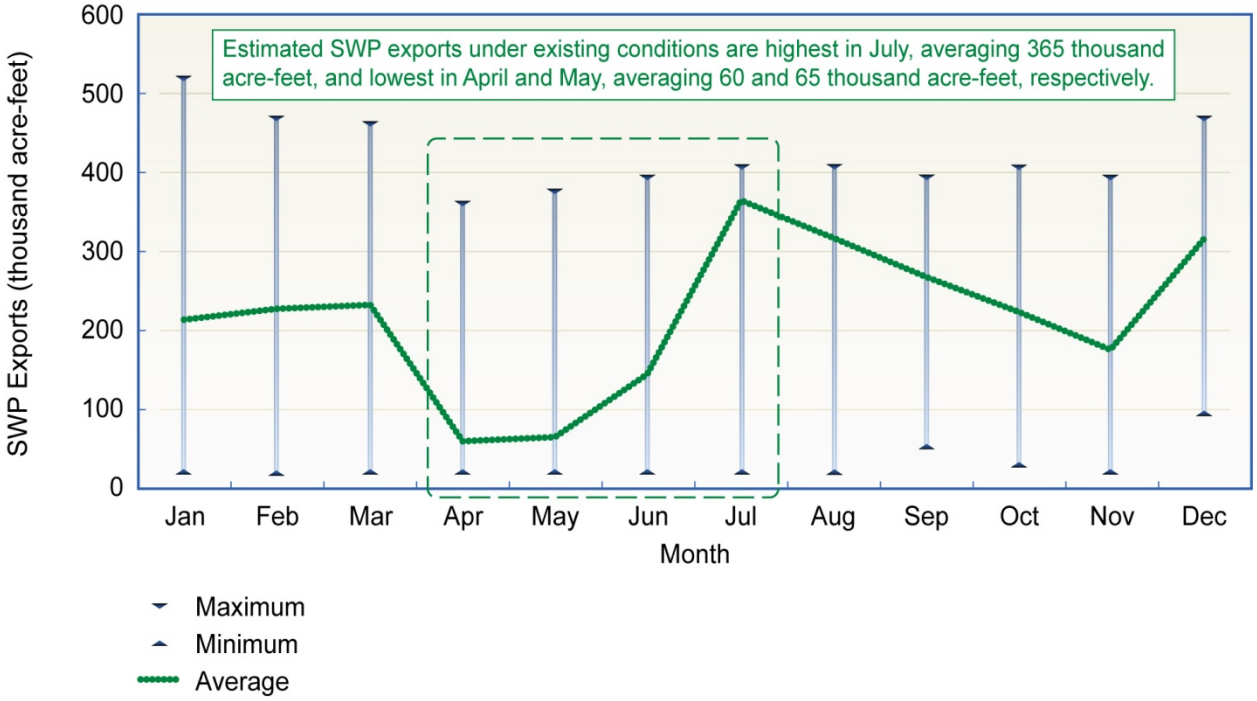


Figure 5-3. Monthly Range of Estimated SWP Exports (Existing Conditions)

Exports by Water Year Type

Tables 5-3 and 5-4 compare SWP exports by water year type under existing conditions and future conditions, as estimated for the 2009 Report and for this 2011 Report. As shown, the existing SWP exports estimated for this 2011 Report are very similar to the existing SWP exports estimated for the 2009 Report for most water year types. The same can be said of the values estimated for future conditions.

Table 5-3. Estimated SWP Exports by Water Year Type—Existing Conditions

Water Year Type	Estimated Existing SWP Exports (thousand acre-feet)	
	2009 Report	2011 Report
Wet	3,233	3,210
Above Normal	2,774	2,784
Below Normal	2,617	2,643
Dry	2,290	2,320
Critical	1,486	1,512
Average	*2,598*	*2,607*

Table 5-4. Estimated SWP Exports by Water Year Type—Future Conditions

Water Year Type	Estimated Future SWP Exports (thousand acre-feet)	
	2009 Report	2011 Report
Wet	3,196	3,182
Above Normal	2,734	2,753
Below Normal	2,557	2,556
Dry	2,173	2,120
Critical	1,526	1,414
Average	*2,550*	*2,521*

Likelihood of SWP Exports—Existing and Future Conditions

The estimated likelihood of a given level of SWP exports under existing conditions and under future conditions is presented in Figure 5-4. As shown in the figure, 4,106 taf is the largest export amount that was modeled for the 2011 Report.

As shown in Figure 5-4, in 79% of simulated cases for existing conditions, estimated SWP exports are between 2,000 and 3,500 taf/year. SWP exports of other amounts are less likely, with the next most likely export amount being between 1,000 and 1,500 taf/year.

Likewise, in about 76% of simulated cases for future conditions, estimated SWP exports are between 2,000 and 3,500 taf/year (Figure 5-4). SWP exports of other amounts are less likely, with the next most likely export amount again being between 1,000 and 1,500 taf/year.

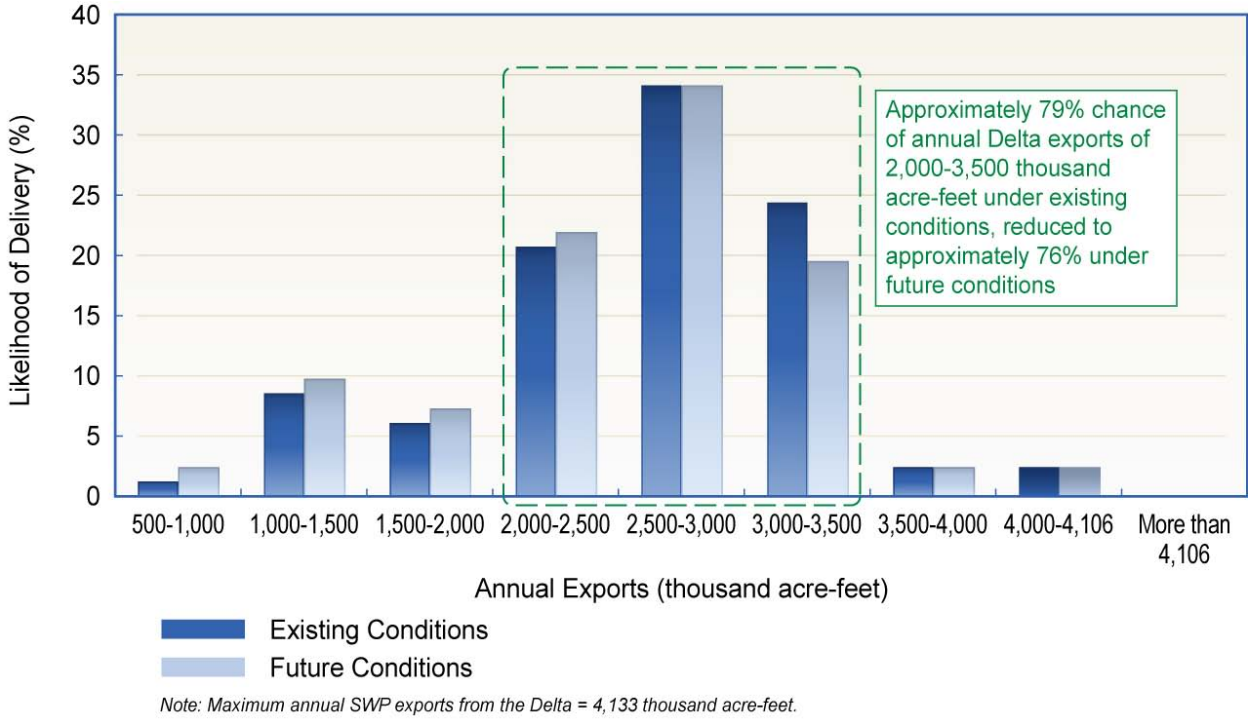


Figure 5-4. Estimated Likelihood of SWP Exports, by Increments of 500 Acre-Feet (under Existing and Future Conditions)

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Chapter 6

Existing SWP Water Delivery Reliability (2011)

This chapter presents estimates of the SWP's existing (2011) water delivery reliability. The estimates are presented below, alongside the reliability results obtained from the *State Water Project Delivery Reliability Report 2009* (2009 Report). Like this *State Water Project Delivery Reliability Report 2011* (2011 Report), the 2009 Report incorporated into its results the requirements of biological opinions issued by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) in December 2008 and June 2009, respectively, on the effects of coordinated operations of the SWP and Central Valley Project. These BOs are discussed in detail in Chapter 2, "A Closer Look at the State Water Project," and Chapter 4, "Factors that Affect Water Delivery Reliability."

The discussions of SWP water delivery reliability in this chapter and Chapter 7 present the results of DWR's updated modeling of the SWP's water delivery reliability. A tabular summary of the modeling results is presented in the technical addendum to this report, which is available online at http://baydeltaoffice.water.ca.gov/. The technical addendum also contains curves of annual delivery probability (i.e., exceedence plots) to graphically show the estimated percentage of years in which a given annual delivery is equaled or exceeded.

Hydrologic Sequence

SWP delivery amounts are estimated in this 2011 Report for existing conditions using computer modeling that incorporates the historic range of hydrologic conditions (i.e., precipitation and runoff) that occurred from water years 1922 through 2003. The historic hydrologic conditions are adjusted to account for land-use changes (i.e., the current level of development) and upstream flow regulations that characterize 2011. By using this 82-year historical flow record, the delivery estimates modeled for existing conditions reflect a reasonable range of potential hydrologic conditions from wet years to critically dry years.

Existing Demand for Delta Water

Demand levels for the SWP water users in this report are derived from historical data and information from the SWP contractors themselves. The amount of water that SWP contractors request each year (i.e., demand) is related to:

- the magnitude and types of water demands,
- the extent of water conservation measures,
- local weather patterns, and
- water costs.

The existing level of development (i.e., the level of water use in the source areas from which the water supply originates) is based on recent land uses, and is assumed to be representative of existing conditions for the purposes of this 2011 Report.

SWP Table A Water Demands

The current combined maximum Table A amount is 4,172 thousand acre-feet per year (taf/year). See "'Table A' Water" in Chapter 3, "SWP Contractors and Water Contracts," for a full discussion of Table A, which is a table within each water supply contract. Of the combined maximum Table A amount, 4,133 taf/year is the SWP's maximum Table A water available for delivery from the Delta. The estimated demands by SWP contractors for deliveries of Table A water from the Delta under existing conditions, as determined for the 2011 Report and previously for the 2009 Report, are shown in Table 6-1. The estimated average demand for SWP Table A water is shown, along with maximum and minimum demands, because demands vary annually depending on local hydrologic patterns and other factors (e.g., demand management and the amount of water storage within the service area).

Table 6-1. Comparison of Estimated Average, Maximum, and Minimum Demands for SWP Table A Water (Existing Conditions)

	2009 Report	2011 Report
Average	3,711	3,722
Maximum	4,115	4,120
Minimum	3,007	3,043

As estimated for the 2011 Report, annual demands for SWP Table A water range between 3,043 taf and 4,120 taf under existing conditions, with an average demand of 3,722 taf. There is a 95% likelihood that more than 3,200 taf/year will be requested (i.e., demanded) for delivery under existing conditions. The estimated maximum SWP Table A water demand in the 2011 Report is very near the maximum possible Table A water delivery amount of 4,133 taf/year; however, the average annual demand of 3,722 taf is approximately 400 taf less than the possible maximum annual delivery.

Figure 6-1 shows that estimated annual demands for deliveries of SWP Table A water, as calculated for the 2009 and 2011 Reports, are essentially the same. Demands calculated for both reports range between 3,000 and 4,120 taf/year, regardless of whether a year is critical, wet, or anywhere in between.

SWP Article 21 Water Demands

Under Article 21 of the SWP's long-term water supply contracts, contractors may receive additional water deliveries only under the following specific conditions:

- such deliveries do not interfere with SWP Table A allocations and SWP operations;
- excess water is available in the Delta;
- capacity is not being used for SWP purposes or scheduled SWP deliveries; and
- contractors can use the SWP Article 21 water directly or can store it in their own system (i.e., the water cannot be stored in the SWP system).

The demand for SWP Article 21 water by SWP contractors is assumed to vary depending on the month and weather conditions (i.e., amounts of precipitation and runoff). For the purposes of this discussion of SWP Article 21 water demands, a Kern wet year is defined as a year when the annual Kern River flow is projected to be greater than 1,500 taf. Kern River inflows are significant

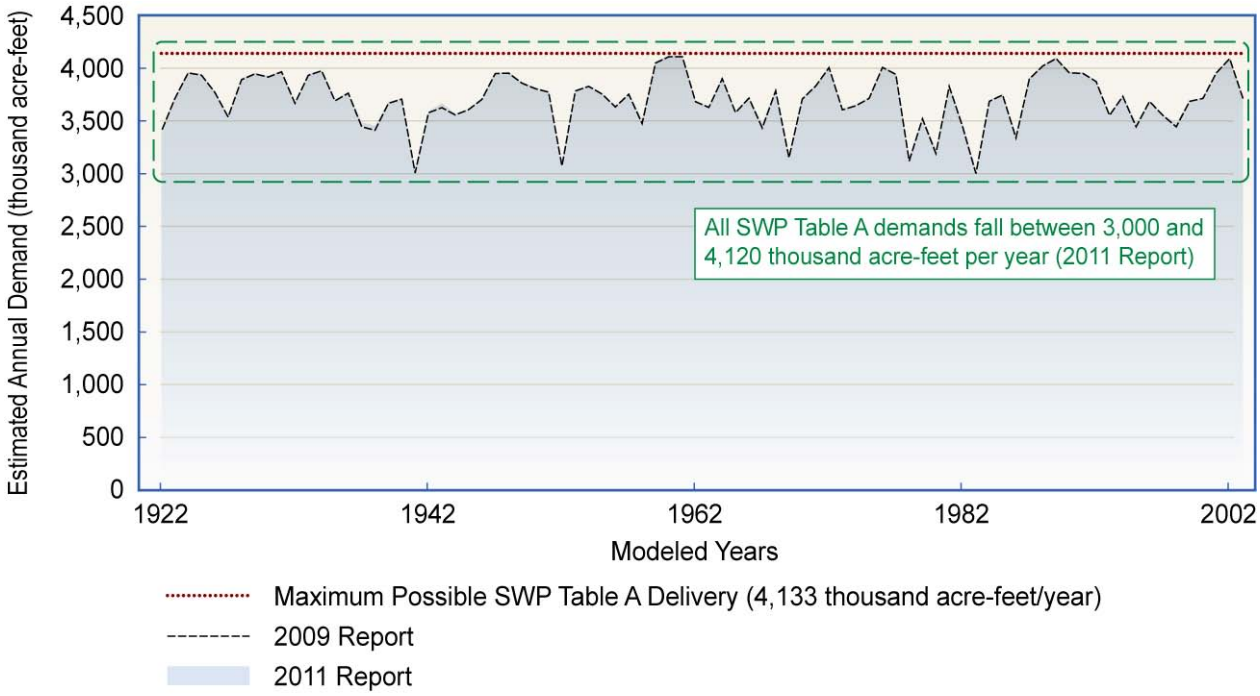

Figure 6-1. Comparison of Estimated Demands for SWP Table A Water on an Annual Basis, Using 82 Years of Hydrology (Existing Conditions)

because they are a major local water supply component for the Kern County Water Agency, which is the second largest SWP contractor and possesses significant local groundwater recharge capability. Using Kern River flows to recharge their groundwater storage significantly reduces their demand for Article 21 supply.

As shown in Figures 6-2 and 6-3, existing demands for SWP Article 21 water estimated for this 2011 Report are assumed to be high during the spring and late fall in non–Kern wet years (214 taf/month), as well as during the winter months of December through March in all weather year types (202 taf in Kern wet years and 414 taf in other years). Demands for SWP Article 21 water are assumed to be very low (2 taf/month) from April through November of Kern wet years and from July through October of other years.

Relative to levels of demand for SWP Article 21 water presented in the 2009 Report for existing conditions, the monthly existing-conditions demands for Article 21 water are 212 taf lower from July through October in normal weather years. This reduction in demand occurs because the modeling was revised for the 2011 Report to assume that only SWP contractors receiving water from the North Bay Aqueduct will have SWP Article 21 water demands during those months. A second revision to the modeling assumptions relative to the 2009 Report resulted in the addition of a year-round demand for 2 taf/month through the North Bay Aqueduct in 2011 during wet weather years.

The estimated reduction in existing-conditions demand for SWP Article 21 water in this 2011 Report relative to the 2009 Report is the result of discussions with DWR's Operations and Maintenance staff and State Water Contractors staff, and it represents their best estimates of current practices. The SWP Article 21 water demands used in the 2009 Report, on the other

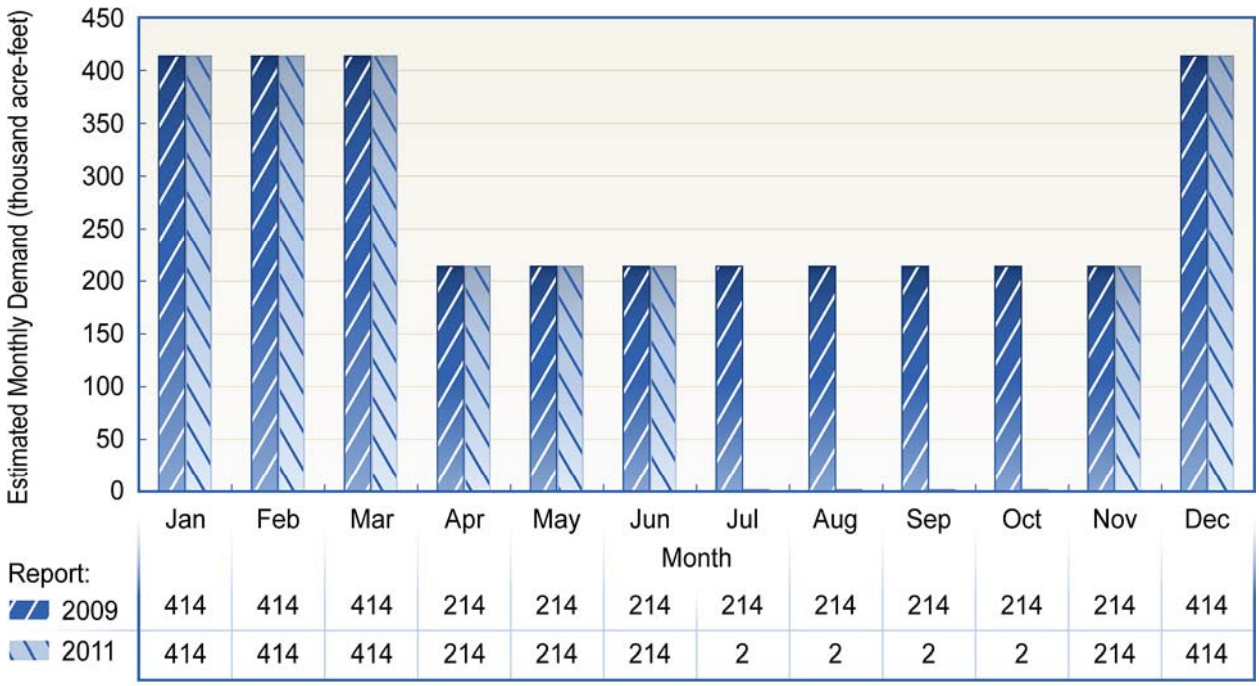

Figure note: Values shown are the maximum amount that can be delivered monthly. However, the actual capability of SWP water contractors to take this amount of SWP Article 21 water is not the sum of these maximum monthly values.

Figure 6-2. Estimated Demands for SWP Article 21 Water in Years When Kern River Flow is Less than 1,500 Thousand Acre-Feet (Existing Conditions)

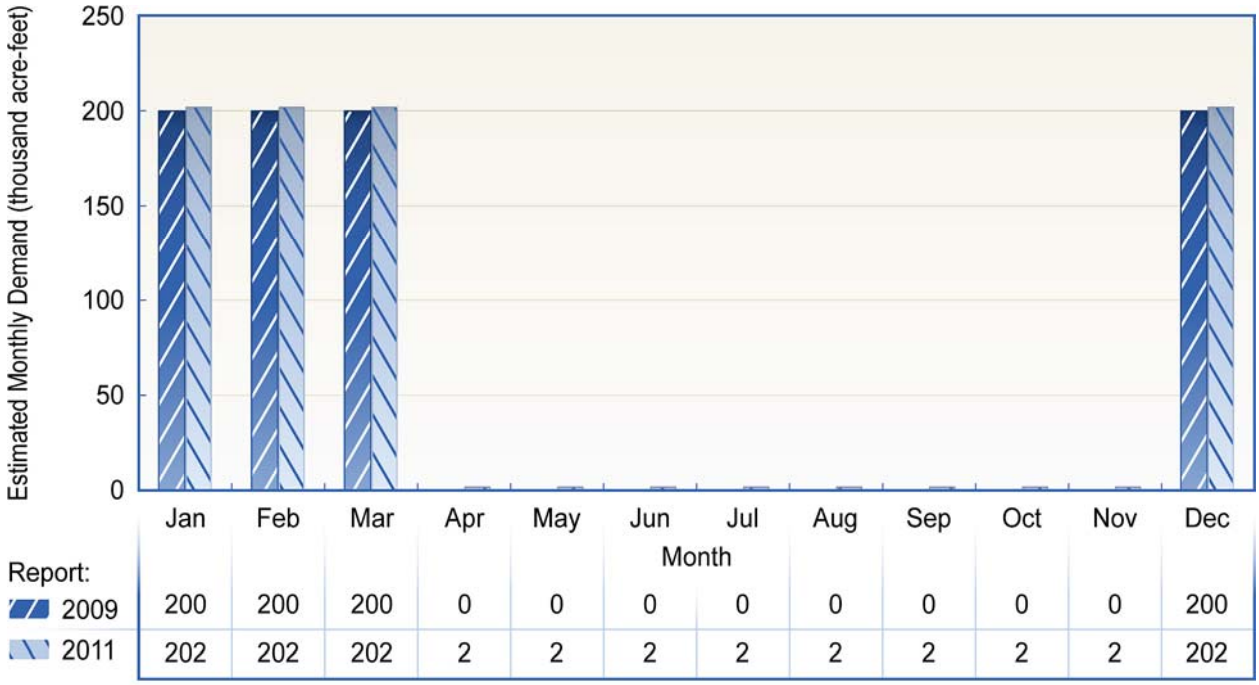

Figure note: Values shown are the maximum amount that can be delivered monthly. However, the actual capability of SWP water contractors to take this amount of SWP Article 21 is not the sum of these maximum monthly values.

Figure 6-3. Estimated Demands for SWP Article 21 Water in Years When Kern River Flow is Greater than 1,500 Thousand Acre-Feet (Existing Conditions)

hand, match the demands assumed in the studies conducted for the 2008 USFWS BO and 2009 NMFS BO, and those demands capture the upper boundary of the potential impact of SWP Article 21 exports on the Delta ecosystem. This assumption reflects a condition in which SWP contractors are able to use essentially any available SWP Article 21 water when capacity for moving that water exists in the SWP delivery system.

Estimates of SWP Table A Water Deliveries

Table 6-2 presents the annual average, maximum, and minimum estimates of SWP Table A deliveries from the Delta for existing conditions, as calculated for the 2009 and 2011 Reports. The Table A deliveries are similar between the 2009 and 2011 Reports. Assumptions about Table A and Article 21 water demands, along with operations for carryover water, have been updated in the model based on discussions with State Water Contractors staff and DWR's Operations and Control Office.

Table 6-2. Comparison of Estimated Average, Maximum, and Minimum Deliveries of SWP Table A Water (Existing Conditions, in Thousand Acre-Feet per Year)

	2009 Report	2011 Report
Average	2,483	2,524
Maximum	3,338	3,365
Minimum	301	380

The estimated likelihood of delivery of a given amount of SWP Table A water under the existing conditions scenario, as estimated for both the 2009 and 2011 Reports, is presented in Figure 6-4. Figure 6-4 shows that the likelihood that 2,000–3,365 taf/year of Table A water will be delivered is now 82%. There is a 48% likelihood that 2,500–3,000 taf of Table A water will be delivered, a 5% likelihood of delivery of less than 1,000 taf, and 0% likelihood of delivery of more than 3,365 taf in a given year. To compare the results estimated for this 2011 Report with results from the 2009 Report, an SWP contractor is just slightly more likely to receive a larger Table A water delivery under the current estimates.

Dry-Year Deliveries of SWP Table A Water

Table 6-3 displays estimates of SWP Table A water deliveries under existing conditions during possible drought conditions and compares them with the corresponding delivery estimates calculated for the 2009 Report. Droughts are analyzed using the historical drought-period precipitation and runoff patterns from 1922 through 2003 as a reference, although existing 2011 conditions (e.g., land use, water infrastructure) are also accounted for in the modeling. For reference, the worst multiyear drought on record was the 1929–1934 drought, although the brief drought of 1976–1977 was more intensely dry.

The results of modeling existing conditions for potential drought-year scenarios indicate that SWP Table A water deliveries during dry years can be expected to range from between 380 and 1,573 taf/year.

Wet-Year Deliveries of SWP Table A Water

Table 6-4 presents estimates of SWP Table A water deliveries under existing conditions during possible wet conditions and compares them with corresponding delivery estimates calculated for the 2009 Report. Wet periods for 2011 are analyzed using historical precipitation and runoff patterns from 1922–2003 as a reference, while accounting for existing 2011 conditions (e.g., land use, water infrastructure). For reference, the wettest single year on record was 1983.

The results of modeling existing conditions for potential wet periods indicate that estimated SWP Table A water deliveries during wet years can be expected to range between 2,833 and 2,958 taf/year.

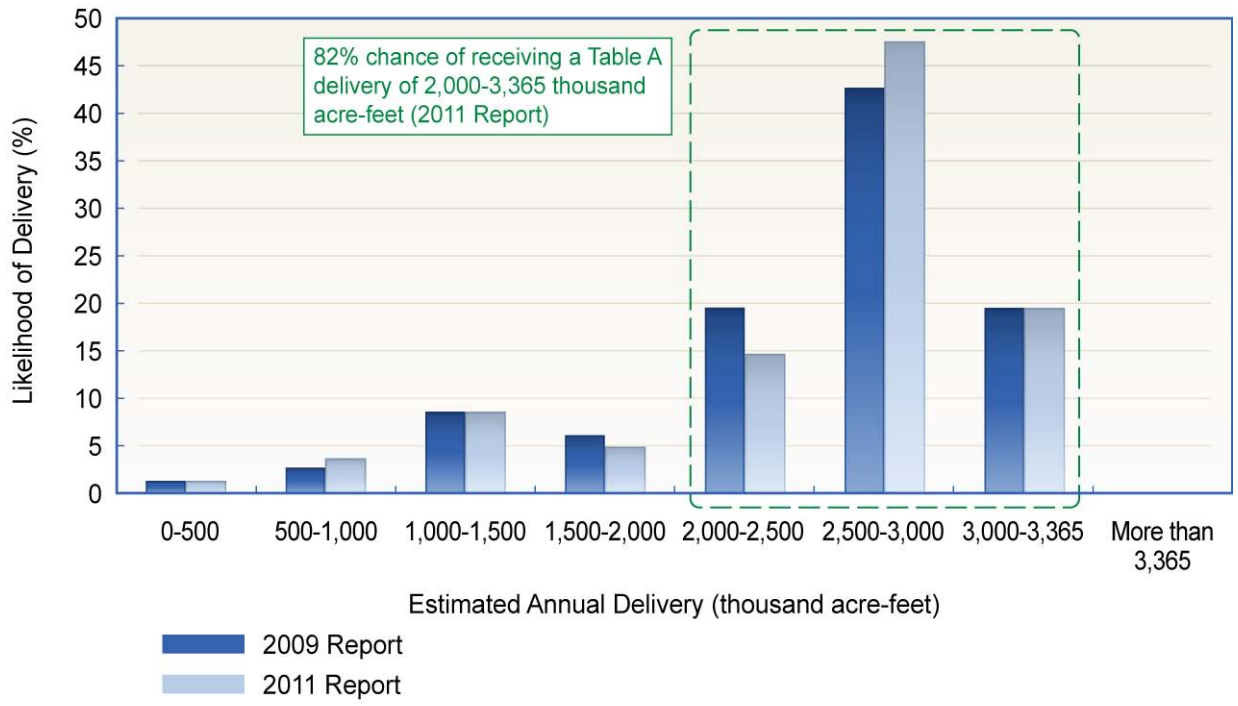

Figure 6-4. Estimated Likelihood of SWP Table A Water Deliveries (Existing Conditions)

Table 6-3. Estimated Average and Dry-Period Deliveries of SWP Table A Water (Existing Conditions), in Thousand Acre-Feet (Percent of Maximum SWP Table A Amount, 4,133 taf/year)

	Long-term Average	Single Dry Year (1977)	2-Year Drought (1976–1977)	4- Year Drought (1931–1934)	6-Year Drought (1987–1992)	6-Year Drought (1929–1934)
2009 Report	2,483 (60%)	302 (7%)	1,496 (36%)	1,402 (34%)	1,444 (35%)	1,398 (34%)
2011 Report	2,524 (61%)	380 (9%)	1,573 (38%)	1,454 (35%)	1,462 (35%)	1,433 (35%)

Table 6-4. Estimated Average and Wet-Period Deliveries of SWP Table A Water (Existing Conditions), in Thousand Acre-Feet (Percent of Maximum SWP Table A Amount, 4,133 taf/year)

	Long-term Average	Single Wet Year (1983)	2-Year Wet (1982–1983)	4-Year Wet (1980–1983)	6-Year Wet (1978–1983)	10-Year Wet (1978–1987)
2009 Report	2,483 (60%)	2,813 (68%)	2,935 (71%)	2,817 (68%)	2,817 (68%)	2,872 (67%)
2011 Report	2,524 (61%)	2,886 (70%)	2,958 (72%)	2,872 (69%)	2,873 (70%)	2,833 (69%)

Estimates of SWP Article 21 Water Deliveries

SWP water delivery is a combination of deliveries of Table A water and Article 21 water. Some SWP contractors store Article 21 water locally when extra water and capacity are available beyond that needed by normal SWP operations. Deliveries of SWP Article 21 water vary not only by year, but also by month. In the summer and early fall months (July through October), a maximum of 1 taf can be delivered. From November through June, maximum deliveries of SWP Article 21 water can be as high as 299 taf and as low as approximately 80 taf in a given month; however, water deliveries average in the range of 0–30 taf. The estimated range of monthly deliveries of SWP Article 21 water is displayed in Figure 6-5.

The estimated likelihood that a given amount of SWP Article 21 water will be delivered is presented in Figure 6-6. There is a 26% likelihood that more than 20 taf/year of SWP Article 21 water will be delivered under existing conditions. There is a 74% likelihood that less than 20 taf/year of SWP Article 21 water will be delivered.

Dry-Year Deliveries of SWP Article 21 Water

Although deliveries of SWP Article 21 water are smaller during dry years than during wet ones, opportunities exist to deliver SWP Article 21 water during multiyear drought periods. Deliveries in dry years are shown to often be small (less than 5 taf); however, longer drought periods can include several years that support Article 21 deliveries. Annual average Article 21 estimates for drought periods of 4 and 6 years vary significantly and can approach or exceed the average annual estimate, as shown in Table 6-5.

Wet-Year Deliveries of SWP Article 21 Water

Table 6-6 shows the estimates of deliveries of SWP Article 21 water during wet periods under existing conditions. Estimated deliveries in wet years are approximately 1.75 to seven times larger than the average delivery of SWP Article 21 water.

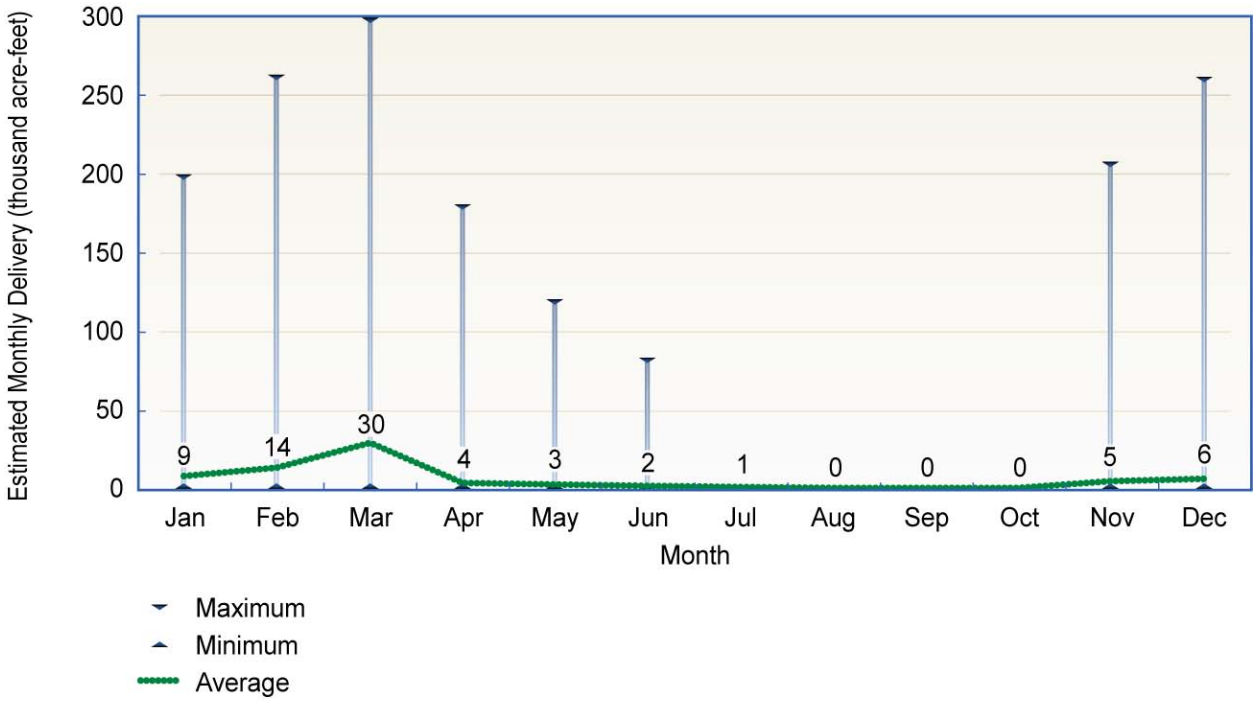

Figure 6-5. Estimated Range of Monthly Deliveries of SWP Article 21 Water (2011 Report—Existing Conditions)

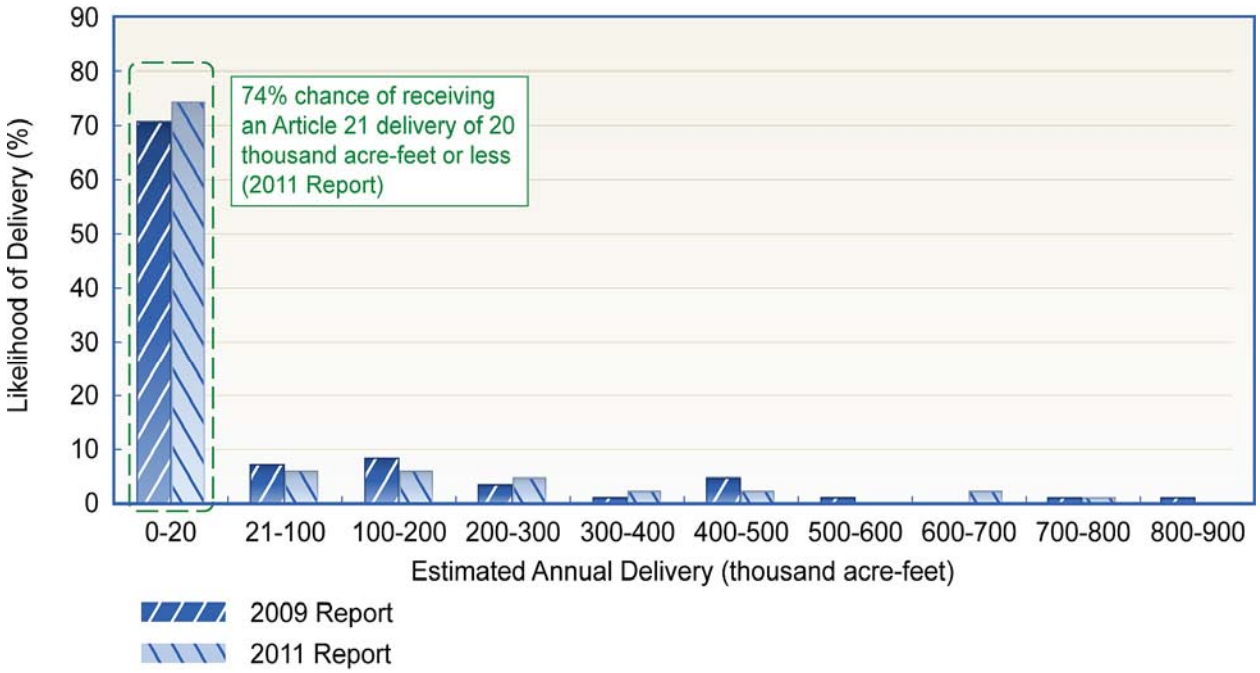

Figure 6-6. Estimated Probability of Annual Deliveries of SWP Article 21 Water (Existing Conditions)

Table 6-5. Estimated Average and Dry-Period Deliveries of SWP Article 21 Water (Existing Conditions, in Thousand Acre-Feet per Year)

	Long-term Average	Single Dry Year (1977)	2-Year Drought (1976-1977)	4- Year Drought (1931-1934)	6-Year Drought (1987-1992)	6-Year Drought (1929-1934)
2009 Report	85	2	6	142	10	98
2011 Report	76	3	5	69	9	49

Table 6-6. Estimated Average and Wet-Period Deliveries of SWP Article 21 Water (Existing Conditions, in Thousand Acre-Feet per Year)

	Long-term Average	Single Wet Year (1983)	2-Year Wet (1982-1983)	4-Year Wet (1980-1983)	6-Year Wet (1978-1983)	10-Year Wet (1978-1987)
2009 Report	85	853	659	379	273	230
2011 Report	76	608	533	307	225	207

Chapter 7

Future SWP Water Delivery Reliability (2031)

This chapter presents estimates of the SWP's delivery reliability for conditions 20 years in the future (2031). These estimates reflect hydrologic changes that could result from climate change, but they incorporate the same requirements that are assumed under existing conditions, including the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions (BOs).

This chapter also compares these estimates of future conditions with the future-condition results presented in the *State Water Project Delivery Reliability Report 2009* (2009 Report) for the year 2029.

For consistency with previous reports, a tabular summary of the modeling results for the future conditions scenario is presented in the technical addendum to this report. The technical addendum also contains curves of annual delivery probability (i.e., exceedence plots) to graphically show the estimated percentage of years in which a given annual delivery is equaled or exceeded.

Future Demand for Delta Water

Demand levels for the SWP water users in this report are derived from historical data and information from the SWP contractors themselves. The 2031 level of development (i.e., the level of water use in the source areas from which the water supply originates) is based on the projected assumptions for land use for that year, and is assumed to be representative of future conditions for the purposes of this 2011 Report.

SWP Table A Water Demands

Future demands for SWP Table A water, as calculated for this 2011 Report, are assumed to be the maximum possible annual amount of 4,133 thousand acre-feet (taf). There is no assumed variation in demand as a result of different annual precipitation and runoff conditions; it is assumed that by 2031, the maximum amount of SWP Table A water will be requested every year. As a reminder, 4,133 taf/year is the maximum Delta SWP Table A amount.

The SWP Table A water demands under future conditions as presented in the 2009 Report are also assumed to be the maximum amount of 4,133 taf/year.

SWP Article 21 Water Demands

The assumed future demands for SWP Article 21 water are the same as those assumed for existing conditions (see Chapter 6, "Existing SWP Water Delivery Reliability [2011]").

Estimates of Future SWP Deliveries

When modeling water supply deliveries 20 years in the future, the unknowns are considerable and many assumptions must be made. As was assumed for existing conditions (see Chapter 6), modeling of SWP deliveries for 2031 take into account current Delta water quality regulations and the requirements of the USFWS and NMFS BOs. Climate change as well as changes to water uses in the upstream watersheds (i.e., source watersheds) are also taken into account when modeling water supply deliveries under future conditions. Additional discussion of how the modeling of SWP water delivery reliability is adjusted to account for climate change is provided in Chapter 4, "Factors that Affect Water Delivery Reliability."

One of the most important assumptions when modeling SWP water delivery under future conditions is that the rules and facilities related to Delta conveyance will remain at the status quo. That is, in the future-conditions scenario, no new facilities to convey water through or around the Delta are assumed to be in place because no new programs have been sufficiently developed that can be assumed with certainty.

Future Deliveries of SWP Table A Water

Table 7-1 presents the annual average, maximum, and minimum estimates of SWP Table A water deliveries from the Delta for future conditions, as calculated for the 2009 and 2011 Reports. The SWP Table A water deliveries under future conditions are similar between the 2009 and 2011 Reports. The maximum possible delivery of SWP Table A water, 4,133 taf/year, is not reached under future conditions.

Table 7-1. Comparison of Estimated Average, Maximum, and Minimum Deliveries of SWP Table A Water (Future Conditions, in Thousand Acre-Feet per Year)

	2009 Report	2011 Report
Average	2487	2,466
Maximum	3,999	4,063
Minimum	458	443

The estimated likelihood that a given amount of SWP Table A water will be delivered under future conditions is presented in Figure 7-1. Currently, there is a 70% likelihood that 2,000–3,500 taf of SWP Table A water will be delivered under the future-conditions scenario. There is a 17% likelihood of an SWP Table A water delivery of 1,000–2,000 taf, a 7% likelihood of less than 1,000 taf, and a 6% likelihood of more than 3,500 taf. In general, the estimates of the likelihood that an SWP contractor will receive a specific amount of SWP Table A water under future conditions, as presented in the 2009 and 2011 Reports, are very similar.

Dry-Year Deliveries of SWP Table A Water under Future Conditions

Table 7-2 presents estimates of future SWP Table A water deliveries during possible drought conditions and compares them with the corresponding delivery estimates calculated for the 2009 Report. Drought scenarios for future conditions in this 2011 Report are analyzed using the historical drought-period precipitation and runoff patterns from 1922–2003 as a reference, while accounting for future 2031 conditions (e.g., land use, climate change).

The results of modeling future conditions under potential drought-year scenarios indicate that estimated dry-year SWP deliveries can be expected to range between 443 and 1,457 taf/year.

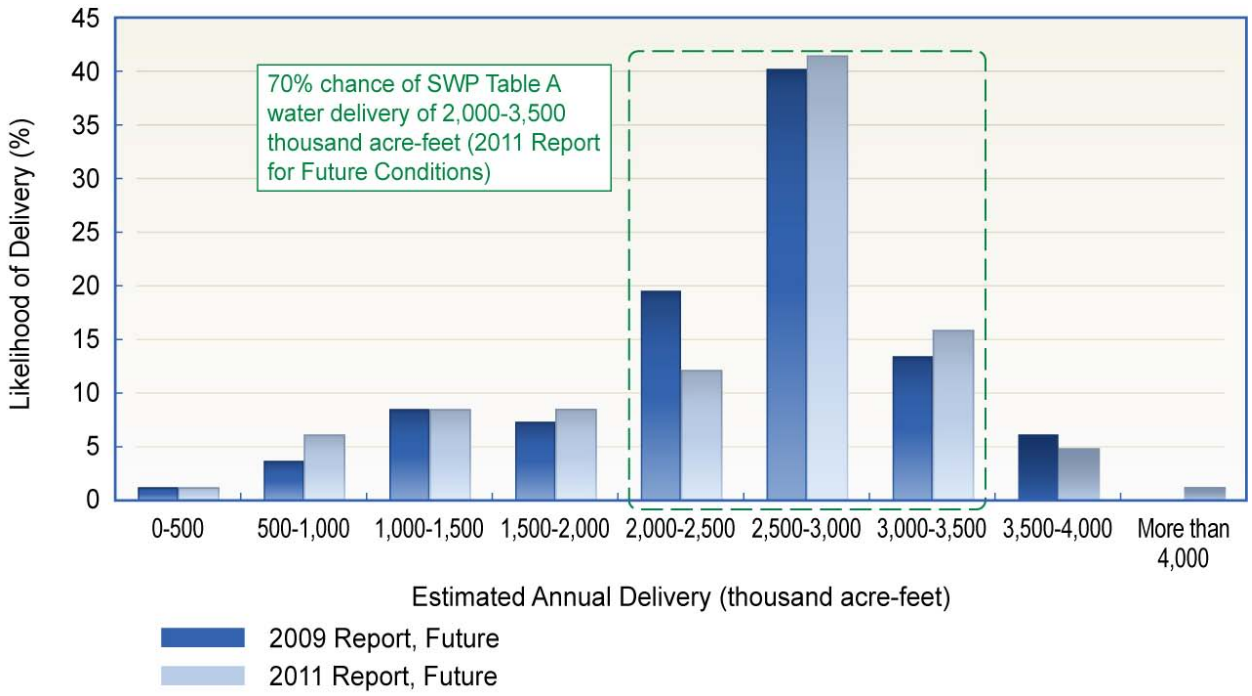

Figure 7-1. Estimated Likelihood of SWP Table A Water Deliveries, by Increments of 500 Thousand Acre-Feet (Future Conditions)

Table 7-2. Estimated Average and Dry-Period Deliveries of SWP Table A Water (Future Conditions), in Thousand Acre-Feet (Percent of Maximum SWP Table A Amount, 4,133 taf/year)

	Long-term Average	Single Dry Year (1977)	2-Year Drought (1976–1977)	4- Year Drought (1931–1934)	6-Year Drought (1987–1992)	6-Year Drought (1929–1934)
2009 Report	2,487 (60%)	458 (11%)	1,570 (38%)	1,431 (35%)	1,308 (32%)	1,480 (36%)
2011 Report	2,466 (60%)	443 (11%)	1,457 (35%)	1,401 (34%)	1,227 (30%)	1,366 (33%)

Wet-Year Deliveries of SWP Table A Water under Future Conditions

Table 7-3 presents estimates of future SWP Table A water deliveries during a wet year and compares them with the corresponding delivery estimates calculated for the 2009 Report. Wet periods were modeled for this 2011 Report using historical precipitation and runoff patterns from 1922–2003 as a reference and accounting for 2031 future conditions such as land use and climate change.

The results of modeling future conditions for potential wet periods indicate that estimated SWP Table A water deliveries during wet years can be expected to range between 2,972 and 4,063 taf/year.

SWP Article 21 Water Deliveries under Future Conditions

Estimated deliveries of SWP Article 21 water under future conditions vary not only by year, depending on the precipitation and runoff, but also by month. In the spring, summer, and early fall months (May through October), deliveries of SWP Article 21 water under future conditions are estimated to be low, with a maximum of approximately 10 taf/month and a minimum of 0 taf/month. From November through April, maximum estimated future deliveries of SWP

Table 7-3. Estimated Average and Wet-Period Deliveries of SWP Table A Water (Future Conditions), in Thousand Acre-Feet (Percent of Maximum SWP Table A Amount, 4,133 taf/year)

	Long-term Average	Single Wet Year (1983)	2-Year Wet (1982–1983)	4-Year Wet (1980–1983)	6-Year Wet (1978–1983)	10-Year Wet (1978–1987)
2009 Report	2,487 (60%)	3,990 (97%)	3,843 (93%)	3,401 (82%)	3,250 (79%)	2,975 (72%)
2011 Report	2,466 (60%)	4,063 (98%)	3,908 (95%)	3,396 (82%)	3,248 (79%)	2,972 (72%)

Article 21 water can be as high as 251 taf and as low as 50 taf in a given month; however, water deliveries average in the range of 2–22 taf. The estimated range of monthly deliveries of SWP Article 21 water is displayed in Figure 7-2.

The estimated likelihood that a given amount of SWP Article 21 water will be delivered under future conditions is presented in Figure 7-3. Currently, there is a 22% likelihood that more than 20 taf/year of SWP Article 21 water will be delivered under future conditions, and a 78% likelihood that 20 taf/year or less will be delivered.

In both the 2009 and 2011 Reports, estimated deliveries of SWP Article 21 water under future conditions are generally 20 taf/year or less (72% and 78% likelihood, respectively).

Dry-Year Deliveries of SWP Article 21 Water under Future Conditions

Table 7-4 shows the estimates of future deliveries of SWP Article 21 water during dry periods. The results of modeling future conditions for potential drought scenarios indicate that deliveries of SWP Article 21 water during dry years can be expected to range between 4 and 50 taf/year. This is a 0% to 92% decrease in Article 21 water deliveries from the average estimated future-conditions delivery calculated for this report. Although drought-period deliveries are typically less than deliveries in average years, Table 7-4 shows that opportunities to deliver SWP Article 21 water exist during multiyear drought periods.

Wet-Year Deliveries of SWP Article 21 Water under Future Conditions

Table 7-5 shows the estimates of deliveries of SWP Article 21 water during wet periods under future conditions. The results of modeling future conditions for potential wet periods indicate that wet-year SWP deliveries can be expected to range between 83 and 291 taf. This is a 66% to 483% increase in deliveries of SWP Article 21 water from the average estimated future-conditions delivery calculated for this report.

Table 7-4. Estimated Average and Dry-Period Deliveries of SWP Article 21 Water (Future Conditions, in Thousand Acre-Feet per year)

	Long-term Average	Single Dry Year (1977)	2-Year Drought (1976–1977)	4- Year Drought (1931–1934)	6-Year Drought (1987–1992)	6-Year Drought (1929–1934)
2009 Report	60	3	7	169	27	142
2011 Report	50	4	7	50	10	37

Table 7-5. Estimated Average and Wet-Period Deliveries of SWP Article 21 Water (Future Conditions, in Thousand Acre-Feet per year)

	Long-term Average	Single Wet Year (1983)	2-Year Wet (1982–1983)	4-Year Wet (1980–1983)	6-Year Wet (1978–1983)	10-Year Wet (1978–1987)
2009 Report	60	509	306	165	123	139
2011 Report	50	291	190	120	83	122

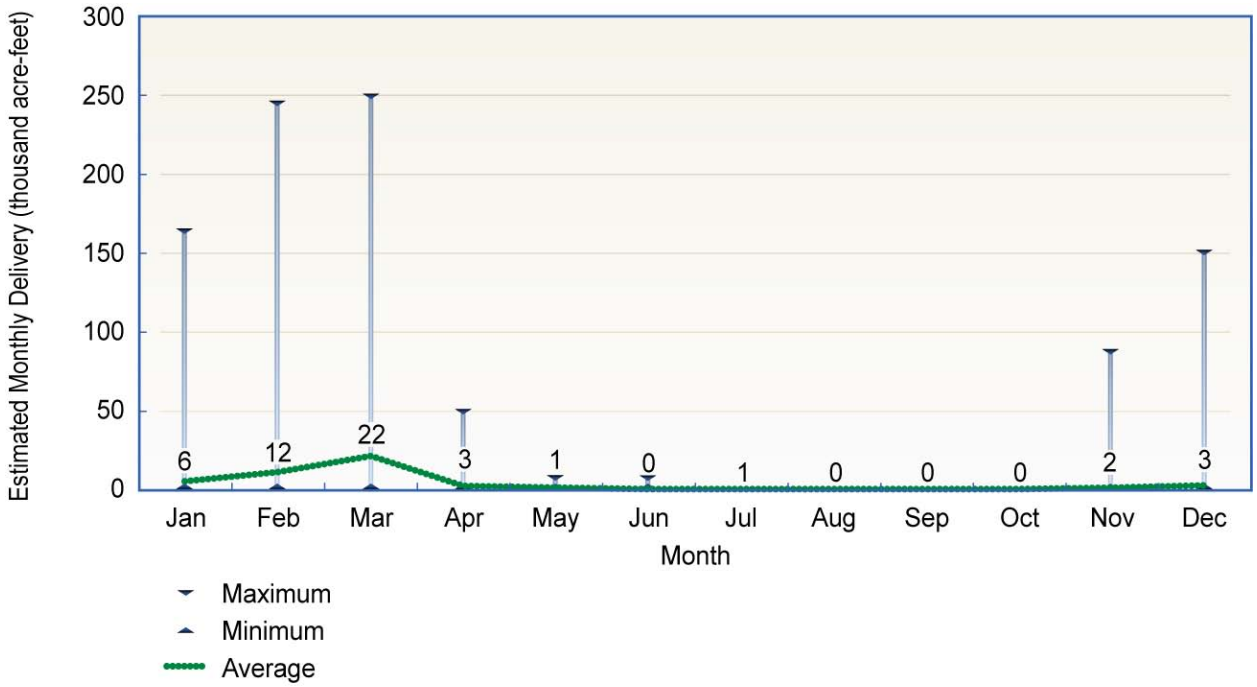

Figure 7-2. Estimated Range of Monthly Deliveries of SWP Article 21 Water (2011 Report—Future Conditions)

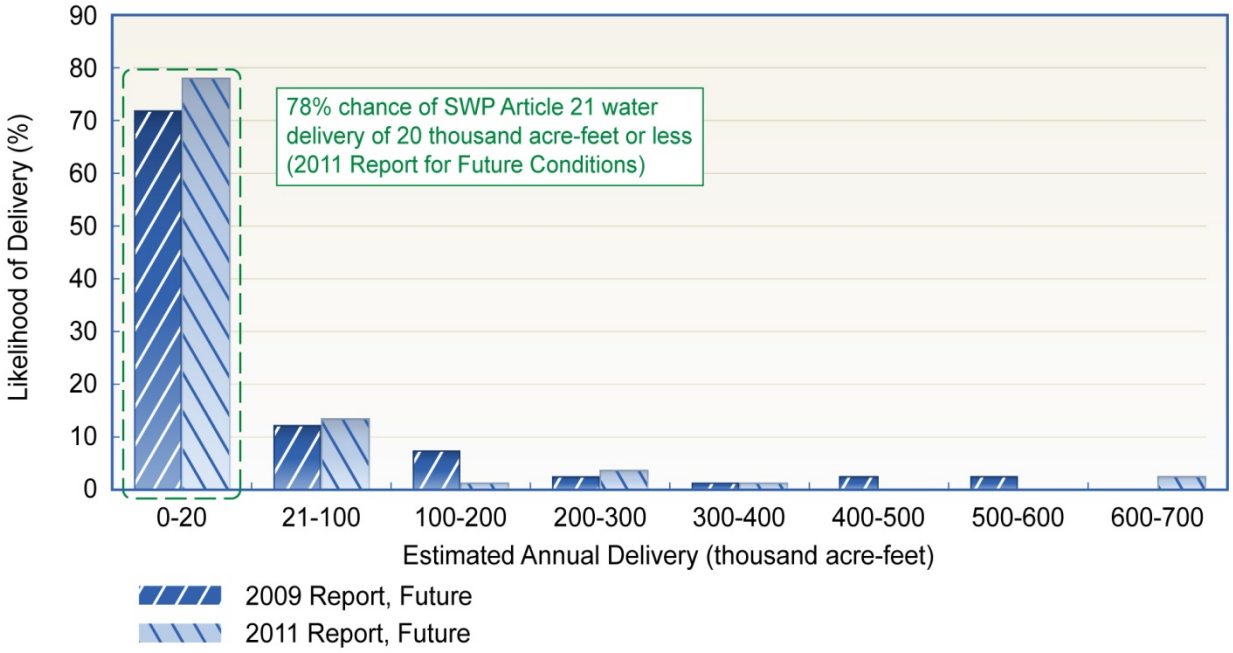

Figure 7-3. Estimated Probability of Annual Deliveries of SWP Article 21 Water (Future Conditions)

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Glossary

acre-foot The volume of water (about 325,900 gallons) that would cover an area of 1 acre to a depth of 1 foot. This is enough water to meet the annual needs of one to two households.

agricultural water supplier As defined by the California Water Code, a public or private supplier that provides water to 2,000 or more irrigated acres per year for agricultural purposes or serves 2,000 or more acres of agricultural land. This can be a water district that directly supplies water to farmers or a contractor that sells water to the water district.

annual Delta exports The total amount of water transferred ("exported") to areas south of the Delta through the Harvey O. Banks Pumping Plant (SWP) and the C. W. "Bill" Jones Pumping Plant (CVP) in 1 year.

appropriative water rights Rights allowing a user to divert surface water for beneficial use. The user must first have obtained a permit from the State Water Resources Control Board, unless the appropriative water right predates 1914.

Article 21 water Water that a contractor can receive in addition to its allocated Table A water. This water is only available if several conditions are met: (1) excess water is flowing through the Delta; (2) the contractor can use the surplus water or store it in the contractor's own system; and (3) delivering this water will not interfere with Table A allocations, other SWP deliveries, or SWP operations.

biological opinion A determination by the U.S. Fish and Wildlife Service or National Marine Fisheries Service on whether a proposed federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of designated "critical habitat." If jeopardy is determined, certain actions are required to be taken to protect the species of concern.

CALSIM II A computer model, jointly developed by DWR and the U.S. Bureau of Reclamation, that simulates existing and future operations of the SWP and CVP. The hydrology used by this model was developed by adjusting the historical flow record (1922–2003) to account for the influence of changes in land uses and regulation of upstream flows.

Among the SWP's facilities are more than 700 miles of canals that distribute water to urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California.

carryover deliveries See "carryover water."

carryover water A water supply "savings account" for SWP water that is allocated to an SWP contractor in a given year, but not used by the end of the year. Carryover water is stored in the SWP's share of San Luis Reservoir, when space is available, for the contractor to use in the following year.

Central Valley Project (CVP) Operated by the U.S. Bureau of Reclamation, the CVP is a water storage and delivery system consisting of 20 dams and reservoirs (including Shasta, Folsom, and New Melones Reservoirs), 11 power plants, and 500 miles of major canals. CVP facilities reach some 400 miles from Redding to Bakersfield and deliver about 7 million acre-feet of water for agricultural, urban, and wildlife use.

cubic feet per second (cfs) A measure of the rate at which a river of stream is flowing. The flow is 1 cfs if a cubic foot (about 7.48 gallons) of water passes a specific point in 1 second. A flow of 1 cubic foot per second for a day is approximately 2 acre-feet.

Delta exports Water transferred ("exported") to areas south of the Delta through the Harvey O. Banks Pumping Plant (SWP) and the C. W. "Bill" Jones Pumping Plant (CVP). The SWP's Delta exports are the primary component of total SWP deliveries.

Delta inflow The combined total of water flowing into the Delta from the Sacramento River, San Joaquin River, and other rivers and waterways.

exceedence curve For the SWP, a chart showing SWP delivery probability (especially for Table A water)—specifically, the likelihood that SWP contractors will receive a certain volume of water under current or future conditions.

existing-conditions scenario For the SWP delivery reliability reports, the results of modeling for SWP Delta exports or deliveries for the year the report was written.

future-conditions scenario For the SWP delivery reliability reports, the results of modeling for SWP Delta exports or SWP deliveries for 20 years into the future.

incidental take permit A permit issued by the U.S. Fish and Wildlife Service, under Section 10 of the federal Endangered Species Act, to private nonfederal entities undertaking otherwise lawful projects that might result in the "take" of an endangered or threatened species. In California, take may be authorized under Section 2081 of the California Fish and Game Code through issuance of either an incidental take permit or a consistency determination. The California Department of Fish and Game is authorized to accept a federal biological opinion as the take authorization for a State-listed species when a species is listed under both the federal and California Endangered Species Acts.

riparian water rights Water rights that apply to lands traversed by or bordering on a natural

watercourse. No permit is required to use this water, which must be used on riparian (adjacent) land and cannot be stored for later use.

State Water Project (SWP) Operated by DWR, a water storage and delivery system of 33 storage facilities, 701 miles of open canals and pipelines, five hydroelectric power plants, and 20 pumping plants that extends for more than 600 miles in California. Its main purpose is to store and distribute water to 29 urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The SWP provides supplemental water to approximately 25 million Californians (two-thirds of California's population) and about 750,000 acres of irrigated farmland. Water deliveries have ranged from 1.4 million acre-feet in a dry year to more than 4.0 million acre-feet in a wet year.

SWP contractors Twenty-nine entities that receive water for agricultural or municipal and industrial uses through the SWP. Each contractor has executed a long-term water supply contract with DWR. Also sometimes referred to as "State Water Contractors."

Table A water (Table A amounts) The maximum amount of SWP water that the State agreed to make available to an SWP contractor for delivery during the year. Table A amounts determine the maximum water a contractor may request each year from DWR. The State and SWP contractors also use Table A amounts to serve as a basis for allocation of some SWP costs among the contractors.

turnback pool water Allocated water that individual SWP contractors may offer early in the year for other SWP contractors to buy later at a set price.

urban water supplier As defined by the California Water Code, a public or private supplier that provides water for municipal use directly or indirectly to more than 3,000 customers or supplies more than 3,000 acre-feet of water in a year. This can be a water district that provides the water to local residents for use at home or work, or a contractor that distributes or sells water to that water district.

Water Rights Decision 1641 (D-1641) A regulatory decision issued by the State Water Resources Control Board in 1999 (updated in 2000) to implement the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta*. D-1641 assigned primary responsibility for meeting many of the Delta's water quality objectives to the SWP and CVP, thus placing certain limits on SWP and CVP operations.

water year In reports on surface water supply, the period extending from October 1 through September 30 of the following calendar year. The water year refers to the September year. For example, October 1, 2010, through September 30, 2011 is the 2011 water year.

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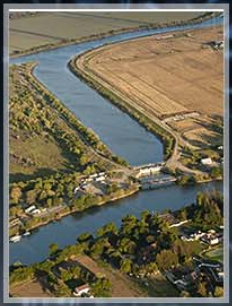

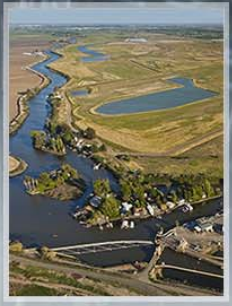

Appendix A

Historical SWP Delivery Tables for 2001–2010

The State Water Project (SWP) contracts define several types of SWP water available for delivery to contractors under specific circumstances: Table A water, Article 21 water, turnback pool water, and carryover water. (See the glossary for definitions of these terms; Chapter 3 describes each type of SWP water in greater detail.) Many SWP contractors frequently use Article 21, turnback pool, and carryover water to increase or decrease the amount of water available to them under SWP Table A.

The Sacramento River Index, previously referred to as the "4 River Index" or "4 Basin Index," is the sum of the unimpaired runoff of four rivers: the Sacramento River above Bend Bridge near Red Bluff, Feather River inflow to Lake Oroville Reservoir, Yuba River at Smartville, and American River inflow to Folsom Lake. The five water year types used in the Sacramento River Index are as follows:

Sacramento River Index	Water Year Type
1	Wet
2	Above Normal
3	Below Normal
4	Dry
5	Critical

Tables A-1 through A-10 list annual historical deliveries by SWP water type for each contractor for 2001 through 2010. The Sacramento River Index and water year type are presented along with the delivery results for each year. Similar delivery tables are presented for years 1999–2008 in the *State Water Project Delivery Reliability Report 2009*. SWP contractors are listed in Tables A-1 through A-10 by location, as follows:

- *Feather River Area:* Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District (FCWCD)
- *North Bay Area:* Napa County FCWCD and Solano County Water Agency (WA)
- *South Bay Area:* Alameda County FCWCD, Zone 7; Alameda County Water District (WD); and Santa Clara Valley WD
- *San Joaquin Valley Area:* Dudley Ridge WD, Empire West Side Irrigation District (ID), Kern County WA, Kings County, Oak Flat WD, and Tulare Lake Basin Water Storage District (WSD)

- *Central Coastal Area:* San Luis Obispo County FCWCD and Santa Barbara County FCWCD
- *Southern California Area:* Antelope Valley–East Kern WA, Castaic Lake WA, Coachella Valley WD, Crestline–Lake Arrowhead WA, Desert Water Agency, Littlerock Creek ID, Metropolitan WD of Southern California, Mojave WA, Palmdale WD, San Bernardino Valley Municipal Water District (MWD), San Gabriel Valley MWD, San Gorgonio Pass WA, and Ventura County Watershed Protection District (WPD)

Table A-1. Historical State Water Project Deliveries, 2001
Sacramento River Index = 4, Water Year Type = Dry

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	513	–	–	–	513
	Yuba City	1,065	–	–	–	1,065
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	4,293	996	1,723	82	7,094
	Solano County WA	17,756	2,304	1,021	–	21,081
South Bay Area	Alameda County FCWCD, Zone 7	22,307	–	5,990	308	28,605
	Alameda County WD	13,695	10	4,192	107	18,004
	Santa Clara Valley WD	35,689	–	12,233	–	47,922
San Joaquin Valley Area	Dudley Ridge WD	18,467	933	6,815	347	26,562
	Empire West Side ID	–	253	1,107	–	1,360
	Kern County WA	363,204	23,233	92,052	6,502	484,991
	Kings County	1,560	–	–	–	1,560
	Oak Flat WD	2,089	–	101	22	2,212
	Tulare Lake Basin WSD	40,830	8,755	7,889	769	58,243
Central Coastal Area	San Luis Obispo County FCWCD	4,184	–	–	99	4,283
	Santa Barbara County FCWCD	14,285	396	–	296	14,977
Southern California Area	Antelope Valley–East Kern WA	45,071	–	–	899	45,970
	Castaic Lake WA (+Rch 31A, 5 & 7)	30,471	850	–	618	31,939
	Coachella Valley WD	9,009	–	–	91	9,100
	Crestline–Lake Arrowhead WA	1,057	–	–	–	1,057
	Desert WA	14,859	–	–	151	15,010
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	686,545	10,415	200,000	7,949	904,909
	Mojave WA	4,433	–	–	–	4,433
	Palmdale WD	8,170	–	2,257	–	10,427
	San Bernardino Valley MWD	26,488	–	–	–	26,488
	San Gabriel Valley MWD	6,534	–	–	–	6,534
	San Gorgonio Pass WA	–	–	–	–	–
	Ventura County WPD	1,850	–	–	–	1,850
	Total SWP Deliveries	**1,374,424**	**48,145**	**335,380**	**18,240**	**1,776,189**
	Total Deliveries from the Delta**	**1,372,846**	**48,145**	**335,380**	**18,240**	**1,774,611**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-2. Historical State Water Project Deliveries, 2002
Sacramento River Index = 4, Water Year Type = Dry

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	419	–	–	–	419
	Yuba City	1,181	–	–	–	1,181
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	2,022	827	3,743	283	6,875
	Solano County WA	28,223	2,242	–	–	30,465
South Bay Area	Alameda County FCWCD, Zone 7	40,707	1,484	8,113	556	50,860
	Alameda County WD	24,250	83	2,331	862	27,526
	Santa Clara Valley WD	55,896	202	3,311	2,053	61,462
San Joaquin Valley Area	Dudley Ridge WD	38,688	1,861	1,994	1,177	43,720
	Empire West Side ID	1,278	26	101	–	1,405
	Kern County WA	670,884	21,951	15,680	20,543	729,058
	Kings County	2,800	–	–	54	2,854
	Oak Flat WD	3,841	50	134	76	4,101
	Tulare Lake Basin WSD	73,785	3,749	5,385	2,289	85,208
Central Coastal Area	San Luis Obispo County FCWCD	4,355	–	–	–	4,355
	Santa Barbara County FCWCD	24,166	436	3,455	324	28,381
Southern California Area	Antelope Valley–East Kern WA	53,907	–	3,256	1,008	58,171
	Castaic Lake WA (+Rch 31A, 5 & 7)	61,880	280	6,657	–	68,817
	Coachella Valley WD	16,170	111	–	474	16,755
	Crestline–Lake Arrowhead WA	2,189	–	–	–	2,189
	Desert WA	26,670	189	–	781	27,640
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	1,273,205	9,624	97,940	14,335	1,395,104
	Mojave WA	4,346	–	–	–	4,346
	Palmdale WD	8,359	–	–	437	8,796
	San Bernardino Valley MWD	68,268	–	3,801	–	72,069
	San Gabriel Valley MWD	18,353	–	4,698		23,051
	San Gorgonio Pass WA	–	–	–	–	–
	Ventura County WPD	4,998	–	–	–	4,998
	Total SWP Deliveries	**2,510,840**	**43,115**	**160,599**	**45,252**	**2,759,806**
	Total Deliveries from the Delta**	**2,509,240**	**43,115**	**160,599**	**45,252**	**2,758,206**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-3. Historical State Water Project Deliveries, 2003
Sacramento River Index = 2, Water Year Type = Above Normal

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	551	–	–	–	551
	Yuba City	1,324	–	–	–	1,324
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	6,026	376	1,055	180	7,637
	Solano County WA	25,135	2,280	1,918	–	29,333
South Bay Area	Alameda County FCWCD, Zone 7	30,695	–	13,099	656	44,450
	Alameda County WD	31,086	–	5,150	354	36,590
	Santa Clara Valley WD	90,620	936	14,104	841	106,501
San Joaquin Valley Area	Dudley Ridge WD	49,723	1,928	1,452	482	53,585
	Empire West Side ID	1,074	175	187	–	1,436
	Kern County WA	841,697	27,891	22,380	8,419	900,387
	Kings County	3,600	58	–	34	3,692
	Oak Flat WD	4,059	19	140	48	4,266
	Tulare Lake Basin WSD	94,376	6,243	4,284	938	105,841
Central Coastal Area	San Luis Obispo County FCWCD	4,417	36	–	–	4,453
	Santa Barbara County FCWCD	24,312	339	2,274	43	26,968
Southern California Area	Antelope Valley–East Kern WA	52,730	–	7,049	250	60,029
	Castaic Lake WA (+Rch 31A, 5 & 7)	49,895	991	4,760	90	55,736
	Coachella Valley WD	14,045	204	–	194	14,443
	Crestline–Lake Arrowhead WA	1,563	–	–	–	1,563
	Desert WA	23,168	330	–	321	23,819
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	1,550,356	17,622	134,845	16,920	1,719,743
	Mojave WA	10,907	–	3,528	–	14,435
	Palmdale WD	9,701	–	1,846	–	11,547
	San Bernardino Valley MWD	25,371	200	1,844	–	27,415
	San Gabriel Valley MWD	13,034	200	–	–	13,234
	San Gorgonio Pass WA	116	–	–	–	116
	Ventura County WPD	5,000	–	–	–	5,000
	Total SWP Deliveries	**2,964,581**	**59,828**	**219,915**	**29,770**	**3,274,094**
	Total Deliveries from the Delta**	**2,962,706**	**59,828**	**219,915**	**29,770**	**3,272,219**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-4. Historical State Water Project Deliveries, 2004
Sacramento River Index = 3, Water Year Type = Below Normal

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	1,440	–	–	–	1,440
	Yuba City	1,434	–	–	–	1,434
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	5,030	1,450	1,602	52	8,134
	Solano County WA	17,991	7,787	47	–	25,825
South Bay Area	Alameda County FCWCD, Zone 7	39,898	–	11,466	–	51,364
	Alameda County WD	20,956	–	6,714	214	27,884
	Santa Clara Valley WD	52,867	2,983	–	508	56,358
San Joaquin Valley Area	Dudley Ridge WD	36,377	7,393	2,185	291	46,246
	Empire West Side ID	1,310	626	1,626	–	3,562
	Kern County WA	640,190	86,513	40,120	5,075	771,898
	Kings County	5,850	3,157	–	46	9,053
	Oak Flat WD	4,324	–	276	29	4,629
	Tulare Lake Basin WSD	58,575	15,299	5,638	489	80,001
Central Coastal Area	San Luis Obispo County FCWCD	4,096	69	–	–	4,165
	Santa Barbara County FCWCD	29,566	–	–	122	29,688
Southern California Area	Antelope Valley–East Kern WA	50,532	–	9,199	–	59,731
	Castaic Lake WA (+Rch 31A, 5 & 7)	46,358	1,618	35,785	–	83,761
	Coachella Valley WD	8,631	–	6,745	89	15,465
	Crestline–Lake Arrowhead WA	2,006	–	–	–	2,006
	Desert WA	9,966	–	11,122	102	21,190
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	1,195,807	91,601	215,000	10,223	1,512,631
	Mojave WA	11,176	–	–	–	11,176
	Palmdale WD	10,549	–	1,613	–	12,162
	San Bernardino Valley MWD	35,522	–	20,631	–	56,153
	San Gabriel Valley MWD	15,600	–	–	–	15,600
	San Gorgonio Pass WA	841	–	–	–	841
	Ventura County WPD	5,250	–	–	–	5,250
	Total SWP Deliveries	**2,312,142**	**218,496**	**369,769**	**17,240**	**2,917,647**
	Total Deliveries from the Delta**	**2,309,268**	**218,496**	**369,769**	**17,240**	**2,914,773**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-5. Historical State Water Project Deliveries, 2005
Sacramento River Index = 2, Water Year Type = Above Normal

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	527	–	–	–	527
	Yuba City	1,894	–	–	–	1,894
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	5,322	606	1,741	–	7,669
	Solano County WA	24,515	10,421	83	–	35,019
South Bay Area	Alameda County FCWCD, Zone 7	38,388	–	7,849	275	46,512
	Alameda County WD	36,469	846	6,341	943	44,599
	Santa Clara Valley WD	89,476	6,298	11,899	342	108,015
San Joaquin Valley Area	Dudley Ridge WD	51,609	28,197	821	1,286	81,913
	Empire West Side ID	1,448	1,799	587	–	3,834
	Kern County WA	893,439	453,078	9,851	22,397	1,378,765
	Kings County	8,100	11,504	–	202	19,806
	Oak Flat WD	4,067	–	–	127	4,194
	Tulare Lake Basin WSD	86,604	47,267	3,973	2,158	140,002
Central Coastal Area	San Luis Obispo County FCWCD	4,006	245	–	–	4,251
	Santa Barbara County FCWCD	22,981	–	–	155	23,136
Southern California Area	Antelope Valley–East Kern WA	57,205	–	2,626	–	59,831
	Castaic Lake WA (+Rch 31A, 5 & 7)	54,303	2,451	2,702	–	59,456
	Coachella Valley WD	26,984	–	12,819	2,716	42,519
	Crestline–Lake Arrowhead WA	807	–	–	–	807
	Desert WA	33,168	–	14,799	1,122	49,089
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California**	1,269,291	168,300	106,032	6,530	1,550,153
	Mojave WA	10,360	–	1,201	–	11,561
	Palmdale WD	10,174	–	1,538	–	11,712
	San Bernardino Valley MWD	31,211	56	283	–	31,550
	San Gabriel Valley MWD	10,500	–	–	–	10,500
	San Gorgonio Pass WA	655	15	–	22	692
	Ventura County WPD	1,665	–	–	–	1,665
	Total SWP Deliveries	**2,775,168**	**731,083**	**185,145**	**38,275**	**3,729,671**
	Total Deliveries from the Delta* **	**2,772,747**	**731,083**	**185,145**	**38,275**	**3,727,250**

* Table A = State Water Project Analysis Office current-year deliveries + Next year's Article 14B carryover water

** Metropolitan Water District of Southern California 2005 Table A deliveries have been updated to reflect the addition of Article 14B carryover water that was previously omitted.

*** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-6. Historical State Water Project Deliveries, 2006
Sacramento River Index = 1, Water Year Type = Wet

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	468	–	–	–	468
	Yuba City	4,148	1,194	–	–	5,342
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	7,312	300	172	–	7,784
	Solano County WA	12,070	18,195	390	–	30,655
South Bay Area	Alameda County FCWCD, Zone 7	50,785	–	2,252	491	53,528
	Alameda County WD	–	2,375	1,331	39,373	43,079
	Santa Clara Valley WD	47,344	26,769	524	–	74,637
San Joaquin Valley Area	Dudley Ridge WD	55,343	18,515	–	1,068	74,926
	Empire West Side ID	1,500	1,124	658	–	3,282
	Kern County WA	961,882	256,634	5,418	18,610	1,242,544
	Kings County	8,991	366	–	173	9,530
	Oak Flat WD	4,118	–	17	107	4,242
	Tulare Lake Basin WSD	48,361	59,424	–	1,787	109,572
Central Coastal Area	San Luis Obispo County FCWCD	3,382	827	–	–	4,209
	Santa Barbara County FCWCD	19,255	4,020	–	–	23,275
Southern California Area	Antelope Valley–East Kern WA	76,623	–	3,761	–	80,384
	Castaic Lake WA (+Rch 31A, 5 & 7)	56,758	2,089	3,905	–	62,752
	Coachella Valley WD	121,100	–	–	–	121,100
	Crestline–Lake Arrowhead WA	257	–	–	–	257
	Desert WA	50,000	–	–	–	50,000
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	1,103,538	238,478	136,424	11,638	1,490,078
	Mojave WA	32,496	–	1,518	–	34,014
	Palmdale WD	10,374	1,653	335	130	12,492
	San Bernardino Valley MWD	31,902	–	3,427	–	35,329
	San Gabriel Valley MWD	13,524	–	–	–	13,524
	San Gorgonio Pass WA	4,262	–	–	–	4,262
	Ventura County WPD	1,850	–	–	–	1,850
	Total SWP Deliveries	**2,727,643**	**631,963**	**160,132**	**73,377**	**3,593,115**
	Total Deliveries from the Delta**	**2,723,027**	**630,769**	**160,132**	**73,377**	**3,587,305**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-7. Historical State Water Project Deliveries, 2007
Sacramento River Index = 4, Water Year Type = Dry

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	956	–	–	–	956
	Yuba City	2,327	–	–	–	2,327
	Plumas County FCWCD	–	–	–	–	–
North Bay Area	Napa County FCWCD	6,362	3,597	998	–	10,957
	Solano County WA	14,892	8,217	1,822	–	24,931
South Bay Area	Alameda County FCWCD, Zone 7	32,972	912	2,895	378	37,157
	Alameda County WD	16,541	550	2,103	197	19,391
	Santa Clara Valley WD	38,812	4,840	8,161	469	52,282
San Joaquin Valley Area	Dudley Ridge WD	28,457	8,953	2,000	269	39,679
	Empire West Side ID	397	1,172	515	–	2,084
	Kern County WA	592,423	99,861	19,645	4,683	716,612
	Kings County	4,924	474	–	43	5,441
	Oak Flat WD	3,430	41	69	27	3,567
	Tulare Lake Basin WSD	57,272	12,902	16,459	450	87,083
Central Coastal Area	San Luis Obispo County FCWCD	3,752	24	–	–	3,776
	Santa Barbara County FCWCD	24,760	1,070	1,390	–	27,220
Southern California Area	Antelope Valley–East Kern WA	74,459	–	4,364	–	78,823
	Castaic Lake WA (+Rch 31A, 5 & 7)	44,974	–	4,216	–	49,190
	Coachella Valley WD	72,660	–	–	568	73,228
	Crestline–Lake Arrowhead WA	1,768	–	–	–	1,768
	Desert WA	30,000	–	–	234	30,234
	Littlerock Creek ID	1,380	–	–	–	1,380
	Metropolitan WD of Southern California	1,146,900	166,517	28,098	8,962	1,350,477
	Mojave WA	45,372	–	737	–	46,109
	Palmdale WD	12,780	843	985	100	14,708
	San Bernardino Valley MWD	57,116	–	–	–	57,116
	San Gabriel Valley MWD	10,000	–	–	–	10,000
	San Gorgonio Pass WA	4,009	–	–	–	4,009
	Ventura County WPD	3,000	–	–	–	3,000
	Total SWP Deliveries	**2,332,695**	**309,973**	**94,457**	**16,380**	**2,753,505**
	Total Deliveries from the Delta**	**2,329,412**	**309,973**	**94,457**	**16,380**	**2,750,222**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-8. Historical State Water Project Deliveries, 2008
Sacramento River Index = 5, Water Year Type = Critical

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	9,436	–	–	–	9,436
	Yuba City	1,923	–	–	–	1,923
	Plumas County FCWCD	243	–	–	–	243
North Bay Area	Napa County FCWCD	3,636	1,219	7,363	21	12,239
	Solano County WA	10,436	1,510	12,389	–	24,335
South Bay Area	Alameda County FCWCD, Zone 7	13,633	–	15,400	–	29,033
	Alameda County WD	4,206	–	8,659	37	12,902
	Santa Clara Valley WD	11,133	–	21,188	88	32,409
San Joaquin Valley Area	Dudley Ridge WD	12,260	–	5,949	51	18,260
	Empire West Side ID		–	915	–	915
	Kern County WA	271,636	–	6,815	883	279,334
	Kings County	3,187	–	–	8	3,195
	Oak Flat WD	1,929	–	–	5	1,934
	Tulare Lake Basin WSD	32,302	–	281	85	32,668
Central Coastal Area	San Luis Obispo County FCWCD	8,512	–	–	–	8,512
	Santa Barbara County FCWCD	11,311	–	2,532	40	13,883
Southern California Area	Antelope Valley–East Kern WA	31,082	–	10,381	125	41,588
	Castaic Lake WA (+Rch 31A, 5 & 7)	18,710	–	12,146	–	30,856
	Coachella Valley WD	42,385	–	–	107	42,492
	Crestline–Lake Arrowhead WA	1,159	–	689	–	1,848
	Desert WA	17,500	–	–	44	17,544
	Littlerock Creek ID	805	–	–	–	805
	Metropolitan WD of Southern California	654,304	–	–	1,689	655,993
	Mojave WA	26,288	–	108	–	26,396
	Palmdale WD	4,226	–	–	19	4,245
	San Bernardino Valley MWD	30,562	–	4,444	–	35,006
	San Gabriel Valley MWD	10,080	–	–	–	10,080
	San Gorgonio Pass WA	5,419	–	300	–	5,719
	Ventura County WPD	3,798	–	–	–	3,798
	Total SWP Deliveries	**1,242,101**	**2,729**	**109,559**	**3,202**	**1,357,591**
	Total Deliveries from the Delta**	**1,230,499**	**2,729**	**109,559**	**3,202**	**1,345,989**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-9. Historical State Water Project Deliveries, 2009
Sacramento River Index = 4, Water Year Type = Dry

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	581	–	–	–	581
	Yuba City	2,114	–	–	–	2,114
	Plumas County FCWCD	200	–	–	–	200
North Bay Area	Napa County FCWCD	2,723	1,588	4,475	13	8,799
	Solano County WA	8,618	4,444	3,123	–	16,185
South Bay Area	Alameda County FCWCD, Zone 7	12,093	–	14,584	–	26,677
	Alameda County WD	5,911	–	10,494	8	16,413
	Santa Clara Valley WD	9,188	–	23,867	54	33,109
San Joaquin Valley Area	Dudley Ridge WD	13,185	–	7,810	32	21,027
	Empire West Side ID	1,034	–	–	–	1,034
	Kern County WA	226,631	–	56,367	544	283,542
	Kings County	3,153	–	70	5	3,228
	Oak Flat WD	1,825	–	66	1	1,892
	Tulare Lake Basin WSD	35,160	–	1,271	52	36,483
Central Coastal Area	San Luis Obispo County FCWCD	3,799	–	–	–	3,799
	Santa Barbara County FCWCD	12,746	–	4,523	25	17,294
Southern California Area	Antelope Valley–East Kern WA	14,419	–	18,408	77	32,904
	Castaic Lake WA (+Rch 31A, 5 & 7)	14,858	–	9,529	52	24,439
	Coachella Valley WD	40,845	–	–	66	40,911
	Crestline–Lake Arrowhead WA	–	–	893	–	893
	Desert WA	16,865	–	–	27	16,892
	Littlerock Creek ID	–	–	–	–	–
	Metropolitan WD of Southern California	544,304	–	10,721	1,042	556,067
	Mojave WA	21,312	–	242	–	21,554
	Palmdale WD	12,095	–	3,229	–	15,324
	San Bernardino Valley MWD	26,785	–	9,348	–	36,133
	San Gabriel Valley MWD	11,516	–	–	–	11,516
	San Gorgonio Pass WA	5,612	–	480	–	6,092
	Ventura County WPD	3,890	–	–	–	3,890
	Total SWP Deliveries	**1,051,462**	**6,032**	**179,500**	**1,998**	**1,238,992**
	Total Deliveries from the Delta**	**1,048,567**	**6,032**	**179,500**	**1,998**	**1,236,097**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

Table A-10. Historical State Water Project Deliveries, 2010
Sacramento River Index = 3, Water Year Type = Below Normal

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A*	Article 21	Carryover	Turnback	
Feather River Area	Butte County	807	–	–	–	807
	Yuba City	2,331	–	–	–	2,331
	Plumas County FCWCD	243	–	–	–	243
North Bay Area	Napa County FCWCD	7,275	2,207	2,845	90	12,417
	Solano County WA	16,793	5,298	3,661	–	25,752
South Bay Area	Alameda County FCWCD, Zone 7	28,694	–	12,756	249	41,699
	Alameda County WD	11,668	–	10,889	14	22,571
	Santa Clara Valley WD	6,068	–	10,741	34	16,843
San Joaquin Valley Area	Dudley Ridge WD	15,833	–	9,752	156	25,741
	Empire West Side ID	380	–	–	–	380
	Kern County WA	375,426	–	55,419	3,044	433,889
	Kings County	4,094	–	522	29	4,645
	Oak Flat WD	2,412	–	455	18	2,885
	Tulare Lake Basin WSD	35,985	–	3,199	275	39,459
Central Coastal Area	San Luis Obispo County FCWCD	3,480	–	277	–	3,757
	Santa Barbara County FCWCD	8,640	–	7,134	140	15,914
Southern California Area	Antelope Valley–East Kern WA	36,462	–	20,813	438	57,713
	Castaic Lake WA (+Rch 31A, 5 & 7)	37,054	–	14,501	295	51,850
	Coachella Valley WD	69,175	–	7,595	429	77,199
	Crestline–Lake Arrowhead WA	357	–	–	–	357
	Desert WA	27,875	–	3,135	173	31,183
	Littlerock Creek ID		–	–	–	–
	Metropolitan WD of Southern California	817,765	–	67,783	5,922	891,470
	Mojave WA	35,241	–	20	–	35,261
	Palmdale WD	5,585	–	5,325	59	10,969
	San Bernardino Valley MWD	37,733	–	11,273	–	49,006
	San Gabriel Valley MWD	19,180	–	–	–	19,180
	San Gorgonio Pass WA	6,626	–	–	6	6,632
	Ventura County WPD	4,075	–	–	–	4,075
	Total SWP Deliveries	**1,617,257**	**7,505**	**248,095**	**11,371**	**1,884,228**
	Total Deliveries from the Delta**	**1,613,876**	**7,505**	**248,095**	**11,371**	**1,880,847**

* Table A = State Water Project Analysis Office current-year deliveries + next year's Article 14B carryover water

** Total deliveries from the Delta = Total SWP deliveries – Feather River Service Area deliveries (Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District)

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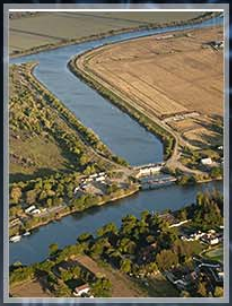
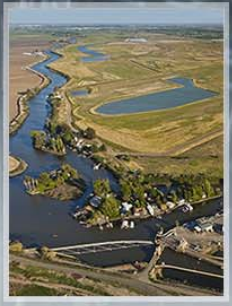
Appendix B

Comment Letters on the Draft Report and the Department's Responses





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THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

Office of the General Manager

March 12, 2012

Ms. Cynthia Pierson
California Department of Water Resources
SWP Delivery Reliability Report – Attn: Cynthia Pierson
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Ms. Pierson:

State Water Project Delivery Reliability Report 2011 – January 2012 Draft

The Metropolitan Water District of Southern California (Metropolitan) has reviewed the Department of Water Resources (Department) January 2012 draft of the State Water Project (SWP) Delivery Reliability Report 2011 (DRR) and offers the following comments and observations.

Metropolitan understands the Department's desire to produce a public outreach document with the intent to educate Californians about the SWP and its operations. However, we do not agree that this should be the purpose of the DRR. The preparation of this report should be to satisfy the obligation set forth in the 2003 Monterey Settlement (Settlement) between DWR, the State Water Contractors (SWC) and the Monterey Amendment Plaintiffs. The Settlement requires a report on the delivery capability of the SWP facilities to be distributed biannually to all SWP contractors, city and county planning departments, and regional and metropolitan planning departments in the SWP's service area. Metropolitan suggests that the Department refocus the report to provide a summary of the technical analysis including the assumptions used in the analysis and a description of the results. Similar to previous versions of the DRR, the report should focus on the technical needs of the SWC and regional planning agencies for information on the reliability of the SWP. This report should not be used as a larger public outreach document.

Metropolitan believes that an education can be provided to readers of the DRR while remaining true to its original intent. To that end, we encourage the Department to reconsider the use of the term "Delta exports", which may mislead the reader. This term is used throughout the report in a fashion that promotes the notion that we are exporting a native supply out of the Delta. Rather, these supplies were developed through SWP Conservation Facilities and SWP water rights and represent a small percentage of the total flows passing through the Delta. We would like to see the report be clear on the fact that the water diverted is a SWP developed supply.

700 N. Alameda Street, Los Angeles, California 90012 • Mailing Address: Box 54153, Los Angeles, California 90054-0153 • Telephone (213) 217-6000

Metropolitan acknowledges the difficulties in preparing a report of this magnitude particularly with the variability in hydrology, regulatory restrictions and climate change uncertainties. Metropolitan continues to offer its assistance with the development of this report. We encourage the Department to engage not only Metropolitan but other SWP contractors early in the preparation of the document. We believe a more collaborative process will facilitate feedback from the end users resulting in an improved document.

Very truly yours,

Deven N. Upadhyay
Manager, Water Resource Management

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Mr. Mark Cowin
Director, California Department of Water Resources
P.O. Box 942836, Room 1115-1
Sacramento, CA 94236-0001

Ms. Katherine Kelly
Chief, Bay-Delta Office
California Department of Water Resources
1416, 9th Street, Room 215-37
Sacramento, CA 95814

Mr. Terry Erlewine
General Manager
State Water Contractors
1121 L Street, Suite 1050
Sacramento, CA 95814

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

EDMUND G. BROWN JR., *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

June 25, 2012

Mr. Deven N. Upadhyay
Manager, Water Resources Management
The Metropolitan Water District of Southern California
PO Box 54153
Los Angeles, California 90054-0153

Dear Mr. Upadhyay:

This letter responds to your letter dated March 12, 2012 commenting on the draft State Water Project Delivery Reliability Report (2011). We appreciate your review and subsequent comments to the draft report.

Your first comment is regarding the format of the report. Metropolitan would like the Department of Water Resources to focus on the technical needs of the State Water Contractors and regional planning agencies for information on the reliability of the State Water Project (SWP) and not plan to use the report as a larger public outreach document.

The reformatting of the Delivery Reliability Report is intended to make the information more understandable to the public. The Monterey Settlement (2003) requires a report covering this subject to be published every two years and that the information contained in the report be readily understandable by the public. The previous versions of the report focus on estimated amounts for Table A deliveries and other categories of deliveries defined in the SWP water delivery contracts. We agree that this is valuable information for our contractors and planning entities within the SWP service area however, it is not readily understandable to the public. Our intent in reformatting the report is to meet the needs of both audiences. The main report is intended for the public audience and the accompanying technical addendum intended for State Water Contractors and regional planning agencies. The technical addendum includes descriptions of the analyses, the results, and the breakdown of the information for each contractor.

Your second comment is regarding the use of the term "Delta exports" for the water pumped from the Delta by the SWP. Your observation is that the term is used in a manner that may mislead the reader by promoting the notion that the SWP exports a "native supply" from the Delta rather than one developed through the SWP conservation facilities and water rights. The term "Delta exports" is one that is commonly used in Department reports. It refers to the water that is released from Oroville Reservoir and transferred across the Delta as well as other flows that enter the Delta and are available to the SWP while meeting the relevant water rights' requirements and other export regulations. Chapters 2 through 4 are intended to inform the reader about the history, facilities and requirements for operation of the SWP. It is our hope that this information will help to avoid any potential misinterpretation by the reader regarding what is meant by the term "Delta exports".

The final 2011 State Water Project Delivery Reliability Report is nearing completion and is expected to be available next month. If you would like to discuss your concerns further, please contact me at (916) 653-1099 or kkelly@water.ca.gov.

Sincerely,

Katherine Kelly

Katherine F. Kelly, Chief
Bay-Delta Office

Mojave Water Agency

13846 Conference Center Drive ♦ Apple Valley, California 92307
Phone (760) 946-7000 ♦ Fax (760) 240-2642 ♦ www.mojavewater.org

VIA ELECTRONIC MAIL

March 12, 2012

California Department of Water Resources
SWP Delivery Reliability Report- Attn: Cynthia Pierson
P.O. Box 942836
Sacramento, CA 94236-0001

RE: Comments on the State Water Project Draft Delivery Reliability Report 2011

Dear Ms. Pierson:

The Mojave Water Agency has reviewed the SWP Draft Delivery Reliability Report 2011 ("2011 DRR") and offers these comments. In general, we appreciated the format and information included in the 2009 DRR and would like to see the same level of detail and information presented in the 2011 DRR. Please consider the following comments:

1. Individual Contractor Modeling Results: We appreciate the inclusion of individual contractor modeling outputs in the Technical Addendum.
2. Reliability Numbers: In addition to the charts in the 2011 DRR (figures 6-5 thru 6-9), the body of the report should include SWP reliability percentages, either in the text or in tables, as was done in the 2009 DRR. This should be done for current and future conditions for the long-term average, drought cycles, and wet cycles (example: Tables 6.1 thru 6.4 in the 2009 DRR). Average-year and dry-year numbers are critical information for urban water suppliers to include in their Urban Water Management Plans, which are used to demonstrate water supply sufficiency for their service areas.
3. Effects of Climate Change: We appreciate the inclusion of modeling results comparing future SWP deliveries with and without the effects of climate change; this will be of great help to agencies preparing climate change evaluations for water supply planning purposes.
4. Factors Affecting Reliability: Chapter 4 describes a number of factors that have reduced or have the potential to reduce future water supply reliability. The chapter should also "disclose" that some future actions may actually increase future reliability:
   a. The recent court decisions overturning Federal Biological Opinions (BO's) were mentioned; but it should be mentioned that implementation of future BO's may result in less restriction on delta exports.
   b. The Bay Delta Conservation Plan (BDCP) was described briefly, but it should also indicate that the conveyance piece of the BDCP will likely result in increased reliability.

Thank you for your consideration of our comments.

Sincerely,

Kirby Brill
General Manager

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

EDMUND G. BROWN JR., *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

May 23, 2012

Kirby Brill
General Manager
Mojave Water Agency
13846 Conference Center Drive
Apple Valley, California 92307

Dear Mr. Brill,

This letter is in response to your letter dated March 12, 2012 providing the comments of the Mojave Water Agency for the Draft 2011 SWP Delivery Reliability Report. Our responses to your four comments are attached.

I appreciate you and your staff's comments. If you or your staff wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. For specific questions regarding the analyses used for the report, please contact Francis Chung at (916) 653-5924.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

Attachment:

Attachment

The following responses are to the comments provided in the March 12, 2012 letter from the Mojave Water Agency. The comments are shown in italics.

1. *Individual Contractor Modeling Results: We appreciate the inclusion of individual contractor modeling outputs in the Technical Addendum.*

   Thank you. We strive to make the Delivery Reliability Report as informative and useful as possible.

2. *Reliability Numbers: In addition to the charts in the 2011 DRR (figures 6-5 thru 6-9), the body of the report should include SWP reliability percentages, either in the text or in tables, as was done in the 2009 DRR. This should be done for current and future conditions for the long-term average, drought cycles, and wet cycles (example: Tables 6.1 thru 6.4 in the 2009 DRR). Average-year and dry-year numbers are critical information for urban water suppliers to include in their Urban Water Management Plans, which are used to demonstrate water supply sufficiency for their service areas.*

   Tables 6-3, 6-4, 7-2, and 7-3 have been added to the report to include this information.

3. *Effects of Climate Change: We appreciate the inclusion of modeling results comparing future SWP deliveries with and without the effects of climate change; this will be of great help to agencies preparing climate change evaluations for water supply planning purposes.*

   Thank you. We are glad you found this information beneficial.

4. *Factors Affecting Reliability: Chapter 4 describes a number of factors that have reduced or have the potential to reduce future water supply reliability. The chapter should also "disclose" that some future actions may actually increase future reliability:*
   a. *The recent court decision overturning Federal Biological Opinions (BO's) were mentioned; but it should be mentioned that implementation of future BO's may result in less restriction on Delta exports.*
   b. *The Bay Delta Conservation Plan (BDCP) was described briefly, but it should also indicate that the conveyance piece of the BDCP will likely result in increased reliability.*

   We appreciate your suggestion. However, we feel it is premature to discuss the effects of potential future BOs or BDCP alternatives. This is something that we can keep in mind and discuss further as we begin to develop the 2013 SWP Delivery Reliability Report.

March 12, 2012

California Department of Water Resources
SWP Delivery Reliability Report-Attn: Cynthia Pierson
P.O. Box 942836
Sacramento, CA 94236-0001

Comments on 2011 SWP Draft Delivery Reliability Report

Dear Ms. Pierson:

The State Water Contractors (SWC) has reviewed the 2011 SWP Draft Delivery Reliability Report and offers these comments. The SWC are generally concerned about the level of detail in the presentation. Additionally, the SWC has also identified numerous specific editorial changes for your consideration.

The SWC are interested in discussing our concerns with DWR, primarily in relation to the forthcoming 2013 SWP Reliability Report. If you have any questions about our concerns or specific comments, please contact me at (916) 447-7357.

Sincerely,

Terry L. Erlewine
General Manager

Attachment

STATE WATER CONTRACTORS
SWC
Served by the State Water Project
FOUNDED IN 1982

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Kern County Water Agency

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Santa Clara Valley Water District

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Antelope Valley-East Kern Water Agency

Mark Gilkey
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Dan Masnada
Castaic Lake Water Agency

Steven Robbins
Coachella Valley Water District

Ray Stokes
Central Coast Water Authority

General Manager
Terry Erlewine

1121 L Street, Suite 1050 • Sacramento, California 95814-3944 • 916.447.7357 • FAX 916.447-2734 • www.swc.org

Attachment

State Water Contractors
Specific Comments on DWR's 2011 State Water Project Delivery Reliability Report

Figure 2-2. This figure shows only inflows and outflows to the Delta, and does not provide information on the magnitude of total flows in the watershed or total outflow. A graph similar to that prepared for the Delta Vision that places the total disposition of water supply into context would be helpful.

Page 13. Discussion of how operations are coordinated with the CVP should reference the Coordinated Operations Agreement, which is the basis for that coordination.

Page 23. There is discussion of how individual SWP contractors manage their water supplies annually on the basis of available water supply. That kind of annual information is not the data that is contained in the Delivery Reliability Report and is provided separately by DWR's Operations Control Office. The discussion here reads as though the Delivery Reliability Report provides that information.

Page 27. The discussion of the status of the 2008 and 2009 Biological Opinions is not very informative. This discussion should expand briefly on Judge Wanger's opinion that the current BOs are BOs are "arbitrary, capricious and unlawful" and are currently being redone. The discussion should also note that a preliminary injunction was issued enjoining implementation of the Fall X2 action of the 2008 Delta Smelt Biological Opinion. Additionally, DWR and other plaintiffs in the case have the option to file actions challenging provisions of the Biological Opinions on a continuing basis until new BOs are developed.

Chapter 5. The SWC question that there is any need for this chapter in this report as this goes beyond the issue of delivery reliability. If DWR wants to report on the topic of exports separately, it should do so in a separate report to meet whatever purpose is identified. If DWR insists of having a chapter on exports, it should be moved to later in the report, after Chapters 6 and 7, which identify the basis for the studies reported on in the export chapter.

Page 37. The statement is made that Delta exports are the only SWP water supply source for 24 of the 29 SWP contractors. In fact, local runoff occasionally provides significant quantities of water supply in some wet years.

Page 38. The reference to "Upper Feather River Area contractors" should drop the term "Upper" and refer simply to the "Feather River contractors." The City of Yuba City is located on the lower Feather River.

Page 38. The discussion of water types is incomplete and confusing. It should either be expanded or dropped. Additionally, the word "surplus" should not be used in relation to Article 21 Water. Surplus water has a distinct meaning under the SWP Water Supply Contracts that is different than Article 21 Water

Figure 5-2. This graph would be better presented as a line graph than as a bar graph.

Page 41. The discussion presents results on existing and future conditions, without describing those conditions. This discussion would be enhanced if the entire Chapter 5 was included after Chapters 6 & 7, which are where the existing and future conditions are described.

Page 44. There is discussion of differences between the 2009 and 2011 Delivery Reliability Report that are not really meaningful and are totally within the margin of error for the modeling analysis. Rather than show repeated figures portraying these meaningless differences between the two reports, it would be preferable to abbreviate the text and figures and include a high level statement that the two reports are essentially identical.

Page 48. The discussion of the basis for local demands changing highlights water conservation as the only specific example of those changes. A much more important factor would be local management (i.e., local storage) within the service area.

Page 48. There is a reference to Kern Wet Year as the basis for variations in Article 21 Water demands, but no explanation of why that would be a factor. It would be useful to state that Kern River inflows are a major local water supply variable in Kern County Water Agency, which is the second largest SWP contractor and possesses significant local groundwater recharge potential.

Pages 51-53. As pointed out earlier, there is extensive discussion and numerous figures are presented to show the differences between the 2009 and 2011 Delivery Reliability Reports, which are essentially not meaningful and within the margin of error of the studies. Rather than included repetitive slides showing the same information, this section should be substantially reduced. In fact, the summary of results presented on Page 57 would suffice for all the presentation starting on page 51 and continuing to Page 57.

Page 57. In discussing the Dry year deliveries of Article 21 Water, there is no indication of the location of those deliveries. Given regulatory restrictions in place, it is likely that all the Article 21 Water Deliveries are made to the SWP contractors located north of the Delta. If so, that should be stated. Otherwise, the reader is left with the impression that Article 21 Water might be available for South of the Delta contractors.

Page 61. There is a reference to 4,133 taf/year as the "maximum Delta SWP Table A." The term Delta should be dropped and the reference should be only to "maximum SWP Table A."

Pages 62-68. Same comment as for Chapter 6. The discussion of differences between essentially identical modeling results is too long and should be truncated. The summary of results starting at page 68 could suffice for this entire discussion.

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

EDMUND G. BROWN JR., *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

May 25, 2012

Terry L. Erlewine
General Manager
State Water Contractors
1121 L Street, Suite 1050
Sacramento, California 95814-3944

Dear Mr. Erlewine,

This letter is in response to your letter dated March 12, 2012 providing the comments of the State Water Contractors. I appreciate you and your members taking the time to review the Draft 2011 SWP Delivery Reliability Report and providing feedback. Our responses to your comments are attached.

If you or your staff wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. For specific questions regarding the analyses used for the report, please contact Francis Chung at (916) 653-5924.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

Attachment:

The following responses are to the comments provided in the March 12, 2012 letter from the State Water Contractors. The comments are shown in italics.

Figure 2-2. This figure shows only inflows and outflows to the Delta, and does not provide information on the magnitude of total flows in the watershed or total outflow. A graph similar to that prepared for the Delta Vision that places the total disposition of water supply into context would be helpful.

We have updated this figure to include a more thorough mass balance of the Delta.

Page 13. Discussion of how operations are coordinated with the CVP should reference the Coordinated Operation Agreement, which is the basis for that coordination.

We have updated the text on page 13 to mention the Coordinated Operation Agreement with language similar to that used in the sidebar on page 14 of the report.

Page 23. There is discussion of how individual SWP contractors manage their water supplies annually on the basis of available water supply. That kind of annual information is <u>not</u> the data that is contained in the Delivery Reliability Report and is provided separately by DWR's Operations Control Office. The discussion here reads as though the Delivery Reliability Report provides that information.

We have updated the language on page 23 to clarify the type of information that can be found in the SWP Delivery Reliability Report.

Page 27. The discussion of the status of the 2008 and 2009 Biological Opinions is not very informative. This discussion should expand briefly on Judge Wanger's opinion that the current BOs are "arbitrary, capricious and unlawful" and are currently being redone. The discussion should also note that a preliminary injunction was issued enjoining implementation of Fall X2 action of the 2008 Delta Smelt Biological Opinion. Additionally, DWR and other plaintiffs in the case have option to file actions challenging provisions of the Biological Opinions on a continuing basis until new BOs are developed.

Staff from the Bay-Delta Office coordinated with DWR's Office of the Chief Counsel on this section and they felt that this section should be a factual summary of the assumptions and criteria used to operate the projects. As a result, discussion of the related litigation is kept to a minimum.

Chapter 5. The SWC question that there is any need for this chapter in this report as this goes beyond the issue of delivery reliability. If DWR wants to report on the topic of exports separately, it should do so in a separate report to meet whatever purpose is identified. If DWR insists of having a chapter on exports, it should be moved to later in the report, after Chapters 6 and 7, which identify the basis for the studies reported on in the export chapter.

We have placed the "Exports" chapter before the "Deliveries" chapters simply because the exports precede deliveries in operations. Reordering chapters would cause significant rewriting to maintain document flow. We prefer to leave the content intact for the current report but we also want to consider the points you have brought up regarding exports as we start to formulate ideas for content to be included in the 2013 SWP Delivery Reliability Report.

Page 37. The statement is made that Delta exports are the only SWP water supply source for 24 of the 29 SWP contractors. In fact, local runoff occasionally provides significant quantities of water supply in some wet years.

The language on page 37 has been modified to clarify that Delta exports are not the only source of SWP water for the contractors.

Page 38. The reference to "Upper Feather River Area contractors" should drop the term "Upper" and refer simply to the "Feather River contractors." The City of Yuba City is located on the lower Feather River.

We agree completely and have removed the term "upper" from the Feather River description throughout the report and technical addendum.

Page 38. The discussion of water types is incomplete and confusing. It should either be expanded or dropped. Additionally, the word "surplus" should not be used in relation to Article 21 Water. Surplus water has a distinct meaning under the SWP Water Supply Contracts that is different than Article 21 Water.

We have made some modifications to the discussion of water types so it will, hopefully, be more clear now. We have also taken out the word "surplus" when describing Article 21 deliveries, per your suggestion.

Figure 5-2. This graph would be better presented as a line graph than as a bar graph.

We feel that the current graph format is aesthetically more consistent with the report layout.

Page 41. The discussion presents results on existing and future conditions, without describing those conditions. This discussion would be enhanced if the entire Chapter 5 was included after Chapters 6 & 7, which are where the existing and future conditions are described.

We have added text to this section to direct the reader to chapters 6 and 7 for more information regarding the assumptions for modeling existing and future conditions.

Page 44. There is discussion of differences between the 2009 and 2011 Delivery Reliability Report that are not really meaningful and are totally within the margin of error for the modeling analysis. Rather than show repeated figures portraying these meaningless differences between the two reports, it would be preferable to abbreviate the text and figures and include a high level statement that the two reports are essentially identical.

We have condensed the discussion of differences between the 2009 and 2011 report and removed some figures. Here is a list of changes for Chapter 5:

- The discussion in *Average, Maximum, and Minimum Annual Delta Exports* on page 41 of the Draft has been reduced
- Figure 5-3 has been replaced with the new Table 5-1
- Percent changes in Table 5-3 (formerly Table 5-2) have been removed and the discussion of existing exports by water year type has been reduced
- Percent changes in Table 5-4 (formerly Table 5-3) have been removed and the discussion of future exports by water year type has been reduced
- Figures 5-5, 5-6 and 5-7 have been removed
- The discussion in *Likelihood of SWP Exports—Existing and Future Conditions* section has been reduced

Page 48. The discussion of the basis for local demands changing highlights water conservation as the only specific example of those changes. A much more important factor would be local management (i.e., local storage) within the service area.

We have updated this section per your suggestion.

Page 48. There is a reference to Kern Wet Year as the basis for variation in Article 21 Water demands, but no explanation of why that would be a factor. It would be useful to state that Kern River inflows are a major local water supply variable in Kern County Water Agency, which is the second largest SWP contractor and possesses significant local groundwater recharge potential.

We have updated this section per your suggestion.

Page 51-53. As pointed out earlier, there is extensive discussion and numerous figures are presented to show the differences between the 2009 and 2011 Delivery Reliability Reports, which are essentially not meaningful and within the margin of error of the studies. Rather than included repetitive slides showing the same information, this section should be substantially reduced. In fact, the summary of results presented on Page 57 would suffice for all the presentation starting on page 51 and continuing to Page 57.

We have condensed the discussion of differences between the 2009 and 2011 report and removed some figures. Here is a list of changes for Chapter 6:

- Figure 6-1 has been replaced with new Table 6-1
- Figure 6-5 has been replaced with new Table 6-2 and the discussion in the *SWP Table A Water Deliveries* section has been reduced.
- Figure 6-7 has been removed
- Figures 6-8 and 6-9 have been replaced with new Tables 6-3 and 6-4 and the discussion of Dry-Year and Wet-Year Table A deliveries has been reduced on Draft page 53
- The discussion of *SWP Article 21 Water Deliveries* on Draft page 55 has been reduced
- The discussion of Dry-Year and Wet-Year Article 21 deliveries has been reduced on Draft page 57 and Figures 6-12 and 6-13 have been replaced with new Tables 6-5 and 6-6
- The Summary of Results for existing conditions have been worked into the main chapter text

Page 57. In discussion the Dry year deliveries of Article 21 Water, there is no indication of the location of those deliveries. Given regulatory restrictions in place, it is likely that all the Article 21 Water Deliveries are made to the SWP contractors located north of the Delta. If so, that should be stated. Otherwise, the reader is left with the impression that Article 21 Water might be available for South of Delta contractors.

Most of the Article 21 deliveries shown in the report for Dry years are for contractors south of the Delta. It happens during a few months under these conditions:

1. There is a low allocation
2. San Luis is full
3. Banks has capacity for pumping
4. Delta is in surplus conditions

Page 61. There is a reference to 4,133 taf/year as the "maximum Delta SWP Table A." The term Delta should be dropped and the reference should be only to "maximum SWP Table A."

This is meant to clarify that the results being presented are specific to those contractors that rely on delivery of water from the Delta. If we used "maximum SWP Table A" the value would be 4,172 taf/year.

Page 62-68. Same comment as for Chapter 6. The discussion of differences between essentially identical modeling results is too long and should be truncated. The summary of results starting at page 68 could suffice for this entire discussion.

We have condensed the discussion of differences between the 2009 and 2011 report and removed some figures. Here is a list of changes for Chapter 7:

- Figure 7-1 has been replaced with new Table 7-1
- The discussion in *Future Deliveries of SWP Table A Water* on Draft page 62 has been reduced
- Figure 7-3 has been removed
- Figures 7-4 and 7-9 have been replaced with new Tables 7-2 and 7-3 and the discussion of Dry-Year and Wet-Year Table A deliveries has been reduced on Draft page 64
- The discussion of *SWP Article 21 Water Deliveries* starting on Draft page 64 has been reduced
- The discussion of Dry-Year and Wet-Year Article 21 deliveries starting on Draft page 66 has been reduced and Figures 7-8 and 7-9 have been replaced with new Tables 7-4 and 7-5