ATTACHMENT 7 – ECONOMIC ANALYSIS — WATER SUPPLY BENEFITS

Santa Clarita Valley Water Use Efficiency Program (CLWA-4)

Summary

The Santa Clarita Valley Water Use Efficiency Strategic Plan (SCV WUE Plan) identifies programs and projects that will most effectively reduce per capita water use in the Santa Clarita Valley. The Santa Clarita Valley Water Use Efficiency Program (CLWA-4) will implement four recommended programs identified in the SCV WUE Plan. These programs are designed to reduce water demand, improve operational efficiency, enhance water supply and improve water quality.

The four programs currently being implemented by this project, and a brief description of each, are listed below.

(1) *Santa Clarita Valley Large Landscape Audit and Incentive Program*: The program will offer water audits, equipment incentives, and water budgeting to public and private sector large landscape sites with high water use.

(2) *Santa Clarita CII Audit and Customized Incentive Program*: The program will offer comprehensive water audits and reporting of cost effective recommendations to commercial, industrial and institutional (CII) customers. Customers will be offered rebate incentives based upon the findings of the audit.

(3) *Residential Santa Clarita Valley Landscape Contractor Certification and Weather-Based Irrigation Controller (WBIC) Program*: The program will provide water efficiency training and certification to landscape contractors, maintenance companies and residents in the Santa Clarita Valley. The training will consist of basic irrigation principles, irrigation scheduling, the value of WBICs and guidelines to proper installation and use. After attending the training and receiving certification, the participants will be eligible to receive free WBICs and high efficiency nozzles.

(4) *Santa Clarita Valley High Efficiency Toilet (HET) Rebate Program*: The Program will offer $100 rebates to single family and multi-family residential units for the replacement of toilets in homes older than 1992with a HET. A total of 500 rebates will be available each year.[1]

Table CLWA-4.1 provides an overview of the costs and benefits presented in Attachment 7 and 8. The remainder of this attachment discusses the water supply benefits, as directed for Attachment 7.

1. HET's are designed to use 1.28 gallons per flush on average. Older toilets can use 3.5 or more gallons per flush. (Vickers, 2001).

TABLE CLWA-4.1
BENEFIT-COST ANALYSIS OVERVIEW

	Present Value
Costs – Total Capital and O&M	$1,645,699
Monetizable Benefits	
Water Supply Benefits	
Avoided Imported Water Costs	$3,405,010
Water Quality and Other Benefits	
Avoided Wastewater Treatment Costs	$187,881
Total Monetizable Benefits	$3,592,891
Quantified Benefit or Cost	**Project Life Total**
Water Quality and Other Benefits	
Avoided Introduction of Chlorides into the Basin	638 Metric Tons
Reduced CO2 Emissions	3,106 Metric Tons
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Supply Benefits	+
Increased Water Supply Reliability for CLWA Customers	+
Improved Operational Flexibility for CLWA	+
Water Quality and Other Benefits	+
Reduced Pollution from Dry-Weather Runoff	+
Increased Water Conservation Education	+
Reduced Disinfection By-Products Precursors	+
Reduced Stress on the Sacramento-San Joaquin Delta	+
Reduced Street Maintenance Costs	+

O&M = operations and maintenance
CO2 = carbon dioxide
* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

Costs

The project budget is focused on providing the various elements of the four water use efficiency programs, including: large landscape audits and equipment incentives, commercial and industrial audits and equipment incentives, and residential irrigation contractor training and efficient irrigation technology. All costs are considered implementation costs, with no post implementation administration, operations, or maintenance costs as once it have been verified that all equipment has been installed correctly, responsibility for operation and maintenance is the homeowner's. The project costs will be spread evenly over an implementation period of July 2011 through July 2013. Total present value costs of the project amount to $1,645,699.

The "Without Project" Baseline

Four retail water providers in the Santa Clarita Valley are participating in the SCV WUE Plan - Valencia Water Company, Santa Clarita Water Division of CLWA, Newhall County Water District, and the Los Angeles County Waterworks District #36. These water agencies currently supply about 50% of potable water demands within their service areas with water from the Castaic Lake Water Agency (CLWA), the regional water wholesaler. CLWA imports State Water Project (SWP) water from the Sacramento-San Joaquin Delta and other imported supplies to Castaic Lake, through SWP facilities.

CLWA has a contractual Table A amount of 95,200 acre-feet per year (AFY) of water from SWP. However, the marginal source of SWP water for CLWA is the water purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA typically receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies.

Without the project, the four water providers will continue to provide potable water to meet outdoor water demand for 2,412 residential and 56 large landscape sites proposed for irrigation efficiency improvements. Additionally, the water providers will continue to provide potable water to meet non-potable indoor and outdoor demand for 126 commercial and industrial customers. The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations. Thus, if the project is not implemented, water supply reliability within the CLWA service area (including the retail water providers' service areas) will be reduced.

The four retail suppliers compiled data to establish baseline water use for their service areas in 2006. Baseline sites that will be included in the *Large Landscape Audit and Incentive Program* include landscape-specific sites and multi-family residential sites. Landscape specific sites averaged 2,764 hundred cubic feet (ccf) per year (6.35 AFY). Multi-family homes in these service areas averaged 586 ccf per year (1.35 AFY). Baseline water use for sites in the *CII Audit & Customized Incentive Program* averaged 1,600 ccf per year (3.67 AFY). Baseline water use for sites in the *Landscape Contractor Certification and Weather-Based Irrigation Controller Program* averaged 293 ccf per year (0.67 AFY). Baseline use for sites in the *Santa Clarita Valley High Efficiency Toilet (HET) Rebate Program* includes single and multi-family residential sites. These sites average 293 ccf per year and 586 ccf per year, respectively.

Water Supply Benefits

By improving indoor and outdoor water use efficiency and conserving water, this project will reduce water demand, avoid costs for purchase of SWP water, increase water supply reliability for the CLWA customers, and improve operational flexibility for CLWA.

Avoided Imported Water Costs

Large Landscape Audit and Incentive Program

Over the 2-year implementation period of the project, 280 large landscape sites will be targeted and 56 sites will be provided water audits followed by customized repair and upgrade of the irrigation

system. The audit will involve an initial site visit to assess the efficiency of the irrigation system and identify leaks and repair opportunities. Following the site visit, an analysis of the irrigation system's efficiency will be conducted to determine the proper watering schedule. Additionally, an analysis of the plant material will be completed to make sure the most ideal types for the Santa Clarita are used Based on this information, a report will be developed detailing upgrade recommendations, available incentives, new irrigation schedules, plant recommendations and a cost/benefit analysis of options.

The report will include an application for available incentives, including high efficiency nozzles and WBICs. The audit and the installed equipment are assumed to result in savings over a 10-year expected equipment lifetime.

Audited sites will achieve savings of 20% compared to baseline water use (A&N Technical Services, 2008). Implementation of the project will start on July 1, 2011 and end on July 1, 2013. In 2011 this project will result in savings of 19.5 acre-feet (AF). In 2012 this project will save 57.5 AF. In 2013 savings will reach their maximum of 76.5 AF. This level of savings will be sustained through 2020. In 2021 and 2022, these savings will be phased-out in accordance with the 10-year expected lifetime of savings.

Santa Clarita Valley CII Audit and Customized Incentive Program

Over the 2-year implementation period of the project, 632 CII sites will be targeted and 126 will be audited. The program will offer comprehensive water audits and report cost effective recommendations in a clear and concise format with a focus on payback. Based on the audit, customers will be offered a per-AF saved incentive.

If customers move 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 will be sent a rebate check by the water retailer or get a credit on their bill from the water retailer.

The targeted equipment for retrofits are high efficiency toilets/urinals, water brooms, commercial/coin operation high efficiency washers, cooling tower repairs and maintenance, landscaping and irrigation, and landscape sub-meters. The audit and the installed equipment are assumed to result in savings over a 10-year expected equipment lifetime.

Audited sites will achieve savings of 20% compared to baseline water use (A&N Technical Services, 2008). Implementation of the project will start on July 1, 2011 and end on July 1, 2013. In 2011, this program will result in savings of 26.5 AF. In 2012, the program will save 78.5 AF. In 2013, savings will reach their maximum of 105 AF. This level of savings will be sustained through 2020. From 2021 through 2022, these savings will be phased-out in accordance with the 10-year expected lifetime of savings.

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

Over the 2-year implementation period of the project, 75 landscape contractor staff and local residents will complete water use efficiency training. The one-day workshop will consist of training

on basic irrigation principles, irrigation scheduling, the value of WBICs, and guidelines to proper irrigation equipment installation and use. Classes will be taught in both English and Spanish and will be offered regularly throughout the year.

After attending the training and receiving certification, landscape contractors will be eligible to receive free WBICs and high efficiency sprinklers. The contractors will receive one WBIC and one set of nozzles after the initial training. They will be required to install them at a customer's site within a participating Santa Clarita Valley water agency. This installation must be inspected and installed properly before the contractor is eligible to receive additional irrigation equipment. Regular customers (not landscape contractors) are also able to participate and attend the classes, but they receive the equipment only for their home. Each person that completes the training will retrofit 12 sites per year. Over the life of the project 2,412 sites will be retrofitted. Each retrofitted site will receive one WBIC and 80 high efficiency sprinkler heads per acre. On average, 20 high efficiency sprinklers per site will be installed (assuming ¼ acre on average per site). Thus, this project will result in the installation of 2,412 WBICs and 48,240 sprinklers.

To calculate the amount of water to be saved annually from this program, the number of planned site retrofits was multiplied the amount of savings per unit of equipment used. WBIC systems are expected to provide 0.0416 AFY savings over a 10-year expected lifetime (A&N Technical Services, 2008). High efficiency sprinklers are expected to provide 0.0051 AFY savings over a 10-year expected lifetime (A&N Technical Services, 2008).

Implementation of the program will begin in July 2011 and end in July 2013. Savings will be phased-in starting in 2011, resulting in 75 AF of savings. In 2012, this project will result in savings of 276. In 2013, savings will reach their maximum of 401.5 AF. This level of savings will be sustained through 2020. From 2021 through 2022, these savings will be phased out in accordance with the 10-year expected lifetime of savings.

Santa Clarita Valley High Efficiency Toilet Rebate Program

Over the 2-year implementation period of the program, 1,004 HETs will replace toilets in homes older than 1992. This program targets both single-family and multi-family residential units. It is assumed for this program that 50% of sites will replace ULFTs and 50% will replace pre-ULF fixtures (A&N Technical Services, 2008).

To calculate the amount of water to be saved annually from this project, the number of planned toilets replacements each year is multiplied by the amount of savings per unit of equipment used. HETs are expected to provide 0.03 AFY of water savings. This benefit will continue to accrue each year over the 25-year expected lifetime (A&N Technical Services, 2008).

Implementation of the project will start in July 2011 and end in July 2013. In 2011 this project will result in savings of 7.5 AF. In 2012 this project will save 22.5 AF. In 2013 savings will reach their maximum of 30 AF. This level of savings will be sustained through 2035. From 2036 through 2037 these savings will be phased-out in accordance with the 25-year expected lifetime of savings.

Total Savings

Implementation of all four programs will result in a phase-in of savings in 2011 through 2013. By 2014, the programs will be fully implemented, achieving a maximum annual savings amount of 613 AF. These savings will be sustained through 2020. From 2021 through 2022, the savings from the *Large Landscape*, *CII*, *and Residential Irrigation* programs will be phased-out. Savings from the *High Efficiency Toilet Program* will continue at maximum savings of 30 AFY through 2035. From 2036 through 2037 savings will be phased out. Over the life of the project, total water savings will amount to 6,580 AF.

Total Avoided Cost

The avoided cost of the marginal water source was used to monetize the water savings. For CLWA, the water wholesaler, the marginal source of supply (i.e., the most expensive source of supply) is currently the water being purchased from the BV/RRB Water Districts in Kern County. The cost of this water in 2007 was estimated to be $790/AF, or $822/AF when updated to 2009 dollars. This includes the cost of purchase, wheeling, and treatment, and factors in system losses (A&N Technical Services, 2008). It is assumed that this cost will rise at the rate of inflation after 2009, thus remaining constant in real dollars.

From project implementation in 2011 until the end of the anticipated lifetime of the water saving services and devices in 2037, 6,580 AF of water will be saved, with an avoided cost of $3,405,010 in present-value 2009 dollars.

Increased Water Supply Reliability for CLWA Customers

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The project will help address reliability issues for CLWA retail agencies by offsetting the future use of imported water delivered by CLWA. The reliability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that water customers are willing to pay $95 to $500 per household per year for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought).

The challenge for use of these values to determine a value of increased reliability as a result of the Santa Clarita Valley Water Use Efficiency Program is recognizing how to reasonably interpret these survey-based household monetary values. The values noted above reflect a willingness to pay per household to ensure complete reliability (zero drought-related use restrictions in the future), whereas the Water Use Efficiency Program only enhances overall reliability and does not guarantee 100% reliability. Thus, if applied directly to the number of households within the CLWA service area, the dollar values from the studies would overstate the reliability value provided by the project.

A simple way to roughly adjust for this "whole versus part" problem is to attribute a portion of the total value of reliability to the portion of the problem that is solved by the project. To adjust for the partial improvement in reliability from the Santa Clarita Valley Water Use Efficiency Program, it is assumed that household willingness to pay for improved reliability is directly proportional to the amount of recycled water that will offset imported water, as a percentage of the total potable water supply. This represents the percentage of total supply that has been improved in terms of overall reliability (i.e., by offsetting imported water demand with local sources).

For example, the project will offset more than 613 AFY of imported water beginning in 2013. In that year, total imported water demand within the CLWA service area will be about 46,350 AFY (without the project) (CLWA, 2005).[2] Thus, about 1.3% of total potable demand will be met by recycled water made available as a result of the project. To obtain a lower bound estimate for the value of improved reliability associated with this water, it is assumed that households within the CLWA service area are willing to pay about $1.24 per year ($95 multiplied by 1.3%). Applying this dollar value per household to the approximately 95,000 households within the CLWA service area would result in $117,800 of benefits in 2013. Taking into account increasing population and changing demands, this calculation could be completed for each year of the project's useful life.

Due to the uncertainty involved in applying these numbers to this situation, this benefit estimate is not included in the tables. However, it is provided here to give an idea of the potential magnitude of this benefit.

Improved Operational Flexibility for CLWA

At full implementation of the Santa Clarita Valley Water Use Efficiency Program will offset the use of 613 AFY of imported SWP water. This will help CLWA directly in their supply operations, allowing for longer shutdowns and improving system reliability. The value of this increased operational flexibility is not monetized in the benefit tables.

Distribution of Project Benefits, and Identification of Beneficiaries

The Santa Clarita Valley Family of Water Suppliers partnered to establish these water use efficiency programs. This group consists of a wholesale supplier and four retail suppliers. Locally, the four retail agencies and their customers will benefit from avoided water supply costs. Locally and regionally, CLWA and the four retail agencies will benefit from increased water supply reliability within the Santa Clarita Valley, and improved operational flexibility for CLWA. This project will also help meet the statewide goal to reduce per capita urban water use by 20 percent by the year 2020. Reduced demand for water imported from the SWP will have benefits for sensitive ecosystems in the Sacramento-San Joaquin Delta. Table CLWA-4.2 shows a breakdown of project beneficiaries.

2. The CLWA Urban Water Management Plan (UWMP) projects total purveyor demand in 2010 and 2015 will be 86,100 AF and 97,100 AF, respectively. To estimate 2013 demand, demand increases were assumed to be linear in the intervening years. In addition, per the UWMP, the analysis assumes that 50% of total demand is met through imported water.

TABLE CLWA-4.2
PROJECT BENEFICIARIES SUMMARY

Local	Regional	Statewide
Valencia Water Agency, Santa Clarita Water Division of CLWA, Newhall County Water District, Los Angeles County Waterworks District #36	Castaic Lake Water Agency	Statewide Water Use Efficiency Goal, Sacramento-San Joaquin Delta

Project Benefits Timeline Description

The project will be implemented over a 2-year period, beginning in July of 2011 and ending in July of 2013. A water savings lifespan of 10 years has been identified for the *Large Landscape, CII, and Residential Irrigation* programs. Benefits from these programs are expected to extend over 12 years, which allows for phase-in implementation over the first two calendar years and the phase-out benefits at the end of the project. A water savings lifespan of 25 years has been identified for the *High Efficiency Toilet Program*. Benefits from this program are expected extend over 27 years, which allow for phase-in implementation over the first two years and the phase out of benefits at the end of the program.

To calculate water savings by year, it was assumed that the project will be implemented across the timeframe from July 2011 through July 2013. This results in a ramp-up of savings where a cumulative total of approximately 21% of project benefits are realized in 2011, 71% are realized in 2012, and all benefits are realized in 2013. For the three projects with a 10-year lifespan, benefits ramp down in 2021 and 2022. For the *High Efficiency Toilet Program* with the 25-year lifespan, benefits ramp down in 2036 and 2037.

Potential Adverse Effects from the Project

There are no adverse effects anticipated from this project.

Summary of Findings

The monetized benefit of this project is the avoided cost of importing water supplies from the BV/RRB Water Districts in Kern County. The cost to purchase, convey and treat this supply is $822/AF in 2009 dollars. The cost of this supply was assumed to remain constant into the future in real dollars. The present value of avoided water supply costs over the life of the project total $3,405,010 in 2009 dollars. Additional qualitative benefits include increased water supply reliability for Santa Clarita Valley water purveyors and improved operational flexibility for CLWA.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the assumption of a 10-year lifetime for certain conservation equipment. This assumption is likely to result in more conservative savings estimates. These issues are listed in Table CLWA-4.3.

TABLE CLWA-4.3
OMISSIONS, BIASES, AND UNCERTAINTIES, AND THEIR EFFECT ON THE PROJECT

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided Water Cost	+	Lifetime of WBICs and high efficiency nozzles is assumed to be 10 years. A review of the marketplace showed that WBIC lifetime could be 15 years (U.S. EPA, 2009). If a 15-year WBIC lifetime is the correct assumption, then the savings from this portion of the project could be greater than shown in this analysis.
Avoided Water Cost	+	Lifetime of indoor water use equipment used in the CII program is assumed to be 10 years. A review of the marketplace showed that the lifetimes of high efficiency toilets and urinals are 25 years and 33 years respectively. Additionally, commercial high efficiency washers have a lifetime of 16 years (Haasz, 2010). Thus, savings are likely underestimated for these devices.
Increased water supply reliability for CLWA customers	+	The potential benefit of increased water supply reliability as a result of the project has not been included due to uncertainties of applying values from the literature to a partial improvement in water supply reliability.
Project costs	U	The calculation of the present value of costs is a function of the timing of capital outlays and a number of other factors and conditions. Changes in these variables will change the estimate of costs.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

References

A&N Technical Services. 2008. Santa Clarita Valley Water Use Efficiency Plan. Prepared for the Santa Clarita Valley Family of Water Suppliers: Castaic Lake Water Agency, Valencia Water Company, Los Angeles County Waterworks Division #36, Newhall County Water District, Santa Clarita Water Division. August.

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U.S. EPA. 2009. EPA WaterSense Draft Specification for Weather-Based Irrigation Controllers. Draft Version 1. November 19. Available: http://www.epa.gov/WaterSense/docs/controller_draftspec508.pdf. Accessed November 30, 2010.

Haasz, D. 2010. Kennedy/Jenks Consultants, personal communication. November 22.

Vickers, A. 2001. Handbook of Water Use and Conservation. WaterPlow Press: Amherst, MA.

Table 11- Annual Cost of Project (All costs should be in 2009 Dollars) Project: CLWA 4 -Santa Clarita Valley Water Use Efficiency									
	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009							$0	1.000	$0
2010							$0	0.943	$0
2011	$489,500						$489,500	0.890	$435,655
2012	$979,000						$979,000	0.840	$822,360
2013	$489,500						$489,500	0.792	$387,684
Project Life								…	
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$1,645,699
Comments: Implementation of the Santa Clarita Valley Water Use Efficiency Program will begin in July 2011 and continue for two years ending July 2013.									

Table 12 - Annual Water Supply Benefits
(All benefits should be in 2009 dollars)
Project: CLWA 4 -Santa Clarita Valley Water Use Efficiency

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009									
2010									
2011	Avoided SWP Water Use	acre feet	0	128.5	128.5	$822	$105,576	0.890	$93,962
2012	Avoided SWP Water Use	acre feet	0	434.5	434.5	$822	$356,985	0.840	$299,868
2013	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.792	$398,884
2014	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.747	$376,220
2015	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.705	$355,067
2016	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.665	$334,921
2017	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.627	$315,783
2018	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.592	$298,155
2019	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.558	$281,032
2020	Avoided SWP Water Use	acre feet	0	613	613	$822	$503,641	0.527	$265,419
2021	Avoided SWP Water Use	acre feet	0	492	492	$822	$404,227	0.497	$200,901
2022	Avoided SWP Water Use	acre feet	0	201	201	$822	$165,142	0.469	$77,451
2023	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.442	$10,894
2024	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.417	$10,278
2025	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.394	$9,711
2026	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.371	$9,144
2027	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.350	$8,627
2028	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.331	$8,158
2029	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.312	$7,690
2030	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.294	$7,247
2031	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.278	$6,852
2032	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.262	$6,458
2033	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.247	$6,088
2034	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.233	$5,743
2035	Avoided SWP Water Use	acre feet	0	30	30	$822	$24,648	0.220	$5,423
2036	Avoided SWP Water Use	acre feet	0	22.5	22.5	$822	$18,486	0.207	$3,827
2037	Avoided SWP Water Use	acre feet	0	7.5	7.5	$822	$6,162	0.196	$1,208
Project Life	10 & 25 Year Lifetime			6580	6580			…	
								Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)	$3,405,010

Comments: Implementation of the Santa Clarita Valley Water Use Efficiency Program will begin July 2011. Water savings will begin immediately upon initiation of audits and installation of water-saving devices. Benefits are assumed to accrue over a 10-year average device lifetime for the Large Landscape, CII, and Residential Irrigation programs. Benefits from these programs are expected to extend over 12 years, which allows for phase-in implementation over the first two years and the phase-out benefits at the end of the project. A water savings lifespan of 25 years has been identified for the High Efficiency Toilet Program. Benefits from this program are expected extend over 27 years, which allow for phase-in implementation over the first two years and the phase out of benefits at the end of the program.

Table 15. Total Water Supply Benefits (All benefits should be in 2009 dollars) Project: CLWA 4 -Santa Clarita Valley Water Use Efficiency			
Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
$3,405,010			$3,405,010
Comments:			

Table 16 - Water Quality and Other Expected Benefits
(All benefits should be in 2009 dollars)
Project: CLWA 4 -Santa Clarita Valley Water Use Efficiency

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009	Avoided Chlorides	Metric Tons	0	0	0				$0
	Avoided CO2	Metric Tons	0	0	0				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	0	0	$550	$0	1.000	$0
2010	Avoided Chlorides	Metric Tons	0	0	0				$0
	Avoided CO2	Metric Tons	0	0	0				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	0	0	$550	$0	0.943	$0
2011	Avoided Chlorides	Metric Tons	0	12.46	12.46				$0
	Avoided CO2	Metric Tons	0	60.65	60.652				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	7.5	7.5	$550	$4,125	0.890	$3,671
2012	Avoided Chlorides	Metric Tons	0	42.15	42.15				$0
	Avoided CO2	Metric Tons	0	205.08	205.084				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	22.5	22.5	$550	$12,375	0.840	$10,395
2013	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.792	$13,068
2014	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.747	$12,326
2015	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.705	$11,633
2016	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.665	$10,973
2017	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.627	$10,346
2018	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.592	$9,768
2019	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.558	$9,207
2020	Avoided Chlorides	Metric Tons	0	59.46	59.46				$0
	Avoided CO2	Metric Tons	0	289.336	289.336				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.527	$8,696
2021	Avoided Chlorides	Metric Tons	0	47.72	47.72				$0
	Avoided CO2	Metric Tons	0	232.224	232.224				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.497	$8,201
2022	Avoided Chlorides	Metric Tons	0	19.5	19.5				$0
	Avoided CO2	Metric Tons	0	94.872	94.872				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.469	$7,739
2023	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.442	$7,293
2024	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.417	$6,881
2025	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.394	$6,501
2026	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0

Table 16 - Water Quality and Other Expected Benefits
(All benefits should be in 2009 dollars)
Project: CLWA 4 -Santa Clarita Valley Water Use Efficiency

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.371	$6,122
2027	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.350	$5,775
2028	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.331	$5,462
2029	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.312	$5,148
2030	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.294	$4,851
2031	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.278	$4,587
2032	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.262	$4,323
2033	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.247	$4,076
2034	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.233	$3,845
2035	Avoided Chlorides	Metric Tons	0	2.91	2.91				$0
	Avoided CO2	Metric Tons	0	14.16	14.16				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	30	30	$550	$16,500	0.220	$3,630
2036	Avoided Chlorides	Metric Tons	0	2.18	2.18				$0
	Avoided CO2	Metric Tons	0	10.62	10.62				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	22.5	22.5	$550	$12,375	0.207	$2,562
2037	Avoided Chlorides	Metric Tons	0	0.73	0.73				$0
	Avoided CO2	Metric Tons	0	3.54	3.54				
	Avoided Wastwater Treatment Costs	Acre-Feet	0	7.5	7.5	$550	$4,125	0.196	$809
Project Life	Avoided Chlorides	Metric Tons		638.25	638.25				$0
Project Life	Avoided CO2	Metric Tons		3,106	3,106				$0
Project Life	Avoided Wastwater Treatment Costs	Acre-Feet		750	750			…	$187,881
								Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table) Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries	$187,881

Comments: Avoided use of SWP water avoids introduction of chlorides into the Watershed. The average concentration of chlorides in SWP water was assumed to be 79 mg/l, which is the value at Metropolitan's Jensen Filtration Plant in 2009, and happens to be the middle of the range of chloride content of SWP water over the last 30 years. The project also will avoid emissions of carbon dixoide associated with the energy needed to deliver SWP water to CLWA. Finally, for each AF of indoor water use avoided the project avoids wastewater treatment charges from SCVSD to CLWA of $550 per AF.

Santa Clara River-Sewer Trunk Line Relocation Project (Phase 1) (NCWD-3)

Summary

The Newhall County Water District (NCWD) currently maintains a sewer trunk line that is located within the Santa Clara River in the Canyon Country area of the City of Santa Clarita. During large rainfall events, the Santa Clara River swells, causing debris to be swept into the river and dirt to erode around the sewer trunk line, exposing the line. If a large piece of debris, moving at a high rate of speed, hits the sewer trunk line, the line could break. If the sewer trunk line breaks, raw sewage would be released into the river, impacting nearby domestic groundwater wells and the ecosystem. The sewer trunk line has been maintained by the NCWD since its installation in 1968.

Instead of continuing preventative maintenance and extending the life of the line in place, NCWD proposes to remove the sewer trunk line out of the riverbed and into the public right-of-way. Under this grant application, NCWD is requesting funds for Phase 1 of the project, which consists of the planning, engineering, and design of the sewer trunk line relocation. If the results from Phase 1 are acceptable, Phases 2 and 3 will be carried out. Phase 2 involves the removal and relocation of the current gravity feed portion of the sewer trunk line, while Phase 3 consists of the construction of a sewer lift station, forced sewer main, and the remaining gravity feed portion of the sewer trunk line. Phase 3 is scheduled for completion in June 2016. With a 50-year lifetime, the project's assets are expected to provide benefits through May 2066.

The benefits of this project can only be properly evaluated based on the full implementation of all three phases of the project. Therefore, this economic analysis starts by considering the benefits of complete implementation of all three phases of the project, and then apportions a share of the benefits to this initial planning and design phase. The benefits are apportioned based on the percentage of costs for the planning and design phase compared to the costs for full implementation of the project.

A summary of all benefits and costs of the project are provided in Table NCWD-3.1. Project costs and water supply benefits are discussed in the remainder of this attachment.

TABLE NCWD-3.1
BENEFIT-COST ANALYSIS OVERVIEW –DEMONSTRATION-SCALE PROJECT

	Present Value
Costs – Total Capital and O&M	$202,718
Monetizable Benefits	
Water Supply Benefits	
Avoided Imported Water Supply Costs	$44,117
Water Quality and Other Benefits	
Avoided Costs of Replacing Sections of Existing Sewer Trunk Line	$14,607
Avoided Repair Costs for Existing Pipe	$14,607
Avoided Clean-Up Costs from Sewer Trunk Line Break	$4,180
Total Benefits	$77,511
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Quality Benefits	
Ecosystem Benefits	+

O&M = operations and maintenance
* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

Costs

The budgeted costs for Phase 1 of the project total $240,000. These costs include an engineering report, environmental planning documentation and permitting, land title requests, river bank protection, and surveying. Tasks will begin in June 2011 and finish by July 2013. The present value costs are $202,718 in 2009 dollars. There will be no construction during Phase 1, nor are there any annual O&M costs.

If results of the initial phase indicate that the project should proceed, Phase 2, which is estimated to cost $310,000, will occur from July 2014 to June 2015, while Phase 3, which is estimated to cost $3,659,000, will occur from July 2015 to June 2016. After construction is complete in 2016, the incremental O&M costs in comparison to the without project baseline will be $29,150 each year over the 50-year project lifetime. For all three phases of the project, the present value of the capital and the O&M costs total $3,258,126 in 2009 dollars.

Since there will not be any monetary benefits accrued during the planning in Phase 1, it is necessary to calculate the costs and benefits of the entire project so that some of the overall benefits can be allocated to Phase 1. Allocation of benefits to Phase 1 is based on the ratio of the present value of costs in Phase 1 to the present value of costs for all three phases. That ratio is 0.0622 or 6.22% ($202,718/$3,258,126).

The "Without Project" Baseline

If the sewer trunk line is not relocated out of the river, it may be struck during a large runoff event by a large piece of debris and break, releasing raw sewage into the river. This would interrupt water pumping from five downstream Santa Clarita Water Division (SCWD) domestic groundwater wells that produce an average of 3,850 acre-feet per year (AFY). With a sewer trunk line break, it is estimated that these wells would be out of production for two months, causing a loss in pumping of 642 AFY when breaks occur. It is assumed that a sewer trunk line break would occur once every ten years beginning in 2017, the last year of the current sewer trunk line's expected lifetime.

To make up for this loss of water, the SCWD would purchase water from the Castaic Lake Water Agency (CLWA). CLWA imports State Water Project (SWP) water and other water from the Sacramento-San Joaquin Delta to Castaic Lake through SWP facilities. Water from Castaic Lake is treated at CLWA's Earl Schmidt Filtration Plant or the Rio Vista Water Treatment Plant and is delivered to the retail water agencies through transmission lines owned and operated by CLWA. SCWD's service area includes more than 27,000 connections within portions of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Canyon Country, Newhall, and Saugus.

Water Supply Benefits

The Santa Clara River Sewer Trunk Line Relocation project will reduce the amount of water imported from the San Francisco Bay-Delta via the SWP, as described below.

Avoided Imported Water Supply Costs

With completion of all three phases of the project, NCWD will avoid the possibility of a break in the existing sewer trunk line, which is located in the bed of the Santa Clara River. Portions of the line have been exposed due to scouring from past storm events. During large storms, there is a possibility that large debris washed down the stream channel could hit the sewer line and cause a break. Such a break would cause release of raw sewage into the stream channel, requiring SCWD to stop pumping from their five groundwater wells located downstream. Those wells currently pump an average of 3,850 AFY.

A return period for large storms is uncertain, but based on the history of flooding events in the area it is assumed that large storms will occur once every 5 years. A break in the sewer causing a spill is assumed to occur once every other storm, or once every 10 years. When there is a spill, it is assumed that groundwater pumping from SCWD's wells will need to be stopped for 2 months to allow for cleanup. During that time, lost groundwater pumping will be replaced by additional imported water brought to the region by CLWA.

CLWA has a contractual Table A amount of 95,200 AFY of water from SWP. However, the marginal source of SWP water for CLWA, which sells water to SCWD, is water purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies. The cost of this water in 2007 was estimated to be $790 per AF, or $822 per AF when updated to 2009 dollars. This

includes the cost of purchase, wheeling, and treatment, and factors in system losses (A&N Technical Services, 2008). It is assumed that this cost will rise at the rate of inflation after 2009, thus remaining constant in real dollars.

In order to calculate the avoided cost of imported water use, SCWD's pumping loss of 642 AF per event is multiplied by the marginal cost of imported water supplied by CLWA, which is $822 per AF. Therefore, the avoided cost of lost groundwater supply is $527,450 every 10 years beginning in 2017, the last year of the sewer trunk line's expected lifetime. In 2009 dollars, the present value avoided cost over the fifty year project lifetime is $709,062. Phase 1 of the project can be attributed a 6.22% share of benefits of the overall project, which is $44,117 in present value 2009 dollars.

Distribution of Project Benefits, and Identification of Beneficiaries

As shown in Table NCWD-3.2, there will be local, regional, and statewide benefits due to the Sewer Trunk Line Replacement Project. Locally and regionally, SCWD will not have to purchase SWP water from CLWA in order to make up for lost groundwater pumping following spill events associated with the trunk line, benefitting both SCWD and CLWA. There will also be statewide benefits as less demands are placed on water from the Sacramento-San Joaquin Delta via the SWP.

TABLE NCWD-3.2
PROJECT BENEFICIARIES SUMMARY

Local	Regional	Statewide
CLWA Santa Clarita Water Division	Castaic Lake Water Agency	Sacramento-San Joaquin Delta

Project Benefits Timeline Description

If the planning and engineering to take place during Phase 1 indicate that this project should proceed, the relocated sewer trunk line will be operational in June 2016. The expected project lifetime is 50 years, so the project will provide benefits until May 2066. Water supply benefits will occur every 10 years beginning in 2017. In these years, SCWD will not have to utilize 642 AF of SWP water from CLWA as a backup supply.

Potential Adverse Effects from the Project

There are no expected adverse effects expected from this project.

Summary of Findings

With implementation of all three phases of the sewer trunk line relocation project, SCWD will avoid loss of pumping from its groundwater wells after sewage spills due to breaks in the existing sewer trunk line located in the riverbed. Over the life of the full project, SCWD will reduce its demand for SWP water by a total of 3,210 AF. Valuing the SWP water at CLWA's marginal cost for this source,

and apportioning these benefits to Phase 1 results in present value benefits of $44,117 in 2009 dollars.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainty is associated with the frequency of sewer trunk line break in the absence of the project. The frequency of sewer trunk line break determines how often SCWD's groundwater wells are not able to pump water, and thus how often the SCWD needs to purchase SWP water. In this analysis, the sewer trunk line is assumed to break every ten years in the without project baseline. However, the sewer trunk line could break at shorter or longer intervals. This issue is listed in Table NWCD-3.3.

TABLE NCWD-3.3
OMISSIONS, BIASES, AND UNCERTAINTIES, AND THEIR EFFECT ON THE PROJECT

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided Imported Water Supply Costs	U	The frequency of sewer trunk line break in the absence of the project determines how often the Santa Clarita Water Division's groundwater wells are not able to pump water. This frequency is assumed to be once every 10 years, but the actual number could be either greater or less than 10.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

References

A&N Technical Services. 2008. Santa Clarita Valley Water Use Efficiency Plan. Prepared for the Santa Clarita Valley Family of Water Suppliers: Castaic Lake Water Agency, Valencia Water Company, Los Angeles County Waterworks Division #36, Newhall County Water District, Santa Clarita Water Division. August.

Table 11- Annual Cost of Project

(All costs should be in 2009 Dollars)

Project: Santa Clara River Sewer Trunk Line Relocation

	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	$0	$0	$0	$0	$0	$0	$0	1.000	$0
2010	$0	$0	$0	$0	$0	$0	$0	0.943	$0
2011	$79,231	$0	$0	$0	$0	$0	$79,231	0.890	$70,515
2012	$101,538	$0	$0	$0	$0	$0	$101,538	0.840	$85,292
2013	$59,231	$0	$0	$0	$0	$0	$59,231	0.792	$46,911
2014	$0	$0	$0	$0	$0	$0	$0	--	$0
Project Life	$240,000						$240,000	…	
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$202,718

Comments: Costs in this table show the budgeted costs associated with Project Phase 1.

Table 11- Annual Cost of Full-Scale Project

(All costs should be in 2009 Dollars)

Project: Santa Clara River Sewer Trunk Line Relocation

	Initial Costs	Operations and Maintenance Costs (1)						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))***	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	$0						$0	1.000	$0
2010	$0						$0	0.943	$0
2011	$79,231						$79,231	0.890	$70,515
2012	$101,538						$101,538	0.840	$85,254
2013	$59,231						$59,231	0.792	$46,916
2014	$155,000						$155,000	0.747	$115,825
2015	$1,984,500						$1,984,500	0.705	$1,398,994
2016	$1,829,500		$29,150.00				$1,858,650	0.665	$1,236,108
2017	$0		$29,150.00				$29,150	0.627	$18,289
2018	$0		$29,150.00				$29,150	0.592	$17,254
2019	$0		$29,150.00				$29,150	0.558	$16,277
2020	$0		$29,150.00				$29,150	0.527	$15,356
2021	$0		$29,150.00				$29,150	0.497	$14,487
2022	$0		$29,150.00				$29,150	0.469	$13,667
2023	$0		$29,150.00				$29,150	0.442	$12,893
2024	$0		$29,150.00				$29,150	0.417	$12,163
2025	$0		$29,150.00				$29,150	0.394	$11,475
2026	$0		$29,150.00				$29,150	0.371	$10,825
2027	$0		$29,150.00				$29,150	0.350	$10,213
2028	$0		$29,150.00				$29,150	0.331	$9,634
2029	$0		$29,150.00				$29,150	0.312	$9,089
2030	$0		$29,150.00				$29,150	0.294	$8,575
2031	$0		$29,150.00				$29,150	0.278	$8,089
2032	$0		$29,150.00				$29,150	0.262	$7,631
2033	$0		$29,150.00				$29,150	0.247	$7,199
2034	$0		$29,150.00				$29,150	0.233	$6,792
2035	$0		$29,150.00				$29,150	0.220	$6,407
2036	$0		$29,150.00				$29,150	0.207	$6,045
2037	$0		$29,150.00				$29,150	0.196	$5,703
2038	$0		$29,150.00				$29,150	0.185	$5,380
2039	$0		$29,150.00				$29,150	0.174	$5,075
2040	$0		$29,150.00				$29,150	0.164	$4,788
2041	$0		$29,150.00				$29,150	0.155	$4,517
2042	$0		$29,150.00				$29,150	0.146	$4,261
2043	$0		$29,150.00				$29,150	0.138	$4,020
2044	$0		$29,150.00				$29,150	0.130	$3,793
2045	$0		$29,150.00				$29,150	0.123	$3,578
2046	$0		$29,150.00				$29,150	0.116	$3,375
2047	$0		$29,150.00				$29,150	0.109	$3,184
2048	$0		$29,150.00				$29,150	0.103	$3,004
2049	$0		$29,150.00				$29,150	0.097	$2,834
2050	$0		$29,150.00				$29,150	0.092	$2,674
2051	$0		$29,150.00				$29,150	0.087	$2,522
2052	$0		$29,150.00				$29,150	0.082	$2,380
2053	$0		$29,150.00				$29,150	0.077	$2,245
2054	$0		$29,150.00				$29,150	0.073	$2,118
2055	$0		$29,150.00				$29,150	0.069	$1,998
2056	$0		$29,150.00				$29,150	0.065	$1,885
2057	$0		$29,150.00				$29,150	0.061	$1,778
2058	$0		$29,150.00				$29,150	0.058	$1,677
2059	$0		$29,150.00				$29,150	0.054	$1,583
2060	$0		$29,150.00				$29,150	0.051	$1,493
2061	$0		$29,150.00				$29,150	0.048	$1,408
2062	$0		$29,150.00				$29,150	0.046	$1,329
2063	$0		$29,150.00				$29,150	0.043	$1,253
2064	$0		$29,150.00				$29,150	0.041	$1,183
2065	$0		$29,150.00				$29,150	0.038	$1,116
Project Life								...	
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$3,258,126

Comments: Costs in this table are associated with Phases I, II, and III. Based on the total present value costs shown in Tables 11A and 11B, Phase I accounts for 6.22% of total project costs.

Table 12 - Annual Water Supply Benefits

(All benefits should be in 2009 dollars)

Project: Santa Clara River Sewer Trunk Line Relocation

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009					0		$0	1.000	$0
2010					0		$0	0.943	$0
2011					0		$0	0.890	$0
2012					0		$0	0.840	$0
2013					0		$0	0.792	$0
2014					0		$0	0.747	$0
2015					0		$0	0.705	$0
2016					0		$0	0.665	$0
2017	Avoided SWP water use	acre-feet	0	642	642	$822	$527,724	0.627	$331,101
2018					0		$0	0.592	$0
2019					0		$0	0.558	$0
2020					0		$0	0.527	$0
2021					0		$0	0.497	$0
2022					0		$0	0.469	$0
2023					0		$0	0.442	$0
2024					0		$0	0.417	$0
2025					0		$0	0.394	$0
2026					0		$0	0.371	$0
2027	Avoided SWP water use	acre-feet	0	642	642	$822	$527,724	0.350	$184,885
2028					0		$0	0.331	$0
2029					0		$0	0.312	$0
2030					0		$0	0.294	$0
2031					0		$0	0.278	$0
2032					0		$0	0.262	$0
2033					0		$0	0.247	$0
2034					0		$0	0.233	$0
2035					0		$0	0.220	$0
2036					0		$0	0.207	$0
2037	Avoided SWP water use	acre-feet	0	642	642	$822	$527,724	0.196	$103,239
2038					0		$0	0.185	$0
2039					0		$0	0.174	$0
2040					0		$0	0.164	$0
2041					0		$0	0.155	$0
2042					0		$0	0.146	$0
2043					0		$0	0.138	$0
2044					0		$0	0.130	$0
2045					0		$0	0.123	$0
2046					0		$0	0.116	$0
2047	Avoided SWP water use	acre-feet	0	642	642	$822	$527,724	0.109	$57,648
2048					0		$0	0.103	$0
2049					0		$0	0.097	$0
2050					0		$0	0.092	$0
2051					0		$0	0.087	$0
2052					0		$0	0.082	$0
2053					0		$0	0.077	$0
2054					0		$0	0.073	$0
2055					0		$0	0.069	$0
2056					0		$0	0.065	$0
2057	Avoided SWP water use	acre-feet	0	642	642	$822	$527,724	0.061	$32,190
2058					0		$0	0.058	$0
2059					0		$0	0.054	$0
2060					0		$0	0.051	$0
2061					0		$0	0.048	$0
2062					0		$0	0.046	$0
2063					0		$0	0.043	$0
2064					0		$0	0.041	$0
2065					0		$0	0.038	$0
Project Life	50 years				3,210			…	

Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)	$709,062
% Benefit claimed by project	6.22
Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)	$44,117

Comments: Relocating the sewer trunk line prevents the line from breaking; thus, there is no discharge of sewage and groundwater wells can continue to pump, so additional SWP water is not needed. CLWA's marginal source of SWP water is the water being purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. The cost of this water is estimated to be $822 per AF, when adjusted to 2009 dollars. The total present value of discounted benefits shown is for all phases of the project, which are then adjusted by the ratio of cost of Phase I to the costs of all phases in order to apportion benefits to Phase I.

Table 15. Total Water Supply Benefits

(All benefits should be in 2009 dollars)

Project: _____

Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
$ 44,117			$ 44,117

Comments:

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Santa Clara River Sewer Trunk Line Relocation

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009					0		$0	1.000	$0
2010					0		$0	0.943	$0
2011					0		$0	0.890	$0
2012					0		$0	0.840	$0
2013					0		$0	0.792	$0
2014					0		$0	0.747	$0
2015					0		$0	0.705	$0
2016					0		$0	0.665	$0
2017	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.627	$62,741
	Avoided sewer line break		$0	$ 50,000	$ 50,000		$50,000	0.627	$31,371
	Avoided repair costs	Number of joint replacements	0	5	5	$20,000	$100,000	0.627	$62,741
2018					0		$0	0.592	$0
2019							$0	0.558	$0
2020					0		$0	0.527	$0
2021					0		$0	0.497	$0
2022	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.469	$46,884
	Avoided repair costs	Number of joint replacements	0	5	5	$20,000	$100,000	0.469	$46,884
2023					0		$0	0.442	$0
2024					0		$0	0.417	$0
2025					0		$0	0.394	$0
2026							$0	0.371	$0
2027	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.350	$35,034
	Avoided sewer line break		$0	$ 50,000	$ 50,000		$50,000	0.350	$17,517
	Avoided repair costs	Number of joint	0	5	5	$20,000	$100,000	0.350	$35,034
2028								0.331	$0
2029							$0	0.312	$0
2030							$0	0.294	$0
2031							$0	0.278	$0
2032	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.262	$26,180
	Avoided repair costs	Number of joint replacements	0	5	5	$20,000	$100,000	0.262	$26,180
2033							$0	0.247	$0
2034							$0	0.233	$0
2035							$0	0.220	$0
2036							$0	0.207	$0
2037	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.196	$19,563
	Avoided sewer line break		$0	$ 50,000	$ 50,000		$50,000	0.196	$9,782
	Avoided repair costs	Number of joint	0	5	5	$20,000	$100,000	0.196	$19,563
2038							$0	0.185	$0
2039							$0	0.174	$0
2040							$0	0.164	$0
2041							$0	0.155	$0
2042	Avoided capital replacement		$0	$ 100,000	$ 100,000		$100,000	0.146	$14,619
	Avoided repair costs	Number of joint	0	5	5	$20,000	$100,000	0.146	$14,619
2043							$0	0.138	$0
2044							$0	0.130	$0
2045							$0	0.123	$0
2046							$0	0.116	$0
2047	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.109	$10,924
	Avoided sewer line break		$0	$ 50,000	$ 50,000		$50,000	0.109	$5,462
	Avoided repair costs	Number of joint	$0	5	5	$20,000	$100,000	0.109	$10,924
2048							$0	0.103	$0
2049							$0	0.097	$0
2050							$0	0.092	$0
2051							$0	0.087	$0
2052	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.082	$8,163
	Avoided repair costs	Number of joint replacements	$0	5	5	$20,000	$100,000	0.082	$8,163
2053							$0	0.077	$0
2054							$0	0.073	$0
2055							$0	0.069	$0
2056							$0	0.065	$0
2057	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.061	$6,100
	Avoided sewer line break		$0	$ 50,000	$ 50,000		$50,000	0.061	$3,050
	Avoided repair costs	Number of joint replacements	$0	5	5	$20,000	$100,000	0.061	$6,100
2058							$0	0.058	$0
2059							$0	0.054	$0
2060							$0	0.051	$0
2061							$0	0.048	$0
2062	Avoided capital replacement costs		$0	$ 100,000	$ 100,000		$100,000	0.046	$4,558
	Avoided repair costs	Number of joint replacements	$0	5	5	$20,000	$100,000	0.046	$4,558
2063							$0	0.043	$0
2064							$0	0.041	$0
2065							$0	0.038	$0
Project Life	Avoided capital replacement costs		$0	$ 1,000,000	$ 1,000,000				$ 234,766
Project Life	Avoided sewer line break		$0	$ 250,000	$ 250,000				$ 67,181
Project Life	Avoided repair costs	Number of joint replacements	$0	50	50			…	$ 234,766
								Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table) Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries	$536,713
								% Benefit claimed by project	6.22
								Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)	$33,394

Comments: Relocating the sewer trunk line prevents the need for section replacements and joint repairs (associated with storm events) every 5 years, beginning in 2010. The project will also avoid sewer line breaks associated with storm events every 10 years. The total present value of discounted benefits shown is for all phases of the project, which are then adjusted by the ratio of cost of Phase I to the costs of all phases in order to apportion benefits to Phase I.

(1) Complete these columns if dollar value is being claimed for the benefit.

Santa Clarita Valley Southern End Recycled Water Project (VWC-1)

Summary

The Santa Clarita Valley Southern End Recycled Water Project will expand the existing Santa Clarita Valley recycled water transmission and distribution system to the south in order to supply additional customers within the Valencia Water Company (VWC) service area. The project will provide 910 acre-feet (AF) of recycled water per year to VWC municipal customers for domestic landscape irrigation. The source of this water will be the Valencia Water Reclamation Plant (Valencia WRP), which currently serves as a source of supply for existing Castaic Lake Water Agency (CLWA), the regional water wholesaler, and VWC recycled water customers.

The project includes planning, designing, and constructing additional recycled water infrastructure, including various recycled water pipelines and pumping stations. Specific project components include 31,000 linear feet of transmission main, 2 booster stations, and 69 service meter connections.

In the future, the project will potentially serve as a source of recycled water for customers within the Newhall County Water District and Santa Clarita Water Division service areas. Some preliminary designs for the extension of the recycled water system to serve these areas have been developed. However, the benefits and costs of this potential extension of the project are not included in this analysis.

A summary of all benefits and costs of the project is provided in Table VWC-1.1. Project costs and water supply benefits are discussed in the remainder of this attachment.

Costs

Undiscounted capital costs shown in the project budget total $11,043,500. Construction-related activities (including construction, construction administration, and contingency) account for $10,268,000, or close to 93% of the total. Costs associated with project design, engineering, and environmental documentation account for $497,000, or less than 5% of the total capital budget. Land purchases for the project amount to $250,000. Administration and miscellaneous costs account for the remainder of total capital costs. Capital cost expenditures will be made starting in 2011 and continue through mid-2014.

Operations and maintenance (O&M) costs (including periodic replacement costs) will average about $175,000 per year. Over the 50-year project life (through 2063, 50 years after the project comes online in 2014), the sum of present value capital and O&M costs will amount to $10,974,099.

TABLE VWC-1.1
BENEFIT-COST ANALYSIS OVERVIEW

	Present Value
Costs – Total Capital and O&M	$10,974,099
Monetizable Benefits	
Water Supply Benefits	
Avoided Imported Water Supply Costs	$9,061,140
Water Quality and Other Benefits	
Avoided Alternative Water Resources Management (AWRM) Costs	$6,875,545
Avoided Fertilizer Costs	$215,557
Total Monetizable Benefits	$16,152,242
Quantified Benefit or Cost	**Project Life Total**
Water Quality and Other Benefits	
Avoided Chlorides Discharge and Avoided Introduction of Chlorides into the Watershed	11,982 Metric Tons
Reduced Carbon Dioxide Emissions	10,731 Metric Tons
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Supply Benefits	
Increased Water Supply Reliability for CLWA customers	+
Improved Operational Flexibility for CLWA	+
Water Quality and Other Benefits	
Reduced Disinfection By-product Precursors	+
Reduced Stress on the Sacramento-San Joaquin Delta	+

* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

The "Without Project" Baseline

VWC is one of four domestic water purveyors that receive water from CLWA for distribution in the Santa Clarita Valley. CLWA imports State Water Project (SWP) water from the Sacramento-San Joaquin Delta to Castaic Lake through SWP facilities. Water from Castaic Lake is treated at CLWA's Earl Schmidt Filtration Plant or the Rio Vista Water Treatment Plant and is delivered to VWC through transmission lines owned and operated by CLWA. VWC's service area includes close to 30,000 connections within 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 currently relies on the purchase of approximately 17,550 acre-feet per year (AFY) of SWP water (imported via CLWA) to meet roughly one-half of its potable water demands.[3] The balance of the VWC's potable demand is met through local groundwater sources. The use of recycled water made available via the Southern End Recycled Water Project will offset the use of 910 AFY of imported water because imported water is the marginal water source (i.e., it is the most expensive source of supply available to VWC).

CLWA has a contractual Table A amount of 95,200 AFY of water from SWP. However, the marginal source of SWP water for CLWA, which sells water to VWC, is the water being purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies. The cost of this water in 2007 was estimated to be $790/AF, or $822/AF when updated to 2009 dollars. This includes the cost of purchase, wheeling, and treatment, and factors in system losses (A&N Technical Services, 2008). It is assumed that this cost will rise at the rate of inflation after 2009, thus remaining constant in real dollars.

The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations. Reduced demand for imported water will improve water supply reliability within the VWC service area. Local groundwater may also be limited in some areas, highlighting the need for additional reliable sources of water to meet current and future demands under all hydrologic conditions.

VWC and CLWA recognize that recycled water is a critical component of the region's water supply portfolio. Implementing and expanding the recycled water system within the CLWA/VWC service area will provide a reliable source of water year-round that can help offset reliance on imported water. By utilizing the effluent from the Valencia WRP, CLWA and its retail water purveyors can more efficiently allocate their potable water and increase the reliability of water supplies in the Santa Clarita Valley.

Water Supply Benefits

This section describes the water supply benefits generated by the Santa Clarita Valley Southern End Recycled Water Project, including avoided imported water supply costs, improved water supply reliability for CLWA customers, and improved operational flexibility for CLWA.

Avoided Imported Water Supply Costs

When the project comes online in mid-2014, it will enable the use of an additional 0.81 million gallons per day (910 AFY) of recycled water.[4] Although VWC uses a mix of imported water and groundwater to supply its customers, imported water is more expensive to provide and is the marginal water source. Thus, reduced overall VWC water demand due to increased use of recycled water will result in reduced reliance on SWP water within the service area.

3. Estimate based on total projected 2010 demand of 35,100 from 2005 CLWA Urban Water Management Plan.

4 In 2014, this will amount to 455 AFY because the project is scheduled to come online in July. In 2015 through 2063, the project will enable the use of 910 AFY.

To calculate the avoided costs of imported water over time, the amount of avoided imported water each year is multiplied by the marginal cost of SWP water delivered via CLWA, which is $822/AF of water delivered. Over the 50-year life of the project, VWC will avoid the use of 45,045 AF of imported water. Assuming no real increases in CLWA water rates, the total present value benefits associated with the avoided purchase of imported water amounts to about $9.1 million.

Increased Water Supply Reliability for CLWA Customers

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The project will help address reliability issues for CLWA retail agencies by offsetting the future use of imported water delivered by CLWA. The reliability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that water customers are willing to pay $95 to $500 per household per year for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought).

The challenge for use of these values to determine a value of increased reliability as a result of the Southern End Recycled Water Project is recognizing how to reasonably interpret these survey-based household monetary values. The values noted above reflect a willingness to pay per household to ensure complete reliability (zero drought-related use restrictions in the future), whereas the Southern End Recycled Water Project only enhances overall reliability and does not guarantee 100% reliability. Thus, if applied directly to the number of households within the CLWA service area, the dollar values from the studies would overstate the reliability value provided by the project.

A simple way to roughly adjust for this "whole versus part" problem is to attribute a portion of the total value of reliability to the portion of the problem that is solved by the project. To adjust for the partial improvement in reliability from the Southern End Recycled Water Project, it is assumed that household willingness to pay for improved reliability is directly proportional to the amount of recycled water that will offset imported water, as a percentage of the total potable water supply. This represents the percentage of total supply that has been improved in terms of overall reliability (i.e., by offsetting imported water demand with local sources).

For example, the project will offset more than 910 AFY of imported water beginning in 2015. In that year, total imported water demand within the CLWA service area will be about 48,550 AFY (without the project) (CLWA, 2005).[5] Thus, about 1.9% of total potable demand will be met by recycled water made available as a result of the project. To obtain a lower bound estimate for the

[5]. The CLWA Urban Water Management Plan projects total purveyor demand in 2015 will be 97,100 AF. Analysis assumes that 50% of total demand is met through imported water.

value of improved reliability associated with this water, it is assumed that households within the CLWA service area are willing to pay about $1.81 per year ($95 multiplied by 1.9%). Applying this dollar value per household to the approximately 97,840 households within the CLWA service area would result in $177,090 of benefits in 2015. Taking into account increasing population and changing demands, this calculation could be completed for each year of the project's useful life.

Due to the uncertainty involved in applying these numbers to this situation, this benefit estimate is not included in the tables. However, it is provided here to give an idea of the potential magnitude of this benefit.

Improved Operational Flexibility for CLWA

As a result of the Southern End Recycled Water Project, the use of recycled water by VWC customers will offset 910 AFY of imported SWP water. This will help CLWA directly in their supply operations, allowing for longer shutdowns and improving system reliability. The value of this increased operational flexibility is not monetized in the benefit tables.

Distribution of Project Benefits and Identification of Beneficiaries

The Southern End Recycled Water Project includes the full range of types of beneficiaries, as is summarized in Table VWC-1.2. At the local level, VWC customers will benefit due to increased reliability of supply and avoided costs associated with importing additional SWP water. Regionally, those dependent on supplies from CLWA will benefit from improved water supply reliability within the CLWA service area and reduced demand on CLWA facilities. The project will provide statewide benefits by reducing future demands on water supplies from the Sacramento-San Joaquin Delta region. The project also helps meet statewide goals to increase use of recycled wastewater by at least 1 million AFY by 2020 and by at least 2 million AFY by 2030 (State Water Resources Control Board, 2009).

TABLE VWC-1.2
PROJECT BENEFICIARIES SUMMARY

Local	Regional	Statewide
VWC and customers	CLWA and Customers, Ventura County Agriculture	Sacramento-San Joaquin-Delta, California's Recycled Water Use Goals

Project Benefits Timeline Description

Design efforts for the Southern End Recycled Water Project should be completed by June 2012 and construction will begin in January 2013. Construction is expected to take 18 months, with operation starting in July 2014. A 50-year useful project life is assumed for this analysis. Selection of this lifetime was based on balancing the long expected life for transmission mains with shorter expected life for booster stations.

Potential Adverse Effects from the Project

The project is not expected to result in any significant adverse effects. Project will be located in a fully developed urbanized area.

Summary of Findings

The monetized water supply benefits from the Southern End Recycled Water Project include the avoided cost of imported SWP supplies. The cost of treated SWP water supply delivered by CLWA to VWC is $822/AF. Over the 50-year life of the project, the avoided water supply costs will total $9.1 million in present value. Non-monetized benefits of the project include improved water supply reliability within the service area and increased operational flexibility for CLWA.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In most cases, omissions lead to a downward bias in benefits: the project is expected to be much more beneficial than the subset of benefits that can be monetized would indicate. These issues are listed in Table VWC-1.3.

TABLE VWC-1.3
OMISSIONS, BIASES, AND UNCERTAINTIES, AND THEIR EFFECT ON THE PROJECT

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Increased water supply reliability for CLWA customers	+	The potential benefit of increased water supply reliability as a result of the project has not been included due to uncertainties of applying values from the literature to a partial improvement in water supply reliability.
Project costs	U	The calculation of the present value of costs is a function of the timing of capital outlays and a number of other factors and conditions. Changes in these variables will change the estimate of costs.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
–– = Likely to decrease net benefits significantly.
U = Uncertain, could be + or -.

References

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State Water Resources Control Board. 2009. Recycled Water Policy. California Environmental Protection Agency. Available: http://www.swrcb.ca.gov/water_issues/programs/water_recycling_policy/docs/recycledwaterpolicy_approved.pdf. Accessed December 13, 2010.

Table 11- Annual Cost of Project

(All costs should be in 2009 Dollars)

Project: Santa Clarita Valley Southern End Recycled Water Project

	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009							$0	1.00	$0
2010							$0	0.943	$0
2011	$386,523						$386,523	0.890	$344,005
2012	$3,423,485						$3,423,485	0.840	$2,875,727
2013	$5,135,228						$5,135,228	0.792	$4,067,100
2014	$2,098,265	$12,500	$37,500	$25,000	$12,500		$2,185,765	0.747	$1,632,766
2015		$25,000	$75,000	$50,000	$25,000		$175,000	0.705	$123,375
2016		$25,000	$75,000	$50,000	$25,000		$175,000	0.665	$116,375
2017		$25,000	$75,000	$50,000	$25,000		$175,000	0.627	$109,725
2018		$25,000	$75,000	$50,000	$25,000		$175,000	0.592	$103,600
2019		$25,000	$75,000	$50,000	$25,000		$175,000	0.558	$97,650
2020		$25,000	$75,000	$50,000	$25,000		$175,000	0.527	$92,225
2021		$25,000	$75,000	$50,000	$25,000		$175,000	0.497	$86,975
2022		$25,000	$75,000	$50,000	$25,000		$175,000	0.469	$82,075
2023		$25,000	$75,000	$50,000	$25,000		$175,000	0.442	$77,350
2024		$25,000	$75,000	$50,000	$25,000		$175,000	0.417	$72,975
2025		$25,000	$75,000	$50,000	$25,000		$175,000	0.394	$68,950
2026		$25,000	$75,000	$50,000	$25,000		$175,000	0.371	$64,925
2027		$25,000	$75,000	$50,000	$25,000		$175,000	0.350	$61,250
2028		$25,000	$75,000	$50,000	$25,000		$175,000	0.331	$57,925
2029		$25,000	$75,000	$50,000	$25,000		$175,000	0.312	$54,600
2030		$25,000	$75,000	$50,000	$25,000		$175,000	0.294	$51,450
2031		$25,000	$75,000	$50,000	$25,000		$175,000	0.278	$48,650
2032		$25,000	$75,000	$50,000	$25,000		$175,000	0.262	$45,850
2033		$25,000	$75,000	$50,000	$25,000		$175,000	0.247	$43,225
2034		$25,000	$75,000	$50,000	$25,000		$175,000	0.233	$40,775
2035		$25,000	$75,000	$50,000	$25,000		$175,000	0.220	$38,500
2036		$25,000	$75,000	$50,000	$25,000		$175,000	0.207	$36,225
2037		$25,000	$75,000	$50,000	$25,000		$175,000	0.196	$34,300
2038		$25,000	$75,000	$50,000	$25,000		$175,000	0.185	$32,375
2039		$25,000	$75,000	$50,000	$25,000		$175,000	0.174	$30,450
2040		$25,000	$75,000	$50,000	$25,000		$175,000	0.164	$28,700
2041		$25,000	$75,000	$50,000	$25,000		$175,000	0.155	$27,125
2042		$25,000	$75,000	$50,000	$25,000		$175,000	0.146	$25,550
2043		$25,000	$75,000	$50,000	$25,000		$175,000	0.138	$24,150
2044		$25,000	$75,000	$50,000	$25,000		$175,000	0.130	$22,750
2045		$25,000	$75,000	$50,000	$25,000		$175,000	0.123	$21,525
2046		$25,000	$75,000	$50,000	$25,000		$175,000	0.116	$20,300
2047		$25,000	$75,000	$50,000	$25,000		$175,000	0.109	$19,075
2048		$25,000	$75,000	$50,000	$25,000		$175,000	0.103	$18,025
2049		$25,000	$75,000	$50,000	$25,000		$175,000	0.097	$16,975
2050		$25,000	$75,000	$50,000	$25,000		$175,000	0.092	$16,100
2051		$25,000	$75,000	$50,000	$25,000		$175,000	0.087	$15,225
2052		$25,000	$75,000	$50,000	$25,000		$175,000	0.082	$14,350
2053		$25,000	$75,000	$50,000	$25,000		$175,000	0.077	$13,475
2054		$25,000	$75,000	$50,000	$25,000		$175,000	0.073	$12,775
2055		$25,000	$75,000	$50,000	$25,000		$175,000	0.069	$12,075
2056		$25,000	$75,000	$50,000	$25,000		$175,000	0.065	$11,375
2057		$25,000	$75,000	$50,000	$25,000		$175,000	0.061	$10,675
2058		$25,000	$75,000	$50,000	$25,000		$175,000	0.058	$10,150
2059		$25,000	$75,000	$50,000	$25,000		$175,000	0.054	$9,450
2060		$25,000	$75,000	$50,000	$25,000		$175,000	0.051	$8,925
2061		$25,000	$75,000	$50,000	$25,000		$175,000	0.048	$8,400
2062		$25,000	$75,000	$50,000	$25,000		$175,000	0.046	$8,050
2063		$25,000	$75,000	$50,000	$25,000		$175,000	0.043	$7,525
								Total Present Value of Discounted Costs (Sum of Column (i))	$10,974,099
								Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries	

Comments: Operation of the Southern End Reycled Water Project is assumed to begin in mid-2014, and have a useful life of 50 years.

Table 12 - Annual Water Supply Benefits

(All benefits should be in 2009 dollars)

Project: Santa Clarita Valley Southern End Recycled Water Project

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009								1.00	$0
2010								0.943	$0
2011								0.890	$0
2012								0.840	$0
2013								0.792	$0
2014	Avoided imported water use	AF	0	455	455	$822	$374,010	0.747	$279,385
2015	Avoided imported water use	AF	0	910	910	$822	$748,020	0.705	$527,354
2016	Avoided imported water use	AF	0	910	910	$822	$748,020	0.665	$497,433
2017	Avoided imported water use	AF	0	910	910	$822	$748,020	0.627	$469,009
2018	Avoided imported water use	AF	0	910	910	$822	$748,020	0.592	$442,828
2019	Avoided imported water use	AF	0	910	910	$822	$748,020	0.558	$417,395
2020	Avoided imported water use	AF	0	910	910	$822	$748,020	0.527	$394,207
2021	Avoided imported water use	AF	0	910	910	$822	$748,020	0.497	$371,766
2022	Avoided imported water use	AF	0	910	910	$822	$748,020	0.469	$350,821
2023	Avoided imported water use	AF	0	910	910	$822	$748,020	0.442	$330,625
2024	Avoided imported water use	AF	0	910	910	$822	$748,020	0.417	$311,924
2025	Avoided imported water use	AF	0	910	910	$822	$748,020	0.394	$294,720
2026	Avoided imported water use	AF	0	910	910	$822	$748,020	0.371	$277,515
2027	Avoided imported water use	AF	0	910	910	$822	$748,020	0.350	$261,807
2028	Avoided imported water use	AF	0	910	910	$822	$748,020	0.331	$247,595
2029	Avoided imported water use	AF	0	910	910	$822	$748,020	0.312	$233,382
2030	Avoided imported water use	AF	0	910	910	$822	$748,020	0.294	$219,918
2031	Avoided imported water use	AF	0	910	910	$822	$748,020	0.278	$207,950
2032	Avoided imported water use	AF	0	910	910	$822	$748,020	0.262	$195,981
2033	Avoided imported water use	AF	0	910	910	$822	$748,020	0.247	$184,761
2034	Avoided imported water use	AF	0	910	910	$822	$748,020	0.233	$174,289
2035	Avoided imported water use	AF	0	910	910	$822	$748,020	0.220	$164,564
2036	Avoided imported water use	AF	0	910	910	$822	$748,020	0.207	$154,840
2037	Avoided imported water use	AF	0	910	910	$822	$748,020	0.196	$146,612
2038	Avoided imported water use	AF	0	910	910	$822	$748,020	0.185	$138,384
2039	Avoided imported water use	AF	0	910	910	$822	$748,020	0.174	$130,155
2040	Avoided imported water use	AF	0	910	910	$822	$748,020	0.164	$122,675
2041	Avoided imported water use	AF	0	910	910	$822	$748,020	0.155	$115,943
2042	Avoided imported water use	AF	0	910	910	$822	$748,020	0.146	$109,211
2043	Avoided imported water use	AF	0	910	910	$822	$748,020	0.138	$103,227
2044	Avoided imported water use	AF	0	910	910	$822	$748,020	0.130	$97,243
2045	Avoided imported water use	AF	0	910	910	$822	$748,020	0.123	$92,006
2046	Avoided imported water use	AF	0	910	910	$822	$748,020	0.116	$86,770
2047	Avoided imported water use	AF	0	910	910	$822	$748,020	0.109	$81,534
2048	Avoided imported water use	AF	0	910	910	$822	$748,020	0.103	$77,046
2049	Avoided imported water use	AF	0	910	910	$822	$748,020	0.097	$72,558
2050	Avoided imported water use	AF	0	910	910	$822	$748,020	0.092	$68,818
2051	Avoided imported water use	AF	0	910	910	$822	$748,020	0.087	$65,078
2052	Avoided imported water use	AF	0	910	910	$822	$748,020	0.082	$61,338
2053	Avoided imported water use	AF	0	910	910	$822	$748,020	0.077	$57,598
2054	Avoided imported water use	AF	0	910	910	$822	$748,020	0.073	$54,605
2055	Avoided imported water use	AF	0	910	910	$822	$748,020	0.069	$51,613
2056	Avoided imported water use	AF	0	910	910	$822	$748,020	0.065	$48,621
2057	Avoided imported water use	AF	0	910	910	$822	$748,020	0.061	$45,629
2058	Avoided imported water use	AF	0	910	910	$822	$748,020	0.058	$43,385
2059	Avoided imported water use	AF	0	910	910	$822	$748,020	0.054	$40,393
2060	Avoided imported water use	AF	0	910	910	$822	$748,020	0.051	$38,149
2061	Avoided imported water use	AF	0	910	910	$822	$748,020	0.048	$35,905
2062	Avoided imported water use	AF	0	910	910	$822	$748,020	0.046	$34,409
2063	Avoided imported water use	AF	0	910	910	$822	$748,020	0.043	$32,165
							Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)		$9,061,140

Comments: The Santa Clarita Valley Southern End Recycled Water Project will avoid the use of 910 AFY of State Water Project water. The marginal cost of imported water to CLWA is $822 AF in 2009 dollars. The project will be come operational in mid-2014, so use of 455 AF of imported is avoided in that year.

Table 15. Total Water Supply Benefits (All benefits should be in 2009 dollars) Project: Santa Clarita Valley Southern End Recycled Water Project			
Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
$ 9,061,140			$ 9,061,140
Comments:			

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Santa Clarita Valley Southern End Recycled Water Project

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009								1.00	
2010								0.943	
2011								0.890	
2012								0.840	
2013								0.792	$0
2014	Avoided fertilizer use	lbs of fertilizer	0	27,461	27,461	$0.32	$8,897	0.747	$6,646
	Avoided introduction/ discharge of chlorides	MT of chlorides		121	121				$0
	Reduced CO2 Emissions	MT of CO_2	0	108	108				$0
2015	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.705	$12,545
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2016	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.665	$11,834
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2017	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.627	$11,157
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2018	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.592	$10,534
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2019	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.558	$9,929
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2020	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.527	$9,378
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2021	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.497	$8,844
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2022	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.469	$8,346
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2023	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.442	$7,865
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2024	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.417	$7,420
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2025	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.394	$7,011
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2026	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.371	$6,602
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2027	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.350	$6,228
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2028	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.331	$5,890
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2029	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.312	$5,552
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2030	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.294	$5,232
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2031	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.278	$4,947
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2032	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.262	$4,662
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2033	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.247	$4,395
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2034	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.233	$4,146
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2035	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.220	$3,915
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2036	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.207	$3,684
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2037	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.196	$3,488
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2038	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.185	$3,292
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2039	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.174	$3,096
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2040	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.164	$2,918
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2041	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.155	$2,758
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Santa Clarita Valley Southern End Recycled Water Project

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2042	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.146	$2,598
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2043	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.138	$2,456
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2044	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.130	$2,313
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2045	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.123	$2,189
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2046	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.116	$2,064
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2047	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.109	$1,940
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2048	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.103	$1,833
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2049	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.097	$1,726
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2050	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.092	$1,637
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2051	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.087	$1,548
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2052	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.082	$1,459
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2053	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.077	$1,370
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2054	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.073	$1,299
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2055	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.069	$1,228
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2056	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.065	$1,157
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2057	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.061	$1,085
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2058	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.058	$1,032
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2059	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.054	$961
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2060	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.051	$908
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2061	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.048	$854
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2062	Avoided fertilizer use	lbs of fertilizer	0	54,922	54,922	$0.32	$17,795	0.046	$819
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2	0	217	217				$0
2063	Avoided fertilizer use	lbs of fertilizer		54,922	54,922	$0.32	$17,795	0.043	$765
	Avoided introduction/ discharge of chlorides	MT of chlorides		242	242				$0
	Reduced CO2 Emissions	MT of CO_2		217	217				
Project Life	Avoided fertilizer use	lbs of fertilizer	0	2,663,722	2,663,722	$0.32	$ 863,046		$ 215,557
Project Life	Avoided introduction/ discharge of chlorides	MT of chlorides		11,982	11,982				
Project Life	Reduced CO2 Emissions	MT of CO_2	0	10,731	10,731				

Comments: Recycled water contains nitrogen, phosphorous and potassium not found in potable water. Use of recycled water for domestic landscape irrigation will avoid the use of 54,922 lbs of fertilizer per year. The average commercial value of fertilizier was used to compute the avoided fertilizer cost. Avoided use of SWP water avoids introduction of chlorides into the Watershed. The average concentration of chlorides in SWP water was assumed to be 79 mg/l, which is the value at Jensen filtration plant in 2009 and happens to be the middle of the range of chloride content of SWP water over the last 30 years. Use of recycled water from this project also avoids discharge of chlorides to the Santa Clara River. The average chloride concentration of discharges from the Valencia WRP is 137 mg/l. The project also will avoid emissions of carbon dixoide associated with the energy needed to deliver SWP water to CLWA.

Table 16a - Annual Costs of Avoided Projects

(All avoided costs should be in 2009 dollars)

Project: Santa Clarita Valley Southern End Recycled Water Project

	Costs				Discounting Calculations	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
YEAR	Alternative (Avoided Project Name): Alternative Water Resources Management Program *Avoided Project Description: The purpose of the AWRM Program is to develop a regional watershed solution for chlorides. If the recycled water project is implemented, the AWRM program will be designed to treat 910 AFY less than currently planned. ·A descripton of the AWRM is included in Attachment 8 for the VWC Southern End Recycled Water Project.*				Discount Factor	Discounted Costs (e) x (f)
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)		
2009				$ -	1.00	$0
2010				$ -	0.943	$0
2011				$ -	0.890	$0
2012	$ 62,500,000			$ 62,500,000	0.840	$52,500,000
2013	$ 62,500,000			$ 62,500,000	0.792	$49,500,000
2014	$ 62,500,000			$ 62,500,000	0.747	$46,687,500
2015	$ 62,500,000			$ 62,500,000	0.705	$44,062,500
2016			4,471,830	$ 4,471,830	0.665	$2,973,767
2017			4,471,830	$ 4,471,830	0.627	$2,803,837
2018			4,471,830	$ 4,471,830	0.592	$2,647,323
2019			4,471,830	$ 4,471,830	0.558	$2,495,281
2020			4,471,830	$ 4,471,830	0.527	$2,356,654
2021			4,471,830	$ 4,471,830	0.497	$2,222,500
2022			4,471,830	$ 4,471,830	0.469	$2,097,288
2023			4,471,830	$ 4,471,830	0.442	$1,976,549
2024			4,471,830	$ 4,471,830	0.417	$1,864,753
2025			4,471,830	$ 4,471,830	0.394	$1,761,901
2026			4,471,830	$ 4,471,830	0.371	$1,659,049
2027			4,471,830	$ 4,471,830	0.350	$1,565,141
2028			4,471,830	$ 4,471,830	0.331	$1,480,176
2029			4,471,830	$ 4,471,830	0.312	$1,395,211
2030			4,471,830	$ 4,471,830	0.294	$1,314,718
2031			4,471,830	$ 4,471,830	0.278	$1,243,169
2032			4,471,830	$ 4,471,830	0.262	$1,171,619
2033			4,471,830	$ 4,471,830	0.247	$1,104,542
2034			4,471,830	$ 4,471,830	0.233	$1,041,936
2035			4,471,830	$ 4,471,830	0.220	$983,803
2036			4,471,830	$ 4,471,830	0.207	$925,669
2037			4,471,830	$ 4,471,830	0.196	$876,479
2038			4,471,830	$ 4,471,830	0.185	$827,289
2039			4,471,830	$ 4,471,830	0.174	$778,098
2040			4,471,830	$ 4,471,830	0.164	$733,380
2041			4,471,830	$ 4,471,830	0.155	$693,134
2042			4,471,830	$ 4,471,830	0.146	$652,887
2043			4,471,830	$ 4,471,830	0.138	$617,113
2044			4,471,830	$ 4,471,830	0.130	$581,338
2045			4,471,830	$ 4,471,830	0.123	$550,035
2046			4,471,830	$ 4,471,830	0.116	$518,732
2047			4,471,830	$ 4,471,830	0.109	$487,429
2048			4,471,830	$ 4,471,830	0.103	$460,598
2049			4,471,830	$ 4,471,830	0.097	$433,768
2050			4,471,830	$ 4,471,830	0.092	$411,408
2051			4,471,830	$ 4,471,830	0.087	$389,049
2052			4,471,830	$ 4,471,830	0.082	$366,690
2053			4,471,830	$ 4,471,830	0.077	$344,331
2054			4,471,830	$ 4,471,830	0.073	$326,444
2055			4,471,830	$ 4,471,830	0.069	$308,556
2056			4,471,830	$ 4,471,830	0.065	$290,669
2057			4,471,830	$ 4,471,830	0.061	$272,782
2058			4,471,830	$ 4,471,830	0.058	$259,366
2059			4,471,830	$ 4,471,830	0.054	$241,479
2060			4,471,830	$ 4,471,830	0.051	$228,063
2061			4,471,830	$ 4,471,830	0.048	$214,648
2062			4,471,830	$ 4,471,830	0.046	$205,704
2063			4,471,830	$ 4,471,830	0.043	$192,289
					Total Present Value of Discounted Costs (Sum of Column (g))	$242,096,644
					(%) Avoided Cost Claimed by Project	2.8%
					Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)	$6,875,545

Comments: . The use for domestic landscape irrigation of tertiary-treated effluent from the Valencia WRP will reduce AWRM implementation costs. Avoided costs for all of AWRM are shown in the tables, and 2.8% of this avoided cost is claimed for the Southern End Recycled Water Project. The 2.8% share was derived in the following manner: AWRM is designed to accommodate the wastewater effluent from the Valencia and Saugus WRPs, which treat about 32,000 AFY. As a result of the Southern End Recycled Water Project, SVCSD can design the AWRM to treat 910 less AFY of wastewater effluent. 910 AFY is 2.8% of 32,000 AFY.

Electrolysis and Volatilization for Bromide Removal and Disinfectant By-product Reduction Pilot Plant (CLWA-2)

Summary

This project will expand an innovative water treatment technique from a small pilot scale to a demonstration scale that will treat 350,000 gallons per day (gpd) of source water. This new technique, pioneered by the Castaic Lake Water Agency (CLWA), was developed to reduce the level of brominated disinfection by-products (DBPs) in finished drinking water by removing bromide from source waters received from the State Water Project (SWP). Brominated DBPs result from a reaction between naturally occurring bromide anions and disinfectants. CLWA's new treatment technique relies on passing source water through metal anodes where it undergoes both an electrolysis and volatilization process that oxidizes the brominated DBPs into bromine. This reduces the risk of adverse health impacts associated with brominated DBPs. CLWA's pilot project has demonstrated that this treatment technique can successfully reduce levels of brominated DBPs. If the demonstration project is shown to cost-effectively remove brominated DBPs at a greater scale, CLWA will incorporate the existing equipment into a larger project that will treat 7 million gallons per day (MGD), approximately one-half of daily plant wide production.

The benefits of this project can only be properly evaluated based on the full-scale implementation of the innovative technology being demonstrated. Therefore this economic analysis starts by considering the benefits of the larger-scale facility, and then apportions a share of the benefits to the smaller-scale demonstration project. The benefits are apportioned based on the percentage of the full-scale costs represented by this demonstration project.

A summary the benefits and costs of the demonstration project is provided in Table CLWA-2.1. Project costs and water supply benefits are discussed in the remainder of this attachment.

TABLE CLWA-2.1
BENEFIT-COST ANALYSIS OVERVIEW –DEMONSTRATION-SCALE PROJECT

	Present Value
Costs – Total Capital and O&M	$1,072,533
Monetizable Benefits	
Water Supply Benefits	
Avoided Flushing Due to Nitrification	$147,960
Water Quality Benefits	
Reduction in Chemical Costs	$53,055
Health Benefits From Improved Water Quality	$624,407
Avoided Costs Associated With Switching From Chloramine Treatment to Free Chlorine	$95,173
Total Monetized Benefits	$920,595
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Quality and Other Benefits	
Developing an Innovative New Technique to Reduce Human Exposure to Brominated DBPs	++
More Effective and Flexible Drinking Water Disinfection Treatment	++
Modest Reduction in Influent Levels of Chloride, Ammonia, Brominated DBPs and Nutrients at the Wastewater Treatment Plant	+
Reduced Stress on Sacramento-San Joaquin Delta	+

O&M = operations and maintenance
* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

Costs

The budgeted costs for the demonstration project total $1,261,210. The majority of these funds (approximately $975,450) will be allocated for construction and implementation of the demonstration project. Specific cost components include: mobilization and site preparation, project construction, and performance testing and demobilization. Remaining funds will be used on direct project administration costs, including general administration and a labor compliance program, along with planning and designing the demonstration project. Present value costs for the demonstration project total $1,072,533.

If the demonstration project is shown to successfully remove brominated DBPs, CLWA will scale this technology to treat 7 MGD. Scaling this technology will result in an initial capital cost of $14,000,000 in 2018. Operations costs are estimated to be $567,210 annually for the 30-year life of the full-scale project. The present value capital and O&M costs for the full-scale project are $11,906,334. Thus, the demonstration project represents roughly 9% of the present value costs of the full-scale project.

The "Without Project" Baseline

The Castaic Lake Water Agency (CLWA) provides customers with a blend of imported water from California's State Water Project and local groundwater. In 2010, CLWA imported close to 74,000 acre-feet of water. Much of this surface water originates from Lake Oroville near Sacramento. Source water flows through three power plants once it reaches the Oroville Dam before traveling down the Feather and Sacramento Rivers to reach the Sacramento-San Joaquin Delta. Source water then moves through the Delta to the Harvey O. Bank pumping plant where water then travels 300 miles south via the California Aqueduct. Finally, source water reaches the A.D. Edmonston Pumping Plant where it is pumped south through the West Branch of the California Aqueduct to Quail Lake, Pyramid, Lake and Castaic Lake to be processed by CLWA. In addition to SWP water, about 1/3 of CLWA's water supply consists of local groundwater. This mix is distributed to the following local water retailers: Los Angeles County Water District #36, Newhall County Water District, CLWA Santa Clarita Water Division, and Valencia Water Company.

SWP water has a number of water quality constituents that affect its suitability as a drinking water source. SWP water contains relatively high levels of bromide and total organic carbon (TOC), two elements that are of particular concern to drinking water agencies. Bromide and TOC combine with chemicals used in the water treatment process to form DBPs such as trihalomethanes (THMs), which are strictly regulated under the federal Safe Drinking Water Act. Currently, there are no standards for bromide or TOC in drinking water. Water treated by CLWA currently meets all federal and state drinking water standards. However, current levels of bromide and TOC are significantly higher than target levels identified by an expert panel hired by the California Urban Water Agencies. These levels are 50 parts per billion (ppb) for bromide and 3 parts per million (ppm) for TOC. Average SWP levels are significantly higher: up to 600% above the target level for bromide and 10% above the target level for TOC (Owen et al., 1998).

Without the project, CLWA will continue to receive SWP water with elevated bromide levels, and distribute water that meets current federal and state health standards but has elevated brominated DBPs (notably, bromate). CLWA will also need to retain its current reliance on chloramine disinfection in order to manage DBP levels while concurrently providing suitable microbial control. The continued reliance on chloramines is expensive, limits operational flexibility (e.g., allowing better use of existing ozonation disinfection facilities), and periodically leads to nitrification of the treated water (due to the ammonia levels associated with chloramine production). During episodes of elevated nitrification, the finished drinking water cannot be served to the public and instead must be flushed from the distribution system and replaced with other water.

If this demonstration project performs as anticipated, based on the pilot study, CLWA can move forward with larger-scale implementation of the technology. Thus, this demonstration-scale project is a gateway to a wide range of highly valuable benefits for the CLWA and its retail water purveyor. In other words, the benefits of the demonstration-scale project are integrally linked to the anticipated benefits of full-scale implementation. If the demonstration project performs as anticipated, the benefits will be realized as described in these Attachments 7 and 8, and a portion of the full-scale benefits can be attributed to the demonstration-scale project.

If, on the other hand, the project indicates problems with the technology at the demonstration scale, then the CLWA will realize benefits by avoiding the cost associated with full-scale implementation of an approach that does not perform as anticipated from the pilot test alone (e.g., a substantial cost savings will be realized by CLWA by avoiding a poor investment). Or, the limitations made evident by the demonstration project can lead to technology and/or operational improvements that might enhance the new approach and increase its net benefits. These scenarios are not included in this assessment, but they indicate in a qualitative manner how the demonstration project can provide benefits even if it does not perform as well as anticipated.

Water Supply Benefits

This section describes the water supply benefits generated by the development of a full-scale treatment process that will remove brominated DBPs from source water, including the avoided cost from a decrease in water flushed as a result of nitrification. The demonstration-scale project is then assigned benefits according to the ratio of the costs of the demonstration-scale project to the full-scale project.

Avoided Flushing Due to Nitrification

The full-scale project will allow CLWA to reduce the amount of ammonia used in chloramine chemical treatment. This will result in a corresponding decrease in nitrification of finished water. Because nitrification results in taste and odor problems, much of this water must be flushed instead of provided to local water retailers. Without this project, source water will continue to experience nitrification, forcing CLWA to replace flushed water with additional purchases of imported water through the SWP.

The completion of the full scale project will result in a total savings of 159 acre-feet per year (AFY), based on current water use levels. Water demand in this region is expected to increase by 2.2% per year, in line with population growth, and so the amount of water saved can also be anticipated to increase by this amount per year.

To monetize the water supply savings, the expected water savings per year is multiplied by CLWA's costs associated with importing water. CLWA has a contractual Table A amount of 95,200 AFY of water from SWP. However, the marginal source of SWP water for CLWA is the water being purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies. The cost of this water in 2007 was estimated to be $790/AF, or $822/AF when updated to 2009 dollars. This includes the cost of purchase, wheeling, and treatment, and factors in system losses (A&N Technical Services, 2008). It is assumed that this cost will rise at the rate of inflation after 2009, thus remaining constant in real dollars.

Over the lifetime of the full-scale project, this results in a total present value benefit from avoided water flushing due to nitrification of $1,642,519 over the assumed 30-year life of the project. The demonstration project can be attributed a 9% share of these benefits based on the ratio of cost of the demonstration-scale project relative to the cost of the full-scale project. Thus, the present value of benefit attributed to the demonstration-scale project is $147,960.

Distribution of Project Benefits, and Identification of Beneficiaries

The bromide removal project includes the full range of beneficiaries, as is shown in Table CLWA-2.2. The decrease in the amount of source water that must be flushed due to nitrification will benefit CLWA and its retail water purveyors, and will provide statewide benefits by reducing future demands on water supplies from the Sacramento-San Joaquin Delta region.

TABLE CLWA-2.2
PROJECT BENEFICIARIES SUMMARY

Local	Regional	Statewide
CLWA Santa Clarita Water Division, LA County Waterworks District 36, Newhall County Water District, Valencia Water Company	Castaic Lake Water Agency, Santa Clarita Valley Sanitation District	Sacramento-San Joaquin Delta

Project Benefits Timeline Description

This demonstration-scale project will treat 350,000 gpd for three years, beginning in July 2011 and lasting until July 2014. If this technology proves to be effective, it will be scaled up to a full-scale treatment project capable of treating 7 MGD. Construction of the full-scale project would begin January 2017 and end July 2018. Once the full-scale treatment process has been completed, it will provide water treatment benefits for approximately 30 years.

Potential Adverse Effects from the Project

This technology, which relies on metal anode plates to treat source water, is highly energy intensive. The project will demand greater amounts of energy than the water treatment facility has used in the past. If this energy is not procured from renewable sources, then this project will result in an increase in GHG emissions and the associated carbon footprint of the CLWA. However, reduced GHG emissions from reduced SWP water imports will at least partially offset this effect. CLWA is also in the process of constructing a solar power plant at the Rio Vista Water Treatment Plant to offset its electrical demand.

Summary of Findings

This project will allow CLWA to reduce the amount of water it must flush due to nitrification. CLWA will be able to purchase less imported water, resulting in a decrease in demand on existing water supplies and substantial costs savings, totaling a present value of $152,510 for the demonstration-scale project.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the attribution of demonstration-scale benefits to full-scale implementation. This issue is discussed in Table CLWA-2.3.

TABLE CLWA-2.3
OMISSIONS, BIASES, AND UNCERTAINTIES, AND THEIR EFFECT ON THE PROJECT

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Basing demonstration-scale benefits on a cost-based percentage of the benefits of full-scale implementation of the innovative bromide control technology.	U	The benefits of the demonstration-scale project are linked to the anticipated benefits of full-scale implementation. If the demonstration projects performs as anticipated, the benefits will be realized as described in Attachments 7 and 8. If the project indicates problems with the technology at the demonstration scale, then CLWA will realize benefits by avoiding full-scale implementation of an approach that does not perform as anticipated from the pilot test alone (e.g., a substantial savings from avoiding a poor investment), or can lead to technology improvements that enhance the new approach and its net benefits.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

References

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Table 11- Annual Cost of Demonstration Project

(All costs should be in 2009 Dollars)

Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)

	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))***	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	$0						$0	1.000	$0
2010	$0						$0	0.943	$0
2011	$504,484						$504,484	0.890	$448,991
2012	$504,484						$504,484	0.840	$423,767
2013	$252,242						$252,242	0.792	$199,776
2014	$0						$0	0.747	$0
Project Life	$1,261,210							…	
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$1,072,533

Comments: Costs in this table show the budgeted costs associated with constructing and operating the demonstration-scale project.

Table 11- Annual Cost of Full-Scale Project

(All costs should be in 2009 Dollars)

Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)

	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))***	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	$0						$0	1.000	$0
2010	$0						$0	0.943	$0
2011	$0						$0	0.890	$0
2012	$0						$0	0.840	$0
2013	$0						$0	0.792	$0
2014	$0						$0	0.747	$0
2015	$0						$0	0.705	$0
2016	$0						$0	0.665	$0
2017	$9,333,333						$9,333,333	0.558	$5,211,685
2018	$4,666,667		$283,605.00				$4,950,272	0.527	$2,607,741
2019	$0		$567,210.00				$567,210	0.497	$281,886
2020	$0		$567,210.00				$567,210	0.469	$265,930
2021	$0		$567,210.00				$567,210	0.442	$250,878
2022	$0		$567,210.00				$567,210	0.417	$236,677
2023	$0		$567,210.00				$567,210	0.394	$223,280
2024	$0		$567,210.00				$567,210	0.371	$210,642
2025	$0		$567,210.00				$567,210	0.350	$198,719
2026	$0		$567,210.00				$567,210	0.331	$187,470
2027	$0		$567,210.00				$567,210	0.312	$176,859
2028	$0		$567,210.00				$567,210	0.294	$166,848
2029	$0		$567,210.00				$567,210	0.278	$157,404
2030	$0		$567,210.00				$567,210	0.262	$148,494
2031	$0		$567,210.00				$567,210	0.247	$140,089
2032	$0		$567,210.00				$567,210	0.233	$132,159
2033	$0		$567,210.00				$567,210	0.220	$124,678
2034	$0		$567,210.00				$567,210	0.207	$117,621
2035	$0		$567,210.00				$567,210	0.196	$110,963
2036	$0		$567,210.00				$567,210	0.185	$104,682
2037	$0		$567,210.00				$567,210	0.174	$98,757
2038	$0		$567,210.00				$567,210	0.164	$93,167
2039	$0		$567,210.00				$567,210	0.155	$87,893
2040	$0		$567,210.00				$567,210	0.146	$82,918
2041	$0		$567,210.00				$567,210	0.138	$78,225
2042	$0		$567,210.00				$567,210	0.130	$73,797
2043	$0		$567,210.00				$567,210	0.123	$69,620
2044	$0		$567,210.00				$567,210	0.116	$65,679
2045	$0		$567,210.00				$567,210	0.109	$61,961
2046	$0		$567,210.00				$567,210	0.103	$58,454
2047	$0		$567,210.00				$567,210	0.097	$55,145
2048	$0		$283,605.00				$283,605	0.092	$26,012
Project Life								…	
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$11,906,334

Comments: Costs in this table are associated with constructing and operating the full-scale project, assuming the demonstration project is successful.

Table 12 - Annual Water Supply Benefits

(All benefits should be in 2009 dollars)

Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009	Reduced Flushing due to Nitrification	Acre Feet per Year (AFY)	0	0	0	$822	$0	1.000	$0
2010	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.943	$0
2011	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.890	$0
2012	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.840	$0
2013	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.792	$0
2014	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.747	$0
2015	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.705	$0
2016	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.665	$0
2017	Reduced Flushing due to Nitrification	AFY	0	0	0	$822	$0	0.627	$0
2018	Reduced Flushing due to Nitrification	AFY	0	93	93	$822	$76,102	0.592	$45,045
2019	Reduced Flushing due to Nitrification	AFY	0	189	189	$822	$155,552	0.558	$86,860
2020	Reduced Flushing due to Nitrification	AFY	0	193	193	$822	$158,974	0.527	$83,746
2021	Reduced Flushing due to Nitrification	AFY	0	198	198	$822	$162,472	0.497	$80,743
2022	Reduced Flushing due to Nitrification	AFY	0	202	202	$822	$166,046	0.469	$77,849
2023	Reduced Flushing due to Nitrification	AFY	0	206	206	$822	$169,699	0.442	$75,058
2024	Reduced Flushing due to Nitrification	AFY	0	211	211	$822	$173,433	0.417	$72,367
2025	Reduced Flushing due to Nitrification	AFY	0	216	216	$822	$177,248	0.394	$69,773
2026	Reduced Flushing due to Nitrification	AFY	0	220	220	$822	$181,148	0.371	$67,272
2027	Reduced Flushing due to Nitrification	AFY	0	225	225	$822	$185,133	0.350	$64,860
2028	Reduced Flushing due to Nitrification	AFY	0	230	230	$822	$189,206	0.331	$62,535
2029	Reduced Flushing due to Nitrification	AFY	0	235	235	$822	$193,368	0.312	$60,293
2030	Reduced Flushing due to Nitrification	AFY	0	240	240	$822	$197,622	0.294	$58,132
2031	Reduced Flushing due to Nitrification	AFY	0	246	246	$822	$201,970	0.278	$56,048
2032	Reduced Flushing due to Nitrification	AFY	0	251	251	$822	$206,413	0.262	$54,038
2033	Reduced Flushing due to Nitrification	AFY	0	257	257	$822	$210,954	0.247	$52,101
2034	Reduced Flushing due to Nitrification	AFY	0	262	262	$822	$215,595	0.233	$50,233
2035	Reduced Flushing due to Nitrification	AFY	0	268	268	$822	$220,339	0.220	$48,433
2036	Reduced Flushing due to Nitrification	AFY	0	274	274	$822	$225,186	0.207	$46,696
2037	Reduced Flushing due to Nitrification	AFY	0	280	280	$822	$230,140	0.196	$45,022
2038	Reduced Flushing due to Nitrification	AFY	0	286	286	$822	$235,203	0.185	$43,408
2039	Reduced Flushing due to Nitrification	AFY	0	292	292	$822	$240,378	0.174	$41,852
2040	Reduced Flushing due to Nitrification	AFY	0	299	299	$822	$245,666	0.164	$40,352
2041	Reduced Flushing due to Nitrification	AFY	0	305	305	$822	$251,071	0.155	$38,905
2042	Reduced Flushing due to Nitrification	AFY	0	312	312	$822	$256,594	0.146	$37,511
2043	Reduced Flushing due to Nitrification	AFY	0	319	319	$822	$262,239	0.138	$36,166
2044	Reduced Flushing due to Nitrification	AFY	0	326	326	$822	$268,008	0.130	$34,869
2045	Reduced Flushing due to Nitrification	AFY	0	333	333	$822	$273,905	0.123	$33,619
2046	Reduced Flushing due to Nitrification	AFY	0	341	341	$822	$279,931	0.116	$32,414
2047	Reduced Flushing due to Nitrification	AFY	0	348	348	$822	$286,089	0.109	$31,252
2048	Reduced Flushing due to Nitrification	AFY	0	178	178	$822	$146,191	0.103	$15,066
Project Life								…	

Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)	**$1,642,519**
(%) Benefit Claimed by Project	**9.0%**
Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)	**$147,960**

Comments: Reduced flushing due to nitrification leads to decreased use of SWP water. CLWA's marginal source of SWP water is the water being purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. The cost of this water is estimated to be $822 per AF, when adjusted to 2009 dollars. The total present value of discounted benefits shown is for the full-scale treatment project, which are then adjusted by the ratio of cost of the demonstration phase to the full-scale phase in order to apportion benefits to the demonstration phase.

Table 15. Total Water Supply Benefits (All benefits should be in 2009 dollars) Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)			
Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
$ 147,960			$ 147,960
Comments:			

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
2009	Reduction in Chemical Costs	Dollars	$0	$0.00	0		$0	1.000	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0		$0	1.000	$0
	Switching to Free Chlorine	Dollars	$0	$0	0		$0	1.000	$0
	..				0		$0	1.000	$0
2010	Reduction in Chemical Costs	Dollars	$0	$0.00	0		$0	0.943	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0		$0	0.943	$0
	Switching to Free Chlorine	Dollars	$0	$0	0		$0	0.943	$0
	..				0		$0	0.943	$0
2011	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.890	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.890	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.890	$0
	..								
2012	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.840	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.840	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.840	$0
	..								
2013	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.792	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.792	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.792	$0
	..								
2014	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.747	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.747	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.747	$0
	..								
2015	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.705	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.705	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.705	$0
	..								
2016	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.665	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.665	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.665	$0
	..								
2017	Reduction in Chemical Costs	Dollars	$0	$0.00	0	$1	$0	0.627	$0
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$0.00	0	$1	$0	0.627	$0
	Switching to Free Chlorine	Dollars	$0	$0	0	$1	$0	0.627	$0
	..								
2018	Reduction in Chemical Costs	Dollars	$0	$35,092	$35,092	$1	$35,092	0.592	$20,771
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$413,000	$413,000	$1	$413,000	0.592	$244,454
	Switching to Free Chlorine	Dollars	$0	$62,950	$62,950	$1	$62,950	0.592	$37,260
	..								
2019	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.558	$39,190
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.558	$461,234
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.558	$70,302
	..								
2020	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.527	$36,972
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.527	$435,126
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.527	$66,323
	..								
2021	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.497	$34,879
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.497	$410,497
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.497	$62,568
	..								
2022	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.469	$32,905
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.469	$387,261
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.469	$59,027
	..								
2023	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.442	$31,043
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.442	$365,341
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.442	$55,686
	..								
2024	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.417	$29,285
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.417	$344,661
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.417	$52,534
	..								
2025	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.394	$27,628
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.394	$325,152
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.394	$49,560
	..								
2026	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.371	$26,064
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.371	$306,747
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.371	$46,755
	..								
2027	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.350	$24,589
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.350	$289,384
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.350	$44,108
	..								
2028	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.331	$23,197
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.331	$273,004
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.331	$41,612
	..								
2029	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.312	$21,884
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.312	$257,551
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.312	$39,256
	..								
2030	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.294	$20,645
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.294	$242,972
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.294	$37,034
	..								
2031	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.278	$19,476
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.278	$229,219
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.278	$34,938

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Electrolysis and Volatilization for Bromide Removal and Disinfectant Byproduct Reduction Pilot Plant (CLWA-2)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (f) x (g) (1)	(i) Discount Factor (1)	(j) Discounted Benefits (h) x (i) (1)
	..								
2032	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.262	$18,374
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.262	$216,245
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.262	$32,960
	..								
2033	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.247	$17,334
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.247	$204,004
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.247	$31,095
	..								
2034	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.233	$16,353
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.233	$192,457
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.233	$29,335
	..								
2035	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.220	$15,427
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.220	$181,563
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.220	$27,674
	..								
2036	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.207	$14,554
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.207	$171,286
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.207	$26,108
	..								
2037	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.196	$13,730
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.196	$161,590
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.196	$24,630
	..								
2038	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.185	$12,953
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.185	$152,444
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.185	$23,236
	..								
2039	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.174	$12,220
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.174	$143,815
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.174	$21,920
	..								
2040	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.164	$11,528
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.164	$135,674
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.164	$20,680
	..								
2041	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.155	$10,876
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.155	$127,995
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.155	$19,509
	..								
2042	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.146	$10,260
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.146	$120,750
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.146	$18,405
	..								
2043	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.138	$9,679
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.138	$113,915
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.138	$17,363
	..								
2044	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.130	$9,131
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.130	$107,467
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.130	$16,380
	..								
2045	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.123	$8,614
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.123	$101,384
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.123	$15,453
	..								
2046	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.116	$8,127
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.116	$95,645
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.116	$14,578
	..								
2047	Reduction in Chemical Costs	Dollars	$0	$70,184	$70,184	$1	$70,184	0.109	$7,667
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$826,000	$826,000	$1	$826,000	0.109	$90,231
	Switching to Free Chlorine	Dollars	$0	$125,900	$125,900	$1	$125,900	0.109	$13,753
	..								
2048	Reduction in Chemical Costs	Dollars	$0	$35,092	$35,092	$1	$35,092	0.103	$3,616
	Health Benefit	0.118 (Cases Avoided Annualy)	$0	$413,000	$413,000	$1	$413,000	0.103	$42,562
	Switching to Free Chlorine	Dollars	$0	$62,950	$62,950	$1	$62,950	0.103	$6,487
Project Life								…	

Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)	**$8,577,130**
(%) Benefit Claimed by Project	**9.0%**
Total Present Value of Discounted Avoided Project Costs Claimed by alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)	**$772,635**

Comments: For the CLWA, this new treatment technique will allow the water utility to reduce its costs in the amount of chlorine and ammonia necessary for achieving water treatment standards.This treatment technique will result in monetizable health benefits for customers who drink this water, due to reduced cancer risk. Additionally there are savings from switching from chloramines to free clorine from not using chemcials necessary to make chloramines including salt, ammonioum hydroxide, sampling reagents and sodium hypochlorite, along with using less electricity and labor. The total present value of discounted benefits shown is for the full-scale treatment project, which are then adjusted by the ratio of cost of the demonstration phase to the full-scale phase in order to apportion benefits to the demonstration phase.

Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project (SC-1/USFS-1)

Summary

The Santa Clara River Arundo and Tamarisk Removal Plan (SCARP) identifies programs and projects that will most effectively remove arundo, tamarisk, and other invasive plants from the Upper Santa Clara River. Implementation of the SCARP within the Upper Santa Clara River Watershed (Watershed) will be conducted in two phases. Phase 1 of the project will remove arundo and tamarisk in the site specific implementation area (Project Area 1), which includes approximately 297 acres. Phase 2 of the project will continue the removal of arundo and tamarisk outside of Project Area 1, up into City- owned reaches along San Franciscquito and Bouquet Canyon Creeks, and eventually into Angeles National Forest.

The Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project will finish the implementation of the Santa Clarita Site Specific Plan (SSP), and move SCARP into the Santa Clara River Long Term Implementation Plan. The project will implement Phases D through G of the SSP, which includes the removal of arundo and tamarisk within roughly half of the total SSP project area (about 150 of the 297 acres). In total, 20 acres of arundo and tamarisk will be removed from targeted locations throughout the 150-acre project area.

Two types of restoration efforts will be employed to ensure effective eradication of the invasive species. The first effort will include non-native biomass removal and herbicide application. Arundo may be ground in place with mechanical equipment such as a brush grinder (where appropriate), or removed by manual means employing tools such as chainsaws and brush cutters. Herbicide application will ensure after removal. After this initial treatment, a diligent monitoring and maintenance program will be implemented to facilitate re-treatments, and avoid re-infestation of the site.

Native species common to this area such as willows (Salix sp.) and mule fat (Baccharis salicifolia) will reestablish readily through natural recruitment once competition from non-native species is removed. Additionally, native plant restoration will ensure reestablishment in areas that require more rapid enhancement than natural recruitment can provide.

A summary of all benefits and costs of the project are provided in Table SC-1.1. Project costs and water supply benefits are discussed in the remainder of this attachment.

TABLE SC-1.1
BENEFIT-COST ANALYSIS OVERVIEW –DEMONSTRATION-SCALE PROJECT

	Present Value
Costs	$648,310
Monetizable Benefits	
Water Supply Benefits	
Avoided Imported Water Costs	$674,560
Total Monetized Benefits	$674,560
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Supply Benefits	
Increased Water Supply Reliability	+
Improved Operational Flexibility for CLWA	+
Water Quality Benefits	
Improved Surface Water Quality	++
Reduced Salt Loading	+
Decreased Streambank Erosion	++
Restoration of Native Habitat	++
Reduced Fire Hazard	++
Reduced CO_2 Emissions	+
Reduced Stress on the Sacramento-San Joaquin Delta	+
Increased Educational Opportunities	+
Flood Control Benefits	
Reduced Flooding Incidence	++

O&M = operations and maintenance
* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

Costs

Undiscounted expenditures shown in the project budget total $765,013. The majority of the budget will be expended in 2011 and 2012. Direct costs for removal of arundo and tamarisk will account for about $500,000, or close to 65%, of the total capital budget. Costs associated with project design, engineering, and environmental documentation account for $60,000 of total costs, while environmental mitigation accounts for $77,700. Administration and miscellaneous costs account for the remainder of total capital costs. Expenditures made in 2013 to 2015 will include follow-up monitoring and maintenance to help ensure removal.

Over the 50-year project life (through 2062, which is 50 years after the eradication of arundo and tamarisk is completed in 2013), the sum of present value capital costs will amount to $648,310.

The "Without Project" Baseline

The Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project is located near the City of Santa Clarita, within the Upper Santa Clara River Watershed (Watershed). The

project area includes a highly-visible 150-acre reach of the Santa Clara River, and the lower reaches of two major tributaries just above the confluence of San Francisquito Creek and the South Fork of the Santa Clara River.

Estimates for the broader SSP project area indicate that infestation by arundo, and to a lesser extent tamarisk, is pervasive, extending throughout the site. Arundo infestations are particularly dense in the site's western (downstream) and central reaches, where large areas of the main stem exhibit historic infestation levels of 51 to 75% cover. While arundo historically tends to exhibit lower density infestation levels in the site's upstream areas, large areas are still infested, with significant areas of 26 percent to 50 percent arundo cover. Tamarisk infestations are concentrated in the east (upstream) portions of the SSP project area. These infestations typically range from 1 percent to 50 percent cover. Project Phases D through G (covered under this grant proposal) are located within the western portions of the SSP project area.

Both arundo and tamarisk consume large amounts of water, which negatively affects both instream and groundwater availability. Reduced water availability also adversely affects water-dependent plants and wildlife, and reduces the water available for beneficial municipal and agricultural uses. Although native riparian plants have similar transpiration rates per unit of surface area to arundo and tamarisk, arundo and tamarisk have approximately two or more times greater leaf surface area. Therefore, they transpire more water than native plants (VCRCD 2006 from Kelly 2003). Water consumption by these species is so high that dense infestations can desiccate riparian areas (seeps, springs, rivers) in arid habitats (VCRCD 2006 from Egan and Walker 2000; Dudley 2000).

The Castaic Lake Water Agency (CLWA) is wholesale water provider in the Watershed. CLWA imports State Water Project (SWP) and other imported water from the Sacramento-San Joaquin Delta to Castaic Lake through SWP facilities. CLWA currently provides about 43,000 acre-feet per year (AFY) of imported water (imported via CLWA) to four water purveyors within the Watershed. This amounts to roughly one-half of total service area potable water demands.6 The balance of potable demand within the service area is met through local groundwater sources.

The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations. Reduced demand for imported water will improve water supply reliability within the CLWA service area.

Without the project, arundo and tamarisk will continue to spread, covering a greater percentage of the watershed. Due to their high rate of water consumption and transpiration, the expansion of these species will have a negative impact on groundwater supply and surface water flows downstream. Thus, if the project is not implemented, reliance on imported SWP water from CLWA will increase.

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[6]. Estimate based on total projected 2010 demand of 86,000 from 2005 CLWA Urban Water Management Plan.

Water Supply Benefits

This section describes the water supply benefits generated by the Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal, including avoided imported water supply costs, improved water supply reliability for CLWA customers, and improved operational flexibility for CLWA.

Avoided Imported Water Supply Costs

Both arundo and tamarisk consume large amounts of water, which negatively affects both surface water and groundwater availability. Dudley (personal communication 2010) estimates from preliminary data that every acre of arundo removal in this area will result in a water savings of approximately 10 AFY. Hendrickson and McGaugh (2005) estimate that savings associated with an acre of tamarisk removal amount to about 4 AFY. Native vegetation that replaces the arundo and tamarisk once it is removed uses about 2 AFY per acre. Thus, every acre of arundo removed will result in 8 AFY of water savings. Every acre of tamarisk removed will result in a savings of 2 AFY.

This project will treat a total of 20 acres for arundo and tamarisk removal. About 70% of these acres are infested with Arundo, while 30% are infested with Tamarisk. Thus, average savings per treated acre will result in a savings of 6.2 AFY. It is estimated that on average about 50% of the water saved as a result of this project will be recovered from the groundwater aquifer.7 The remaining water will be available groundwater percolation that is not used, and as surface flows downstream. CLWA purveyors will use the groundwater made available by this project in lieu of imported SWP water, because groundwater is a much less expensive source of supply.

CLWA has a contractual Table A amount of 95,200 AFY of water from SWP. However, the marginal source of SWP water for CLWA purveyors is the water being purchased from the Buena Vista Water District in Kern County. CLWA receives part of Buena Vista's Kern River entitlements through exchange of Buena Vista's SWP supplies. The cost of this water in 2007 was estimated to be $790/AF, or $822/AF when updated to 2009 dollars. This includes the cost of purchase, wheeling, and treatment, and factors in system losses (A&N Technical Services, 2008). It is assumed that this cost will rise at the rate of inflation after 2009, thus remaining constant in real dollars.

With the project, a total of 62 AFY of water will be added to the groundwater supply pool. To calculate the avoided costs of imported water over time, the amount of avoided imported water each year is multiplied by the marginal cost of SWP water delivered by CLWA. As a result of the project, CLWA retail water purveyors will avoid the use of 3,100 AF of imported water over the 50-year project life. Assuming no real increases in CLWA water rates, the total present value benefits associated with the avoided purchase of imported water amounts to $674,560.

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[7]. This assumption reflects expected groundwater recovery during normal precipitation years. During dry years, recovery is expected to reach up to 100%, and during wet years recovery is expected to approach 0%.

Increased Water Supply Reliability for CLWA Customers

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The project will help address reliability issues for CLWA retail agencies by offsetting the use of imported water delivered by CLWA. The reliability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that water customers are willing to pay $95 to $500 per household per year for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought).

The challenge for use of these values to determine a value of increased reliability as a result of the Arundo and Tamarisk Removal Project is recognizing how to reasonably interpret these survey-based household monetary values. The values noted above reflect a willingness-to-pay per household to ensure complete reliability (zero drought-related use restrictions in the future), whereas the Arundo and Tamarisk Removal Project only enhances overall reliability and does not guarantee 100% reliability. Thus, if applied directly to the number of households within the CLWA service area, the dollar values from the studies would overstate the reliability value provided by the project.

Due to the uncertainty involved in applying these numbers to this situation, this benefit estimate is not monetized, but is instead assessed qualitatively.

Improved Operational Flexibility for CLWA

Water savings achieved by the Arundo and Tamarisk Removal Project will offset the use of 62 AFY of imported SWP water. This will help CLWA directly in its supply operations, allowing for longer shutdowns and improving system reliability. The value of this increased operational flexibility is not monetized in the benefit tables.

Distribution of Project Benefits and Identification of Beneficiaries

The Arundo and Tamarisk Removal Project includes the full range of types of beneficiaries, as is summarized in Table SC-1.2. At the local and regional level, CLWA and its retail water purveyors will benefit due avoided costs associated with importing additional SWP water, improved operational flexibility for CLWA and increased reliability of supply. The project will provide statewide benefits by reducing demands on water supplies from the Sacramento-San Joaquin Delta.

TABLE SC-1.2
PROJECT BENEFICIARIES SUMMARY

Local	Regional	Statewide
CLWA Santa Clarita Water Division, LA County Waterworks District 36, Newhall County Water District, Valencia Water Company	Castaic Lake Water Agency, Ventura Co. Agricultural Interests	Sacramento-San Joaquin Delta

Project Benefits Timeline Description

Project implementation will be completed in December of 2012, with some administration and monitoring activities taking place through 2015. A 50-year useful project life is assumed for this analysis. Thus, benefits are calculated through 2062 (50 years after the project begins providing benefits in 2013).

Potential Adverse Effects from the Project

The Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project may have short-term negative impacts during removal work, but steps will be taken to avoid long-term disturbance to habitat and native species living in the area. A CEQA document is being prepared and will address any potential adverse impacts.

Summary of Findings

The monetized water supply benefits from the Arundo and Tamarisk Removal Project include the avoided cost of imported SWP supplies. The cost of treated SWP water supply delivered by CLWA is $822/AF. Over the 50-year life of the project, the avoided water supply costs will total $674,560 in present value. Nonmonetized benefits of the project include improved water supply reliability within the service area and increased operational flexibility for CLWA.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In most cases, omissions lead to a downward bias in benefits: the project is expected to be much more beneficial than the subset of benefits that can be monetized would indicate. These issues are listed in Table SC-1.3.

TABLE SC-1.3
OMISSIONS, BIASES, AND UNCERTAINTIES, AND THEIR EFFECT ON THE PROJECT

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Increased water supply reliability for CLWA customers	+	The potential benefit of increased water supply reliability as a result of the project has not been included due to uncertainties of applying values from the literature to a partial improvement in water supply reliability.
Avoided imported water costs	+	The estimated water savings of 10 AFY per acre of arundo removal is conservative. For example, the estimate included in the Upper Santa Clara River Watersehd Arundo and Tamarisk Removal Progarm Long-Term Implementation Plan is almost 21 AFY per acre of arundo removal. If additional savings are achieved, this would result in additional groundwater availability. Thus, avoided imported water costs would be higher.
Project costs	U	The calculation of the present value of costs is a function of the timing of expenditures and a number of other factors and conditions. Changes in these variables will change the estimate of costs.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

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Table 11- Annual Cost of Project

(All costs should be in 2009 Dollars)

Project: Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project

	Initial Costs	Operations and Maintenance Costs [1]						Discounting Calculations	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
YEAR	Grand Total Cost From Table 7 (row (i), column(d))	Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (f)	Discount Factor	Discounted Costs(g) x (h)
2009	$0						$0	1.00	$0
2010	$0						$0	0.943	$0
2011	$325,132						$325,132	0.890	$289,367
2012	$325,132						$325,132	0.840	$273,110
2013	$38,250						$38,250	0.792	$30,294
2014	$38,250						$38,250	0.747	$28,573
2015	$38,250						$38,250	0.705	$26,966
2016	$0						$0	0.665	$0
Project Life	$765,013						$765,013		
Total Present Value of Discounted Costs (Sum of Column (i)) Transfer to Table 20, column (c), Exhibit F: Proposal Costs and Benefits Summaries									$648,310

Comments:

Table 12 - Annual Water Supply Benefits (All benefits should be in 2009 dollars) Project: Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (f) x (g) (1)	Discount Factor (1)	Discounted Benefits (h) x (i) (1)
2009								1.00	$0
2010								0.943	$0
2011								0.890	$0
2012								0.840	$0
2013	Avoided imported water use	AF	0	62	62	$822	$50,964	0.792	$40,363
2014	Avoided imported water use	AF	0	62	62	$822	$50,964	0.747	$38,070
2015	Avoided imported water use	AF	0	62	62	$822	$50,964	0.705	$35,930
2016	Avoided imported water use	AF	0	62	62	$822	$50,964	0.665	$33,891
2017	Avoided imported water use	AF	0	62	62	$822	$50,964	0.627	$31,954
2018	Avoided imported water use	AF	0	62	62	$822	$50,964	0.592	$30,171
2019	Avoided imported water use	AF	0	62	62	$822	$50,964	0.558	$28,438
2020	Avoided imported water use	AF	0	62	62	$822	$50,964	0.527	$26,858
2021	Avoided imported water use	AF	0	62	62	$822	$50,964	0.497	$25,329
2022	Avoided imported water use	AF	0	62	62	$822	$50,964	0.469	$23,902
2023	Avoided imported water use	AF	0	62	62	$822	$50,964	0.442	$22,526
2024	Avoided imported water use	AF	0	62	62	$822	$50,964	0.417	$21,252
2025	Avoided imported water use	AF	0	62	62	$822	$50,964	0.394	$20,080
2026	Avoided imported water use	AF	0	62	62	$822	$50,964	0.371	$18,908
2027	Avoided imported water use	AF	0	62	62	$822	$50,964	0.350	$17,837
2028	Avoided imported water use	AF	0	62	62	$822	$50,964	0.331	$16,869
2029	Avoided imported water use	AF	0	62	62	$822	$50,964	0.312	$15,901
2030	Avoided imported water use	AF	0	62	62	$822	$50,964	0.294	$14,983
2031	Avoided imported water use	AF	0	62	62	$822	$50,964	0.278	$14,168
2032	Avoided imported water use	AF	0	62	62	$822	$50,964	0.262	$13,353
2033	Avoided imported water use	AF	0	62	62	$822	$50,964	0.247	$12,588
2034	Avoided imported water use	AF	0	62	62	$822	$50,964	0.233	$11,875
2035	Avoided imported water use	AF	0	62	62	$822	$50,964	0.220	$11,212
2036	Avoided imported water use	AF	0	62	62	$822	$50,964	0.207	$10,550
2037	Avoided imported water use	AF	0	62	62	$822	$50,964	0.196	$9,989
2038	Avoided imported water use	AF	0	62	62	$822	$50,964	0.185	$9,428
2039	Avoided imported water use	AF	0	62	62	$822	$50,964	0.174	$8,868
2040	Avoided imported water use	AF	0	62	62	$822	$50,964	0.164	$8,358
2041	Avoided imported water use	AF	0	62	62	$822	$50,964	0.155	$7,899
2042	Avoided imported water use	AF	0	62	62	$822	$50,964	0.146	$7,441
2043	Avoided imported water use	AF	0	62	62	$822	$50,964	0.138	$7,033
2044	Avoided imported water use	AF	0	62	62	$822	$50,964	0.130	$6,625
2045	Avoided imported water use	AF	0	62	62	$822	$50,964	0.123	$6,269
2046	Avoided imported water use	AF	0	62	62	$822	$50,964	0.116	$5,912
2047	Avoided imported water use	AF	0	62	62	$822	$50,964	0.109	$5,555
2048	Avoided imported water use	AF	0	62	62	$822	$50,964	0.103	$5,249
2049	Avoided imported water use	AF	0	62	62	$822	$50,964	0.097	$4,944
2050	Avoided imported water use	AF	0	62	62	$822	$50,964	0.092	$4,689
2051	Avoided imported water use	AF	0	62	62	$822	$50,964	0.087	$4,434
2052	Avoided imported water use	AF	0	62	62	$822	$50,964	0.082	$4,179
2053	Avoided imported water use	AF	0	62	62	$822	$50,964	0.077	$3,924
2054	Avoided imported water use	AF	0	62	62	$822	$50,964	0.073	$3,720
2055	Avoided imported water use	AF	0	62	62	$822	$50,964	0.069	$3,517
2056	Avoided imported water use	AF	0	62	62	$822	$50,964	0.065	$3,313
2057	Avoided imported water use	AF	0	62	62	$822	$50,964	0.061	$3,109
2058	Avoided imported water use	AF	0	62	62	$822	$50,964	0.058	$2,956
2059	Avoided imported water use	AF	0	62	62	$822	$50,964	0.054	$2,752
2060	Avoided imported water use	AF	0	62	62	$822	$50,964	0.051	$2,599
2061	Avoided imported water use	AF	0	62	62	$822	$50,964	0.048	$2,446
2062	Avoided imported water use	AF	0	62	62	$822	$50,964	0.046	$2,344
Project Life	Avoided imported water use	AF	0	3,100	3,100				
							Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)		$674,560

Comments: The Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project will avoid the use of 62 AFY of State Water Project water. The marginal cost of imported water to CLWA is $822 AF in 2009 dollars.

Table 15. Total Water Supply Benefits (All benefits should be in 2009 dollars) Project: Santa Clara River, San Francisquito Creek Arundo and Tamarisk Removal Project			
Total Discounted Water Supply Benefits (a)	Total Discounted Avoided Project Costs (b)	Other Discounted Water Supply Benefits (c)	Total Present Value of Discounted Benefits (d) (a) + (c) or (b) + (c)
$ 674,560			$ 674,560
Comments:			