Attachment 2- Project Justification

Introduction

This attachment is organized into the following sub-sections:

☑ Project Summary Table (Table 4)

☑ Project Descriptions

☑ Regional Map and Project Maps

☑ Project's Physical Benefits (Table 5)

☑ Technical Analysis of Physical Benefits Claimed

☑ Direct Water-Related Benefit to a DAC

☑ Project Performance Monitoring Plan (Table 6)

☑ Cost Effectiveness Analysis (Table 7)

Project Summary Table

Table 4 – 2015 IRWM Grant Solicitation Project Summary Table					
IRWM Project Element		Project 1	Project 2	Project 3	Project 4
		Outingdale Water Intake	Well 10 Hexavalent Chromium Treatment	North Freeway Well Conversion	Regional Water Conservation Measures
IR.1	Water supply reliability, water conservation, and water use efficiency	☒	☒	☒	☒
IR.2	Stormwater capture, storage, clean-up, treatment, and management	☐	☐	☐	☐
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	☐	☐	☐	☐
IR.4	Non-point source pollution reduction, management, and monitoring	☐	☐	☐	☐
IR.5	Groundwater recharge and management projects	☐	☐	☒	☐
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	☐	☐	☐	☐
IR.7	Water banking, exchange, reclamation, and improvement of water quality	☐	☒	☐	☐
IR.8	Planning and implementation of multipurpose flood management programs	☐	☐	☐	☐
IR.9	Watershed protection and management	☐	☐	☐	☐
IR.10	Drinking water treatment and distribution	☒	☒	☒	☐
IR.11	Ecosystem and fisheries restoration and protection	☐	☐	☐	☐

Table 4 lists the applicable Integrated Regional Water Management (IRWM) project elements for each project contained in this Proposal.

Project Descriptions

As stated in the American River Basin Integrated Regional Water Management Plan (ARB IRWMP) 2013 Update, the ARB IRWMP vision, goals, principles, objectives, and strategies all support long-term, adaptable, proactive management in the region, and are implemented by the projects and programs that are led by project proponents in the region. The strategies and projects support adaptability to future situations, as both of these elements are designed to be dynamic and adaptive. ARB IRWMP projects are updated, reviewed, reported, and vetted quarterly. Therefore, the list of approved projects is always aligned to regional and statewide priorities.

Examples of current strategies that help meet needs within the region and have influenced projects included in this proposal include:

- *Water Resources Strategy 2.* Increase groundwater production capacity to 550 MGD by 2030.
- *Water Resources Strategy 4.* Improve connections between water systems in the Region for greater operational flexibility.
- *Water Resources Strategy 6.* Implement water conservation to reduce regional per capita water use by 20% by 2020.
- *Community Stewardship Strategy 1.* Increase availability and access to educational material on sustainable water resources.
- *Community Stewardship Strategy 6.* Increase engagement of community leaders (e.g., using community-based social marketing where applicable).

Successful IRWM planning and implementation requires the identification of, and collaboration on, projects of regional significance. It is a "living process" that continues after formal adoption of the IRWMP and project implementation. This proposal is the result of this process within the ARB Region. All projects included in this proposal yield multiple benefits, include one or more of the IRWM project elements, and address current needs of the region.

This section includes both a brief project description and an expanded project description for each proposed project.

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District (EID)

Brief Description: El Dorado Irrigation District will construct a 200 gallon per minute raw water intake to provide the Outingdale community with a reliable water supply year-round.

Description: The Outingdale water treatment and distribution system draws raw water from the Middle Fork Cosumnes River by means of a raw water pump station that diverts water just upstream of the Outingdale Dam, approximately one half mile from the water treatment plant. These pumps suction water from the river through an inlet screen simply laid on the river bottom and deliver the raw water to the treatment plant. The Outingdale diversion dam is a 10-foot tall rock and concrete structure that is very old and deteriorating.

In drought years, the dam water impoundment capacity has been greatly reduced due to growing sediment impoundment in front of the dam. At times during both 2014 and 2015, EID suspended river intake pumping operations due to low river levels that prevented pumping. As the Middle Fork Cosumnes River is the only source of raw water for the community of Outingdale, they were left with no water to meet public health and safety needs. As this was a human right to water concern, EID trucked in potable water to meet basic needs. In August

2014, pumping of water from the Middle Fork Cosumnes River was discontinued due to low river levels exposing the existing river intake screen. As a result, over 10,137 miles were driven to truck in potable water to Outingdale from elsewhere in EID's distribution system, resulting in 41.5 tons of CO2 emissions.

To eliminate the need to truck in water and, therefore, reduce greenhouse gas emissions, this project is proposing construction of a new horizontal lateral screen intake within the Middle Fork Cosumnes River and an in-ground package pump station to improve EID's ability to reliably supply water to the community of Outingdale. A new in-ground pump station will have two submersible pumps with a capacity of 100 gallons per minute each. This will replace the existing system and provide reliable performance regardless of river stage. This new system will allow for historical water demands of 8.39 acre-feet (based on data from August from 2008 through 2013) to be delivered and eliminate the need for water to be trucked in to meet water demands.

Long term benefits will include allowing EID to continuously pump raw water from the Middle Fork Cosumnes River despite drought-induced low river stages. The new design will improve suction hydraulics, increase the reliability of the raw water pump station to continuously deliver source water, reduce the number of operator trips to the facility, and eliminate the need for large truck hauling of water. In addition, both the reduction in operator trips and elimination of trucking water will reduce truck mileage and greenhouse gas emissions.

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District (RLECWD)

Brief Description: Rio Linda/Elverta Community Water District will restore 900 gallons per minute of its water supply by adding hexavalent chromium treatment to Well 10.

Description: The State Water Resources Control Board's Division of Drinking Water (DDW) has determined that hexavalent chromium is carcinogenic, and the new primary maximum contaminant level (MCL) of 10 parts per billion (ppb) became law in July 2014. RLECWD's Well 10 has a hexavalent chromium concentration of 13 ppb, and it will be out of compliance by the end of 2015. There is no alternative supply, so this is a human right to water concern for the customers served by this well.

By adding hexavalent chromium treatment to Well 10, this project will enable RLECWD to restore 900 gpm of its water supply and fire protection flows to the southwestern section. An initial pilot test was completed in the summer of 2014. The test showed that strong-based ion exchange was successful in removing hexavalent chromium from the well water and did not require regeneration until over 60,000 bed volumes has passed through the filters. A second pilot test is being conducted to further refine when media regeneration would be required.

Based on the results of the pilot testing, RLECWD is planning on installing a strong-based ion exchange treatment system. The major physical components of the project will consist of the following:

A. *Treatment System:* The treatment system will be a strong-based ion exchange system with a capacity of 450 gpm. The treatment system will consist of two cargo containers and two tanks. The first container will house the ion exchange vessels and controls. The second container will house the treatment system, programmable logic controller, and regeneration salt solution containers. The two tanks will consist of a briner tank that will contain the salt required for regeneration of the filter media and the second tank will contain the hexavalent chromium waste from media regeneration. The treatment system will reduce the level of hexavalent chromium to non-detectable levels. A bypass blending line will be installed and blend raw well water with hexavalent chromium treated water to meet a target combined effluent hexavalent chromium concentration of not-to-exceed 8 ppb and a combined flow rate of 900 gpm.

B. *Plant Piping:* The plant piping will require modification to connect the treatment system into the discharge of the well and the removal of the existing hydropneumatic tank because this tank is not pressure certified. With

the removal of the hydropneumatic tank, a variable speed drive will be added to drive the well pump to ease the pump on and off in an effort to eliminate system water hammering.

C. *Pump and Motor:* The pump and motor will require an upgrade to maintain the plant's pretreatment capacity of 900 gpm. The new pump and motor will be designed with additional pumping head to overcome the additional headloss that is associated with the treatment system.

D. *Electrical:* To meet the additional horsepower required due to the upgraded pump and motor, a new motor control center with a variable speed drive will be installed that meets arc flash requirements. Additionally, a new four-wire electrical service will be required to replace the existing three-wire service as required by the electric service provider, and the site's programmable logic controller (PLC) will be upgraded for remote control via RLECWD's Supervisory Control and Data Acquisition (SCADA) system.

Project 3: North Freeway Well Conversion

Implementing Agency: Sacramento County Water Agency (SCWA)

Brief Description: Sacramento County Water Agency is rehabilitating an energy-inefficient 1.8-mgd stand-by well to increase production capacity and provide drought relief to the City of Sacramento.

Description: The North Freeway well is located at 3935 N. Freeway Blvd. within the SCWA's Northgate 880 service area just north and east of the City of Sacramento. The North Freeway well is currently permitted for operation as a "stand-by" (emergency) well to provide water in emergencies for fire protection only. This well is currently off-line due to a failed propane-powered angle drive engine. Including this well, the Northgate 880 water system has 5 existing water wells permitted for operation. These wells have the ability to supply the City of Sacramento with water supply through an existing intertie under an existing wholesale agreement with the City.

The SCWA had intended to simply repair the failed engine and place the well back in service as a stand-by well only. As the drought became more severe and it became apparent that available surface water supplies could be reduced or curtailed, The SCWA decided make additional improvements at this well to allow it to be used as a fully equipped on-line well to provide partial relief for the City of Sacramento. By making these additional improvements, the project is able to realize a secondary benefit of carbon emission reduction. If the City calls upon the well to provide its maximum capacity, the savings on emissions will be up to 738,197 pounds per year, while producing 2,018 acre feet of water per year. Without this project, the City of Sacramento would not have access to the production from the North Freeway well, up to 1.8 million gallons a day (mgd).

This project will rehabilitate the well by removing the propane storage and engine from the site and installing new electrical gear requiring 3-phase SMUD power, automatic transfer switches (ATS) for owner supplied portable back-up generator, a new well pump and electric motor, new chemical sheds, new above ground piping, and other supporting equipment. Once complete, the well will be capable of providing 1.8 mgd or 2,018 acre-feet per year. Following site improvements, this well will be permitted as "on-line" changing from the existing stand-by (emergency) status.

As an on-line well, it can serve the City of Sacramento as a drought relief production source for the City when needed. Without this potable water source available to the City of Sacramento, there is a risk of City customers not receiving adequate levels of water service to meet the most basic drinking water needs. This project is currently expedited in anticipation of the water deliveries in fall of 2015.

Project 4: Regional Water Conservation Measures

Implementing Agency: Regional Water Authority (RWA)

Brief Description: Regional Water Authority will take a comprehensive approach to achieve water and energy savings by reducing supply-side non-revenue water use and demand-side residential water use.

Description: The majority of the greater Sacramento region's water agencies are mandated to have a 30 percent or above decrease in use compared to 2013 usage. Thus far in 2015, the region has achieved a 26 percent savings compared to the same months in 2013. Even with these aggressive conservation targets, the region is still at risk because Folsom Reservoir must meet the water supply needs of urban, agricultural, and export users; as well as Delta water quality standards, and flow requirement for fish. There are concerns about intake infrastructure failures that could lead to water supply interruptions. To minimize these risks, the region has increased its short-term conservation efforts to respond to the drought.

The Regional Water Conservation Measures Project will be a comprehensive approach to achieving water and energy savings by reducing supply-side non-revenue water use and demand-side residential sector water use, specifically through leak detection and repair, advanced customer systems, and public outreach. The project will be implemented by seven of the region's public water agencies. Both supply and demand-side conservation actions will be implemented because water conservation is most effective when implemented both through the water agency and its customers. Leading by example, a water agency can demonstrate that they themselves are good stewards of water. **This ethic is then passed down to the water customer through public outreach efforts such as the creation of water conservation messages and the distribution of those messages through media buys.** Success is achieved when consistent communication with customers about why and how to save water is paired with tools to help customers implement the messages. This project proposes to save 19,342 acre-feet of water and 6,693,403 kilowatt hours (kWh) of energy over 20 years through reducing supply-side non-revenue water use and demand-side residential sector water use.

The first component of the project will focus on reducing non-revenue water through leak detection and repair and will include the participating water agencies: City of Folsom, City of Lincoln, City of Sacramento, Placer County Water Agency, and Sacramento Suburban Water District. The region's water agencies will survey 1,200 miles of pipes and expect to identify an estimated 250 leaks for an accumulative savings of 10,500 acre feet and 3,633,565 kWh over 20 years. Once leaks are identified, the participating water agencies will be responsible for implementing infrastructure upgrades and replacements to achieve the intended water and energy savings. These energy savings will be especially important in dry years, when energy use increases with the extraction of more groundwater.

The second component of the project will focus on educating residential customers about how much water they use and how to reduce their use both inside and outside of the home. It will be implemented by the following participating water agencies: City of Folsom, City of Sacramento, Placer County Water Agency, Rio Linda/Elverta Community Water District, San Juan Water District, and Sacramento Suburban Water District. This will primarily be accomplished through Advanced Customer Systems Programs that will take individual household account water use data, organize it in an easy to understand format (such as an online portal or handout), and distribute that information to customers to encourage better management of water use through tailored water conservation messages. With implementation of the second component, the region will reach 87,000 residential accounts and save 8,842 acre feet and 3,059,838 kWh. The Advanced Customer Systems will be complimented with an overall public outreach effort to reinforce a strong water conservation ethic through regional media buys, and workshops.

The intended outcome is to achieve water and energy savings benefits, increase the reliability of the region's water supply through targeted long-term infrastructure replacement, and to build a deeper water conservation ethic in the region's residents through household-level water use information sharing and a more general public outreach campaign.

Regional and Project Maps

The American River Basin 2015 IRWM Program includes a regional map and four individual project maps that are presented in the figures below. Note that while Project 1 does not fall within the ARB IRWM Plan boundary, El Dorado Irrigation District has been an active participant in the development and implementation of the ARB IRWM Plan. In recognition of the importance of the relationship between the upper and lower watersheds in the ARB region, ARB IRWM stakeholders have reviewed and approve this project, and many others not in the current funding application, as part of the ARB IRWM implementation.

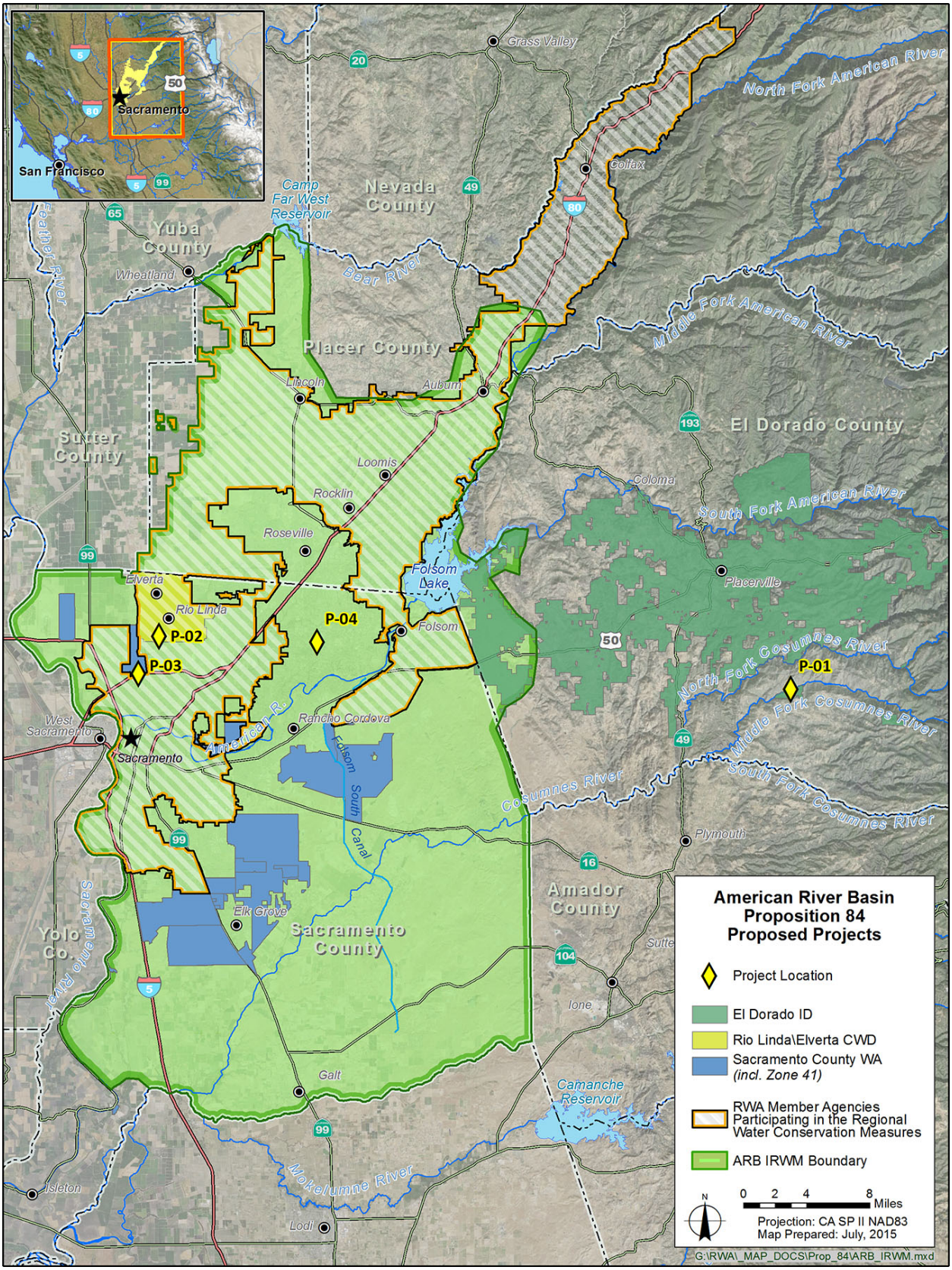


Figure 1: Regional Map displaying American River Basin IRWM Boundary, and Locations of the 4 Proposed Projects

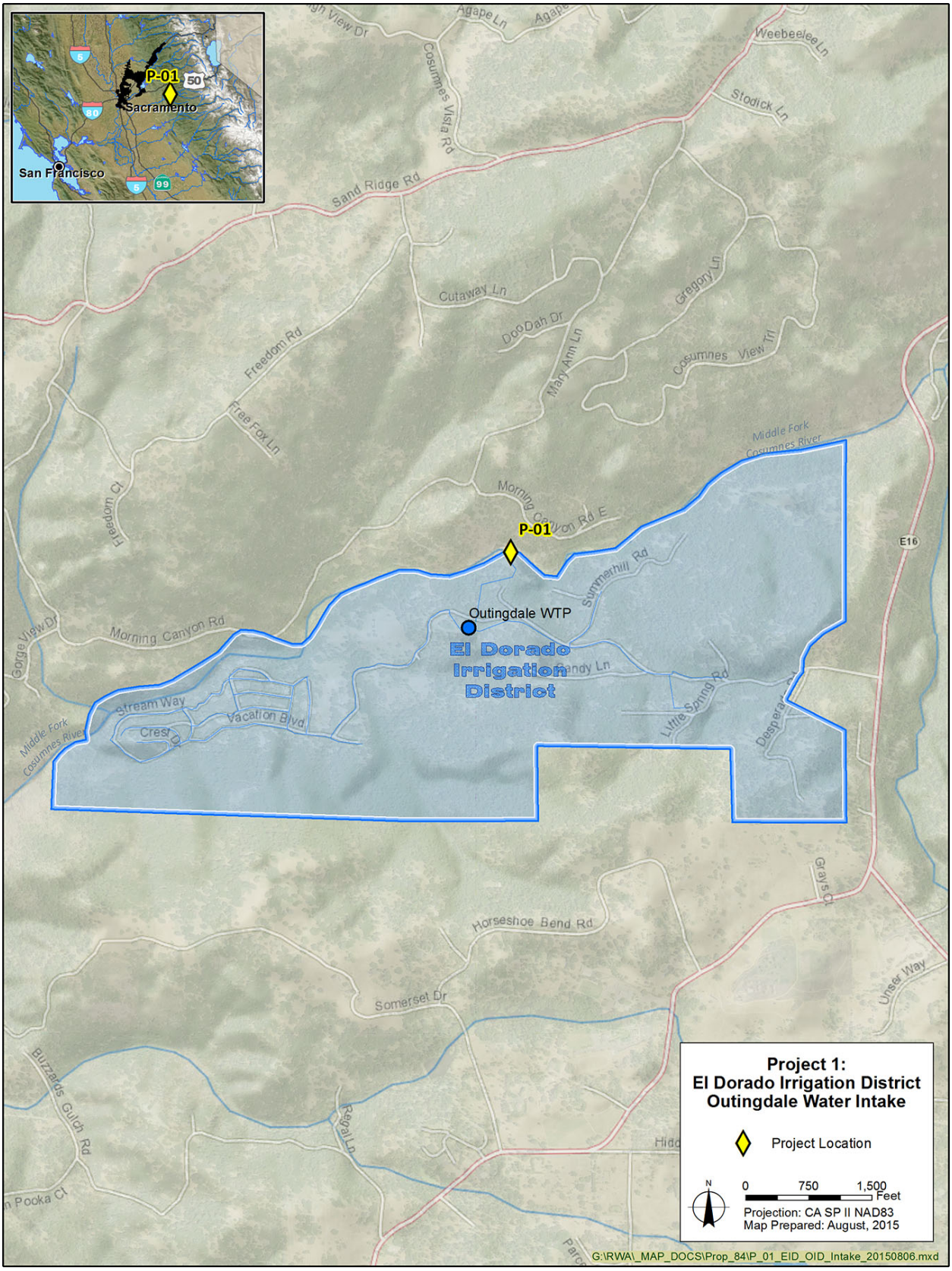


Figure 2: Project 1: Outingdale Water Intake

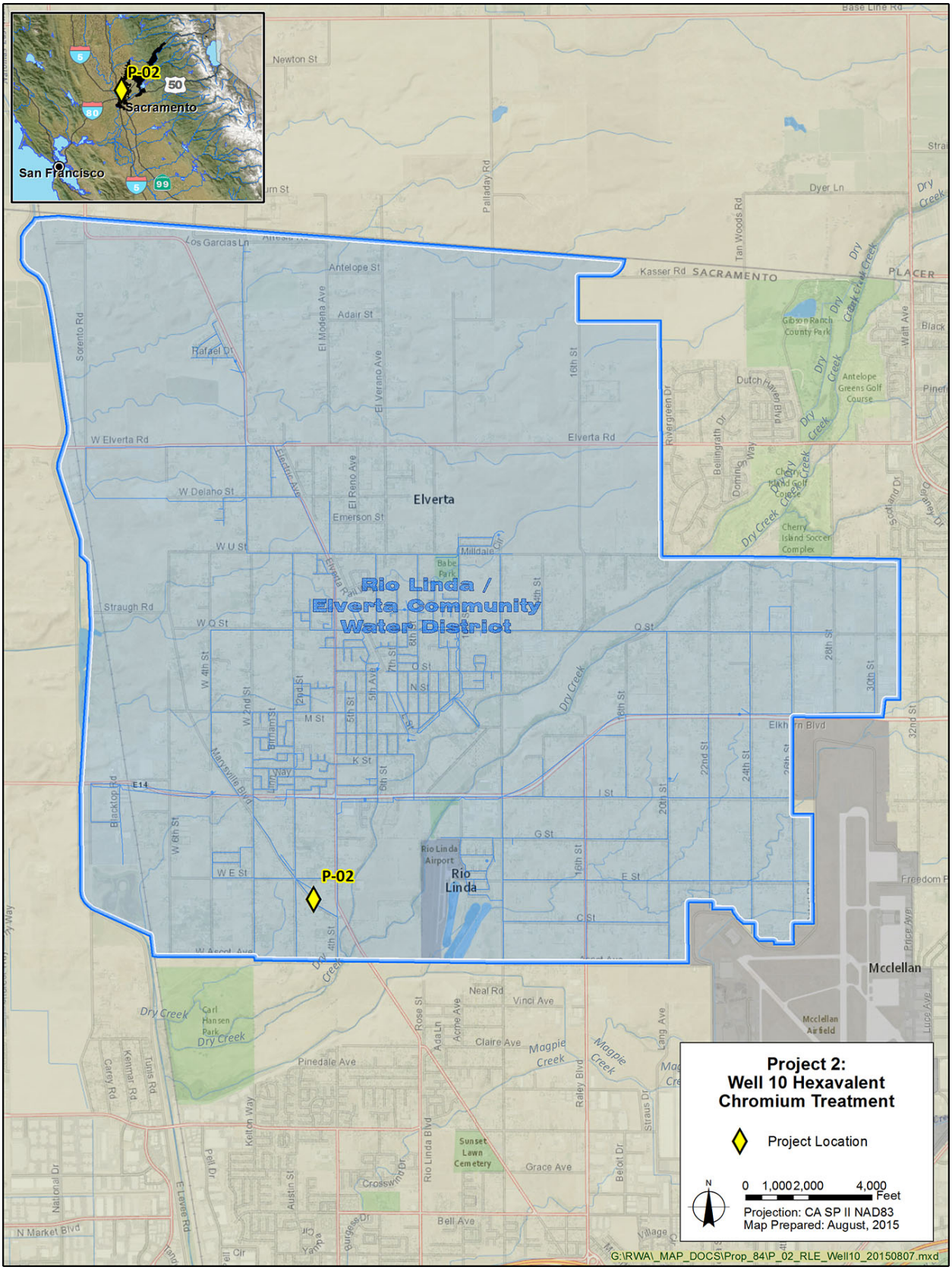


Figure 3: Project 2: Well 10 Hexavalent Chromium Treatment

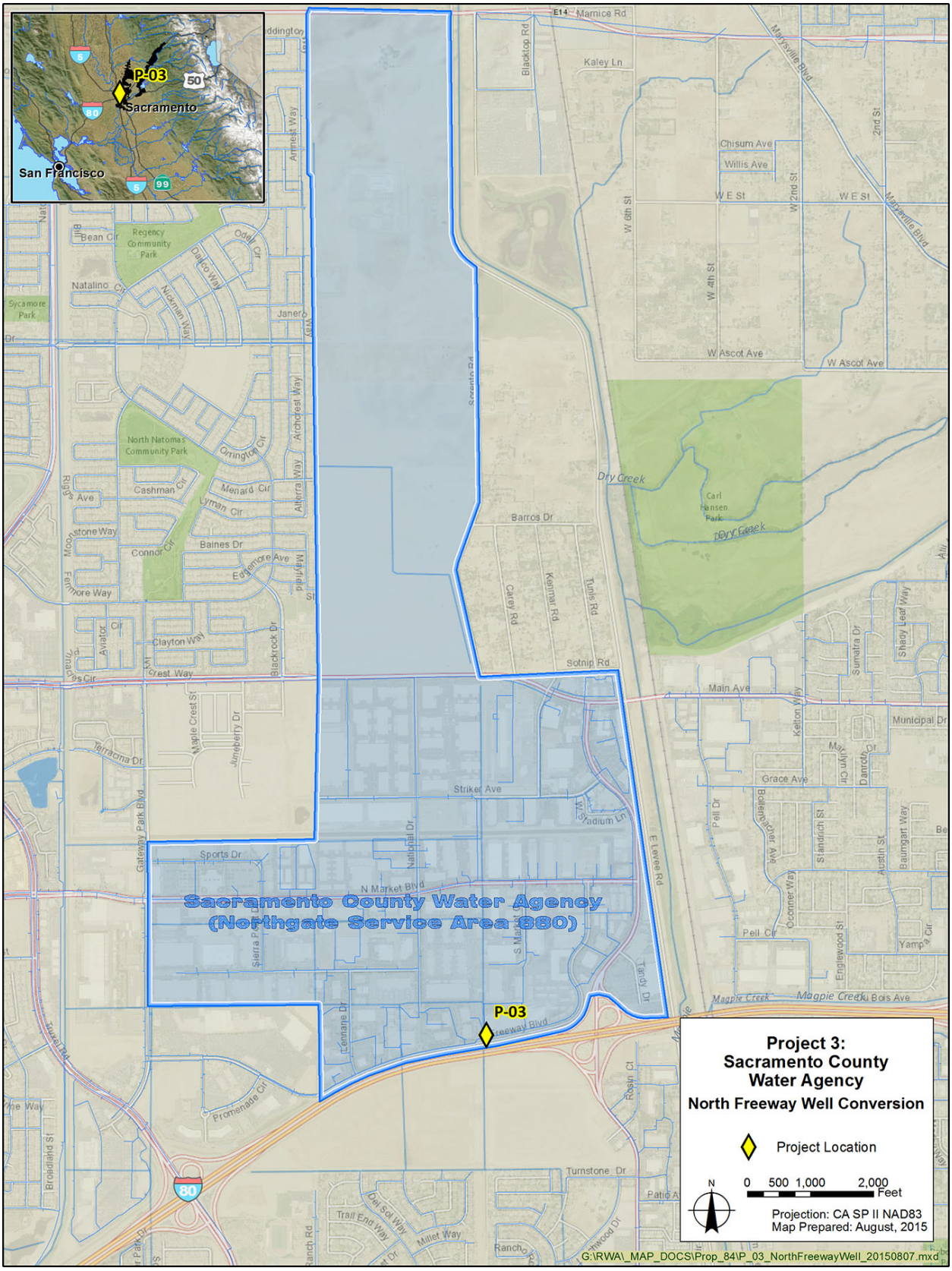


Figure 4: Project 3: North Freeway Well Conversion

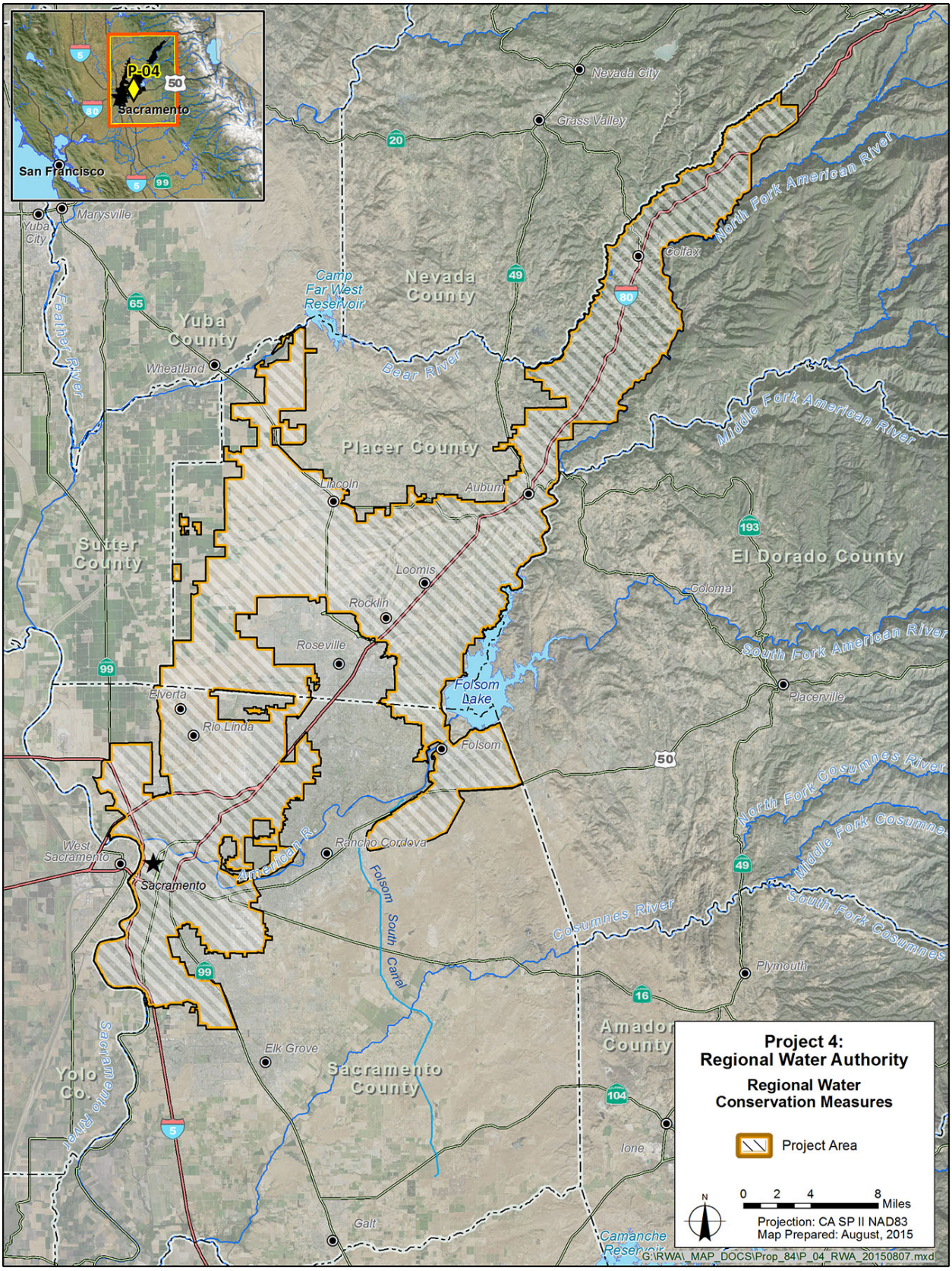


Figure 5: Project 4: Regional Water Conservation Measures

Project Physical Benefits

This section presents the expected measurable accomplishments of the proposed projects. Physical benefits are quantified and presented below in DWR's Table 5, provided in the PSP.

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District

Table 5 – Annual Project Physical Benefits Project Name: Outingdale Water Intake Type of Benefit Claimed: Primary Benefit – Water Supply Produced Units of the Benefit Claimed: acre-feet per year Anticipated Useful Life of Project (years): 30 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	N/A	N/A
2016	0	N/A	N/A
2017 - 2046	0	8.39	8.39

Comments:
1. Project to be constructed during low river flows in 2016 and physical benefits will be realized starting in 2017.
2. Without the additional 'water supply produced, the community is 100% without water for public health and safety. The Middle Fork of the Cosumnes River is the only source of raw water for the Outingdale community without requiring extraordinary measures of trucking in water from elsewhere.
3. Data obtained from the monthly plant operation logs as submitted to the State Department of Drinking Water. Amount of water supply produced is the average water demand for the month of August from 2008 through 2013.

Table 5 – Annual Project Physical Benefits			
Project Name: Outingdale Water Intake Type of Benefit Claimed: Secondary Benefit – Greenhouse Gas Emissions (reduction in CO_2 production) Units of the Benefit Claimed : tons CO_2 emission per year Anticipated Useful Life of Project (years): 30 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	41.5	N/A	N/A
2016	41.5	N/A	N/A
2017-2046	41.5	0	41.5

Comments:
1. Physical benefits are based on August 2014 during which 31 days of trucking potable water were required due to extreme low river flows preventing raw water pumping.
2. Benefits are calculated as elimination of the 10,137 miles driven by the tanker truck and resulting reduction of CO_2.
3. Estimated CO2 emissions are derived utilizing the Sacramento Metropolitan Air Quality Management District Road Construction Emissions Model, Version 7.5.51 which utilizes emissions estimates from EMFAC2011. (EMFAC2011 is the California Air Resources Board's approved tool for estimating emissions from on-road vehicles.)
4. Estimated CO2 emissions without the project, based on 2014 miles driven are 1,220.61 pounds per day of CO_2 which equates to 1.34 tons per day of CO2.

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District

Table 5 – Annual Project Physical Benefits Project Name: Well 10 Hexavalent Chromium Treatment Type of Benefit Claimed: Primary Benefit – Water Supply Produced Units of the Benefit Claimed : acre-feet per year Anticipated Useful Life of Project (years): 40 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	N/A	N/A
2016	0	N/A	N/A
2017 - 2057	0	400	400

Comments:

Well 10 with the treatment system will have a capacity of 900 gpm that can be delivered to the water distribution system (Carson, 2015). Well 10 will be operated to provide water when demands are greater than the base load to RLECWD. The current average annual demand for RLECWD is approximately 2,724 acre-feet per year as reported to the Sacramento Groundwater Authority, and based on the judgment of the District Engineer, Well 10 will need to run approximately 2,400 hours to meet peak demands during the summer, spring, and fall. The total volume over that period will be 400 acre-feet.

Sources:

Affinity Engineering. (2014). Water Master Plan, Rio Linda/Elverta Community Water District.

Carson, J. (2015) Technical Memorandum: Water Supply Strategy Update for Hexavalent Chromium. Rio Linda/Elverta Community Water District

Table 5 – Annual Project Physical Benefits

Project Name: Well 10 Hexavalent Chromium Treatment
Type of Benefit Claimed: Secondary Benefit – Water Quality (reduction in hexavalent chromium concentration)
Units of the Benefit Claimed : milligrams per liter (mg/L)
Anticipated Useful Life of Project (years): 40 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	.013	N/A	N/A
2016	.013	N/A	N/A
2017 - 2056	.013	.008	.005

Comments:

Water quality in Well 10 based on recently performed lab testing has 13 ppb (.013 mg/L) hexavalent chromium levels (Affinity Engineering, 2014). Based on results from a pilot study of the Strong Base treatment system, performed in 2014, water quality after treatment will be approximately 8 ppb (.008 mg/L) (Ionex SG, 2015). A second pilot study is being performed to confirm results and determine media regeneration timelines.

Sources:

Affinity Engineering. (2014). Water Master Plan, Rio Linda/Elverta Community Water District.

Ionex SG. (2015). IXC Cr(vi) Treatment and Brine Waste Management. Rio Linda/Elverta Community Water District.

Project 3: North Freeway Well Conversion

Implementing Agency: Sacramento County Water Agency

Table 5 – Annual Project Physical Benefits Project Name: North Freeway Well Conversion Type of Benefit Claimed: Primary Benefit – Water Supply Produced Units of the Benefit Claimed : acre-feet per year Anticipated Useful Life of Project (years): 50 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	1.22	84 to 673	83 to 672
2016 – 2064	1.22	253 to 2018	252 to 2017

Comments:

A 1.8 MGD well is typical for this area and standard construction for SCWA facilities. The North Freeway well has an exceptional Specific Capacity resulting in efficient yields. The "Project" will allow an existing water well to be fully utilized "on-line" instead of "stand-by" with new SMUD power and chemical disinfection equipment.

Following the completion of the "Project", the North Freeway well at a minimum will be placed in the normal operational rotation with the other 4 wells in the system and will produce approximately 82.3 MG or 253 acre-ft. per year using 2014 production numbers for our Northgate 880 service area.

The North Freeway well without improvements from this project is not set up to easily produce water for long periods of time because of the lack of storage of propane and disinfectant chemicals; therefore the existing reliable continuous production of the North Freeway well is only 1.22 acre-ft. per 2014 statistics without the implementation of the "Project". With this projects improvements, the City of Sacramento will have access to up to 2018 acre feet per year of production from this well, which could help supplement strained surface water supplies in a drought emergency.

This 1.22 acre-ft. is generally water produced for weekly testing of the engine to run the well or other emergency water need applications. 2015 statistics above are assuming the project is complete and on-line by September 2015 therefore only represents partial year benefits.

Table 5 – Annual Project Physical Benefits

Project Name: North Freeway Well Conversion
Type of Benefit Claimed: Secondary Benefit – Greenhouse Gas Emissions (reduction in CO_2 production)
Units of the Benefit Claimed : pounds of CO_2 per year
Anticipated Useful Life of Project (years): 50 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	43,884 – 344,194	12,633-98,128	31,251-246,066
2016 – 2064	130,492 – 1,031,423	36,739-293,226	93,753-738,197

Comments:

1. Utilizing the well at full capacity of 1.8 MGD or 2018 acre-ft. per year would result in a net savings of electricity of 4,000 KWH/DAY following the completion of the Project. The existing inefficient propane fueled angle drive engine requires 13,137 BTU/MIN to provide power to operate the existing pump.
2. Project will install a new high efficiency pump and electric motor with a variable speed drive greatly reducing the power consumption to operate. Without the project, the well produces water at 3,077 KWH/MG. With the completion of the project, the well will produce water at 855 KWH/MG. Per SMUD's 2012 California Climate Registry Report, a reduction of .522 pounds (lbs.) of Carbon Dioxide (CO_2) per KWH is assumed following the project.
3. The pounds of CO_2 listed for the "without project" projection includes having to routinely physically deliver propane to the site to keep the engine energy source available.
4. The pounds of CO_2 listed above for "without project" include both anticipated propane consumed and diesel fuel used for the delivery of the propane using U.S. Energy Information Administration (EIA) values for pounds of CO_2 produced utilizing both propane and diesel fuels.
5. The range of pounds of carbon dioxide listed above are similar to the range in production for the Primary Benefit; 1/5 of SCWA demands only (253 acre-ft. or 82.3 MG) to the maximum well capacity of 2018 acre-ft. (657 MG) per year.

Project 4: Regional Water Conservation Measures

Implementing Agency: Regional Water Authority

Table 5 – Annual Project Physical Benefits Project Name: Regional Water Conservation Measures Type of Benefit Claimed: Primary Benefit – Water Supply Saved Units of the Benefit Claimed : acre-feet per year Anticipated Useful Life of Project (years): 20 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	0	0-
2016 – 2020	0	2,293	2,293
2021 – 2035	0	525	525

Comments:

1. The table includes both leak detection and repair and advanced customer systems savings. We expect that the leak detection and repair savings (10,500 acre feet over project life, or 525 acre feet per year) will last a minimum of 20 years as this component results in long-term infrastructure improvements.
2. We expect the Advanced Customer Systems savings will last 5 years (8,842 acre feet over project life, or 1,768 acre feet per year) as the technology used to implement these programs is rapidly changing and is based on customer behavior.
3. We anticipate increased savings from these programs in the future but exact estimates are not available and are hence not included. Water savings associated with the Public Outreach Effort were not calculated. A full explanation of savings estimates is in .the Cost Effectiveness Analysis (Table 7)

Table 5 – Annual Project Physical Benefits Project Name: Regional Water Conservation Measures Type of Benefit Claimed: Secondary Benefit – Energy Saved Units of the Benefit Claimed : kilowatt-hours per year (kWh per year) Anticipated Useful Life of Project (years): 20 years			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	0	0
2016 – 2020	0	793,646	793,646
2021 – 2035	0	181,678	181,678

Comments:

1. Energy savings are strictly a function of the anticipated water savings described in the above Table 5. Due to the varying energy intensities of water supply between water agencies in the region, a regional average of 1,062 kilowatt hours per million gallons is used based on the 2014 AB 32 Water-Energy Assessment. A full explanation of savings estimates is in the Cost Effectiveness Analysis (Table 7)
2. Data Source: 2014 AB 32 Water-Energy Assessment. Prepared for Sacramento Municipal Utility District by GEI Consultants. October 2014 Project No. 1326390, page 1.

Technical Analysis of Physical Benefits Claimed

This section provides a narrative description for each of the proposed projects that describes the primary and secondary expected physical benefits.

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District (EID)

Primary Physical Benefit: Water Supply Produced

Secondary Physical Benefit: Greenhouse Gas Emissions (reduction in CO_2 production)

1. Explanation of Need for Project:

The community of Outingdale is a satellite community and has only one source of water for public health and safety purposes – the Middle Fork Cosumnes River. The existing intake consists of a slotted well screen laid across the river bottom. During low river flow conditions, the intake screen experiences insufficient water cover, often vortexing and air binding the suction lift pumps. For the entirety of August 2014 (31 days), river levels were sufficiently low to completely expose the intake screen and totally prevent the pumping or delivery of any water to the community. All water instead had to be delivered to Outingdale by utilizing a bulk haul water tanker truck to bring water from elsewhere within EID's distribution system. In addition to being a more costly water supply, this method of delivery also created greenhouse gas emissions due to numerous truck trips.

For the month of August, recent historical demands for the community range from approximately 6.59 acre-feet (AF) to 10.92 AF of water, averaging at 8.39 AF. The primary physical benefit of the project will be the ability to continue to pump raw water from the river to produce an uninterrupted water supply at the least cost. The secondary physical benefit will be the elimination of 41.5 tons of CO_2 produced by driving 10,137 truck miles bring water from elsewhere in EID's system for a month.

Bulk Haul Water Tanker Truck

2. Estimates of Without-Project Conditions:

Without the project, EID will need to continue bulk water hauling during any period of low river flows (drought periods, summer months, etc.) to maintain minimum public health and safety conditions for the community. This alternative means of water delivery will require the routine travel of a 50 foot long tanker through a small residential neighborhood. During August 2014, a total of 10,137 truck miles were logged to enable continued supply of water to the community. The impact of bulk water hauling will be the detriment and damage to the existing public roads, and will add a level of risk for pedestrian and private vehicle travel in the neighborhood of the deliveries.

3. Description of Methods Used to Estimate Physical Benefits:

The physical benefits will include the primary benefit of water supply produced (in acre-feet per year), and the secondary benefit of reduced greenhouse gas emissions (in tons of CO_2 per month).

<u>Primary Benefit:</u> During the ongoing drought in August, 2014, pumping of water from the Middle Fork Cosumnes River was discontinued due to low river levels exposing the existing river intake screen. The potential benefits were calculated by comparing August water demands from 2008 through 2013 against the total inability to pump and

deliver water during August 2014. During the months of August from 2008 to 2013, water demand ranged from 6.59 AF to 10.92 AF, with an average of 8.39 AF (source: monthly plant operations logs as submitted to the State Department of Drinking Water). To be conservative, it was assumed that implementing this project will allow water to continue to be pumped (i.e., avoid the need to truck water in) for one month a year over the project life which equates to a 8.39 AF per year benefit.

Secondary Benefit: During August, 2014, the bulk haul truck traveled 10,137 miles to deliver potable water to Outingdale from elsewhere in EID's distribution system (source: 2014 invoice to EID from trucking company). Eliminating the need to bulk haul water to Outingdale via a tanker truck will eliminate the associated greenhouse gas emissions.

The tons of CO_2 generated were estimated utilizing the Sacramento Metropolitan Air Quality Management District Road Construction Emissions Model, Version 7.5.51, which utilizes emissions estimates from EMFAC2011. (EMFAC2011 is the California Air Resources Board's approved tool for estimating emissions from on-road vehicles.).

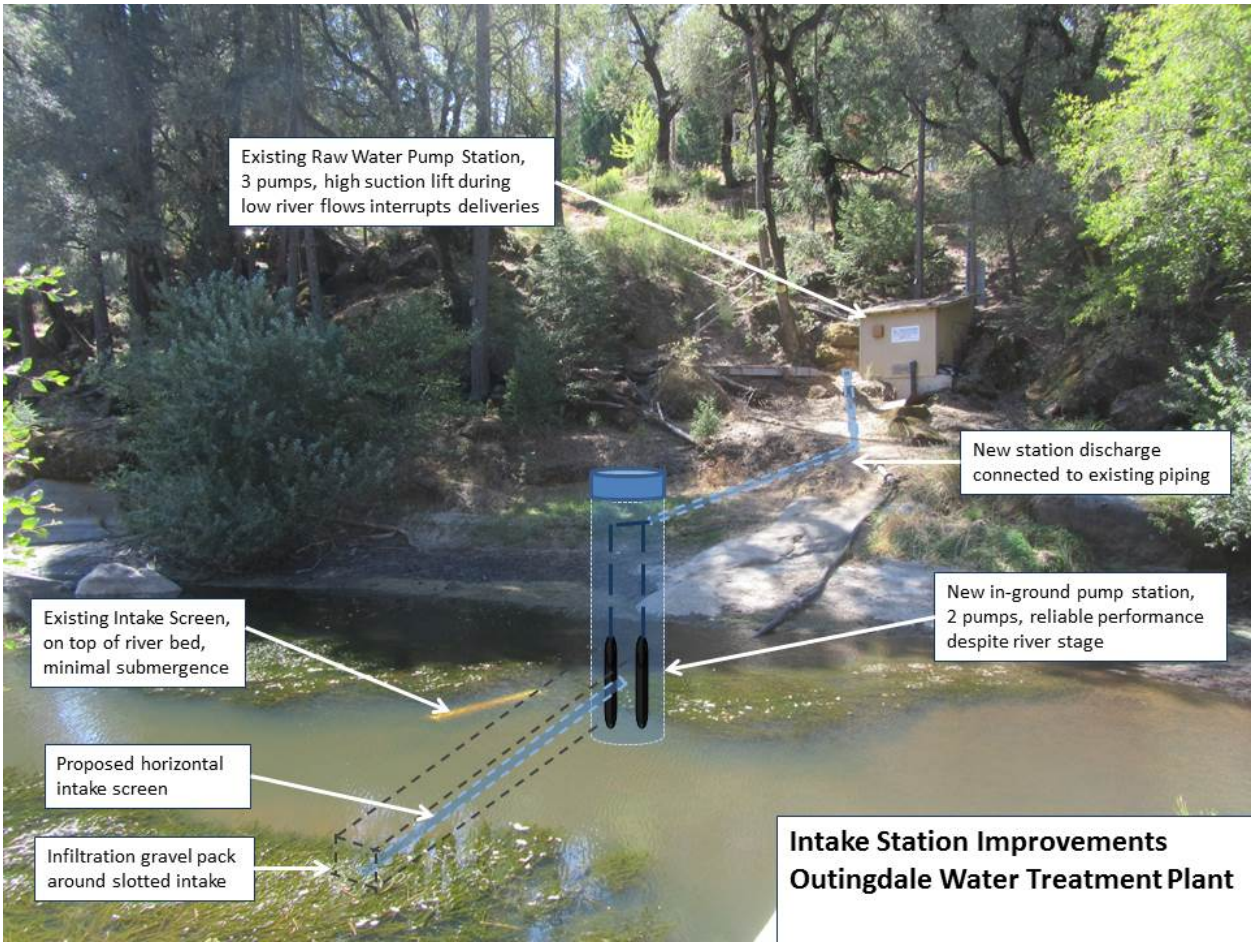
The tanker truck drove a total of 10,137 miles during 2014, and in each trip, the truck hauled 6,700 gallons of water (25 tons cargo weight). Using this data, it was estimated the project will eliminate 1.34 tons per day of CO_2 (1,220.61 pounds per day), or a total of 41.5 tons CO_2, as experienced during the drought in August 2014.

4. Identification of All New Facilities, Policies, and Actions Required to Obtain Physical Benefits:

New Facilities: New facilities will include:

- A horizontal lateral intake screen within a gravel infiltration gallery in the river bed (similar to a Ranney Collector Well style infiltration gallery)
- A packaged in-ground pump station with two submersible pumps with a capacity of 100 gallons per minute (gpm) each

Installation of the facilities will involve minor piping to tie-in the new submersible pump station discharge piping to the existing pump station discharge piping, and abandonment of the old suction lift style centrifugal pumps. Electrical power and control will be run to the new package pump station. The existing raw water pump station enclosure will remain in place to continue housing the existing electrical gear, new variable frequency controllers, existing remote programmable logic controller (PLC) unit and instrumentation. The figure below shows these existing and proposed new facilities.



New Policies: The physical benefits may be obtained using existing EID policies.

New Actions: EID has its portion of the funding available for this project. No new actions will be needed to obtain the physical benefits.

5. Description of Any Potential Adverse Physical Effects and Mitigation for Those Impacts:

No potential adverse physical effects are anticipated from the proposed project based on the Notice of Exemption for EID's Outingdale Emergency Intake Project (August 2014). Similarly, no mitigations are expected to be required.

6. Description of Whether Proposed Project Effectively Addresses Long-Term Drought Preparedness:

This project will provide water supplies to meet public health and safety needs during low river flow conditions when the current intake screen cannot be used to pump raw water, thereby contributing to sustainable water supply and reliability during water shortages.

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District (RLECWD)

Primary Physical Benefit: Water Supply Produced

Secondary Physical Benefit: Water Quality (reduction in hexavalent chromium concentration)

1. Explanation of Need for Project:

The State Water Resources Control Board's Division of Drinking Water (DDW) has determined that hexavalent chromium is carcinogenic, and the new primary maximum contaminant level (MCL) of 10 parts per billion (ppb) (0.01 mg/L) became law in July 2014. RLECWD's Well 10 has a hexavalent chromium concentration of 13 ppb (0.013 mg/L), and it will be out of compliance by the end of 2015. There is no alternative supply, so this is a human right to water concern for the customers served by this well.

View of Well 10

Well 10 currently produces 900 gallons per minute (gpm) and is needed to continue to supply water and fire protection to the southwest section of the water system. The well requires treatment of hexavalent chromium to below 10 ppb (0.01 mg/L) to continue to operate and provide potable water to the Rio Linda and Elverta communities.

Currently, over 50 percent of RLECWD's water supply exceeds the MCL of 10 ppb for hexavalent chromium, and the district is minimizing the use of its non-compliance wells. During higher demand times, RLECWD is required to operate these wells to maintain pressure and fire protection throughout its service area. RLECWD has developed a water supply strategy that looks to modify, treat, or replace its water supply wells over time to be in compliance with the new hexavalent chromium MCL (Carson, 2015). Adding treatment to Well 10 is part of RLECWD's overall water supply strategy.

2. Estimates of Without-Project Conditions:

RLECWD is required to produce water that meets all water quality requirements from DDW. RLECWD has sampled Well 10 for hexavalent chromium 5 times since 2013. The water quality results are as follows:

Sample Date	Hexavalent chromium Concentration (ppb)
September 13, 2013	9 (0.009 mg/L)
January 28, 2014	13 (0.013 mg/L)
April 16, 2014	13 (0.013 mg/L)
March 18, 2015	13 (0.013 mg/L)
June 3, 2015	13 (0.013 mg/L)

At the end of the 2015, RLECWD's wells that have a 4-quarter average of above 10 ppb (0.01 mg/L) will be out of compliance with DDW. A compliance plan will be required by DDW to show how RLECWD will get back into compliance by either taking the water supply out of service or adding treatment. With the large amount of water supply within the district that exceeds the MCL for hexavalent chromium, RLECWD has developed a water supply strategy (Carson, 2015) to address its out of compliance water supply facilities. This strategy includes adding

treatment to two wells (including Well 10), performing modifications to one well, and drilling two new wells that will require no treatment to replace four lower producing wells. RLECWD will minimize the use of wells that exceed the MCL for hexavalent chromium by operating its compliant wells as lead wells and utilizing its non-compliance wells as backup wells during high demand times or for fire flow situations until the compliant water supply is increased.

The most common treatment methods for the removal of hexavalent chromium are coagulation/filtration, ion exchange, and reverse osmosis. Of these three types of treatment, ion exchange is the only DDW-approved treatment system that is currently treating water for hexavalent chromium. Ion exchange also has the smallest footprint and lowest capital and operational and maintenance costs than the other types of treatment.

DDW has determined that hexavalent chromium is carcinogenic and requires public water purveyors to have their water at levels at less than 10 ppb (0.01 mg/L) hexavalent chromium. If RLECWD operates wells that exceed 10 ppb (0.01 mg/L) hexavalent chromium, DDW will require mandatory notification and language to notify RLECWD's customers that water is being provided at unsafe levels.

3. Description of Methods Used to Estimate Physical Benefits:

Primary Benefit: Well 10 has a capacity of 900 gpm. Due to the headloss across the treatment system, the pump will be upgraded to maintain 900 gpm at a higher head pressure. The District water supply plan is to operate its wells in the following order as follows:

1. Wells – In compliance (no treatment required)
2. Wells – hexavalent chromium treatment
3. Wells – Non-compliance

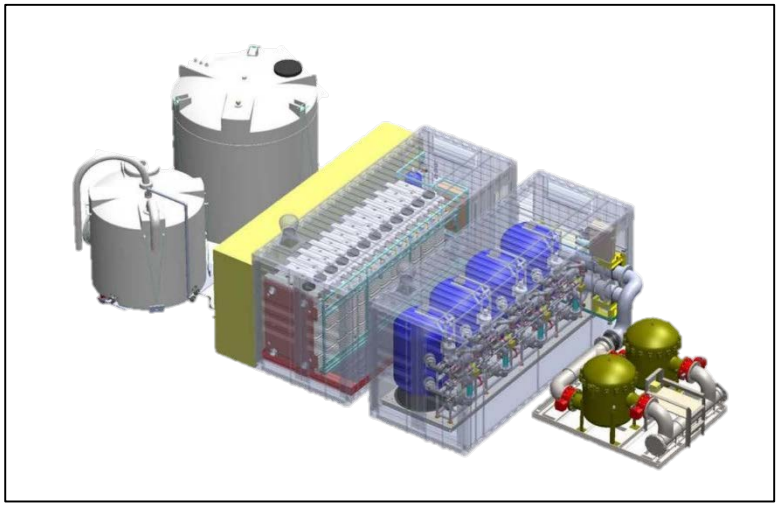
According to the District Engineer when water demand is low, wells that are in compliance and do not require treatment will be the wells that supply the base load to RLECWD. As water demand increases seasonally or throughout the day, wells that have hexavalent chromium treatment will operate to supplement the water supply. When RLECWD's compliant and hexavalent chromium treatment wells cannot maintain pressure within the service area, non-compliant wells will operate and RLECWD will be required to notify DDW of their operation as well as provide mandatory notification to its customers. It is estimated that Well 10 will operate intermittently in the spring and fall as water demand varies, and during peak times every day during the summer. Based on this type of operation, it is estimated that during an average annual demand scenario, Well 10 will be operated for approximately 90 summer days for 18 hours a day, 45 days in spring and fall for 12 hours a day, and approximately 45 days in spring and fall for 6 hours a day. This is a total of approximately 2,400 hours using the full capacity of the pump. This operation scenario will provide approximately 400 acre-feet per year.

Secondary Benefit: A pilot test was completed in 2014 to determine how effective the ion exchange process would treat Well 10. Preliminary pilot testing results from 2014 have shown that the ion exchange media are able to remove hexavalent chromium to non-detectable levels for over 60,000 bed volumes before media regeneration would be required (Ionex SG, 2015). A second pilot test is being conducted to further refine when media regeneration would be required, and this test will be completed in the summer of 2015. The initial and current pilot testing is being performed by a treatment supplier. Ion exchange treatment for hexavalent chromium will enable RLECWD to meet DDW water quality requirements and compliance requirements. This type of type of treatment has been recently permitted by DDW and is online in Northern and Southern California (Hazen and Sawyer, 2015) Source: http://www.hazenandsawyer.com/news/chromium-6-removal-facilities-go-online-in-california/.

4. Identification of All New Facilities, Policies, and Actions Required to Obtain Physical Benefits:

New Facilities: Based on the results of the pilot testing, RLECWD will install a strong-based ion exchange treatment system on the discharge of the well to reduce the hexavalent chromium level to less than 10 ppb (0.001 mg/L). The major physical components of the project will consist of the following:

A. *Treatment System:* The treatment system will be a strong-based ion exchange system with a capacity of 450 gpm. It will be purchased from a supplier and will be pre-piped and wired in cargo containers. It will consist of two cargo containers and two tanks. The first contain will house the ion exchange vessels and controls. The second container will house the treatment system programmable logic controller and regeneration salt solution containers. The two tanks will consist of a briner tank that will contain the salt required for regeneration of the filter media and the second tank will contain the hexavalent chromium waste from media regeneration. The treatment system will reduce the level of hexavalent chromium to non-detectable levels. A bypass blending line will be installed and blend raw well water with hexavalent chromium treated water to meet a target combined effluent hexavalent chromium concentration of not to exceed 8 ppb (0.008 mg/L). (This blending system reduces the required capacity of the treatment system from 900 gpm to 450 gpm as well as reduces the capital cost of the treatment system.)



Model Example of Treatment System

B. *Plant Piping:* The plant piping will require modification to connect the treatment system into the discharge of the well and the removal of the existing hydropneumatic tank because this tank is not pressure certified. With the removal of the hydropneumatic tank, a variable speed drive will be added to drive the well pump to ease the pump on and off in an effort to eliminate system water hammering.

C. *Pump and Motor:* The pump and motor will require an upgrade to maintain the plant's pretreatment capacity of 900 gpm. The new pump and motor will be designed with additional pumping head to overcome the additional headloss that is associated with the treatment system.

D. *Electrical:* To meet the additional horsepower required due to the upgraded pump and motor, a new electrical service and motor control center with a variable speed drive will be installed that meets arc flash requirements. Additionally, a new four-wire electrical service will be required to replace the existing three-wire service as required by the electric service provider, and the site's programmable logic controller (PLC) will be upgraded for remote control via RLECWD's Supervisory Control and Data Acquisition (SCADA) system.

Once the treatment system is installed, testing the treatment system will commence to work out the control system and to develop a media regeneration plan. Once the treatment system is working as intended, the bypass blending system will be put into operation to blend the untreated well water with the treated well water to achieve a reliable blended water quality that goes to the distribution system of approximately 8 ppb (0.008 mg/L).

New Policies: The physical benefits may be obtained using existing RLECWD policies.

New Actions: RLECWD has its portion of the funding available for this project. No new actions will be needed to obtain the physical benefits.

5. Description of Any Potential Adverse Physical Effects and Mitigation for Those Impacts:

RLECWD does not anticipate any potential adverse physical effects from this project. The treatment system will be located in 8-ft wide by 20-ft long cargo containers along with a brine and waste tank. The complete treatment system will be located on RLECWD property, and no additional property will be required.

RLECWD will not be developing additional water supply with the facility, and it is located in a non-dense rural part of the service area. The well will be out of service for approximately 1 year while improvements to the facility are being completed. During that time, RLECWD will rely on its existing facilities to maintain water pressure to this area of the water system for non-emergency events. The local fire protection district will be notified that the facility is temporarily out of service while the treatment system is being installed, as there will be a reduction to fire flow in the area. Since this area of the system is low density, the fire protection district will supplement the fire flow with a fire tanker truck that can fill up in other areas of the RLECWD.

6. Description of Whether Proposed Project Effectively Addresses Long-Term Drought Preparedness:

This project will provide water supplies and fire protection flows using water that will meet DDW's MCLs, thereby contributing to sustainable water supply and reliability during water shortages. It also ensures access to safe and reliable groundwater, which is critical in response to drought conditions.

Project 3: North Freeway Well Conversion

Implementing Agency: Sacramento County Water Agency (SCWA)

Primary Physical Benefit: Water Supply Produced

Secondary Physical Benefit: Greenhouse Gas Emissions (reduction in CO_2 production)

1. Explanation of Need for Project:

The State of California and the Sacramento region are experiencing a fourth year of unprecedented drought conditions. These drought conditions have greatly affected the amount of surface water available to water purveyors that depend on it to meet the needs of existing and future customers.

The SCWA owns a public water system known as the Northgate 880 Water System adjacent to the City of Sacramento in north Sacramento County. The SCWA owns and operates 5 existing groundwater wells in its Northgate 880 system, all without arsenic which is prevalent in water wells within this region. One of these 5 wells is known as the North Freeway well and is located at 3935 North Freeway Blvd. The North Freeway well is currently off-line due to failure of the propane fueled angle drive engine which provides power to the well. The SCWA had intended to simply repair the failed engine and place the well back in service. However, as the drought became more severe and it became apparent that available surface water supplies may be reduced or curtailed, the SCWA decided make additional improvements at this well to allow it to be used as a fully equipped on-line well which could be used to serve the City of Sacramento when needed, as the City relies primarily on surface water supplies. This water supply could be used during drought conditions by the City of Sacramento.

2. Estimates of Without-Project Conditions:

Without this project, the City of Sacramento would not have access to the production from the North Freeway well because the well would not be equipped for day to day use, if it remained propane fueled and permitted for operation as a “Stand-By” well only.

The existing reliable continuous production of the North Freeway well is only 1.22 acre-feet per year, based on 2014 SCWA data. This 1.22 acre-feet per year is generally water produced for weekly testing of the engine to run the well or other emergency water need applications.

3. Description of Methods Used to Estimate Physical Benefits:

<u>Primary Benefit:</u> This project will allow an existing production well to be fully utilized “on-line” instead of “stand-by” with new SMUD power and chemical disinfection equipment. A 1.8 million gallon per day (mgd) well is typical for this area and standard construction for SCWA facilities. The North Freeway well has an exceptional Specific Capacity resulting in efficient yields.

Following the completion of the well improvements, the North Freeway well at a minimum will be placed in the normal operational rotation with the other 4 wells in the system and will produce approximately 82.3 million gallons per year or 252 acre-feet per year, based on 2014 production numbers for the SCWA Northgate 880 service area. At full production capacity (1.8 mgd), the North Freeway well will produce approximately 657 million gallons per year or 2,018 acre-feet per year.

<u>Secondary Benefit:</u> Switching the power source for this existing well from the aforementioned propane driven angle-drive engine to SMUD electrical power will have great benefits related to carbon footprint (greenhouse gas reduction), or the amount of energy required to produce potable water. The old engine was very inefficient; this combined with the age/efficiency of the existing pump made the proposed upgrades even more desirable. The existing energy efficiency was calculated to be 325 gallons per kilowatt hour (kWh) or 3,077 kWh per million gallons. Following implementation of the proposed improvements, the new efficiency of energy will be 1,169

gallons per kWh or 855 kWh per million gallons produced. This will be a substantial reduction of energy required to produce this needed water source.

Following the completion of the project, the North Freeway well will reduce its carbon emissions starting in 2016 by 93,753 – 738,197 pounds of CO_2 per year (depending on whether the well is utilized for just the existing SCWA water use alone or if used at its full capacity to provide water to the City of Sacramento as needed). This CO_2 determination is based on SMUD's 2012 California Climate Registry Report using a reduction of 0.522 pounds of CO_2 per kWh of electricity saved or not used. Over the 50-year life of this project, this will be a net reduction of CO_2 of 4,687,650 – 369,098,850 pounds (depending on the way the well is utilized).

4. Identification of All New Facilities, Policies, and Actions Required to Obtain Physical Benefits:

New Facilities: In order to facilitate using the North Freeway well for more than just emergency use, site improvements must be made. The SCWA is currently installing on-site electrical improvements to receive 3-Phase power from SMUD. Additionally, on-site chemical storage is being completed so that sodium hypo-chlorite can be injected for residual disinfection purposes. The existing water well pump was over 40 years old and inefficient, as well as not compatible with the new electric motor, discharge pipe, and product (water) lubed line shaft to be purchased.

Following the proposed improvements at the North Freeway well, the SCWA will be able to monitor on their SCADA (Supervisory Control and Data Acquisition) system remotely the amount of water produced (gallons) and the amount of energy consumed (KWH) at any time to track the well site production and efficiency as it relates to pump/power efficiency. By operating more efficiently, SCWA can maximize the carbon reduction benefits realized from lowered electricity consumption. In addition, the electric operation allows SCWA to no longer truck in propane during high usage periods as needed in the old system.

New Policies: The physical benefits may be obtained using existing SCWA policies.

New Actions: The SCWA has its portion of the funding available for this project. No new actions will be needed to obtain the physical benefits.

5. Description of Any Potential Adverse Physical Effects and Mitigation for Those Impacts:

This project has no known potential adverse physical effects as this is an existing well site and is located within an Industrial/Commercial area along the frontage road of Interstate 80. Conversely, this project will offer positive physical effects by resulting in the production of potable water utilizing energy at greater than 300% efficiency (comparing the operation of the existing well and pump with that following the installation of the new pump and motor being installed with the project).

6. Description of Whether Proposed Project Effectively Addresses Long-Term Drought Preparedness:

This project will effectively address long-term drought preparedness by the two metrics provided in Table 1 of the grant guidelines:

- Promote water conservation, conjunctive use, reuse and recycling.
- Establish system interties.

The project will provide another source of supply to the existing connection of the City of Sacramento and SCWA water delivery systems.

Project 4: Regional Water Conservation Measures

Implementing Agency: Regional Water Authority (RWA)

Primary Physical Benefit: Water Supply Saved

Secondary Physical Benefit: Energy Saved

1. Explanation of Need for Project:

California is experiencing a fourth year of unprecedented drought conditions. Following three dry years, weather patterns diverted storms away from California most of the winter, leaving January and March 2015 as the driest in more than 100 years of record keeping. The Sierra Nevada snowpack was virtually nonexistent this year at 5 percent of average, and will provide little runoff to refill the state's reservoirs, including Folsom Reservoir, the region's primary reservoir, during the long, dry summer months. In response, Governor Jerry Brown issued an Executive Order mandating the State of California to reduce water use. The State Water Resources Control Board, which is charged with implementing the Governor's Executive Order, set mandatory water conservation targets for California's communities. In the greater Sacramento region, targets range from 20 percent to 36 percent, with the majority of the region's water agencies needing a 30 percent or above decrease in use compared to 2013 usage.

Even with these aggressive conservation targets, the region is still at risk from a water supply standpoint because Folsom Reservoir is a multiuse reservoir that must meet the water supply needs of urban, agricultural, and exports users. Additionally, the reservoir is a first responder to maintain Delta water quality standards and flow temperatures for fish populations. Considering all of these needs, the United States Department of the Interior, Bureau of Reclamation, estimated that Folsom Reservoir will only hold 120,000 acre feet by the end of the September 2015. The reservoir has never dropped to this level and it is unknown how the reservoir will operate at this level and there are concerns about intake infrastructure failures, which may lead to water supply interruptions.

To minimize these risks, the greater Sacramento region has increased its short-term conservation efforts to respond to the drought. The region saved 19 percent in 2014 compared to 2013 total production, nearly achieving the Governor's voluntary request of 20 percent. Thus far in 2015 (January through June), the region has achieved a 26 percent savings compared to the same months in 2013. These water savings have come at a substantial cost to the region's water agencies as reduced production means reduced revenue to cover costs. When coupled with the increased costs for expanding water conservation programs, reduced production is a double hit to a water agency's bottom line. While increasing water rates can offer some relief to these losses, changing rates is a lengthy process and cannot provide viable revenue assistance at this time. Despite revenues continuing to drop, the need to save water continues.

2. Estimates of Without-Project Conditions:

This project proposal will enhance existing water conservation programs in the region by infusing additional funding to:

- Reduce supply-side non-revenue water through identifying and repairing system water leaks.
- Reduce demand-side residential sector water use by reaching more customers through Advanced Customer Systems and general public outreach.

Without the Regional Water Conservation Measures Project, the region's water agencies will continue to provide some level of leak detection and repair and public outreach, but those efforts will fall short of the additional water and energy savings identified in this proposal. As discussed next, this project will lead to direct water and energy savings in the near-term with the Advanced Customer Systems and long-term with the leak detection and repair.

Additional investments and water and energy savings made now can make a difference both now and in the future.

3. Description of Methods Used to Estimate Physical Benefits:

This project proposes to save 19,342 acre feet of water and 6,693,403 kilowatt hours (kWh) of energy over 20 years through reducing supply-side non-revenue water use and demand-side residential sector water use.

Primary Benefit: The first component of the project will focus on reducing non-revenue water through leak detection and repair and will include the following participating water agencies: City of Folsom, City of Lincoln, City of Sacramento, Placer County Water Agency, and Sacramento Suburban Water District. The region's water agencies will survey 1,200 miles of pipes and expect to identify an estimated 250 leaks for an accumulative savings of 10,500 acre feet and 3,633,565 kWh over 20 years. Once leaks are identified, the participating water agencies are responsible for implementing infrastructure upgrades and replacements to achieve the intended water and energy savings.
Water savings of 10,500 acre feet were calculated by the individual participating agencies as age of pipe, pipe material, soil type, system pressure, and other pertinent factors that affect system leaks vary between water agencies. For those agencies that had not performed leak surveys, operators considered local conditions (described above), available meter data, and previous leak detection and repair projects within their water agency to estimate number of potential leaks, leak rates, and targeted number of miles. For those water agencies that have already completed leak surveys, performed either in house or by a contractor, project summary data (number of leaks, average leak rate, etc.) was provided to RWA along with their water savings estimates. For these surveys, generally acoustic leak detection methods were performed using permaloggers, correlators, and sound amplifiers. It is anticipated that similar methods to those surveys will be performed as part of this project. RWA summarized the provided data from all the participating water agencies to calculate total miles of pipe, number of leaks, and the resulting water savings for this grant.

Secondary Benefit: The physical benefit of energy savings associated with leak detection and repair is a direct function of the associated water savings. Since this is a regional project, energy savings were calculated by converting the total estimated water savings of 10,500 acre feet to million gallons (MG), and then multiplying by 1,062 KWh/MG. The 1,062 kWh/MG was derived from the joint Sacramento Municipal Utility District (SMUD), RWA, and GEI Consultants' 2014 AB 32 Water-Energy Assessment dated October 2014 Project No. 1326390. In this 2014 assessment, water system energy use data were obtained for all eighteen water agencies within the SMUD service area directly through SMUD accounts. The SMUD service area overlaps with the RWA's member area. Water supplies of individual agencies ranged from a low of 312 kWh/MG to a high of 2,379 kWh/MG, with the average energy intensity being 1,062 kWh/MG. This energy savings is anticipated to occur over a 20 year span for both water and energy savings for infrastructure upgrades and replacements based on previous similar projects. (Mitchell, Chesnutt, 2013, Evaluation of East Bay Municipal Utility District's Pilot of WaterSmart Home Water Reports)

The second component of the project will focus on educating residential customers about how much water they use and how to reduce their use both inside and outside of the home. It will be implemented by the following participating water agencies: City of Folsom, City of Sacramento, Placer County Water Agency, Rio Linda/Elverta Community Water District, San Juan Water District, and Sacramento Suburban Water District. This will primarily be accomplished through Advanced Customer Systems like WaterSmart Software and Dropcountr which take individual household account meter data, organize it in easy to understand format (such as an online portal or handout), and distribute that information to customers to encourage better management of their water use through tailored water conservation messages. With this component, the region will reach 87,000 residential accounts and save 8,842 acre feet and 3,059,838 kWh over 5 years. The Advanced Customer Systems will be complimented with an overall public outreach effort to reinforce a strong water conservation ethic through regional media buys, workshops, and other related actions.

Water savings were calculated based on two existing similar water agencies programs in the region (City of Roseville, and San Juan Water District) that have achieved a 5.4 percent and 5.9 percent savings after approximately one year of an active residential Advanced Customer Systems when compared to a similar sample of customers for each agency (a control group). For a conservative estimate, a 5 percent overall water savings was used for this regional component. Available literature such as the December 2013 "Evaluation of East Bay Municipal Utility District's Pilot of WaterSmart Home Water Reports" report prepared by David L. Mitchell, M. Cubed and Thomas W. Chestnut, A&N Technical Services, Inc. for the California Water Foundation and East Bay Municipal Utility District also aligns with these estimates showing a 4.6 percent and 6.6 percent reduction for their two participating pilot groups. Analysis of water savings also shows similar results. The total number of new residential accounts reached with this program would be 87,000. The average residential household water demand in the Sacramento region is 363 gallons per day per household. This number is based on the total single family and multifamily demand data for twenty-one water agencies provided in their 2010 Urban Water Management Plans divided by total residential population also provided in the 2010 Urban Water Management Plans. Total savings of 8,842 acre feet were calculated by multiplying the 87,000 residential accounts by the estimated 363 gallons per day per household by the anticipated 5 percent water savings over 5 years ($87{,}000\ households\ \times 363\,\frac{gallons}{day} \times 5\%\ savings\ \times 365\,\frac{days}{year} \times 5\ years\ \times \frac{3.0688\ acre-feet}{1{,}000{,}000\ gallons}$).

The methodology for calculating energy savings for this component is the same described as above. RWA anticipates a 5 year life for both water and energy savings for these benefits due to the changing nature of these new technologies. Water and energy savings were not available for the public outreach component although RWA believes public outreach campaigns and media buys are essential long-term practices in which every water agencies should participate.

4. Identification of All New Facilities, Policies, and Actions Required to Obtain Physical Benefits:

No new facilities, policies, or actions are required to obtain the physical benefits. The proposal is an extension of current programs that are already successful in the Sacramento region.

5. Description of Any Potential Adverse Physical Effects and Mitigation for Those Impacts:

No adverse physical effects are anticipated as a result of implementing this project. In fact, the opposite is anticipated. This project will likely result in positive physical effects due to water and energy savings. Water savings will allow more water to remain in or at the water source for additional uses which include flows for fish and habitat, hydropower, Delta water quality or other downstream entities in need of additional water supplies. Furthermore, the associated energy savings will reduce greenhouse gas emissions which will minimize existing air quality issues. Since these savings will be derived from existing public outreach and Advanced Customer Systems, there will be no adverse physical effects. Furthermore, any areas disturbed from leak detection and repair activities were already disturbed during initial installation. The project will repair those initially disturbed areas.

6. Description of Whether Proposed Project Effectively Addresses Long-Term Drought Preparedness:

In summary, this project will provide immediate water and energy savings to the Sacramento region. In addition to immediate results, the project will also effectively address long-term drought preparedness by the following two metrics provided in Table 1 of the 2015 Guidelines:

- Promote water conservation, conjunctive use, reuse and recycling.
- Achieve long-term reduction in water use.

The project will promote water conservation not only through the tangible water savings of 19,342 acre feet (10,500 acre feet + 8,842 acre feet), but also through the implementation of a public outreach campaign that will focus communicating ways to save water to residents in the Sacramento region. The project will promote

conjunctive use by minimizing withdrawals from the region's water sources so that they may be more effective when implementing conjunctive use now and in the future. The project will achieve long-term reductions in water use as described above in the 20-year life savings timeframe of the leak detection and repair project component. Furthermore, the public outreach campaign will continue to build a water conservation ethic in the region that will lead to a long-term reduction in water use through education on how to more efficiently use available water supplies.

Direct Water Related Benefit to a DAC

Two project areas in this application include disadvantaged communities that will receive a direct water-related benefit:

- Project 1: Outingdale Water Intake (El Dorado Irrigation District)
- Project 2: Well 10 Hexavalent Chromium Treatment (Rio Linda/Elverta Community Water District)

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District (EID)

Demonstration that Community Meets DAC Definition: Outingdale is a small, isolated community on the Middle Fork Cosumnes River in El Dorado County. Because the region is so sparsely populated, the geographic size of census tracts is large. Therefore, it is extremely difficult to precisely calculate the income status of the community.

As described in Attachment 7 of this Proposal, the community of Outingdale is a subset of Census Tract 314.02. Outingdale has 197 of the 789 households in the tract, so it is most likely to be representative of information available for the tract as a whole. The American Community Survey (ACS) data for 2013 indicates that Census Tract 314.02 has a 2013 median household income of $49,798, which only marginally exceeds the definition of a DAC as a whole. A query of the Block Group and Census Tract from the Census Bureau for 2013 provided a more detailed look at the breakdown of incomes in the tract. Of the 789 households in the tract, 317 households (40 percent of the total) earn less than $45,000. **Based on the already low income of the tract and the large percentage of households earning less than $45,000, it is reasonable to assume that at least 25 percent of the population served in the Outingdale community can be considered as a DAC**.

Water Related Need of the DAC: The water related need of the community is clear. The need to truck in water to the community for 31 days in 2014 makes this a human right to water concern. Recent climate conditions and climate change projections would indicate that the loss of basic service will likely increase in duration and frequency.

How the Project Will Address the Need: The project will allow EID to continuously pump water from the Middle Fork Cosumnes River under nearly all conditions. The community will not need to rely on trucked water for its basic water supply needs.

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District (RLECWD)

Demonstration that Community Meets DAC Definition: RLECWD serves an estimated population of 10,936, based on its 2010 Urban Water Management Plan. RLECWD has been under a connection moratorium until very recently, so the population served is still assumed to be fairly accurate. Additionally, no new development has been approved by Sacramento County in the RLECWD service area since 2010.

As described in Attachment 7 of this Proposal, for DACs in the area, GIS data files were downloaded from DWR's DAC mapping tool. The proposed project and the RLECWD service area located in DAC Tract 7208 (note that the district service area has a larger geographic extent than this one tract). The population of Tract 7208 is 4,364, which constitutes 40 percent of the RLECWD service area population. Because the project is located within the heart of the known DAC, the most direct benefits will accrue to these DAC customers. **Based on the low income of the tract and the large percentage of households earning less than $45,000, it is reasonable to assume that at least 25 percent of the population served in Tract 7208 can be considered as a DAC**.

Water Related Need of the DAC: The project is needed because the well currently exceeds the primary maximum contaminant level (MCL) for hexavalent chromium. This violation of an MCL represents a clear health risk to these customers, so the need is great. This is also a human right to water concern for these DAC customers, because they have no alternative supply.

How the Project Will Address the Need: The project will directly address the need of the DAC by bringing the hexavalent chromium concentrations of this well below the MCL. As pilot studies of the treatment system at the well have already demonstrated its effectiveness, the benefits will be recognized.

Project Performance Monitoring Plan

A Project Performance Monitoring Plan has been prepared for each of the proposed projects below. These plans describe the tools that will be used to monitor project performance and interim targets that will be used to track each project's pace in meeting the benefits claimed in Table 5.

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District

Table 6 – Project Performance Monitoring Plan Project: Outingdale Water Intake		
Proposed Physical Benefits	Targets	Measurement Tools and Methods
Water Supply Produced	Up to 100 gallons per minute during low river stage shortage conditions*	Water meter –Supervisory Control and Data Acquisition (SCADA) readings
Greenhouse Gas Emissions (reduction in CO_2 production)	0 tons CO_2 emission per month	Trucking invoices and Sacramento Metropolitan Air Quality Management District Road Construction Emissions Model to estimate CO_2 emissions
Note: *Full plant flow is 100 gallons per minute. During low river stage shortage conditions, up to 8.39 acre-feet per year is expected.		

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District

Table 6 – Project Performance Monitoring Plan Project: Well 10 Hexavalent Chromium Treatment		
Proposed Physical Benefits	Targets	Measurement Tools and Methods
Water Supply Produced	400 acre-feet per year	Well flow meter
Water Quality (reduction in Hexavalent chromium concentration)	8 parts per billion (0.008 mg/L)	Certified laboratory sampling

Project 3: North Freeway Well Conversion

Implementing Agency: Sacramento County Water Agency

Table 6 – Project Performance Monitoring Plan Project: North Freeway Well Conversion		
Proposed Physical Benefits	Targets	Measurement Tools and Methods
Water Supply Produced	252 to 2017 acre-feet/year	Water meter – manual and Supervisory Control and Data Acquisition (SCADA) readings
Greenhouse Gas Emissions (reduction in CO_2 production)	93,753-738,197 reduction in CO_2 production	Downloads of electricity consumption data directly from the project site, and made available by SMUD. KWh saved can be converted to CO_2 data as needed.

Project 4: Regional Water Conservation Measures

Implementing Agency: Regional Water Authority

Table 6 – Project Performance Monitoring Plan Project: Regional Water Conservation Measures		
Proposed Physical Benefits	Targets	Measurement Tools and Methods
Water Supply Saved	Non-Revenue Water: 525 acre feet per year for 20 years, starting in 2016 and ending in 2035	The measurement tool will be the International Water Association (IWA) /American Water Works Association (AWWA)'s Water Audit Method. Each water agency will use the associated water audit software to produce a water loss report. The specific line item "Real Losses" categorized under "Non-Revenue Water" to track water savings progress. Reductions in water agency's real losses will be summarized to show water savings resulting from the implementation of this project. Water agencies already fill out this report on a regular basis. This method has been identified as a best management practice by the California Urban Water Conservation Council (CUWCC) and several other national and international organizations.
	Advanced Customer Systems Programs: 1,768 acre feet per year for 5 years, starting in 2016 and ending in 2020	Water meters at the individual properties will be used to calculate water savings. Pre- and post-project meter readings will be taken and used to calculate water savings. Meter data are the most accurate option for analyzing associated water savings.
Energy Saved	793,646 kilowatt-hours per year for 2016-2020 and 181,678 kilowatt-hours per year for 2021-2035	Directly based on water savings (above) and multiplied by regional energy intensity of 1,062 kilowatt hours per million gallon. A regional energy intensity is necessary because energy intensity varies between water agencies. This regional average is the most recent and available estimate.

Cost Effectiveness Analysis

A cost effectiveness analysis has been conducted for each of the proposed projects below. This analysis evaluates whether the physical benefits provided by each project are provided at the least possible cost. Table 7 was provided by DWR for this analysis.

Project 1: Outingdale Water Intake

Implementing Agency: El Dorado Irrigation District (EID)

Table 7 – Cost Effective Analysis Project Name: Outingdale Water Intake	
Question 1	Types of benefits provided as shown in Table 5: • *Primary Physical Benefit – Water Supply Produced* • *Secondary Physical Benefit – Greenhouse Gas Emissions (reduction in CO_2 production)*
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? *Yes*
	If no, why? *n/a*
	If yes, list the methods (including the proposed project) and estimated costs. *Alternatives considered previously include:* *1. Install a new pipeline to deliver water to the satellite community and abandon the water treatment plant and river intake. This alternative had an estimated construction cost of over $7,000,000 for the 6.8 miles of new water line required. The estimated costs, documented from other similar EID waterline installation projects, averaged $200/lineal foot.* *2. Bulk water hauling: This alternative was used in 2014 during low river flows. The cost of bulk water hauling averaged approximately $1,500 per day for truck costs. The water supplied was EID water from elsewhere in the distribution system. Costs were based off of 2014 trucking invoices.* *3. Improvements to the intake and pump station: This alternative proved to be the lowest capital cost (about $226,000 as shown in Attachment 4) and improved reliability of the intake and pump station, thereby reducing the number of site visits required by operators. The improved horizontal lateral well intake and submersible pump station provides the greatest reliability of success and continued water production by enabling water pumping despite low flows in the Middle Fork Cosumnes River. It will also eliminate the need to truck in water, thus eliminating greenhouse gas emissions.*
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. *The proposed project is the least cost alternative for EID*
Comments: *N/A*	

Project 2: Well 10 Hexavalent Chromium Treatment

Implementing Agency: Rio Linda/Elverta Community Water District (RLECWD)

Table 7 – Cost Effective Analysis Project name: Well 10 Hexavalent Chromium Treatment	
Question 1	Types of benefits provided as shown in Table 5: • *Primary Physical Benefit – Water Supply Produced* • *Secondary Physical Benefit – Water Quality (reduction in hexavalent chromium concentration)*
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? *Yes*
	If no, why? *n/a*
	If yes, list the methods (including the proposed project) and estimated costs. *Yes, several project alternatives to address RLECWD's water supply and water quality issues have been evaluated. Modification and a hexavalent chromium treatment system for Well 15 would cost around $3,200,000 and have a capacity of 2,800 gpm, Well 16 and Well 17 replacement would cost around $3,025,000 each and have a capacity of 1,500 gpm each, Well 2A hexavalent chromium treatment system would cost around $960,000 and have a capacity of 700 gpm, and Well 14 Arsenic/Manganese Treatment System reservoir and boosters would cost around $7,000,000 and have a capacity of 2,000 gpm. Description and costs of these alternatives are included in the District Water Supply Strategy (Carson, 2015).*
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. *The proposed project is the least cost alternative for RLECWD.*
Comments: *N/A*	

Project 3: North Freeway Well Conversion

Implementing Agency: Sacramento County Water Agency (SCWA)

Table 7 – Cost Effective Analysis Project Name: North Freeway Well Conversion	
Question 1	Types of benefits provided as shown in Table 5: • *Primary Physical Benefit – Water Supply Produced* • *Secondary Physical Benefit – Greenhouse Gas Emissions (reduction in CO_2 production)*
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? *No*
	If no, why? *The SCWA Northgate 880 service area does not have access to water sources other than groundwater. During drought events, there are opportunities for efficiently delivering water to the City of Sacramento through a nearby intertie under and existing wholesale agreement. Simply replacing the failed engine with another propane powered angle drive engine would not allow the well to be operated as an energy-efficient on-line well for potable water.*
	If yes, list the methods (including the proposed project) and estimated costs. *n/a*
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. *The proposed project is the preferred alternative to increase the production of water in service areas adjacent to the City of Sacramento for possible drought relief, and to achieve carbon reductions by converting to electrical systems. During peak usage, savings will be realized when SCWA no longer has to truck in propane regularly to fuel pumps.*
Comments: *N/A*	

Project 4: Regional Water Conservation Measures

Implementing Agency: Regional Water Authority

Table 7 – Cost Effective Analysis Project Name: Regional Water Conservation Measures	
Question 1	Types of benefits provided as shown in Table 5: • *Primary Physical Benefit – Water Supply Saved* • *Secondary Physical Benefit – Energy Saved*
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? *No*
	If no, why? *To achieve supply-side water savings, leak detection and repair is a widely accepted and successful practice. This practice also has the additional benefit of increasing the region's and water agency's water supply reliability by addressing the long-term concern of replacing and upgrading aging infrastructure. The American Water Works Association estimates that between 2011 and 2035, the western portion of the United States will need $83 million in drinking water main investment, not counting the additional $154 million needed for new mains to accommodate growth.* *To achieve demand-side water savings and continue to develop a conservation ethic at the individual customer level, Advanced Customer Systems Programs are the most appropriate choice because they have the ability to share detailed individual-specific data directly with customers. When customers are prompted with personalized information about their household water use, they are more likely to participate in savings programs. To develop a conservation ethic, water agencies need to provide information that resonates with that individual customer's water use. Tailored meter data are the only available way to do that. Data can be made available on a daily, weekly, and monthly frequency in some cases. This availability gives customers almost immediate feedback on their use. They can see their behavior changes directly reflected through reports provided by these programs. Furthermore, organizing the meter data in a way that can be useful to a customer necessitates public outreach expertise. Similar watering savings may be achieved through alternative conservation programs but none will provide the constant water use feedback needed to change longer-term water use behavior patterns.* *There is no substitute to direct public outreach efforts including water conservation messages, advertising buys on television, radio and online outlets such as AccuWeather.com and Facebook, and public workshops. Public outreach is needed to support all conservation programs.* *Energy savings directly depend on water savings.*
	If yes, list the methods (including the proposed project) and estimated costs. *n/a*

Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. *No other methods were evaluated to determine if this was the least cost alternative to achieve the desired water supply and energy savings. However it is the preferred alternative because it is a continuation of the region's current programs that have already proven to be successful (Mitchell, Chesnutt, 2013). Reducing non-revenue water through leak detection and repair is an integral part to water supply planning and management. Eight water agencies in the Sacramento region are already implementing various Advanced Customer Systems Programs including WaterSmart Software and Dropcountr. These current programs are achieving similar water savings as are anticipated with the proposed project. Implementation of the proposed project will be more seamless than other alternatives because the programs are already established. As a result, water savings will be achieved earlier and have already been proven to be successful.*
Comments: *Source for (Mitchell, Chesnutt, 2013) http://californiawaterfoundation.org/uploads/1389391749-Watersmart_evaluation_report_FINAL_12-12-13(00238356).pdf*	