Attachment 3

Greater Los Angeles County Region

IRWM Implementation Grant Proposal

Project Justification

Attachment 3 consists of the following items:

Project Justification. Attachment 3 provides a project description, estimated physical benefits, technical justification, a description of how claimed benefits can be achieved, and least cost alternative information for each project. Attachment 3 also provides a summary of how the proposed projects meet the needs created by the drought.

The *Greater Los Angeles County Prop. 84, Round 3, Part 1 Grant Application Proposal* involves implementation of fourteen projects to meet the region's water management needs:

1. Los Angeles-Burbank Groundwater System Interconnection Project
2. Mission Wells Improvement Project
3. Manhattan Well Improvement Project
4. Terminal Island Water Reclamation Plant (TIWRP) Advanced Water Purification Facility and Distribution System Expansion Project
5. Recycled Water Turnouts Project
6. Goldsworthy Desalter Expansion Project
7. Be a Water Saver Conservation Program Project
8. On-Site Recycled Water Retrofits Project
9. Upper San Gabriel Valley Municipal Water District (USGVMWD) Recycled Water Program Expansion Project
10. West Coast Basin Barrier Project Unit 12 Injection and Observation Wells Project
11. Rockhaven Well Project
12. Water Budget Based Rates Implementation Project
13. Well No. 2 Rehabilitation Project
14. Pomona Basin Regional Groundwater Project

For each of these projects, Attachment 3 contains a detailed project description, estimated physical benefits, technical justification, a description of how claimed benefits can be achieved, and least cost alternative information organized into the table format provided in the Drought Solicitation PSP. This attachment is organized to first provide the project summary table and the regional project map, then provide the project information listed above. Also included as part of this attachment are appendices containing the supporting documents listed as support for each project.

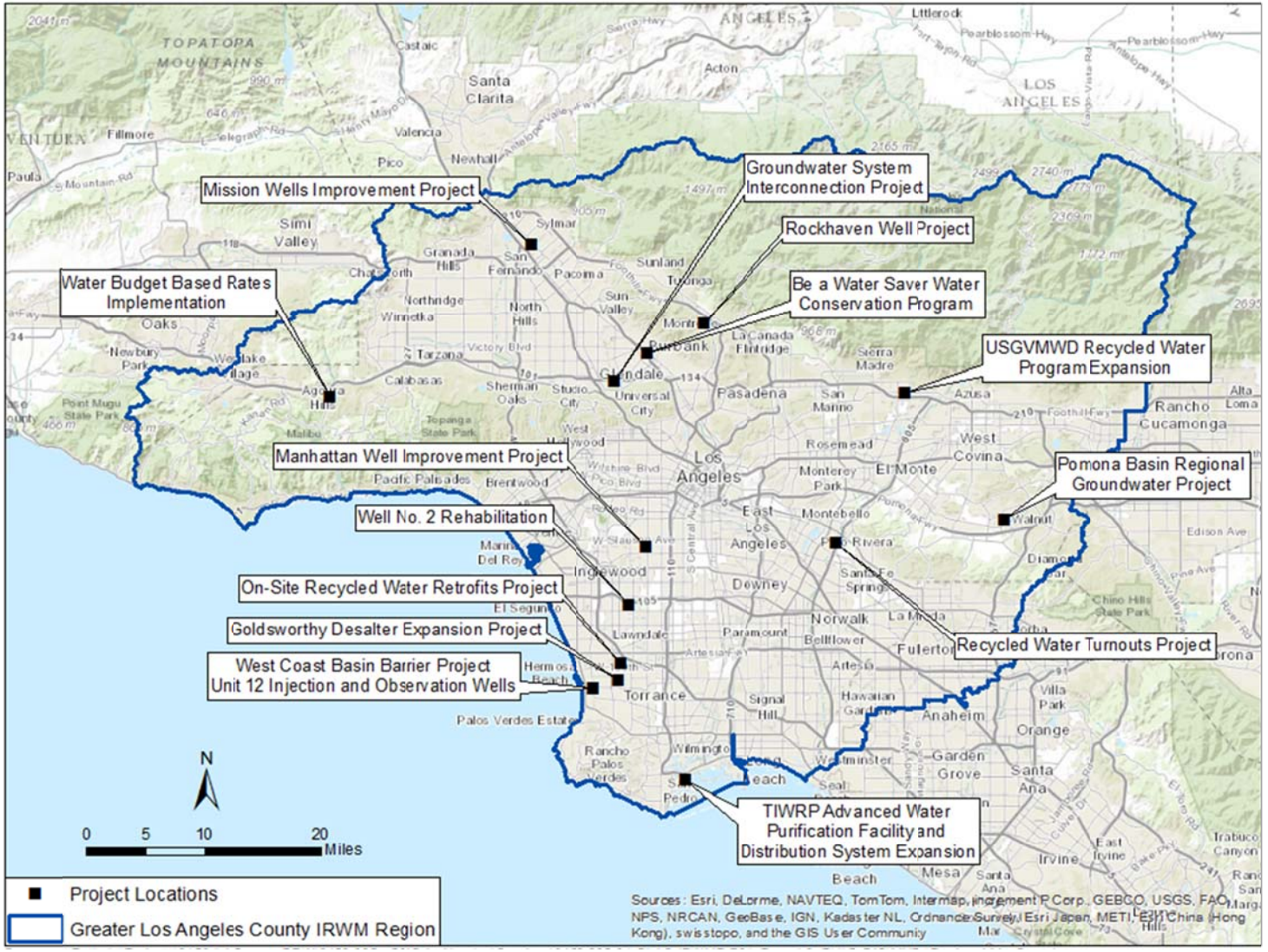
Project Summary Table

The following table (Table 4 in the PSP) provides information on how each project meets drought project elements and IRWM project elements. Each project meets at least one item in each of these categories. Please note that the Grant Administration Project does not apply. Further description of how each project will meet the drought project elements is included in the individual project descriptions that can be found later in this attachment.

	Project	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Drought Project Element	**LA-Burbank**	**Mission Wells Improvement**	**Manhattan Wells Improvement**	**TIWRP AWPF and Distribution System Expansion**	**Recycled Water Turnouts**	**Goldsworthy Expansion**	**Water Saver**	**On-Site Recycled Water Retrofits**	**Upper District**	**WCBBP**	**Rockhaven Well Project**	**Water Budget Based Rates Implementation**	**Well No. 2 Rehabilitation**	**Pomona Basin Regional Groundwater**
D.1	Provide immediate regional drought preparedness	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D.2	Increase local water supply reliability and the delivery of safe drinking water	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D.3	Assist water supplier and regions to implement conservation programs and measures that are not locally cost-effective														
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought				X								X		
	IRWM Project Element														
IR.1	Water Supply reliability, water conservation, and water use efficiency	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management							X							
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, monitoring							X					X		
IR.5	Groundwater recharge and management				X	X	X				X	X		X	X
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	X			X		X		X	X	X	X			X
IR.7	Water banking, exchange, reclamation, and improvement of water quality	X			X		X					X			X
IR.8	Planning and implementation of multipurpose flood management programs														
IR.9	Watershed protection and management						X	X					X		
IR.10	Drinking water treatment and distribution	X	X	X			X					X			X
IR.11	Ecosystem and fisheries restoration and protection				X								X		

Regional Map

Figure 3-1 provides a regional map that shows the Greater Los Angeles County IRWM Region boundaries and the project locations.



Los Angeles Department of Water and Power (LADWP)-Burbank Water and Power (BWP) Groundwater System Interconnection Project (Project)

Project Description

(25 Words) This Project will construct a pipeline to connect the LADWP and BWP distribution systems and provide additional groundwater from the Burbank Operable Unit to LADWP.

(Expanded) The Project will construct 2,000 linear feet of 8-inch ductile iron pipeline and appurtenances to connect the Los Angeles and Burbank potable water distribution systems, increasing the use of local groundwater by 1,700 acre-feet per year (AFY) and increasing utilization of the existing Burbank Operable Unit (BOU) treatment capacity. Presently, the BOU operates at less than full capacity, in particular during winter months, because the BWP service area does not have sufficient demands. The BOU is a U.S. Environmental Protection Agency (EPA) Superfund groundwater remediation facility with a capacity to produce 9,000 gallons per minute (gpm), or more than 12,000 AFY, of treated groundwater in the San Fernando Basin (SFB). The SFB is an aquifer that currently provides drinking water to over 800,000 residents. In 1980, concentrations of chlorinated volatile organic compounds (VOC), including trichloroethylene (TCE) and perchloroethylene (PCE), were found to be above the Federal Maximum Contaminant Levels (MCLs) and State Action Levels in the production wells. In response to the public health threat, overlying pumpers including BWP and LADWP were directed to shut down their wells and provide alternate sources of drinking water, blend contaminated well water with water from cleaner sources, and/or provide treatment for remediation. The BOU was implemented in response, but BWP does not fully utilize the existing BOU treatment capacity due to insufficient demands in their system. The current cleanup treatment regime consists of groundwater pumping and treatment using aeration and granular activated carbon (GAC) air filtering units, with conveyance of the treated water to LADWP's pumping station for chlorination and subsequent distribution in the public water supply.

This Project provides immediate regional drought preparedness by allowing LADWP to offset 1,700 AFY of critical and drought diminished State Water Project (SWP) water and other imported supplies with remediated groundwater from the SFB. Increasing the use of the existing BOU treatment capacity and providing a pipeline connection will allow LADWP to reduce purchases of imported water from both the SWP and Colorado River Aqueduct (CRA).

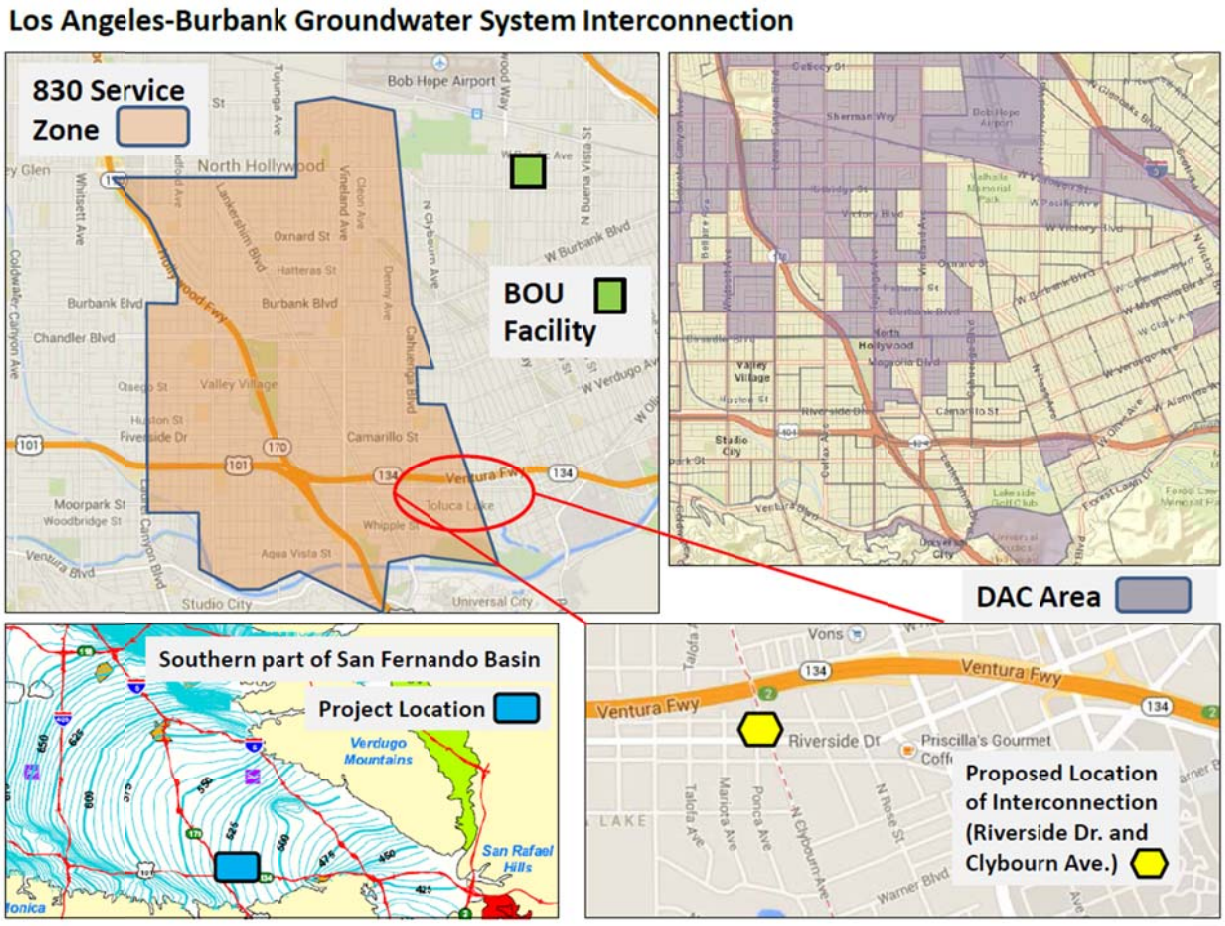
The Metropolitan Water District of Southern California (MWD) (LADWP's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. Although LADWP's constituents have paid for water storage investments, LADWP has maintained an aggressive conservation program during the drought. If drought conditions persist through 2014, it is anticipated that mandatory rationing within LADWP's service area could go into effect by spring 2015. The Project will assist LADWP in meeting a portion of these demands despite reductions in imported water allocations and storage supplies.

The Project increases local water supply reliability and the delivery of safe drinking water by offsetting 1,700 AFY of LADWP's imported water with remediated groundwater from the BOU. Investments in local supplies provide diversification to LADWP's service area and increase overall supply reliability. Presently, the BOU operates at less than full capacity, in particular during the winter months. Annual production has ranged from 10,000 to 11,364 AFY over the past three years, resulting in an average under-utilized capacity of 1,700 AFY. This local source will increase local water supply reliability and the delivery of safe drinking water by allowing the BOU to operate at capacity year round and supply that water to customers for safe drinking purposes. If this project is not implemented, 1,700 AFY of imported water will continue to strain the imported supplies which are already stressed from the previous drought of 2009-2011.

Expedited funding is needed for this Project to effectively increase the amount of groundwater remediation in the SFB and to expand the use of a substantial local drinking water supply in an area where this resource is already scarce. Funding will allow LADWP customers to quickly gain access to a more reliable local supply while improving the overall quality of the SFB.

Project Map

The figure below shows the facilities of the Project, located within the disadvantaged communities, LADWP's 830 service area that will receive the groundwater supply, and the location of the Project in City of Los Angeles.



Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Improve Water Quality
- Reduce Energy Usage
- Reduce Greenhouse Gas (GHG) Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The table below provides information on the benefit of increasing local water supplies and reliability by remediating additional groundwater within the SFB and conveying it to the LADWP service area. The Project will increase the amount of water being provided by 1,200 AFY for the year of construction and by 1,700 AFY during full implementation. This increase in local supplies will lead to a direct reduction in imported water demands.

Table 5 – Annual Project Physical Benefits

Project Name: Los Angeles-Burbank Groundwater System Interconnection Project
Type of Benefit Claimed: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
Units of the Benefit Claimed: AFY
Additional Information About this Benefit: Due to construction during some months in 2015, the amount of demand reduced in that year will be less than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 – Construction	0
2015	0	1,200	1,200
2016 - 2035	0	1,700	1,700

Comments:

- *Upper Los Angeles River Area (ULARA) Watermaster Report, 2011-2012 Water Year (May 2013), pages 3-11 and 3-12 and Appendix A Table, page A-1 Burbank Operable Unit Section.* This report discusses the capacity of the BOU and the appendix shows the current production rate.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, LADWP's service area uses an imported water blend of 85% SWP water, which comes from the Bay-Delta system, and 15% CRA water.

Table 5 – Annual Project Physical Benefits

Project Name: Los Angeles-Burbank Groundwater System Interconnection Project

Type of Benefit Claimed: Reduce Demands on the Bay-Delta

Units of the Benefit Claimed: AFY

Additional Information About this Benefit: The percentage of SWP water (vs. CRA water) that is reduced with the Project will proportionally reduce demands on the Bay-Delta ecosystem and help address the CALFED Bay-Delta Program objectives. The volumes below reflect only those reduced demands from the Bay-Delta. Due to construction during some months in 2015, the amount of demand reduced in that year will be less than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,445	1,445 – Construction	0
2015	1,445	425	1,020
2016 -2035	1,445	0	1,445

Comments:

- *Los Angeles Department of Water and Power 2010 Urban Water Management Plan, Chapter 8 Page 163.* This document states that LADWP uses MWD water to supplement other sources.
- *Personal communication with Chris Repp, LADWP*: Proportions of imported water used by LADWP (85% SWP/15% CRA).

Benefit #3 – Improve Water Quality

The table below provides information regarding increased use of existing BOU treatment capacity for groundwater remediation. Contaminants, such as TCE and PCE have been detected in the SFB at levels that are above the MCLs. As a result of the groundwater contamination, many production wells have been taken out of service by overlying pumpers. Due to this contamination, the residents have to rely on imported water that is purchased from MWD. BWP has indicated that the BOU removes approximately 0.45 pounds (lbs) of contaminants per acre-foot of water treated. This value is used to calculate the water quality benefit.

Table 5 – Annual Project Physical Benefits

Project Name: Los Angeles-Burbank Groundwater System Interconnection Project

Type of Benefit Claimed: Improve Water Quality

Units of the Benefit Claimed: lbs per year of water remediated

Additional Information About this Benefit: BWP has indicated that the BOU removes approximately 0.45 lbs of contaminants per acre-foot of water treated. Due to construction during some months in 2015, the amount of contaminants reduced in that year will be less than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 – Construction	0
2015	0	540	540
2016 -2035	0	765	765

Comments:

- *Per BWP via personal communication with Chad Lamacchia, LADWP*: Amount of contaminants currently removed at the BOU.

Benefit #4 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 85% SWP and 15% CRA) with remediated groundwater. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,850 kWh/AF of energy is used to provide imported supplies to LADWP. The average cost to pump groundwater in the SFB was $63/AF in 2004, which was updated to 2014 dollars as $86/AF. The energy requirements for remediation are assumed to be negligible compared to imported conveyance and groundwater pumping.

According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the SFB is approximately 483 kWh/AF. Over the 20-year lifespan on the Project, this totals approximately 79,289,613 kWh of conserved energy for an equivalent amount of AF.

Table 5 – Annual Project Physical Benefits

Project Name: Los Angeles-Burbank Groundwater System Interconnection Project

Type of Benefit Claimed: Reduce Energy Usage

Units of the Benefit Claimed: kWh/year

Additional Information About this Benefit: Values in column (d) show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from both SWP and CRA with pumped local groundwater. Due to construction during some months in 2015, the amount of energy conserved in that year will be less than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	4,845,000	4,845,000 – Construction	0
2015	4,845,000	2,004,775	2,840,225
2016 -2035	4,845,000	821,348	4,023,652

Comments:

- MWD of Southern California, 2007. *Groundwater Assessment Study*. Report Number 1308. – Chapter IV, Page IV-2-7 Table 2-3: Indicates groundwater pumping costs for the SFB of $63/AF in 2004.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* – Page 1: 17.8 cents per kWh paid for electricity in Los Angeles.
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Chris Repp, LADWP*: Proportions of imported water used by LADWP (85% SWP/15% CRA).

Benefit #5 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the extra energy needed for imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 1,700 AFY of blended imported water, the Project will avoid GHG emissions of approximately 1,322 metric tons (MT) per year of carbon dioxide (CO_2) equivalents per year (1,591 MT per year to import water versus 270 MT per year to pump groundwater). Over the 20-year lifespan of the Project, this totals approximately 26,032 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: Los Angeles-Burbank Groundwater System Interconnection Project
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT
Additional Information About this Benefit: The Project would avoid GHG emissions generated by the extra energy needed for imported water. Due to construction during some months in 2015, the amount of GHG emissions avoided in that year will be less than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,591	1,591 – Construction	0
2015	1,591	658	933
2016-2055	1,591	270	1,321

Comments:

- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total tons of CO_2 equivalents.
- *Personal communication with Chris Repp, LADWP*: Proportions of imported water used by LADWP (85% SWP/15% CRA).

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit:** 1,700 AFY	
Technical Basis of the Project	• *Upper Los Angeles River Area (ULARA) Watermaster Report, 2011-2012 Water Year (May 2013)* o Pages 3-11 and 3-12 discuss the capacity and production of the BOU. Appendix A Table (page A-1) shows the detailed extractions on a monthly basis. o The ULARA Watermaster Report compares the capacity of the BOU and the current extractions to show that additional remediated groundwater can be produced.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The SFB is known to have contamination, and it is also known that multiple treatment facilities (Operable Units) remediate groundwater from that basin. The BOU has the capacity to increase the volume of remediated groundwater from its current production.
Description and Estimates of Without-Project Conditions	Without implementation of this Project, it is estimated that 1,700 AFY of water from the SFB will not be produced and supplied to end users, requiring the continued use of imported water (85% SWP and 15% CRA).
Methods Used to Estimate the Physical Benefit	Estimates of increased local supply were determined by comparing the production capacity of the BOU to historical extraction records.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will install approximately 2,000 linear feet of 8-inch ductile iron pipe and appurtenances such as meters, valves, and sample locations. These will be installed to allow the water to flow from the BWP distribution system to the LADWP distribution system. A memorandum of understanding (MOU) is required between BWP and LADWP to detail the water exchange.
Any Potential Adverse Physical Effects	None. This Project produces local water from a facility with a history of effective operation.

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,020-1,445 AFY**	**540-765 lbs per year**	**2,840,225-4,023,652 kWh/year**	**933-1,321 MT/year**
Technical Basis of the Project	• *LADWP 2010 Urban Water Management Plan* o Discusses the usage of MWD water by LADWP to supplement other sources. Additional water supplied to LADWP from local sources, such as the SFB, will lead to a corresponding reduction in need for imported water. o Chapter 8: discusses the allocation of water from CRA and SWP. • *ULARA Watermaster Report, 2011-2012 Water Year (May 2013).* o Compares the capacity of the BOU and the current extractions to show that additional groundwater can be produced. o Pages 3-11 and 3-12 and Appendix A Table (page A-1).	• *ULARA Watermaster Report, 2011-2012 Water Year (May 2013).* o Describes the contamination of the SFB groundwater with PCE and TCE. o Plates 14 and 15: show PCE and TCE contamination plumes. • *U.S. EPA 5-Year Review of BOU (2004)* o Discusses implementation of remedial action at the BOU. o Chapter 4: summarizes remedial actions at the BOU. • *Per BWP via personal communication with Chad Lamacchia, LADWP:* o Amounts of contaminants in lbs/AF that is removed with treatment at the BOU.	• *Groundwater Assessment Study. Chapter 4 – Groundwater Basin Reports, SFB. Report Number 1308.* (MWD, *2007).* o Chapter IV, Page IV-2-7 Table 2-3: this indicates the groundwater pumping cost for the SFB. • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* o Page 1: Provides an estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007)* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total tons of CO_2 equivalents.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,020-1,445 AFY**	**540-765 lbs per year**	**2,840,225-4,023,652 kWh/year**	**933-1,321 MT/year**
	• P*ersonal communication with Chris Repp, LADWP:* o Provided proportion of imported water used by LADWP that is SWP water (85% SWP/15% CRA).		• P*ersonal communication with Chris Repp, LADWP:* o Provided proportion of imported water used by LADWP that is SWP water (85% SWP/15% CRA).	• P*ersonal communication with Chris Repp, LADWP:* o Provided proportion of imported water used by LADWP that is SWP water (85% SWP/15% CRA).
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	When LADWP has received more water from other sources, such as the Los Angeles Aqueduct or local groundwater, purchases from MWD are reduced a corresponding amount. Of the imported water, 85% is from the SWP and 15% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with remediated groundwater will reduce demands on the Bay-Delta.	In 1980, concentrations of contaminants, such as PCE and TCE were found to be above the MCLs and State Action Levels. The BOU removes these contaminants from the groundwater, producing a product water with levels below their respective MCLs.	The imported water delivered consumes energy to transport from the Bay-Delta and the CRA at a higher rate than remediating local groundwater.	The imported water delivered consumes energy to transport from the Bay-Delta and the CRA at a higher rate than remediating local groundwater. This energy usage generates GHG emissions that cause climate change.
Description and Estimates of Without-Project Conditions	Without the Project, imported supplies would continue to be used, proportionally 85% SWP and 15% CRA.	Without the Project, remediation of the SFB will proceed at a slower pace. Presently, the BOU operates at less than full capacity, particularly in winter months.	Without the Project, up to approximately 4,023,652 kWh/year of energy would be used to serve imported water.	Without the Project, up to approximately 1,321 MT of CO_2 equivalents per year would be generated.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,020-1,445 AFY**	**540-765 lbs per year**	**2,840,225-4,023,652 kWh/year**	**933-1,321 MT/year**
Methods Used to Estimate the Physical Benefit	Estimates of reduced imported water use were determined by comparing the production capacity of the BOU to historical extraction records. Proportionally, 85% SWP and 15% CRA water was applied to the total imported water offset.	Estimates of improved water quality were determined by analyzing the amount of contaminants exceeding MCLs.	The SWP and CRA imported water use volume and corresponding remediated groundwater volume was applied to the energy use estimates (contained in documents cited above) for conveying and treating supply sources. The difference between the project and imported water supplies was calculated.	The SWP and CRA imported water use volume and corresponding remediated groundwater volume was applied to the energy use estimates (contained in documents cited above) for conveying and treating all supply sources. The difference between the project and imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will install approximately 2,000 linear feet of 8-inch ductile iron pipe and appurtenances such as meters, valves, and sample locations. A MOU is required between the City of Burbank and City of Los Angeles to detail the water exchange.	The Project will install approximately 2,000 linear feet of 8-inch ductile iron pipe and appurtenances such as meters, valves, and sample locations. A MOU is required between the City of Burbank and City of Los Angeles to detail the water exchange.	The Project will install approximately 2,000 linear feet of 8-inch ductile iron pipe and appurtenances such as meters, valves, and sample locations. A MOU is required between the City of Burbank and City of Los Angeles to detail the water exchange.	The Project will install approximately 2,000 linear feet of 8-inch ductile iron pipe and appurtenances such as meters, valves, and sample locations. A MOU is required between the City of Burbank and City of Los Angeles to detail the water exchange.
Any Potential Adverse Physical Effects	None	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effectiveness Analysis **Project Name:** Los Angeles-Burbank Groundwater System Interconnection Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Improve Water Quality • Reduce Energy Usage • Reduce GHG Emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Alternative methods have not been considered.
	If no, why?	No other alternatives are available that can achieve the benefits described in Question 1 above for the following reasons: 1. Construction of a new groundwater remediation facility and associated extraction wells is prohibitive. 2. The existing BOU facility is already running with excess capacity available. 3. Maximizing efficiencies and production from existing facilities is more economical, timely, and cost-effective than constructing new facilities.
	If yes, list the methods (including the proposed project) and estimated costs.	Not applicable
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.**	Not applicable
Comments:		

Los Angeles Department of Water and Power (LADWP) Mission Well Improvement Project (Project)

Project Description

(25 Word) The Project will install three production wells, up to five monitoring wells, and new distribution infrastructure to supply groundwater to LADWP's existing potable distribution network.

(Expanded) The Mission Wells Improvement Project will restore approximately 3,077 AFY (from 2017 through 2031) and 2,477 AFY (from 2032 through 2066) of LADWP's production capacity and increase local safe drinking water supplies. The Project consists of two stages: Stage 1 installs up to five monitoring wells and three production wells (each with a capacity of 4 cubic feet per second [cfs]/2,900 AFY) at LADWP's Mission Wellfield in the Sylmar Basin as well as a pump station upgrade and a collector line (596 feet of 12-inch diameter pipeline); Stage 2 includes a Hypochlorite Generating Station to comply with the Safe Drinking Water Act - Stage 2 Disinfection Byproduct Rule. LADWP is requesting funding for Stage 1 of the Project which will restore the overall capacity to produce safe drinking water from under-utilized groundwater rights. Stage 2 is not needed to put water into the distribution system because water can be distributed with the current chlorination facility. However, Stage 2 will be completed in 2018 as part of required improvements for the City-wide conversion to chloramine disinfection.

The City of Los Angeles owns Court-adjudicated water rights to produce 3,570 of AFY of groundwater from the Sylmar Basin. However, these rights have been under-utilized, partly due to deteriorating infrastructure and TCE contamination. LADWP's recent groundwater production from Sylmar Basin (water year 2011-2012) was approximately 1,093 AF, less than half the annual entitlement. The new production wells will be installed in a deeper confined aquifer layer and will restore approximately 2,477 AFY (3,570 AFY – 1,093 AFY). In addition to the 3,570 AFY adjudicated rights and based on the Upper Los Angeles River Area (ULARA) Watermaster Report 2011-12, the Project will also allow LADWP to pump an "extra" 600 AFY for 15 years (for a total of 4,170 AFY). This will allow LADWP to use 9,014 AF of stored water credit and translates to a net supply increase of 3,077 AFY for the first 15 years of the Project.

This Project provides immediate regional drought preparedness by offsetting 3,077 (1st 15 years) and 2,477 AFY (subsequent 35 years) of critical and drought diminished SWP and other imported supplies with groundwater from the Sylmar Basin. Given that groundwater supply is available, the Project can be implemented rapidly and begin delivery of critical local supplies as early as 2016.

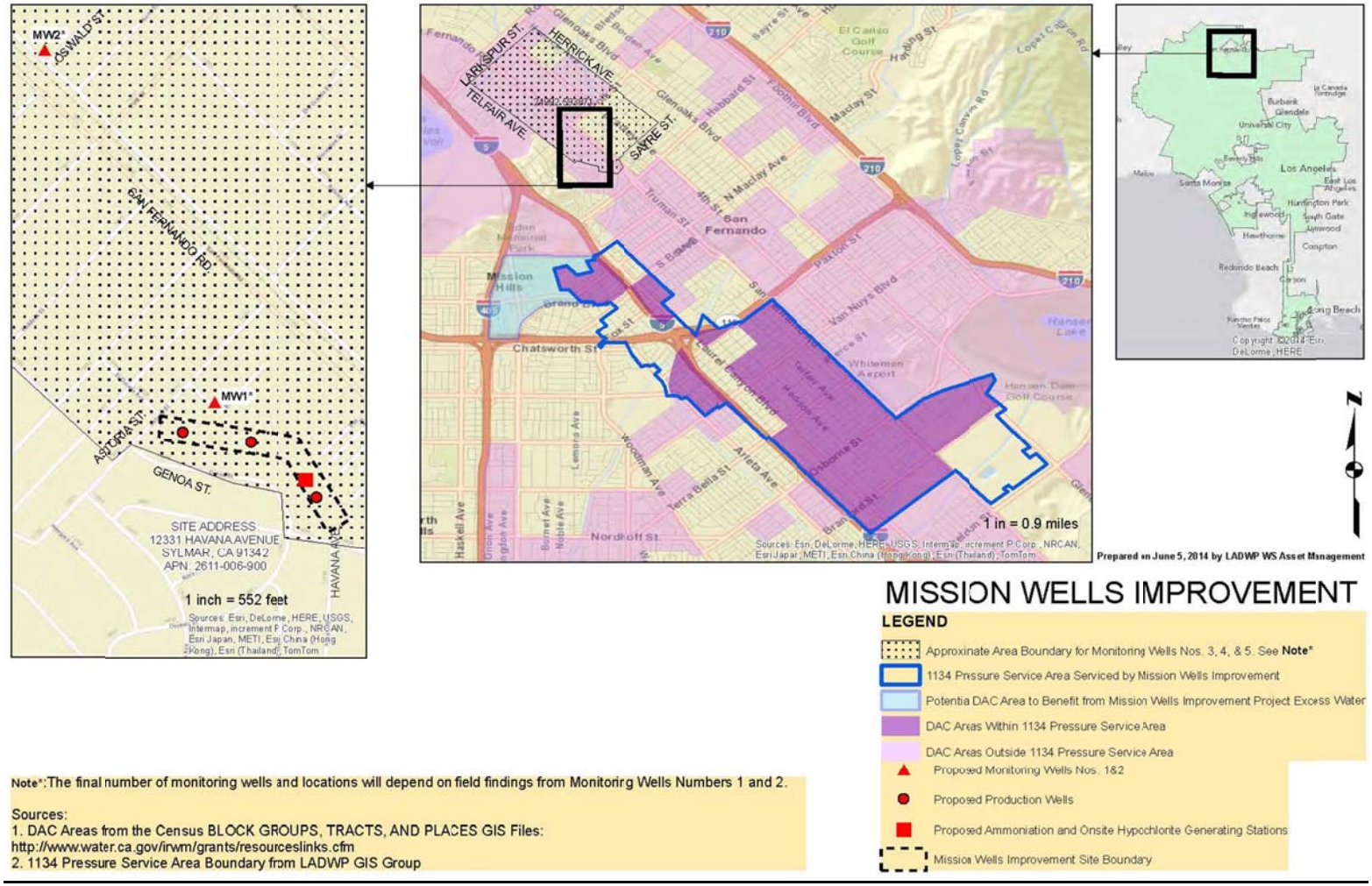
The MWD (LADWP's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. MWD and its member agencies have made significant investments over the years in developing storage reserves for the Southern California region for use during the dry-year periods to meet the regional demands. As a result of the current drought, MWD plans to draw significantly upon its storage reserves for the remainder of 2014. If drought conditions persist into 2015, MWD may implement its Water Supply Allocation Plan which would likely entail reducing supply allocations to its member agencies. LADWP has responded to the prior dry-year conditions by implementing Phase 2 of its aggressive water conservation ordinance and has successfully reduced water use by over 17 percent since the 2009 dry-year period. However, MWD supply reductions could impact LADWP customers and the entire Southern California region whereas higher levels of mandatory water use restrictions would need to be imposed in order to conserve significantly more water.

The Project increases local water supply reliability and the delivery of safe drinking water by increasing the ability to produce 2,477 to 3,077 AFY of additional groundwater and better utilize the LADWP's adjudicated water right in the Sylmar Basin. Investments in local supplies provide diversification to LADWP's service area, increase overall supply reliability and reduce dependence on more costly imported water from MWD. The production at LADWP's Mission Wellfield has decreased substantially in recent years, primarily due to deteriorating infrastructure and TCE contamination that impacts six of the seven existing production wells. With six wells off line, the service area's demand for imported water has increased. If this Project is not implemented, 2,477 to 3,077 AFY of imported water will continue to strain the imported supplies which are already stressed from the previous drought of 2009-2011.

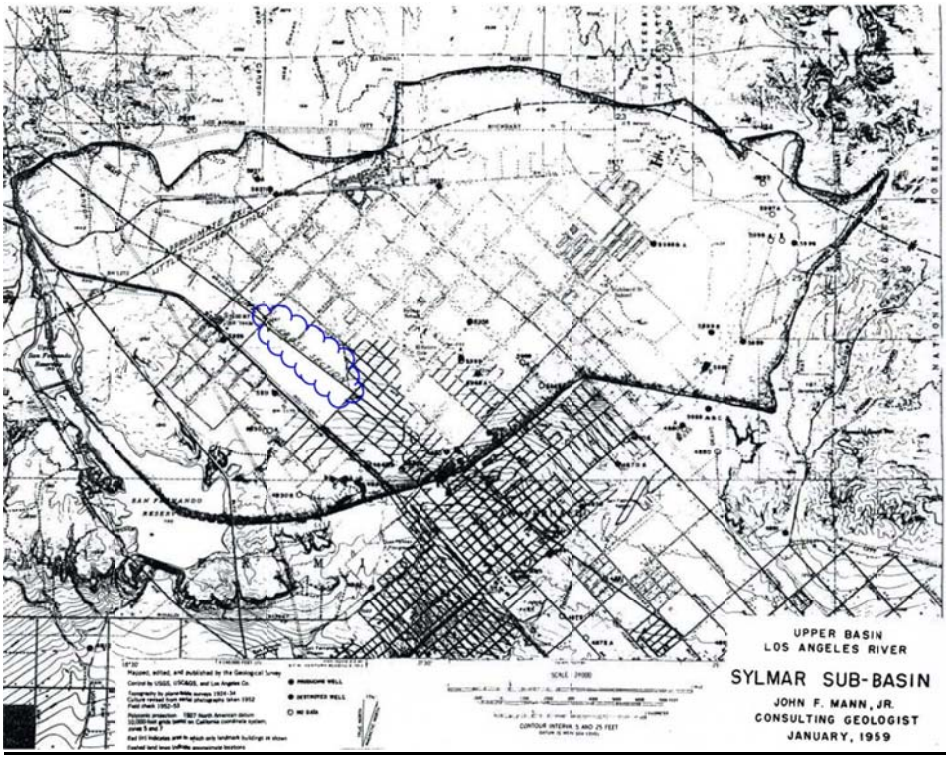
Expedited funding is needed for this Project to increase local groundwater production of safe drinking water as quickly as possible. The full Project scope is estimated to cost approximately $22,650,000 and is currently on schedule to begin construction in Summer 2014. The Project is part of a larger multi-phased project; however, only Stage 1 (for which grant funding is being requested) is needed to increase local safe drinking water supplies from the Sylmar Basin.

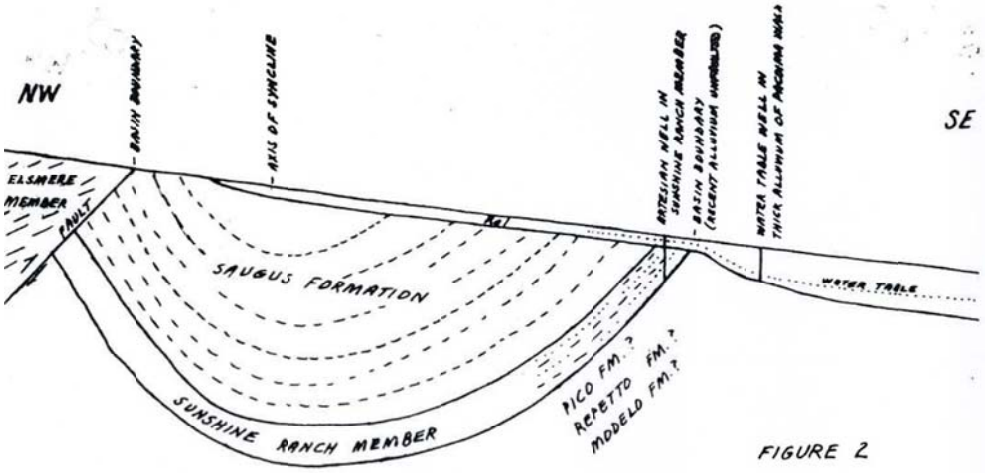
Project Map

The figure below shows the facilities of the Project, located within the disadvantaged communities, LADWP's 1134 pressure service area that will receive the groundwater supply, and the location of the Project in City of Los Angeles.



The figure below shows the Sylmar Basin area and the cross section of the groundwater basin.





DIAGRAMMATIC CROSS-SECTION—SYLMAR BASIN
JOHN F. MANN, JR. CONSULTING GEOLOGIST JANUARY 1959

Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Supplies/Reliability and Decrease Dependence on Imported Water Supply

This Project allows LADWP to pump their full adjudicated groundwater right of 3,570 AFY from the Sylmar Basin, a net increase of 2,477 AFY of supplies for safe drinking water. In addition to their 3,570 AFY adjudicated rights and based on the Upper Los Angeles River Area (ULARA) Watermaster Report 2011-12, the Project will also allow LADWP to pump an "extra" 600 AFY for 15 years (for a total of 4,170 AFY). This will allow LADWP to use 9,014 AF of stored water credit and translates to a net supply increase of 3,077 AFY for the first 15 years of the Project. The net increase for the subsequent 35 years is the original 2,477 AFY.

The table below provides information on the benefit of increasing local water supplies and reliability by replacing potable water with groundwater supply. This increase in local supplies will lead to a direct reduction in imported water demands since imported water is the more expensive water supply.

Table 5 – Annual Project Physical Benefits

Project Name: Mission Wells Improvement
Type of Benefit Claimed: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Measure: The volumes below show the increase in local water supply provided by replacing potable water use with groundwater. The first 15 years of the Project reflect a net supply increase of 3,077 AFY (including 600 AFY of stored groundwater credit) and the subsequent 35 years reflect a net supply increase of 2,477 AFY.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	1,093	1,093 - Construction	0
2017-2031	1,093	4,170	3,077
2032-2066	1,093	3,570	2,477

Comments:

- *ULARA Watermaster Report 2011-12 Water Year, Sylmar Basin:*
  - Table 2-9B (Total Extraction) and Table 2-10B (Extraction Rights) lists the City of Los Angeles annual amount of 1,093 AFY of groundwater pumped in 2011-12 and City of Los Angeles extraction rights of 3,570 AFY.
  - Table 2-11B lists the City of Los Angeles stored groundwater credit of 9,014 AF which is in addition to the annual groundwater rights of 3,570 AFY. Appendix L, Page 20, Item 8 – Section f and g states City of Los Angeles can increase their extraction rights of 3,570 AFY by 600 AFY for a total of 4,170 AFY.
  - *Mission Wells Facility Improvement Project Phase II, Scope of Work Document*, August 2011: Establishes the production capacity of the new production wells.

Benefit #2 – Decrease Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, LADWP's service area uses an imported water blend of 85% SWP, that comes from the Bay-Delta system, and 15% CRA. The first 15 years of the Project reflect a decrease in Delta demands 2,615 AFY (as explained under Benefit #1) and the subsequent 35 years reflect a decrease in Delta demands of 2,105 AFY.

Table 5 – Annual Project Physical Benefits

Project Name: Mission Wells Improvement
Type of Benefit Claimed: Decrease Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The local supply benefit provided by the Project will offset 3,077 AFY of LADWP's imported water for the first 15 years (2017-2031) and will offset 2,477 AFY of imported water for the remaining lifespan of the Project (2032-2066). Of the imported water, 85% is supplied by the SWP water which is from the Bay-Delta. The volumes below show the reduction in demands on the Delta.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	2,615	2,615 - Construction	0
2017-2031	2,615	0	2,615
2032-2066	2,615	510	2,105

Comments:

- *ULARA Watermaster Report, 2011-12 Water Year,Sylmar Basin:* Table 2-9B (Total Extraction), Table 2-11B (Stored Groundwater Credits), Appendix L, Page 20, Item 8 – Section f and g. The document establishes City of Los Angeles extraction rights of 3,570 AFY, stored groundwater credits of 9,014 AFY and the amount pumped in 2011-12 from the Sylmar Basin.
- *Personal communication with Chris Repp, LADWP:* Proportions of imported water used by LADWP (85% SWP/15% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 85% SWP and 15% CRA) with Sylmar Basin groundwater. Approximately 3,000 kWh /AF are required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,850 kWh/AF of energy is used to provide imported supply to LADWP.
The average cost to pump groundwater in the Sylmar Basin was $63/AF in 2004 which is updated to 2014 dollars as $86/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the Sylmar Basin is approximately 483 kWh/AF. The energy requirements for chlorination are assumed to be negligible compared to imported conveyance and groundwater pumping. By offsetting the demand of 3,077 AF of imported water from 2017 through 2031, approximately 7,282,810 kWh/year of energy will be saved. From 2032 through 2066, only 2,477 AF of imported water will be offset (as explained under Benefit #1) and approximately 5,862,697 kWh/year of energy will be saved. Over the 50-year lifespan of the Project, this totals 314,436,545 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits

Project Name: Mission Wells Improvement
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column b show the amount of energy required to import 3,077 AFY of imported water from SWP and CRA. Values in column c show the amount of energy required to pump 3,077 (2014-3031) and 2,477 AFY (2032-2066) of groundwater. In years 2032 through 2066, energy to import 600 AFY is also included, therefore increasing the amount of energy used. Values in column d show the amount of energy saved thorough implementation of the Project. More energy will be saved for the first 15 years as LADWP will use stored groundwater credits to offset more imported water.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	8,769,450	8,769,450 – Construction	0
2017-2031	8,769,450	1,486,640	7,282,810
2032-2066	8,769,450	2,906,753	5,862,697

Comments:

- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Report Number 1308. – Chapter IV, page IV-2-7, Table 2-3: Indicates groundwater pumping costs for Sylmar Basin of $63/AF.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*. – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Mission Energy GHGs Calculations:* Energy calculations

Benefit #4 – Reduce GHG Emissions

The table below provides the estimated reduction in GHG provided through the offset of imported water (85% SWP and 15% CRA blend) with groundwater pumped from the Sylmar Basin. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 3,077 AF of imported water from 2017 through 2031, the Project will avoid GHG emissions of approximately 2,392 MT per year of CO_2 equivalents (2,880 MT per year to import water versus 488 MT per year to pump groundwater). From 2032 through 2066, only 2,477 AF of imported water will be offset, and approximately 1,927 MT per year of CO_2 equivalents will be emitted (2,880 MT per year to import water versus 953 MT per year to pump groundwater and import 600 AFY). Over the 50-year lifespan of the Project, this totals approximately 103,261 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: Manhattan Wells Improvement
Type of Benefit Claimed: Reduce GHG Emissions
Units of Benefit Claimed: MT of CO_2
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced as the results of replacing imported water from both SWP and CRA with groundwater pumped from the Sylmar Basin. Values in column b show the amount of GHG emissions used to import 3,077 AFY of imported water from SWP and CRA. Values in column c show the amount of GHG emissions emitted when 3,077 (2014-3031) and 2,477 AFY (3032-2066) of groundwater is pumped. In years 2032 through 2066, energy to import 600 AFY is also included, therefore increasing the amount of GHG emissions emitted. More GHG emissions will be reduced for the first 15 years as LADWP will use their stored groundwater credits to offset imported water.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	2,880	2,880 – Construction	0
2017-2031	2,880	488	2,392
2032-2066	2,880	955	1,925

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Mission Energy GHGs Calculations:* GHGs calculations
- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit:** 2,477-3,077 AFY	
Technical Justification of Physical Benefit	• *ULARA Watermaster Report 2011-12 Water Year, Sylmar Basin* o Table 2-9B (Total Extraction) o Table 2-10B (Extraction Rights) o Table 2-11B (Stored Groundwater Credits) o Appendix L, Page 20, Item 8 – Section f and g The document establishes City of Los Angeles extraction rights of 3,570 AFY and stored groundwater credits of 9,014 AFY. LADWP will pump an extra 600 AFY for 15 years to their 3,570 AFY adjudicated rights (total of 4,170 AFY) to use their stored groundwater credits. In the 2011-12 Water Year, LADWP pumped 1,093 AFY from Sylmar Basin. This Project will increase the groundwater pumping by 3,077 AFY (4,170 AFY -1,093 AFY) for the first 15 years and 2,477 AFY (3,570 AFY – 1,093 AFY) for the remaining lifespan of the Project, to enable full extraction of the groundwater rights amount as well as use their stored groundwater credits. • *Mission Wells Facility Improvement Project Phase II, Scope of Work Document*, August 2011; Page 16 The document establishes the production capacity of the new production wells.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The Mission Wells Improvement is a restoration/upgrade to an existing deteriorated facility. Six of the seven existing production wells are out of service and are unlikely to be returned to service soon. Only 1,093 AFY was pumped from the Sylmar Basin by LADWP in 2011-12. Therefore, the remainder of LADWP's groundwater rights are unused and are being compensated by purchased imported water. Restoration of LADWP's pumping capacity would allow full utilization of local groundwater pumping rights in the Sylmar Basin.
Description and Estimates of Without-Project Conditions	Without the Project, LADWP would continue to serve approximately 3,077 AFY of imported water to their 1134 pressure service area instead of groundwater. According to MWD, the average cost of Tier 1 treated water for 2014 is $890/AF. Therefore, the average cost to supplement the deficit of 3,077 AF would be approximately $2.7M per year.
Methods Used to Estimate the Physical Benefit	Estimates of groundwater pumped from Sylmar Basin for the City of Los Angeles are based on ULARA Watermaster Report 2011-12 Water Year, Sylmar Basin. The capacity of the three new production wells is estimated to be 12cfs (8,700 AFY). The operation of the wells will be based on LADWP's operational needs, the adjudicated water rights and stored groundwater credits.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Production wells, monitoring wells, collector line, and pump station upgrade are included in the Project scope.
Any Potential Adverse Physical Effects	There will be no potential adverse physical effects.

Secondary Physical Benefit

Type of Physical Benefit:	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount/ Volume and Unit:	**2,105 – 2,615 AFY**	**5,862,697 – 7,282,810 kWh/year**	**1,925 – 2,392 MT/year**
Technical Justification of Physical Benefit	• *ULARA Watermaster Report, 2011-12 Water Year,Sylmar Basin:* o Table 2-9B (Total Extraction) o Table 2-11B (Stored Groundwater Credits) o Appendix L, Page 20, Item 8 – Section f and g ▪ The document establishes City of Los Angeles extraction rights of 3,570 AFY, stored groundwater credits of 9,014 AFY and the amount pumped in 2011-12 from the Sylmar Basin. • *Personal communication with Chris Repp, LADWP:* o Provided proportions of imported water used by LADWP (85% SWP/15% CRA).	• Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study. Report Number 1308. – Chapter IV:* o Page IV-2-7, Table 2-3: Indicates groundwater pumping costs for Sylmar Basin of $63/AF. • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County:* o Page 2: 17.8 cents per kWh paid for electricity in Los Angeles • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007.* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water • *Mission Energy GHGs Calculations:* GHGs calculations	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007:* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water. • *Mission Energy GHGs Calculations:* GHGs calculations • *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009):* o Section 3: Document converts energy saved to a reduction in emissions of CO_2 equivalents
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Six of the seven existing production wells are out of service and are unlikely to be returned to service soon. Only 1,093 AFY was pumped from the Sylmar Basin by LADWP in 2011-12. Therefore, the remainder of LADWP's groundwater rights are unused and are being compensated by purchased imported water. Of the imported water, 85% is from the SWP and 15% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta,	Six of the seven existing production wells are out of service and are unlikely to be returned to service soon. Only 1,093 AFY was pumped from the Sylmar Basin by LADWP in 2011-12. Therefore, the remainder of LADWP's groundwater rights are unused and are being compensated by purchased imported water. Imported water	The imported water delivered to the Project service area requires energy to transport from the Bay-Delta and the CRA at a higher rate than local groundwater. This energy usage generates GHG emissions that cause climate change.

Type of Physical Benefit:	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount/ Volume and Unit:	**2,105 – 2,615 AFY**	**5,862,697 – 7,282,810 kWh/year**	**1,925 – 2,392 MT/year**
	so the offset of this portion of the imported water supply with groundwater will reduce demands on the Bay-Delta.	delivered to the Project area requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater pumping. Restoration of LADWP's pumping capacity would allow full utilization of their local groundwater pumping rights and avoid using the energy needed to convey imported water.	
Description and Estimates of Without-Project Conditions	Without the Project, LADWP would continue to serve 2,477 to 3,077 AFY of imported water to their 1134 pressure service area. Since 85% of the imported water is from the SWP, 2,105 to 2,615 AFY would continue to be supplemented by the Delta.	Without the Project, 8.8 million kWh/year of energy would be used to serve 2,477 to 3,077 AFY of imported water to the 1134 pressure service area, which is 5.9 to 7.3 million kWh/year more than the energy required to serve local groundwater to this area.	Without the Project, 2,880 MT of CO_2 equivalents per year would be emitted by serving 2,477 to 3,077 AFY of imported water to the 1134 pressure service area, which is 1,925 to 2,392 MT of CO_2 equivalents per year more than the emissions generated by serving local groundwater to this area.
Methods Used to Estimate the Physical Benefit	Estimates of groundwater pumped from Sylmar Basin for the City of Los Angeles are based on ULARA Watermaster Report 2011-12 Water Year, Sylmar Basin. The capacity of the three new production wells is estimated to be 12cfs (8,700 AFY). The operation of the wells will be based on LADWP's operational needs, the adjudicated water rights and stored groundwater credits. Proportions of imported water that are from SWP and CRA	The SWP and CRA imported water use volumes and corresponding groundwater volumes were applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the Project compared to imported water supplies was calculated. Energy estimates for conveyance of	The SWP and CRA imported water use volumes and corresponding groundwater volumes were applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the Project compared to imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in

Type of Physical Benefit:	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount/ Volume and Unit:	**2,105 – 2,615 AFY**	**5,862,697 – 7,282,810 kWh/year**	**1,925 – 2,392 MT/year**
		SWP and CRA water supplies were compared to the energy estimate for pumping groundwater.	emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Production wells, monitoring wells, collector line, and pump station upgrade are included in the Project scope.	Production wells, monitoring wells, collector line, and pump station upgrade are included in the Project scope.	Production wells, monitoring wells, collector line, and pump station upgrade are included in the Project scope.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effectiveness Analysis **Project name:** Mission Wells Improvement Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Decrease Demands on Bay-Delta • Reduce Energy Usage • Reduce GHG Emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Alternative methods have not been considered.
	If no, why?	Not applicable
	If yes, list the methods (including the proposed project) and estimated costs.	No other alternatives are available that can achieve the benefits described in Question 1 above for the following reasons: 1. There are no other local supplies in the vicinity. The remaining production well pumps 1,350 gpm and cannot provide LADWP's extraction rights. The three new production wells will have the 4,350 AFY (3,750 AFY + 600 AFY) capacity needed to pump the full adjudicated rights and stored groundwater credits. 2. More strain will be placed on areas that rely on imported water over the 50-year design life of the proposed new wells.
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.**	Not applicable
Comments:		

Los Angeles Department of Water and Power (LADWP) Manhattan Well Improvement Project (Project)

Project Description

(25 Word) The Project will install eight production wells and distribution infrastructure to support an additional 4,200 AFY of local groundwater supply for LADWP's existing distribution network.

(Expanded) The Project will install eight production wells, well collector lines, and related infrastructure in the existing Manhattan Wellfield to increase LADPW's local water supplies by an average of 4,200 AFY. The City of Los Angeles owns Court-adjudicated water rights to produce 15,000 AFY of groundwater from the Central Basin. However, these rights have been under-utilized, partly due to industrial contamination, contamination with volatile organic compounds, and advanced mechanical deterioration impacting four of the six existing production wells. Moreover, the remaining two wells are nearing the end of their effective useful life. Production over the recent 10 years has averaged approximately 10,800 AFY and has been steadily decreasing. The full capacity of the eight new wells is 23,200 AFY, which is more than needed to pump the full groundwater right in an average year. The Project will replace the six existing wells and add two other wells, for a total of eight (each with a capacity of 4 cfs/23,200 AFY) and collector line (1,000 feet of 30-inch diameter pipeline). The new wells will be drilled into deeper, higher-quality aquifers to avoid contamination issues.

Separately from the grant-funded Project, LADWP is investigating the Manhattan Wellfield to identify the in situ water quality within each of the confined aquifers. This is to confirm that water produced from the deeper aquifers will be free of contamination. Finding contaminants in the deeper aquifers is considered a low risk considering the multiple confining layers which separate the various water bearing zones of the Central Basin. However, if contaminants are discovered in the deep zone(s), wellhead treatment consisting of liquid-phase granular activated carbon and/or advanced oxidation will be deployed to address the volatile organic compounds. Such treatment would be readily installed using pre-packaged treatment unit(s) at the required location and according to the schedule in Attachment 6. LADWP is committed to funding any additional cost of treatment if needed, independent of the IRWM grant funding.

This Project provides immediate regional drought preparedness by offsetting an average of 4,200 AFY of critical and drought diminished SWP and other imported supplies with local groundwater supplies from the Central Basin. The Project can be implemented rapidly and begin delivery of critical local supplies by as early as 2017.

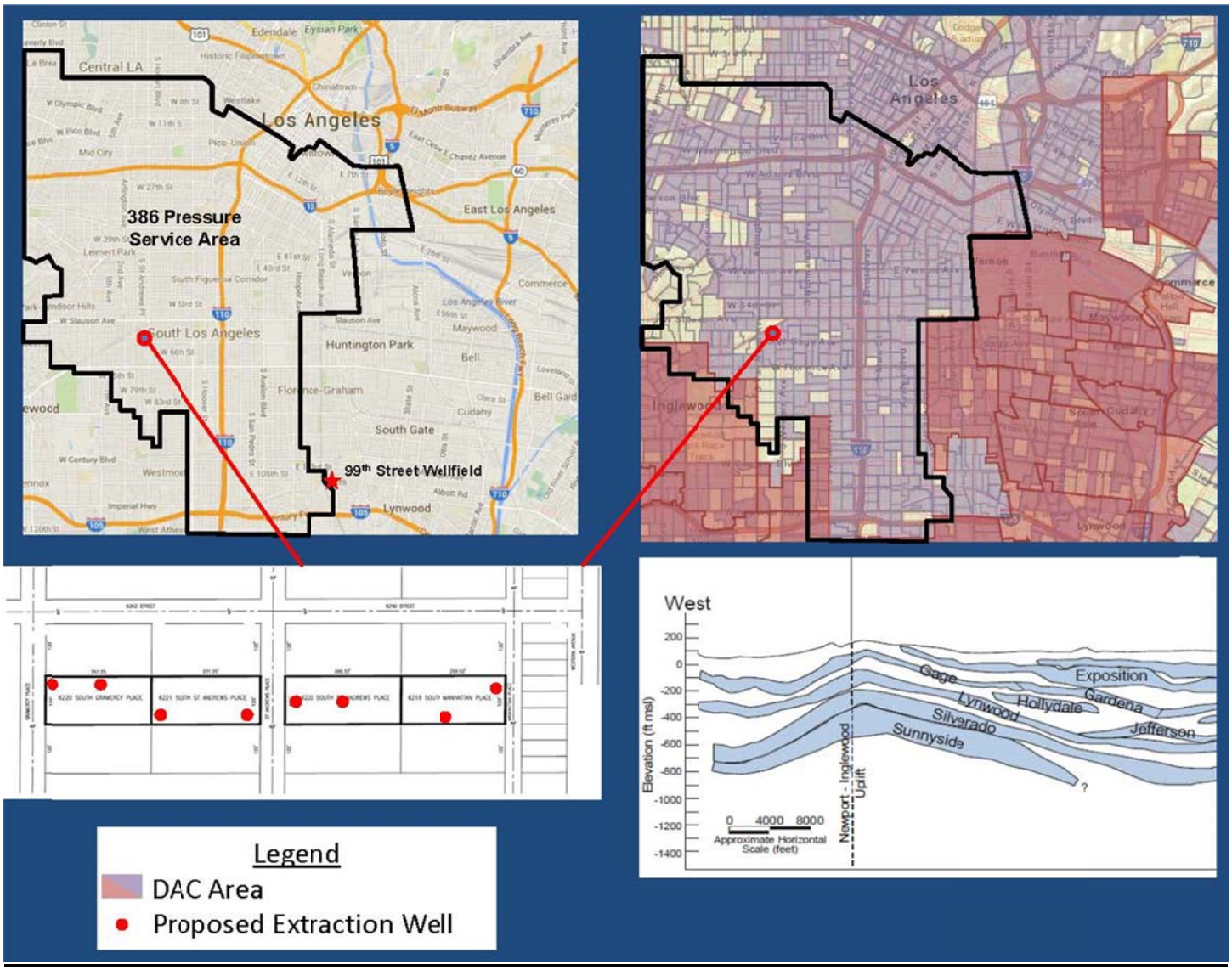
The MWD (LADWP's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. MWD and its member agencies have made significant investments over the years in developing storage reserves for the Southern California region for use during the dry-year periods to meet the regional demands. As a result of the current drought, MWD plans to draw significantly upon its storage reserves for the remainder of 2014. If drought conditions persist into 2015, MWD may implement its Water Supply Allocation Plan which would likely entail reducing supply allocations to its member agencies. LADWP has responded to the prior dry-year conditions by implementing Phase 2 of its aggressive water conservation ordinance and has successfully reduced water use by over 17 percent since the 2009 dry-year period. However, MWD supply reductions could impact LADWP customers whereas higher levels of mandatory water use restrictions would need to be imposed in order to conserve significantly more water. This Project supports LADWP in the use of local supplies to meet demands during these drought periods.

The Project increases local water supply reliability and the delivery of safe drinking water by increasing the ability to produce more local groundwater and better utilize the LADWP's adjudicated water rights. Investments in local supplies provide diversification to LADWP's service area, increase overall supply reliability and reduce dependence on more costly imported water from MWD. If this Project is not implemented, 4,200 AFY of imported water will continue to strain imported supplies which are already stressed from the previous drought of 2009-2011.

Expedited funding is needed for this Project to increase local groundwater production of safe drinking water as quickly as possible. The full Project scope is estimated to cost approximately $25,000,000 and is currently on schedule to begin construction in Fall 2014. The Project is not part of a larger multi-phased Project as the distribution system is preexisting and no additional improvements are needed for the Project to be fully implemented and operational.

Project Map

The figure below shows the Project location within LADWP's 386 pressure service area, the facilities of the Project, the disadvantaged communities in the Project area and the target aquifer in Central Basin where groundwater pumping will occur.



Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Supplies/Reliability and Decrease Dependence on Imported Water Supply

The table below provides information on the benefit of increasing local water supplies and reliability by replacing potable water with groundwater supply. This increase in local supplies will lead to a direct reduction in the need for more costly imported water, which is a highly variable and currently unreliable water supply. The value of this benefit is based on the 10-year average production from five of the six existing wells. With eight new wells replacing six old wells, the full production capacity will increase to 17,400 AFY, more than enough to produce LADWP's 15,000 AFY groundwater right in the Central Basin.

Table 5 – Annual Project Physical Benefits

Project Name: Manhattan Wells Improvement
Type of Benefit Claimed: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The volumes below show the increase in local water supply provided by replacing imported water use with groundwater. The value of this benefit is based on the 10-year average production from five of the six existing wells as compared to the capacity of eight new wells.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	10,800	8,920 - Construction	0
2017	10,800	15,000	4,200
2018-2066	10,800	15,000	4,200

Comments:

- *Watermaster Service in the Central Basin, 2003 through 2013 Reports, Table 2:* Lists the City of Los Angeles annual amount of groundwater pumped. The 2003-2013 average was used to determine the amount of groundwater pumped from Central Basin.
- *Manhattan Wells Improvement (Restoration) Project, Scope of Work Document*, June 2011, Page 14: Establishes the production capacity of the new production wells.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, LADWP's service area uses an imported water blend of 85% SWP that comes from the Bay-Delta system, and 15% CRA water.

Table 5 – Annual Project Physical Benefits

Project Name: Manhattan Wells Improvement
Type of Benefit Claimed: Decrease Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The local supply benefit provided by the Project will offset an average of 4,200 AFY of LADWP's imported water, 85% of which is SWP water from the Bay-Delta. The volumes below show the reduction in demands on the Delta.

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	3,570	3,570 - Construction	0
2017	3,570	0	3,570
2018-2066	3,570	0	3,570

Comments:

- *Personal communication with Chris Repp, LADWP:* Proportions of imported water used by LADWP (85% SWP/15% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 85% SWP and 15% CRA) with Central Basin groundwater. Approximately 3,000 kWh /AF are required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,850 kWh/AF of energy is used to provide imported supply to LADWP.

The average cost to pump groundwater in the Central Basin was $65/AF in 2007 which is updated to 2014 dollars as $78/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the Central Basin is approximately 437 kWh/AF. The energy requirements for chloramination are assumed to be negligible compared to imported conveyance and groundwater pumping. By offsetting the demand of 4,200 AF of imported water, approximately 10,136,500 kWh/year of energy will be saved by the Project. Over the 50-year lifespan of the Project, this totals 506,820,000 kWh of conserved energy.

Table 5 - Annual Project Physical Benefits

Project Name: Manhattan Wells Improvement
Type of Benefit Claimed: Reduce Energy Usage
Units of Benefit Claimed: kWh
Additional Information About this Benefit: Values in column b show the amount of energy required to convey 4,200 AFY of imported water from SWP and CRA. Values in column c show the amount of energy required to pump 4,200 AFY of groundwater. Values in column d show the amount of energy saved thorough implementation of the Project.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	11,970,000	11,970,000 - Construction	0
2017	11,970,000	1,833,500	10,136,500
2018-2066	11,970,000	1,833,500	10,136,500

Comments:

- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Report Number 1308. – Chapter IV, page IV-4-7, Table 4-3: Indicates groundwater pumping costs for Central Basin of $65/AF.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*. – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles.
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Manhattan Energy GHGs Calculations:* Energy calculations

Benefit #4 – Reduce GHG Emissions

The table below provides the estimated reduction in GHG provided through the offset of imported water (85% SWP/15% CRA blend) with groundwater pumped from the Central Basin. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 4,200 AF of imported water, the Project will avoid GHG emissions of approximately 3,329 MT per year of CO_2 equivalents per year (3,931 MT per year to import water versus 602 MT per year to pump groundwater). Over the 50-year lifespan of the Project, this totals approximately 166,440 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: Manhattan Wells Improvement
Type of Benefit Claimed: Reduce GHGEmissions
Measure of Benefit Claimed (Name of Units): MT
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced as the result of replacing imported water from both SWP and CRA with groundwater pumped from the Central Basin.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2016	3,931	3,931 - Construction	0
2017	3,931	602	3,329
2018-2066	3,931	602	3,329

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Manhattan Energy GHGs Calculations:* GHGs calculations
- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit** 4,200 AFY	
Technical Justification of Physical Benefit	• *Watermaster Service in the Central Basin*, 2003 through 2013 Reports; Table 2 o The documents establish that City of Los Angeles pumped an average of 10,800 AFY from Central Basin in the past 10 years (2003-2013). The Project (4,200 AFY) will restore the difference between LADWP's current capacity and LADWP's allowed pumping allocation (APA) of 15,000 AF/yr. • *Manhattan Wells Improvement (Restoration) Project, Scope of Work Document*, June 2011; Page 14 o The document establishes the production capacity of the new production wells.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Four of the six existing production wells at the Manhattan Wellfield are out of service and are unlikely to be returned to service soon due to advanced deterioration and shallow contamination. The other two wells are nearing the end of their useful service lives. Therefore, the remainder of LADWP's APA is unused and is being compensated by purchased imported water. Restoration of LADWP's pumping capacity would allow full utilization of local groundwater pumping rights.
Description and Estimates of Without-Project Conditions	Without the Project, LADWP would to continue to serve imported water to their 386 pressure service area. According to MWD, the average cost of Tier 1 treated water for 2014 is $890/AF. Therefore, the average cost to supplement the deficit of 4,200 AF would be approximately $3.7M per year.
Methods Used to Estimate the Physical Benefit	Estimates of groundwater pumped from Central Basin for the City of Los Angeles are based on Central Basin pumping records and expected capacities of new wells.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Eight production wells, well collector lines, and related infrastructure in the existing Manhattan Wellfield.
Any Potential Adverse Physical Effects	None. LADWP is restoring their allowed pumping capacity that has diminished due to age and industrial contamination.

Secondary Physical Benefits

Type of Physical Benefit:	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount/ Volume and Unit:	**3,570 AFY**	**10,136,500kWh**	**3,329 MT/year**
Technical Basis of the Project	• *Watermaster Service in the Central Basin, 2003 through 2013 Reports, Table 2:* o The documents establish the amount the City of Los Angeles has pumped from Central Basin in the past 10 years (2003-2013). • *Personal communication with Chris Repp, LADWP:* o Provided proportions of imported water used by LADWP (85% SWP/15% CRA).	• Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study. Report Number 1308. – Chapter IV:* o Page IV-4-7, Table 4-3: Indicates groundwater pumping costs for Central Basin of $65/AF. • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County:* o Page 2: 17.8 cents per kWh paid for electricity in Los Angeles. • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007.* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water. • *Manhattan Energy GHGs Calculations:* Shows the energy calculations	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007:* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water. • *Manhattan Energy GHGs Calculations:* Shows the GHGs calculations • *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009):* o Section 3: Document converts energy saved to a reduction in emissions of CO_2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Four of the six existing production wells are out of service and the remaining two wells are nearing the end of their service lives. Therefore, the remainder of LADWP's APA is unused and is being compensated by purchased imported water. Of the imported water, 85% is from the SWP and 15% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with groundwater will	Four of the six existing production wells are out of service and the remaining two wells are nearing the end of their service lives. Therefore, the remainder of LADWP's APA is unused and is being compensated by purchased imported water. Imported water delivered to the Project area requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater pumping. Restoration of LADWP's pumping capacity would allow full utilization of	The imported water delivered to the Project service area requires energy to transport from the Bay-Delta and the CRA at a higher rate than local groundwater. This energy usage generates GHG emissions that cause climate change.

Type of Physical Benefit:	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount/ Volume and Unit:	**3,570 AFY**	**10,136,500kWh**	**3,329 MT/year**
	reduce demands on the Bay-Delta.	their local groundwater pumping rights and avoid using the energy needed to convey imported water.	
Description and Estimates of Without-Project Conditions	Without the Project, LADWP would continue to serve imported water to their 386 pressure service area. Since 85% of the imported water is from the SWP, 3,570 AFY would continue to be supplemented by the Delta.	Without the Project, 11.97 million kWh/year of energy would be used to serve imported water, which is 10.1 million kWh/year more than the energy required to serve local groundwater.	Without the Project, 3,931 MT of CO_2 equivalents per year would be emitted by serving imported water, which is 3,329 MT of CO_2 equivalents per year more than the emissions generated by serving local groundwater.
Methods Used to Estimate the Physical Benefit	Historical and current pumping records Proportions of imported water that are SWP and CRA.	Historical and current pumping records Energy estimates for conveyance of SWP and CRA water supplies.	Historical and current pumping records. Conversion factor between kWh of energy and MT of GHG emitted.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Eight production wells, well collector lines, and related infrastructure in the existing Manhattan Wellfield.	Eight production wells, well collector lines, and related infrastructure in the existing Manhattan Wellfield.	Eight production wells, well collector lines, and related infrastructure in the existing Manhattan Wellfield.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effectiveness Analysis **Project name:** Manhattan Wells Improvement Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Decrease Demands on Bay-Delta • Reduce Energy Usage • Reduce GHGEmissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Alternative methods have not been considered.
	If no, why?	No other alternatives are available that can achieve the benefits described in Question 1 above for the following reasons: 3. The Project is a refurbishment of an existing facility, which is the most cost-effective alternative as opposed to constructing a new wellfield at an alternative site. 4. There are no other local supplies in the vicinity. The remaining production wells pumps 10,800 gpm and cannot provide LADWP's extraction rights. The eight new production wells will have the 4,200 AFY capacity needed to pump the full adjudicated rights. 5. More strain will be placed on areas that rely on imported water over the 50-year design life of the proposed new wells.
	If yes, list the methods (including the proposed project) and estimated costs.	Not applicable
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.**	Not applicable
Comments:		

Los Angeles Department of Water and Power (LADWP) TIWRP Advanced Water Purification Facility and Distribution System Expansion (Project)

Project Description

(25 Words) The Project expands the advanced recycled water purification capacity at TIWRP and extends the distribution system, providing 7,280 AFY of new local supply to customers.

(Expanded) The Project expands the TIWRP recycled water treatment and distribution capacity in the Los Angeles (LA) Harbor Area by implementing two components simultaneously:

1. TIWRP Advanced Water Purification Facility (AWPF) Expansion – This includes expanding the existing highly purified recycled water treatment capacity from 5,600 AFY to 12,880 AFY. The Project will expand the capacity of the limited microfiltration/reverse osmosis (MF/RO) treatment train and add an advanced oxidation process (AOP) to produce an additional 7,280 AFY of local high-quality recycled water. The recycled water will offset potable water use in the LA Harbor area.
2. Distribution System Expansion – Approximately 10,200 linear feet of pipeline will be constructed to supply TIWRP's recycled water to seven (7) customers, including both new and converted demands. The seven customers combined, including the Dominguez Gap Seawater Intrusion Barrier Project (DGBP) which protects the West Coast Basin (WCB) from seawater intrusion, have demands that exceed 7,280 AFY.

This Project provides immediate regional drought preparedness by offsetting 7,280 AFY of critical and drought diminished SWP and other imported supplies with purified recycled water. LADWP's current supplies are composed of 52% imported (SWP and CRA), 26% LA Aqueduct, 11% groundwater and 1% recycled water (2010 UWMP). It is assumed that the reduced potable water use as a result of this project will lead to a direct reduction in imported water use since it is the most expensive supply of the four and may not be available at all if the current drought conditions persist. Given TIWRP's proximity to the eight recycled water sites, the Project can be implemented rapidly and will bring critical local supply on line as early as 2017.

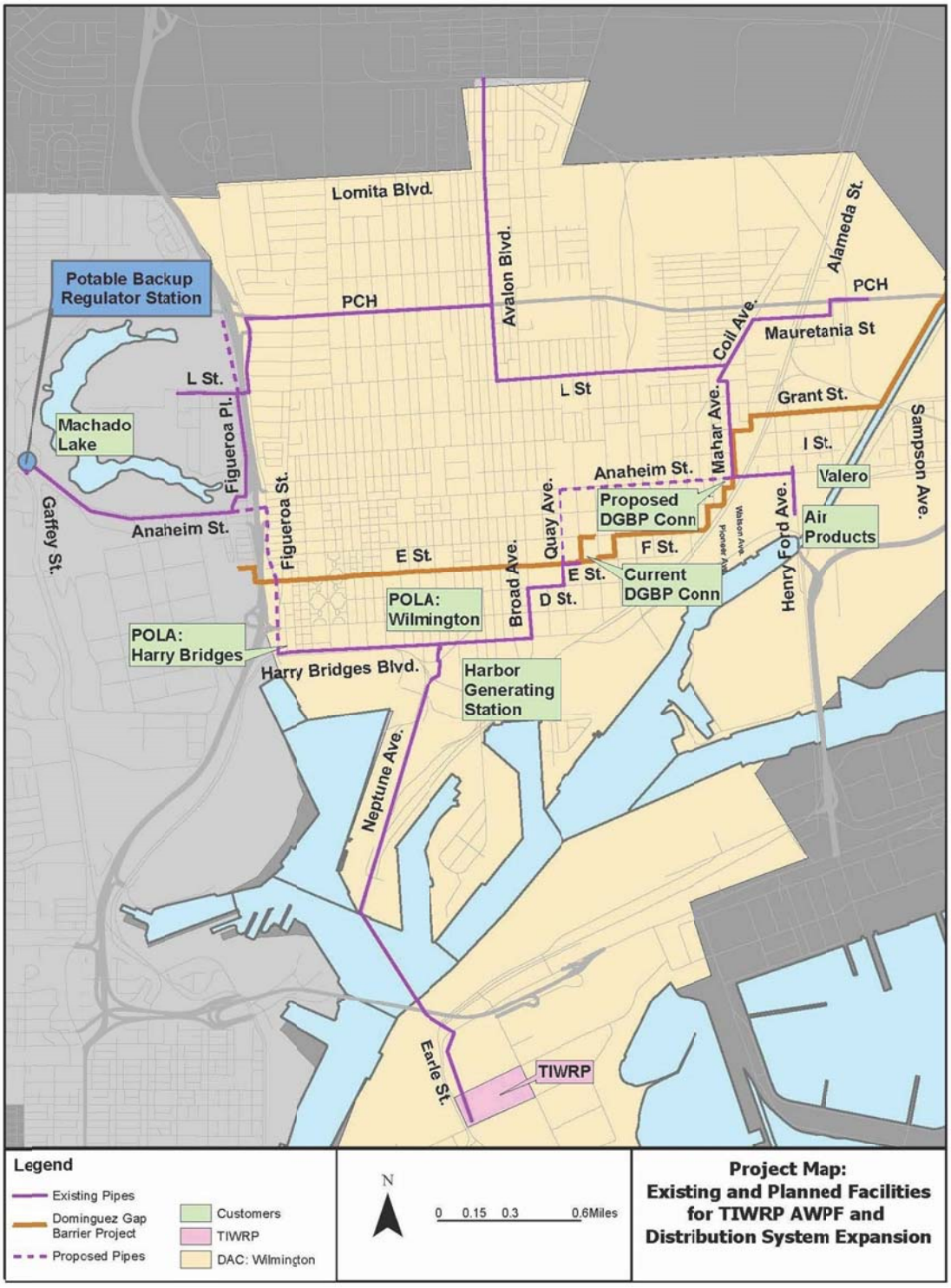
The Metropolitan Water District of Southern California (MWD) (LADWP's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. Although LADWP's constituents have paid for water storage investments, LADWP has maintained an aggressive conservation program since 2009 and during the more recent drought years. If drought conditions persist through 2014, it is anticipated that mandatory rationing within LADWPs service area could go into effect by spring 2015 that could impact customer demands. This Project will assist LADWP in meeting a portion of these demands despite anticipated reductions in imported water allocations and storage supplies.

The Project increases local water supply reliability and the delivery of safe drinking water by offsetting 7,280 AFY of potable imported water use with locally-produced recycled water, a supply source that is not subject to seasonal fluctuations or reductions in times of drought. Investments in local supplies provide diversification to LADWP's service area and increase overall supply reliability. If this project is not implemented, 7,280 AFY of potable demand will continue to strain the imported, LA Aqueduct and groundwater supplies which are already stressed from the previous drought of 2009-2011. Since groundwater is relied upon heavily during drought conditions and there has been a lack of imported replenishment supply available, both direct and indirect recycled water supplies are needed to maintain WCB groundwater levels. Groundwater levels are of particular concern in the WCB as they are a necessary component for the DGBP to continue protection from seawater intrusion and overall groundwater quality.

Expedited funding is needed for this project to ensure that both components meet the start-up date of November 2017. Because the two components are vital to achieving the physical benefits, a delay in either will significantly delay the physical benefits, including local supply reliability.

Project Map

The figure below shows the locations of the TIWRP, the recycled water distribution system expansion, the seven recycled water customers (DGBP is shown with both existing and new connection points), and the disadvantaged communities (in yellow) in the Project area.



*Note: The Project Map does not show separate monitoring locations; monitoring will occur at the customer meters for consumption quantities and at TIWRP (the source) for water quality and production quantities.

Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increase Local Water Supplies/Reliability
- Decrease Dependence on Imported Water (listed as separate benefit due to Machado Lake)
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions
- Improve Water Quality
    - Dominguez Gap Barrier Project – avoided injection of constituents
    - Machado Lake – improved local surface water quality

Benefit #1 – Increase Local Water Supplies/Reliability

The table below provides information on the benefit of increasing local water supplies and reliability by increasing the amount of purified recycled water produced at TIWRP for recycled water use. This increase in local supplies will also offset imported water supplies, though in this case the offset is not one-to-one. Previously, Machado Lake only used 140 AFY of potable water for makeup in a typical year; but with the Project, 840 AFY of purified recycled water will be used for both makeup and water quality improvement. Since the AFY values for 'increase local water supplies/reliability' and 'decrease dependence on imported water' are different, they are tabulated separately under Benefit #1 and Benefit #2, respectively.

TIWRP currently treats 5,600 AFY to purified recycled water levels and the remaining flow is treated to tertiary levels and discharged into the LA Harbor. The Project will increase the total amount of purified recycled water to 12,880 AFY, an increase of 7,280 AFY. This increase in local supply will offset the need to purchase imported water to meet the same potable demands, and it will reduce the amount of tertiary-treated effluent discharged to the Harbor. Approximately 10,200 linear feet of pipeline will be constructed to supply TIWRP's recycled water to seven customers, including the DGBP. The seven customers combined have demands that exceed 7,280 AFY and therefore provide assurance that all of the new recycled water supply will be beneficially reused.

Table 5 – Annual Project Physical Benefits
Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion
Type of Benefit Claimed: Increase Local Water Supplies/Reliability
Units of the Benefit Claimed: AF
Additional Information About this Measure: The volumes below show the increase in local water supply provided by increasing the amount of purified recycled water produced at TIWRP. An average of 5,600 AFY of purified recycled water is currently being treated and once the Project is implemented, 12,880 AFY of purified recycled water will be produced at TIWRP.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	5,600	5600 – Construction	0
2018	5,600	12,880	7,280
2019-2037	5,600	12,880	7,280

Comments:

- *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-

2): The TM documents the expansion of TIWRP AWPF to 11.5 million gallons per day (MGD) (12,880 AFY). The TM also lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system. Table 1 on Page 2 of the TM lists all potential customers in the vicinity of the Harbor recycled water distribution system and indicates that the maximum demand from all potential customers is well above the 12,880 AFY maximum production rate from TIWRP.

Benefit #2 – Decrease Dependence on Imported Water

The table below provides information on the benefit of decreasing dependence on imported water by replacing some imported water demands with purified recycled water produced at TIWRP. This AFY value for imported water offset is less than the AFY value for increased local water supplies. Previously, Machado Lake only used 140 AFY of potable water for makeup in a typical year, but with the Project 840 AFY of purified recycled water will be used for both makeup and water quality improvement. Since the AFY values for 'increase local water supplies/reliability' and 'decrease dependence on imported water' are different, they are tabulated separately under Benefit #1 and Benefit #2, respectively.

Of the total demands, approximately 840 AFY are associated with Machado Lake, leaving 6,440 AFY for the other six customers. If the 140 AFY of potable water offset are added back in, this yields 6,580 AFY that will decrease demands on imported water.

Table 5 – Annual Project Physical Benefits

Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion
Type of Benefit Claimed: Decrease Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Measure: The volumes below show the amount of imported water that will be offset with purified recycled water produced at TIWRP. With the Project, TIWRP will produce an additional 7,280 AFY of purified recycled water which will offset 6,580 AFY of imported water, including approximately 6,440 AFY of demand from six customers and approximately 140 AFY of demand from Machado Lake. The remaining 700 AFY of new demand for Machado Lake will not offset imported water as they are intended for new water quality improvement purposes.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	6,580	6,580 – Construction	0
2018	6,580	0	6,580
2019-2037	6,580	0	6,580

Comments:

- *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-2): The TM lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system. Table 1 on Page 2 of the TM lists all potential customers in the vicinity of the Harbor recycled water distribution system and indicates that the maximum demand from all potential customers is well above the 12,880 AFY maximum production rate from TIWRP.
- *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*; Page 22 describes Machado Lake demands for 840 AFY of purified recycled water (recommended for 9 months)

Benefit #3 – Reduce Demands on Bay-Delta

The benefit described under Benefit #2 above includes imported water from the SWP and the CRA. The table below provides information regarding the benefit of reducing demands on the Bay-Delta (i.e., only from the SWP). The use of purified recycled water in the DGBP will decrease dependence on imported water from the Bay-Delta and SWP. On average, LADWP's service area uses an imported water blend of 85% SWP, that comes from the Bay-Delta system, and 15% CRA.

Table 5 – Annual Project Physical Benefits

Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion

Type of Benefit Claimed: Reduce Demands on Bay-Delta

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The local supply benefit provided by the Project will offset 6,580 AFY of LADWP's imported water, 85% of which is SWP water from the Bay-Delta. The volumes below show the reduction in demands on the Delta.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	5,593	5,593 - Construction	0
2018	5,593	0	5,593
2019-2037	5,593	0	5,593

Comments:

- *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-2): The TM lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system.
- *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*; Page 22 describes Machado Lake demands for 840 AFY of purified recycled water (recommended for 9 months)
- *Personal communication with Chris Repp, LADWP:* Proportions of imported water used by LADWP (85% SWP/15% CRA).

Benefit #4 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (85% SWP/15% CRA blend) with 100% advanced treated recycled water. Approximately 3,000 kilowatts per acre-foot (kWh/AF) is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,850 kWh/AF of energy is used to provide imported supply to LADWP.

Since 1,800 kWh/AF is used to treat and convey MF, RO and AOP recycled water, there is an energy savings benefit of approximately 1,050 kWh/AF. Since the Project will offset 6,580 AFY of imported water with advanced treated recycled water, about 6,909,000 kWh/year of energy will be conserved. Over the 20-year lifespan of the Project, this totals 138,180,000 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits

Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column d show the amount of energy saved thorough implementation of the project. Energy saved results from replacing imported water from both SWP and CRA with LADWP's advanced treated recycled water.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	18,753,000	18,753,000 - Construction	0
2018	18,753,000	11,844,000	6,909,000
2019-2037	18,753,000	11,844,000	6,909,000

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007. Documents the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Andrew Han, LADWP:* Energy required to treat MF/RO/AOP recycled water.
- *TIWRP Energy GHGs Calculations:* Energy calculations

Benefit #5 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the additional need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 6,580 AF of imported water, the Project will avoid GHG emissions of approximately 2,269 MT per year of CO_2 equivalents per year (approximately 6,159 MT per year to import water versus 3,890 MT per year to treat highly purified recycled water). Over the 20-year lifespan of the Project, this totals approximately 67,850 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits
Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT
Additional Information About this Benefit: The Project would avoid GHG emissions generated by transporting imported water.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	6,159	6,159 - Construction	0
2018	6,159	3,890	2,269
2019-2037	6,159	3,890	2,269

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007. Documents the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Andrew Han, LADWP:* Energy required to treat MF/RO/AOP recycled water.
- *TIWRP Energy GHGs Calculations:* GHGs calculations
- *California Action Registry, General Reporting Protocol. Version 3.1, January 2009. Section 3:* Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.

Benefit #6 – Improve Water Quality at the Dominguez Gap Barrier Project by Avoiding Injection of Constituents

The table below provides information on the water quality improvements for multiple constituents as the result of injecting 1,936 AFY of purified recycled water into the DGBP instead of imported water. Based on injection well flow data from January 2010 to September 2011, the total average flow rate was 10.41 cfs (7,536 AFY) of which, 5 MGD (5,600 AFY) is recycled water from TIWRP. With the Project, it is assumed that the DGBP would offset all the imported water (1,936 AFY) with MF/RO/AOP recycled water which contains lower constituent levels in the product water when compared to the imported water. The values in the table below are based on concentrations (in milligrams per liter [mg/L]) for various constituents in imported water that will no longer be injected into the DGBP. Concentration data is provided in the reference documents, and the values below are expressed in pounds of constituent per year using the following formula:

$$\frac{mg}{L} * \frac{8.245 \frac{lbs}{MG}}{\frac{mg}{L}} * 0.325851 \frac{MG}{AF} * \frac{1{,}936\ AF}{year} = lbs/year$$

Table 5 – Annual Project Physical Benefits

Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion
Type of Benefit Claimed: *Improve Water Quality at the DGBP by Avoiding Injection of Constituents*
Units of the Benefit Claimed: pounds of constituent
Additional Information About this Measure: Benefits in pounds per year are based on concentration values and AFY for imported water that will no longer be injected into the DGBP (see references below).

(a)		(b)	(c)	(d)
	Physical Benefits			
Year	**Constituent**	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	Total Hardness	816,610	816,610 – Construction	0
	Sulfate	634,563	634,563 – Construction	0
	Copper	2,996	2,996 – Construction	0
	Total Dissolved Solids	2,064,931	2,064,931 – Construction	0
	Total Organic Carbon	11,443	11,443 - Construction	0
2018	Total Hardness	816,610	381,778	434,832
	Sulfate	634,563	20,805	613,758
	Copper	2,996	84	2,912
	Total Dissolved Solids	2,064,931	1,732,046	332,886
	Total Organic Carbon	11,443	1,040	10,403
2019-2037	Total Hardness	816,610	381,778	434,832
	Sulfate	634,563	20,805	613,758
	Copper	2,996	84	2,912
	Total Dissolved Solids	2,064,931	1,732,046	332,886
	Total Organic Carbon	11,443	1,040	10,403

Comments:

- *BOS Water Quality Data* shows the water quality constituents for the current imported water and the proposed purified recycled water that would be injected in the DGBP.
- *Dominguez Gap Barrier Project Condition Assessment;* Page 5.7 shows the total amount of water that is injected into the DGBP.

Benefit #7 – Improve Water Quality at Machado Lake by Introducing Purified Recycled Water

The table below provides information regarding water quality at Machado Lake, one of the seven recycled water customers that would use a portion of the 7,280 AFY of additional TIWRP purified recycled water. Water quality and maintenance of the lake levels is an ongoing concern, and an additional high-quality water supply is needed to offset evaporation and to avoid an expensive, on-site treatment system to reduce nutrient and other constituent levels. As discussed previously, approximately 140 AFY of potable imported water was typically used to provide makeup water for Machado Lake.

Based on the *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*, approximately 840 AFY of supplemental purified recycled water is needed for Machado Lake to achieve the interim Nutrients TMDL compliance targets (total phosphorus 1.25 mg/L, total nitrogen 2.45 mg/L). Based on the modeling results, a minimum flow of 840 AFY of purified recycled water is recommended for approximately nine months of the year in order to avoid construction of an on-site treatment system to reduce nitrogen, phosphorus, phytoplankton, and other constituent levels. This flow rate would allow LADWP to meet the TMDL requirements, assuming subsequent implementation of full watershed BMPs to reduce nutrient loads from upstream non-point sources. The technical memorandum also states that additional purified recycled water above this minimum value of 840 AFY will further improve the water quality.

The total demand for Machado Lake is therefore 840 AFY, all of which provides the water quality benefit and 140 AFY of which provides minimum makeup water for evaporative losses at the lake as discussed for Benefit #2.

The table below calculates the water quality improvement benefit of supplying 840 AFY of purified recycled water into Machado Lake to reduce phosphorus, nitrogen and phytoplankton levels, avoiding the need for an on-site treatment system. The values in the table are expressed in mg/L of constituent in the lake water both with and without the Project.

Table 5 – Annual Project Physical Benefits

Project Name: TIWRP Advanced Water Purification Facility and Distribution System Expansion

Type of Benefit Claimed: Improve Water Quality At Machado Lake

Units of the Benefit Claimed: mg/L of constituent

Additional Information About this Measure: Column b shows the water quality at Machado Lake without the Project; Column c shows the projected water quality at Machado Lake with the addition of 840 AFY of purified recycled water; Column d show the change in water quality for these constituents.

(a)		(b)	(c)	(d)
	Physical Benefits			
	Constituent	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2017	Total Phosphorus	0.6	0.6-Construction	0
	Total Nitrogen	0.7	0.7-Construction	0
	Phytoplankton (chl-a)	0.016	0.016-Construction	0
2018	Total Phosphorus	0.6	0.1	0.5
	Total Nitrogen	0.7	0.6	0.1
	Phytoplankton (chl-a)	0.016	0.008	0.008
2019-2037	Total Phosphorus	0.6	0.1	0.5
	Total Nitrogen	0.7	0.6	0.1
	Phytoplankton (chl-a)	0.016	0.008	0.008

Comments:

- *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum* (Page 15) shows the water quality concentrations at the lake with potable water and with purified recycled water for year 1 summer average.
- *California Regional Water Quality Control Board, Los Angeles Region. 2008; Attachment A to Resolution No. R08-006, Page 5* provides the TMDL interim compliance targets for Machado Lake.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability **Amount of Benefit**: 7,280 AFY	
Technical Justification of Physical Benefit	• *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-2) The TM evaluates the feasibility and effects of expanding the Harbor recycled water distribution system with the expansion of TIWRP. The TM lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system. Table 1 on Page 2 of the TM lists all potential customers in the vicinity of the Harbor recycled water distribution system, and it can be seen that the maximum potential demand from all potential customers is well above the 12,880 AFY of maximum production from TIWRP. The total production amount from TIWRP can be delivered to the customers named in the Project Map.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	TIWRP is designed to treat an average dry weather flow of 30 MGD and a peak flow of 50 MGD to tertiary standards. The plant has a current average daily influent flow rate of 15.5 MGD (data from 1999 to 2009). Unused tertiary effluent from the plant is discharged into the Harbor outfall. Approximately 5 MGD (on an annual average basis) of tertiary effluent is treated to MF/RO levels, which began operating in 2002 and subsequently began supplying water to the DGBP in 2006. The MF/RO treatment has a nominal production capacity of 5.0 MGD. Customers in the Harbor Area currently use imported water. The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply and offset imported water demands. Customers have been identified in the Harbor area that can use the additional 7,280 AFY of purified recycled water.
Description and Estimates of Without-Project Conditions	Without the Project, TIWRP would continue to discharge tertiary recycled water into the LA Harbor and LADWP would continue to serve imported water to six Harbor customers and to the DGBP, for a total of seven customers.
Methods Used to Estimate the Physical Benefit	The physical benefit of 7,280 AFY of additional recycled water to offset potable demand was estimated by allocating the additional planned capacity of the expanded TIWRP to potential recycled water customers along the planned and existing distribution system. The demands of the potential recycled water customers were estimated using historical demands and/or customer reported estimates. The yearly injection data at the DGBP was used to estimate the amount of imported water used for injection. The Machado Lake TM was used to estimate the demand for the evaporation losses as well as the amount of purified recycled water needed to improve water quality at the lake.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.
Any Potential Adverse Physical Effects	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.

Secondary Physical Benefit (Table 1 of 2)

Type of Physical Benefit:	**Decrease Dependence on Imported Water**	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**
Amount/ Volume and Unit:	**6,580 AFY**	**5,593 AFY**	**10,330,600 kWh/year**
Technical Basis of the Project	• *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-2): The TM lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system. Table 1 on Page 2 of the TM lists all potential customers in the vicinity of the Harbor recycled water distribution system, and it can be seen that the maximum potential demand from all potential customers is well above the 12,880 AFY maximum production rate from TIWRP. • *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*; Page 22 identifies recommendations for Machado Lake, including an additional 840 AFY of purified recycled water for nine month to meet water quality objectives	• *2013 Harbor Recycled Water System Alternatives Evaluation: Technical Memorandum – Alternatives Evaluation* (Page 1-2): The TM lists potential customers along the expansion of the distribution system and states that the expanded TIWRP AWPF flow of 12,880 AFY can all be served to customers along the expanded distribution system. • *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*; Page 22 identifies recommendations for Machado Lake, including an additional 840 AFY of purified recycled water for nine month to meet water quality objectives • *Personal communication with Chris Repp, LADWP:* o Provided proportions of imported water used by LADWP (85% SWP/15% CRA).	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007.* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water • *Personal communication with Andrew Han, LADWP:* Provided energy required to treat MF/RO/AOP recycled water. • *TIWRP Energy GHGs Calculations:* Energy calculations
Recent and Historical Conditions that Provide Background for	TIWRP has a current average daily influent flow rate of 15.5 MGD (data from 1999 to 2009). Approximately 5 MGD (on an annual average basis) of tertiary effluent is treated to MF/RO levels and sent to the DGBP. Unused	Of the entire LA Harbor area, only 5,600 AFY of purified recycled water is served from TIWRP. The remaining customers use imported water. Of the imported water, 85% is from the SWP and 15% is from the CRA. The portion of	Of the entire LA Harbor area, only 5,600 AFY of purified recycled water is served from TIWRP. The remaining customers use imported water. Imported water delivered to the project area requires energy to transport from the Bay-

Type of Physical Benefit:	Decrease Dependence on Imported Water	Decrease Demands on Bay-Delta	Reduce Energy Usage
Amount/ Volume and Unit:	**6,580 AFY**	**5,593 AFY**	**10,330,600 kWh/year**
the Benefit Being Claimed	tertiary effluent from the plant is discharged into the Harbor outfall. The customers in the Harbor Area currently use imported water. The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply and offset of imported water demands.	imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with purified recycled water will reduce demands on the Bay-Delta.	Delta and the CRA at a higher rate than the treatment and conveyance energy for MF/RO and AOP.
Description and Estimates of Without-Project Conditions	Without the Project, TIWRP would continue to discharge approximately 10.5 MGD of tertiary recycled water into the LA Harbor (15.5 MGD – 5 MGD product water from AWT; brine concentrate to outfall). LADWP would continue to serve 6,580 AFY [7,280 – 700 AFY] of imported water to Harbor customers and to the DGBP.	Without the project, LADWP would continue to serve imported water to the rest of LA Harbor area. Since 85% of the imported water is from the SWP, 5,593 AFY would continue to be supplemented by the Delta.	Without the project, 18.8 million kWh/year of energy would be used to serve imported water, which is 10.3 million kWh/year more than the energy required to treat and convey purified recycled water to customers.
Methods Used to Estimate the Physical Benefit	The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply by 7,280 AFY and offset 6,580 AFY of imported water demands, including approximately 6,440 AFY of demands from six customers and approximately 140 AFY of demand from Machado Lake. The remaining 700 AFY of new demand for Machado Lake will not offset imported water as they are intended for new water quality improvement purposes.	The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply by 7,280 AFY and offset 6,580 AFY of imported water demands, including approximately 6,440 AFY of demands from six customers and approximately 140 AFY of demand from Machado Lake. The remaining 700 AFY of new demand for Machado Lake will not offset imported water as they are intended for new water quality improvement purposes. Proportions of imported water that are SWP and CRA were used to determine the amount	The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply by 7,280 AFY and offset 6,580 AFY of imported water demands, including approximately 6,440 AFY of demands from six customers and approximately 140 AFY of demand from Machado Lake. The remaining 700 AFY of new demand for Machado Lake will not offset imported water as they are intended for new water quality improvement purposes. Energy estimates for conveyance of SWP and CRA water supplies as well as for treatment of purified recycled water were used to

Type of Physical Benefit:	**Decrease Dependence on Imported Water**	**Decrease Demands on Bay-Delta**	**Reduce Energy Usage**
Amount/ Volume and Unit:	**6,580 AFY**	**5,593 AFY**	**10,330,600 kWh/year**
		of reduced demand from the Bay-Delta.	determine the amount of energy benefits.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.
Any Potential Adverse Physical Effects	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.

Secondary Physical Benefit (Table 2 of 2)

Type of Physical Benefit:	**Reduce GHG Emissions**	**Improve Water Quality at the DGBP by Avoiding Injection of Constituents**	**Improve Water Quality at Machado Lake by Providing Purified Recycled Water**
Amount/ Volume and Unit:	**3,393 MT/year**	**1,716 – 613,758 pounds per year (depending on constituent)**	**0.008 – 0.5 mg/L (depending on constituent)**
Technical Basis of the Project	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007:* o Page 4: Lists the kWh/AF associated with SWP imported water and CRA imported water. • *Personal communication with Andrew Han, LADWP:* Provided energy required to treat MF/RO/AOP recycled water. • *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009):* o Section 3: Document converts energy saved to a reduction in emissions of CO_2 equivalents • *TIWRP Energy GHGs Calculations:* GHGs calculations	• *BOS Water Quality Data* shows the water quality constituents for the current potable water and the proposed purified recycled water. • *Dominguez Gap Barrier Project Condition Assessment;* Page 5.7 shows the amount of imported water that DGBP currently injects.	• *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum* (Page 15) shows the water quality concentrations at the lake with 140 AFY of potable water and with 840 AFY of purified recycled water for year 1 summer average. • *California Regional Water Quality Control Board, Los Angeles Region. 2008; Attachment A to Resolution No. R08-006, Page 5* provides the TMDL interim compliance targets for Machado Lake.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The imported water delivered to the project service area requires energy to transport from the Bay-Delta and the CRA at a higher rate than the treatment and conveyance energy for MF/RO and AOP. This energy usage generates GHG emissions that cause climate change.	The DGBP has historically injected recycled and imported water into the WCB for protection against seawater intrusion. Based on injection well flow data from January 2010 to September 2011, the total average flow rate was 10.41 cfs (7,536 AFY) of which, 5 MGD (5,600 AFY) is recycled water from TIWRP. The Project will allow DGBP to replace all imported water with purified recycled water. Since the total amount of water injected will not be altered by the Project and the quality of the injected water will	Water quality and maintenance of Machado Lake levels is an ongoing concern, and an additional high-quality water supply is needed to offset evaporation and to avoid an expensive, on-site treatment system to reduce nutrient and other constituent levels. Approximately 140 AFY of potable imported water was typically used to provide makeup water for Machado Lake.

Type of Physical Benefit:	Reduce GHG Emissions	Improve Water Quality at the DGBP by Avoiding Injection of Constituents	Improve Water Quality at Machado Lake by Providing Purified Recycled Water
Amount/ Volume and Unit:	**3,393 MT/year**	**1,716 – 613,758 pounds per year (depending on constituent)**	**0.008 – 0.5 mg/L (depending on constituent)**
		be higher than potable, there will be no changes to the DGBP operations or the groundwater basin as a result of the Project.	
Description and Estimates of Without-Project Conditions	Without the project, 6,159 MT of CO_2 per year would be emitted by serving imported water, which is 3,393 MT of CO_2 equivalents per year more than the emissions generated by treating and conveying purified recycled water.	Without the Project, 1,936 AFY of DGBP flows will continue to use imported water. Importing water to inject into the ground would not be optimal use of imported water.	Without the Project, 140 AFY of potable water will have to be introduced into the lake to offset evaporation and a total of 840 AFY could be needed to achieve water quality objectives. Expensive, on-site treatment systems would have to be built to reduce constituent and nutrient levels without the purified recycled water.
Methods Used to Estimate the Physical Benefit	The TIWRP expansion of MF/RO and AOP to 11.5 MGD will increase local recycled water supply by 7,280 AFY and offset 6,580 AFY of imported water demands, including approximately 6,440 AFY of demands from six customers and approximately 140 AFY of demand from Machado Lake. The remaining 700 AFY of new demand for Machado Lake will not offset imported water as they are intended for new water quality improvement purposes. Conversion factor between kWh of energy and MT of CO_2 equivalents emitted was used to determine the amount of GHG emission reduced.	Water quality data for imported water was used to compare with proposed purified recycled water quality. Based on the data, purified recycled water quality would reduce the following pounds of constituents each year: Total Hardness (434,832 lbs/yr), Sulfate (613,758 lbs/yr), Copper (2,912 lbs/yr), Total Dissolved Solids (332,886 lbs/yr), Total Organic Carbon (10,403 lbs/yr)	The Machado Lake TM used water quality models and field data to model and estimate the physical benefits of the Project. Based on the modeling results, a minimum flow of 840 AFY of purified recycled water will reduce nitrogen (by 0.1 mg/l), phosphorus (by 0.5 mg/l), phytoplankton (by 0.008 mg/l), and other constituent levels to achieve the interim Nutrients TMDL compliance targets.

Type of Physical Benefit:	**Reduce GHG Emissions**	**Improve Water Quality at the DGBP by Avoiding Injection of Constituents**	**Improve Water Quality at Machado Lake by Providing Purified Recycled Water**
Amount/ Volume and Unit:	**3,393 MT/year**	**1,716 – 613,758 pounds per year (depending on constituent)**	**0.008 – 0.5 mg/L (depending on constituent)**
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.	Expansion of the MF/RO treatment train, AOP treatment and approximately 10,200 linear feet of pipeline are required to obtain physical benefit. In addition, because of the separation requirements between recycled and potable water, the industrial customers will require varying degrees of on-site retrofits. These retrofits are to be performed by the customers and are separate from this Project.
Any Potential Adverse Physical Effects	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.	No potential adverse physical effects are expected. CEQA has been completed and all impacts during construction will be mitigated.

Cost Effectiveness Analysis

Table 6 – Cost Effectiveness Analysis **Project Name:** TIWRP Advanced Water Purification Facility and Distribution System Expansion Project		

Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability
		• Decrease Dependence on Imported Water
		• Reduce Demands on the Bay-Delta
		• Reduce Energy Usage
		• Reduce GHG Emissions
		• Improve Water Quality
		  o Dominguez Gap Barrier Project – avoided injection of constituents
		  o Machado Lake – improved local surface water quality

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.	An alternative alignment was proposed to supply purified recycled water to Machado Lake. The second alternative consisted of 11,500 LF instead of 7,000 LF of 12-inch diameter pipeline. The second alternative cost was $4.85 M, which was more expensive than the proposed Project costs of $2.95 M. In addition, a phosphorus removal system and an oxygenation system were considered as an alternative to resolve water quality issues at Machado Lake. The cost for the treatment systems was about $4.1M. However, this alternative does not provide all the benefits listed above. The costs of this treatment system are avoided with the Project.
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 most expedient and least cost alternative for achieving the types and amounts of claimed physical benefits.
Comments: *TIWRP Recycled Water Opportunity Analysis – Machado Lake Analysis Technical Memorandum*; Page 29 lists the costs for the pipeline alternative. Page 37 lists the costs for the treatment system at Machado Lake.		

Water Replenishment District (WRD) of Southern California Recycled Water Turnouts Project (Project)

Project Description

(25 Word) This Project will construct two turnout connection facilities on an existing recycled water pipeline to replenish groundwater supplies with 11,000 AFY of local recycled water.

(Expanded) This Project is an element of the Groundwater Reliability Improvement Program (GRIP) Recycled Water Project, which will offset the current use of imported water by providing a sustainable and reliable source of recycled water for groundwater basin replenishment in the Montebello Forebay Spreading Grounds (MFSG). The Project will require the construction of two reinforced concrete turnout structures on the existing recycled water pipeline that extends from the San Jose Creek Water Reclamation Plant (SJCWRP). These turn-out structures will allow the delivery of 11,000 AFY of recycled water to replenish the groundwater supplies. For nearly 50 years, the Water Replenishment District (WRD) of Southern California has taken proactive steps to artificially recharge the groundwater basins. Three types of water have historically been used for replenishment: 1) storm water that includes local runoff from rainfall that is conserved and collected in dams in the San Gabriel Mountains to prevent flooding in downstream communities, 2) imported water that originates in Northern California or from the Colorado River and is transported to the Los Angeles area through aqueducts, canals, and river channels, and 3) recycled water which comes from local water reclamation plants that purify wastewater. The Central Basin has been the subject of numerous studies over the years due to the challenges of groundwater supply reliability and availability that have occurred as a result of over-pumping, drought, climate change, and decreased availability of imported water for replenishment.

This Project provides immediate regional drought preparedness by offsetting the delivery of 11,000 AFY of drought diminished SWP and other imported supplies. The Project enhances the replenishment of groundwater supplies within the MFSG (a major area of recharge to the Central Basin of Los Angeles County), increases the operational flexibility of the San Gabriel Coastal Spreading Grounds (a portion of MFSG), and provides the ability to recharge more locally-generated recycled water. Groundwater provides up to 40% of the drinking water supply in the Central Basin area, with the rest supplied by imported water from both the SWP and CRA. Since SWP allocations have dramatically decreased due to the drought, local water purveyors are trying to conserve imported supplies and rely more heavily on stored groundwater supplies. Increasing the capacity to replenish the Central Basin by approximately 11,000 AFY using a local supply source that is not impacted by the drought conditions will help to immediately reduce demands for limited imported supplies by allowing more groundwater to be pumped.

The Project increases local water supply reliability and the delivery of safe drinking water by offsetting 11,000 AFY of imported replenishment water with recycled water, a supply source that is not subject to seasonal fluctuations or reductions in times of drought. Recycled water is also not dependent on precipitation, and it can be used to replenish the underlying Central Basin which is a primary source of safe drinking water for about 4 million people in the Region. The pressures on the Bay-Delta ecosystem, climate change, and continuing population growth have increased the challenges to the Region in providing clean water needed for a healthy population and economy. Recycled water can significantly increase access to local potable water supplies and help increase reliability. If this Project is not implemented, 11,000 AFY of replenishment demand will continue to strain imported supplies, which are already stressed from the previous drought of 2009-2011.

Expedited funding is needed to secure an immediate source of sustainable, locally-generated replenishment water that will protect and preserve safe drinking water supplies within the Central Basin. Funding from this grant will allow these turn-out structures to be constructed and provide the necessary access to recycled water supplies during a drought period when imported replenishment water is not available.

Project Map

The figure below shows the facilities of the Project, including the two turnout structures and the location of the Project in the City of Montebello.

Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below:

- Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The reliability of traditional sources of water for replenishment is decreasing because of the combined effects of pumping, long-term drought, and climate change. To address this challenge, this Project will increase groundwater recharge in the Central Basin through the use of locally-generated recycled water and the increased operational flexibility of the San Gabriel Coastal Spreading Grounds. Replenishment with recycled water allows for a sustainable supply of safe drinking water that is not subject to the fluctuations of precipitation and imported water availability. For this benefit, it is assumed that the Project will allow for 11,000 AFY of new local water supply and a corresponding decrease in dependence on imported water.

Table 5 – Annual Project Physical Benefits

Project Name: Recycled Water Turnouts Project
Type of Benefit Claimed: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The volume shown below shows the amount of recycled water provided for groundwater recharge and consequently for use as a drinking water supply.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014 – 2015	0	0 – Construction	0
2016	0	11,000	11,000
2017 – 2065	0	11,000	11,000

Comments:

- *Preliminary Engineering Report GRIP Recycled Water Project Final (February 2013)*. Technical Memorandum 2-4 (TM Page 5): 11,000 AFY of tertiary-treated recycled water will be used for MFSG spreading recharge.
- *GRIP Alternative Analysis Final Report (June 2011)* Section 1: discusses that a maximum of 21,000 AFY of new or additional water will need to be provided to the Central Basin by 2020-2025. Section 9 (Pages 70 through 71): discusses potentially feasible alternatives that will provide recycled water to the Central Basin.
  - *GRIP Alternatives Analysis Updated Report (October 2012)*: comprises seven technical memoranda (TM) that discuss the alternatives to offset imported water use for groundwater replenishment. TM 1-5 Page 10: describes the hybrid alternative that will provide 11,000 AFY of tertiary treated recycled water to recharge the Montebello Forebay.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, WRD's service area uses an imported water blend of 50% SWP water, which comes from the Bay-Delta system, and 50% CRA water. The Greater Los Angeles County has made it a priority to reduce dependence on imported water supplies received from the Bay-Delta. This Project is expected to reduce demands on the Delta by using recycled water to replenish groundwater in the Central Basin in lieu of using imported water.

Table 5 – Annual Project Physical Benefits

Project Name: Recycled Water Turnouts Project
Type of Benefit Claimed: Reduce Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The Project will reduce the need to use 11,000 AFY of imported water, of which 50% is SWP water from the Bay-Delta. The volumes below show the reduction in demands on the Delta.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014 – 2015	0	0 – Construction	0
2016	5,500	0	5,500
2017 – 2065	5,500	0	5,500

Comments:

- *Preliminary Engineering Report GRIP Recycled Water Project Final (February 2013)*. Technical Memorandum 2-4 (TM Page 5): 11,000 AFY of tertiary-treated recycled water will be used for MFSG spreading recharge.
- *GRIP Alternative Analysis Final Report (June 2011)* Section 1: discusses that a maximum of 21,000 AFY of new or additional water will need to be provided to the Central Basin by 2020-2025. Section 9 (pages 70 through 71): discusses potentially feasible alternatives that will provide recycled water to the Central Basin.
- *GRIP Alternatives Analysis Updated Report*: comprises seven technical memoranda (TM) that discuss the alternatives to offset imported water use for groundwater replenishment. TM 1-5 Page 10: describes the alternative that will provide 11,000 AFY of tertiary treated recycled water to recharge the Montebello Forebay.
- *Personal communication with Esther Rojas, WRD*: Proportion imported water used by WRD that is SWP water (50% SWP/50% CRA)

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of imported water. For imported supplies, the WBMWD estimated that approximately 3,000 kWh/AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies, and approximately 2,000 kWh/AF of energy is required for CRA contracting agencies. Based on the ratio of these supplies, this results in an estimated 2,500 kWh/AF of energy consumption to provide imported water supply. Over the 50-year lifespan of the Project, this totals to approximately 1,375,000,000 kWh of reduced energy usage.

Since pumping of groundwater takes place whether it is replenished with imported water or recycled water, it is not necessary to deduct a pumping energy offset for this benefit. Also, recycled water will flow by gravity from the SJCWRP, where it is already treated to tertiary level, to the proposed turnout structures; so no energy offset is required for recycled water treatment or conveyance.

Table 5 – Annual Project Physical Benefits

Project Name: Recycled Water Turnouts Project
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column (d) show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from both SWP and CRA with locally-generated recycled water.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014 – 2015	27,500,000	27,500,000 – Construction	0
2016	27,500,000	0	27,500,000
2017 – 2065	27,500,000	0	27,500,000

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Esther Rojas, WRD*: Proportion imported water used by WRD that is SWP water (50% SWP/50% CRA)

Benefit #4 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the additional need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 11,000 AFY of blended imported water, the Project will avoid GHG emissions of approximately 9,031 MT of CO_2 equivalents per year. Over the 50-year lifespan of the Project, this totals to approximately 451,550 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: Recycled Water Turnouts Project

Type of Benefit Claimed: Reduce GHG Emissions

Units of the Benefit Claimed: MT of CO_2 equivalents

Additional Information About this Benefit: Values in column (d) show the amount of GHGs reduced as the results of replacing imported water from both SWP and CRA with recycled water.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014 – 2015	9,031	9,031 – Construction	0
2016	9,031	0	9,031
2017 – 2065	9,031	0	9,031

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Estimates how much energy is used to provide SWP and CRA.
- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MTof CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit:** 11,000 AFY	
Technical Basis of the Project	• *Preliminary Engineering Report GRIP Recycled Water Project Final (February 2013):* o TM 2-4: This TM discusses the total supply available from SJCWRP to use as recharge in the MFSG. The assessment of replenishment capabilities of the MFSG is based upon a spreading recharge capacity. o TM 2-4 Page 5: discusses that 11,000 AFY of tertiary-treated recycled water will be used to help offset the current use of imported supplies. • *GRIP Alternatives Analysis Final Report (June 2011):* o This report investigated replacing 21,000 AFY of imported water currently being used for groundwater replenishment with an alternative source of supply. The results of the study recommended that the 21,000 AFY of imported water used for groundwater replenishment be replaced using recycled water. o Section 1: discusses that a maximum of 21,000 AFY of new or additional water will need to be provided to the Central Basin by 2020-2025. o Section 9 (Pages 70 through 71): discusses potentially feasible alternatives that will provide recycled water to the Central Basin. • *GRIP Alternatives Analysis Updated Report (October 2012)* o This report discusses GRIP's goal to offset the current use of imported water with recycled water for groundwater replenishment in the Central Basin. It proposed using 11,000 AFY of additional tertiary recycled water and 10,000 AFY of advanced treated recycled water. The proposed project will increase the operational flexibility at the spreading facilities to accommodate the additional 11,000 AFY of tertiary treated recycled water. o TM 1-5 Page 10: describes the alternative that will provide 11,000 AFY of tertiary treated recycled water to recharge the MFSG.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The WRD is a special district established in 1959 under the California Water Code to manage the groundwater resources of the Central and West Coast Basins, which supply water to about four million people over a service area that covers 420 square miles in southern Los Angeles County. WRD is responsible for maintaining adequate groundwater supplies, as well as preventing seawater intrusion into the groundwater aquifers and protecting groundwater quality against contamination. Historically, imported water has been available on an annual basis for use in recharging the groundwater aquifers. Recently, this imported water has only been available on an intermittent basis and this condition is expected to continue into the foreseeable future.
Description and Estimates of Without-Project Conditions	Without the Project, 11,000 AFY of imported water would continue to be used at a rate of 50% SWP and 50% CRA. Local supplies would not become more available.
Methods Used to Estimate the Physical Benefit	The total available supply was compared to the existing and projected demands from the SJCWRP. Assessment of the replenishment capabilities of the MFSG was based upon the spreading recharge capacity. The analysis concluded that capacity would be available for recycled water recharge for the major portion of the year. It was estimated that 1-2 months of the year will have stormwater application where spreading recharge may be limited. On that basis, there is adequate recharge capacity to accommodate increased use of recycled water for replenishment via spreading at the MFSG.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will provide the additional facilities (two new turn out structures) to allow for increased recharge of tertiary treated recycled water. In April 2014, WRD amended the Regional Water Quality Control Board's permit to allow for the use of additional recycled water for groundwater recharge.
Any Potential Adverse Physical Effects	A Mitigated Negative Declaration has been completed for the Project. Mitigation measures include practices to reduce the impacts to biological and cultural resources during construction.

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**5,500 AFY**	**27,500,000 kWh/year**	**9,031 MT/year**
Technical Basis of the Project	• *Preliminary Engineering Report GRIP Recycled Water Project Final (February 2013).* o TM 2-4: discusses the total supply available from SJCWRP to use as recharge in the MFSG. The assessment of replenishment capabilities of the MFSG is based upon a spreading recharge capacity. o TM 2-4 Page 5, Adobe Page 133: discusses that 11,000 AFY of tertiary-treated recycled water will be used to help offset the current use of imported supplies. • *GRIP Alternative Analysis Final Report (June 2011):* o Contains a comprehensive analysis of the offset of imported water through the use of new and additional water sources. o Section 9 (Pages 70 through 71) discusses potentially feasible alternatives that will provide recycled water to the Central Basin.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA. • *Personal communication with Esther Rojas, WRD:* o Provided proportion of imported water used by WRD that is SWP water (50% SWP/50% CRA).	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Converts energy saved to a reduction in emissions of CO_2 equivalents.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**5,500 AFY**	**27,500,000 kWh/year**	**9,031 MT/year**
	• *GRIP Alternatives Analysis Updated Report (October 2012):* o This report discusses GRIP's goal to offset the current use of imported water with recycled water for groundwater replenishment. o TM 1-5 Page 8: describes the alternative that will provide 11,000 AFY of tertiary treated recycled water to recharge the Montebello Forebay. • P*ersonal communication with Esther Rojas, WRD:* o Provided proportion of imported water used by WRD that is SWP water (50% SWP/50% CRA).		
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Imported water supplies have historically been used to replenish the Central Basin. Of the imported water, 50% is from the SWP and 50% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with recycled water will reduce demands on the Bay-Delta.	The energy cost incurred by WRD to import water from the Bay-Delta and the Colorado River to the MFSG is higher than the energy cost to transport local recycled water.	The energy cost incurred by WRD to import water from the Bay-Delta and the Colorado River to the MFSG is higher than the energy cost to transport local recycled water. This energy usage results in GHG emissions that contribute to effecting climate change.
Description and Estimates of Without-Project Conditions	Without the Project, the MFSG would continue to recharge imported water, which would continue to be comprised of 50% SWP and 50% CRA.	Without the Project, approximately 27,500,000 kWh/year of excess energy would be used to convey imported water.	Without the Project, 9,031 MT of excess CO_2 equivalents per year would be generated.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**5,500 AFY**	**27,500,000 kWh/year**	**9,031 MT/year**
Methods Used to Estimate the Physical Benefit	Estimates of reduced imported water use were calculated based on the supply available from the SJCWRP and the recharge capabilities of the MFSG. A ratio of 50% SWP to 50% CRA water used was applied to the total imported water offset.	The SWP and CRA imported water volume and corresponding recycled water volume offset was applied to the energy use estimates (contained in documents cited above) for conveying and treating all three supply sources. The difference between the Project and imported water supplies was calculated.	The SWP and CRA imported water volume and corresponding recycled water volume offset was applied to the energy use estimates (contained in documents cited above) for conveying and treating all three supply sources. The difference between the Project and imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will provide the additional facilities (two new turn out structures) to allow for increased recharge of tertiary treated recycled water. In April 2014, WRD amended the Regional Water Quality Control Board's permit to allow for the use of additional recycled water for groundwater recharge.	The Project will provide the additional facilities (two new turn out structures) to allow for increased recharge of tertiary treated recycled water. In April 2014, WRD amended the Regional Water Quality Control Board's permit to allow for the use of additional recycled water for groundwater recharge.	The Project will provide the additional facilities (two new turn out structures) to allow for increased recharge of tertiary treated recycled water. In April 2014, WRD amended the Regional Water Quality Control Board's permit to allow for the use of additional recycled water for groundwater recharge.
Any Potential Adverse Physical Effects	A Mitigated Negative Declaration has been completed for the project. Mitigation measures include practices to reduce the impacts to biological and cultural resources during construction. A salt and nutrient management plan will be implemented to mitigate the effects of added Total Dissolved Solids to the West Coast Basin.	A Mitigated Negative Declaration has been completed for the project. Mitigation measures include practices to reduce the impacts to biological and cultural resources during construction. A salt and nutrient management plan will be implemented to mitigate the effects of added Total Dissolved Solids to the West Coast Basin.	A Mitigated Negative Declaration has been completed for the project. Mitigation measures include practices to reduce the impacts to biological and cultural resources during construction. A salt and nutrient management plan will be implemented to mitigate the effects of added Total Dissolved Solids to the West Coast Basin.

Cost Effectiveness Analysis

Table 6 – Cost Effectiveness Analysis **Project Name:** Recycled Water Turnouts Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Reduce Energy Usage • Reduce GHG Emissions
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?	Not applicable
	If yes, list the methods (including the proposed project) and estimated costs.	1. Tertiary Treatment Alternative – tertiary recycled water would be conveyed in the existing outfall pipeline to the MFSG. The capital cost of this project is $1,749,000. 2. Advanced Water Treatment (AWT) Alternative – AWT recycled water would be conveyed in a new, dedicated outfall pipeline to the MFSG and/or Montebello Forebay injection sites. The capital cost of this project is $246,664,000.
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.**	Not applicable.
Comments: This Project utilizes tertiary-treated water for recharge in the MFSG, and is therefore the least cost alternative. The capital costs provided were from the 2011 GRIP Alternatives Analysis Updated Report (Table ES-2). The costs include construction of treatment and conveyance facilities, injection, and flow equalization. Sewer connection fees and flow diversion costs are also included. The costs for improvements to the MFSG are not included in this cost estimate. Estimate assumes a 20 percent markup for engineering, legal, and administrative fees and a 20 percent contingency. According to the budget, the Proposed Project is now $4,900,000 for construction; however, it still remains the least-cost alternative in comparison to using AWT.		

City of Torrance (City) Goldsworthy Desalter (Desalter) Expansion Project (Project)

Project Description

(25 Words) This Project will expand the capacity of the existing desalting facility and construct two new groundwater wells to extract water from the local saline plume.

(Expanded) The Project will allow the City of Torrance and the WRD to expand the treatment capacity of the existing Desalter and increase the delivery of locally-produced safe drinking water in the West Coast Basin (WCB). Construction components include: (1) two new wells that will be drilled in locations with high chloride brackish groundwater, (2) wellhead facilities, (3) a pipeline to convey brackish groundwater to the Desalter, (4) the installation of high-efficiency reverse osmosis (RO) treatment equipment to expand the desalination capacity from 2.5 MGD to 5 MGD (or 5,000 AFY based on actual operation, including shutdown periods), an increase of approximately 3,514 AFY, and (5) upgrades to the existing RO equipment and electrical and mechanical systems (see Figure 1). In addition, a new flushing line from the Project will be constructed to divert flows that currently go to Santa Monica Bay (Bay) to discharge in the Dominguez Channel. Diversion of these discharge flows from the Desalter will reduce bacteriological contamination to the Bay.

In the early half of the 20th century, groundwater extractions in the WCB caused severe overdraft and the lowering of groundwater elevations to over 100 feet below sea level. In 2002, the Desalter was constructed as part of a regional program intended to remediate the high chloride groundwater plume and increase the local water supply in the WCB that was trapped when the seawater intrusion barriers began operation (see Figure 2). Despite this effort, the local WCB groundwater is still under-utilized by approximately 35%, due in part to the brackish groundwater. The existing source for the Desalter, Madrona Well, has experienced a drop in specific capacity due to damage of the well casing and screening over time and is currently only pumping 1,486 AFY.

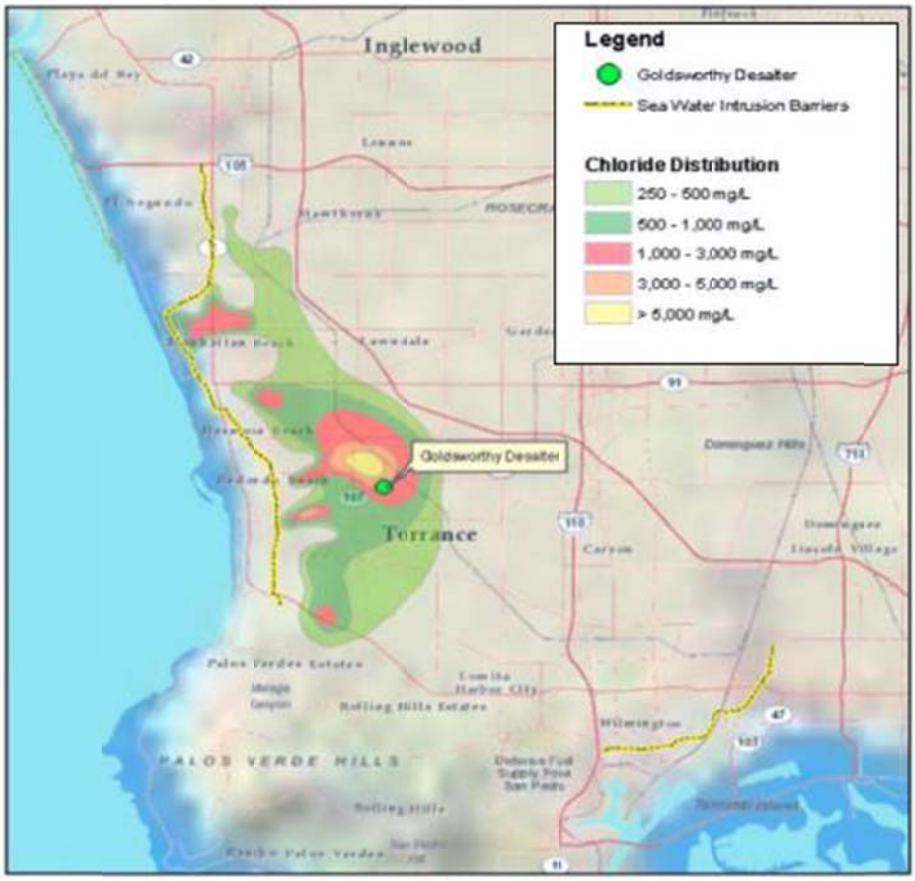
This Project provides immediate regional drought preparedness by offsetting approximately 3,514 AFY of critical and drought diminished SWP water from the MWD with additional pumped groundwater. The Desalter represents an effort to develop a locally sustainable and drought resistant groundwater supply that will reduce dependence on imported water and increase the amount of high-chloride brackish groundwater that is remediated. The MWD is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. If drought conditions persist through 2014 and into 2015, it is anticipated that mandatory rationing within the service area could go into effect by spring 2015. This Project will assist the City in meeting a portion of these demands despite reductions in imported water allocations and storage supplies.

This Project increases local water supply reliability and the delivery of safe drinking water by offsetting approximately 3,514 AFY of MWD's imported water with remediated groundwater that will be used directly for safe drinking water supplies. In addition, by gradually diminishing the extent of the brackish water plume, the Project will improve groundwater quality throughout the WCB. This will create a reliable local water source that will also be vitally important in the event of a water emergency, such as a major earthquake, which has the potential to interrupt imported deliveries to the Region.

Expedited funding is needed to immediately increase the amount of local safe drinking water supply and accelerate the remediation of groundwater in the WCB in response to recent drought conditions. Over time, the Project will increase the rate of local groundwater desalination to over twice the current rate and help restore the basin to a non-contaminated state.

Project Map

The figure below shows the current limits of the high-chloride plume and the areas of varying chloride concentrations around the Goldsworthy Desalter.



The figure below shows the Goldsworthy Desalter Expansion Facility along with the new groundwater production wells.

Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Decrease Demands on the Bay-Delta
- Improve Water Quality
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The table below provides information on the benefit of increasing local water supplies and reliability by remediating additional groundwater within the WCB and conveying it to the City of Torrance. The Desalter was originally designed to have an expanded capacity of 5 MGD, or 5,600 AFY. Due to operations and shut down periods of the Desalter, the actual increase in water supply provided will be slightly less (5,000 AFY). Note that 2016 has a lower value because construction ends in June of that year.

Annual Project Physical Benefits

Project Name: Goldsworthy Desalter Expansion Project
Type of Benefit Claimed: Increase Local Supplies/Reliability and Decrease Dependence on Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Benefit: Due to construction, operation will initiate in June 2016 resulting in a lower benefit for that year than subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014-2015	1,486	1,486 – Construction	0
2016	1,486	2,500	1,014
2017 - 2066	1,486	5,000	3,514

Comments:

- *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012), Section 1, page 1-1 and Section 4, pages 4-6 through 4-7:* discusses the current capacity and expanded capacity of the Desalter along with the contributing Desalter facilities.
- *Potable Water Production Report, 1995 to Current, WRD Desalter Purchases Tables*: average of Desalter purchases for the last three calendar years (2011-2013), which shows a production of approximately 1,486 AFY.
- *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014*: the performance of the Madrona Well has deteriorated over the years to 1,486 AFY. The additional treatment capacity and two new wells will bring the supply up to 5,000 AFY.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, The City's service area uses an imported water blend of 50% SWP water, which comes from the Bay-Delta system, and 50% CRA water. Note that 2016 has a lower value because construction ends in June of that year.

Annual Project Physical Benefits

Project Name: Goldsworthy Desalter Expansion Project

Type of Benefit Claimed: Reduce Demands on the Bay-Delta

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The percentage of SWP water (vs. CRA water) that is reduced with the Project will proportionally reduce demands on the Bay-Delta ecosystem and help address the CALFED Bay-Delta Program objectives. The volumes below reflect only those reduced demands from the Bay-Delta. Due to construction, operation will initiate in June 2016 resulting in a lower benefit for that year than subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2015	1,757	1,757 – Construction	0
2016	1,757	1,250	507
2017 -2066	1,757	0	1,757

Comments:

- *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012), Section 1, page 1-1 and Section 4, pages 4-6 through 4-7:* discusses the current capacity and expanded capacity of the Desalter along with the contributing Desalter facilities.
- *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014*: Proportions of imported water used by the City (50% SWP/50% CRA).

Benefit #3 –Improve Water Quality

The table below provides information about improving the water quality through remediation of the high salinity plume trapped in the WCB. Currently, the source water being pumped by the Madrona Well contains approximately 790 parts per million (ppm) of chlorides. After RO treatment, this is reduced to approximately 40 ppm, removing 750 ppm of chloride. In order to avoid corrosion, the product water is blended with raw water to produce a concentration of approximately 130 ppm. Due to this contamination, the residents have to rely on imported water that is purchased from MWD. The Project will drill two new wells in the immediate vicinity of the Desalter where higher chloride brackish groundwater is available. Once the Project is implemented, the two groundwater wells will produce approximately 1,400 ppm of chloride. After RO treatment, 1,360 ppm of chloride will be removed. Note that 2016 has a lower value because construction ends in June of that year. The values are calculated using the amount of chloride removed in ppm and converting to pounds per year (lbs/year).

Annual Project Physical Benefits

Project Name: Goldsworthy Desalter Expansion Project

Type of Benefit Claimed: Improve Water Quality

Units of the Benefit Claimed: lbs of chloride removed

Additional Information About this Benefit: Currently, the amount of chloride concentration removed after RO treatment is approximately 750 ppm. With implementation of the Project, approximately 1,360 ppm, of chloride would be removed after treatment. These values were converted to lbs/year of chloride removed using the amount of water supply available with and without the Project (AFY x Concentration x Conversion Factor = lbs/year of chloride removal). Due to construction, operation will initiate in June 2016 resulting in a lower benefit for that year than subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014 - 2015	3,027,420	3,027,420 – Construction	0
2016	3,027,420	4,622,028	1,594,608
2017 - 2066	3,027,420	18,479,586	15,452,166

Comments:

- *Clinical Laboratory of San Bernardino Report for the City of Torrance (April 2014).* Page 1: describes the amount of chloride in the source water being removed from the Madrona Well (790 ppm).
- *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012).* Section 2.2.1, page 2-3 and 2-10: discusses the amount of chloride that will be removed by the two new groundwater wells.

Benefit #4 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 50% SWP and 50% CRA) with remediated groundwater. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,500 kWh/AF of energy is used to provide imported supplies to the City of Torrance.

The average cost to pump groundwater in the West Coast Basin was $65/AF in 2006, which was updated to 2014 dollars as $81/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the WCB is approximately 455 kWh/AF. Over the 50-year lifespan of the Project, this totals 357,899,290 kWh of conserved energy. Note that 2016 has a lower value because construction ends in June of that year.

Annual Project Physical Benefits

Project Name: Goldsworthy Desalter Expansion Project
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column (b) show the amount of energy required to import 3,514 AFY of imported water from SWP and CRA. Values in column (c) show the amount of energy required to produce 1,014 AFY and 3,514 AFY of water supply. Values in column (d) show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from both SWP and CRA with pumped local groundwater. Due to construction, operation will initiate in June 2016 resulting in a lower benefit for that year than subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2015	8,785,000	8,785,000 – Construction	0
2016	8,785,000	2,996,427	5,788,573
2017 -2066	8,785,000	1,599,067	7,185,933

Comments:

- MWD of Southern California, 2007. *Groundwater Assessment Study*. Report Number 1308. – Chapter IV, West Coast Basin Page IV-4-7 in Table 4-3: Indicates groundwater pumping costs at $65/AF.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles.
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014*: Proportions of imported water used by the City (50% SWP/50% CRA).

Benefit #5 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the extra energy needed for imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 5,000 AFY of blended imported water, the Project will avoid GHG emissions of approximately 2,885 MT per year of carbon dioxide (CO_2) equivalents per year. Over the 50-year lifespan of the Project, this totals approximately 117,541 MT of avoided carbon emissions. Note that 2016 has a lower value because construction ends in June of that year.

Annual Project Physical Benefits

Project Name: Goldsworthy Desalter Expansion Project
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT
Additional Information About this Benefit: The Project would avoid GHG emissions generated by the extra energy needed for imported water. Due to construction, operation will initiate in June 2016 resulting in a lower benefit for that year than subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014-2015	2,885	2,885 – Construction	0
2016	2,885	984	1,901
2017-2066	2,885	525	2,360

Comments:

- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total tons of CO_2 equivalents.
- *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014*: Proportions of imported water used by the City (50% SWP/50% CRA).

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit:** 3,514 AFY	
Technical Basis of the Project	• *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012)* o Section 1, page 1-1: discusses the current capacity of the Desalter and the additional capacity available for expansion. o Section 4, pages 4-6 through 4-12: discusses the facilities needed for expansion and additional remediation of the groundwater.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In the early half of the 20th century, groundwater extractions in the Central Basin and WCB increased to a level that was double the natural replenishment, causing severe overdraft and the lowering of groundwater elevations in the basins to over 100 feet below sea level. In 2002, the Desalter was constructed as part of a regional program intended to accelerate the remediation of the high chloride groundwater plume and increase the local water supply in the WCB that was trapped when the seawater intrusion barriers began operation. The Desalter was originally designed with additional space to accommodate expanded treatment capacity.
Description and Estimates of Without-Project Conditions	Without the Desalter Expansion, the existing facility would be limited to its current approximate effective capacity of 1,486 AFY.
Methods Used to Estimate the Physical Benefit	Estimates of increased local supply were determined by considering the planned expansion capacity of the Desalter as compared to the existing capacity.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Facilities: The expansion of the existing Desalter includes the addition of a new RO treatment train, installation of more efficient pumping, electrical and mechanical equipment and the drilling of two new source water brackish groundwater wells. Policies: The City of Torrance currently has a series of agreements with WRD for the purchase of potable water from the Desalter and for operation and maintenance of the facility. Licensing agreements between the City and WRD for the development of the two new brackish groundwater wells has been approved by both the Torrance City Council and WRD Board of Directors. Actions: A new MOU between the City and WRD is pending, which will delineate the respective roles and responsibilities of the City and WRD with regard to Desalter expansion.
Any Potential Adverse Physical Effects	A Mitigated Negative Declaration has been completed for the Project. Mitigation measures during construction include practices to reduce air pollution and noise and minimize construction impacts to water quality. The WRD and the City of Torrance will ensure safe handling of any mineral or archeological objects should they be uncovered on the well construction sites or pipeline pathways. Traffic abatement measures will be implemented to allow for installation of a pipeline underneath an asphalt roadway.

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,757 AFY**	**15,452,166 lbs/year**	**7,185,933 kWh/year**	**2,360 MT/year**
Technical Basis of the Project	• *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012)* o Section 1, page 1-1: discusses the current capacity of the Desalter and the additional capacity available for expansion. o Section 4, pages 4-6 through 4-12: describes the facilities needed for expansion and additional remediation of the groundwater. • P*ersonal communication with Chuck Schaich, City of Torrance, June 23, 2014* o Provided proportion of imported water used by the City that is SWP water (50% SWP/50% CRA).	• *Clinical Laboratory of San Bernardino Report for the City of Torrance (April 2014)* o Page 1: describes the amount of chloride in the source water being removed from the Madrona Well (790 ppm). • *Feasibility Study for the Expansion of Robert W. Goldsworthy Desalter (October 2012)* o Section 2.2.1, Page 2-3: discusses the amount of blended product water that will be produced by the two new groundwater wells.	• *MWD of Southern California, 2007. Groundwater Assessment Study. Report Number 1308.* o Table 4-3: Provides an estimated cost to pump local groundwater ($65/AF). • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* o Page 1: Provides an estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007)* o Page 4: Estimates how much energy is used to provide SWP and CRA water.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA water. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Documents converts energy saved to a reduction in emissions of CO_2 equivalents

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,757 AFY**	**15,452,166 lbs/year**	**7,185,933 kWh/year**	**2,360 MT/year**
			• *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014* o Proportions of imported water used by the City (50% SWP/50% CRA).	• *Personal communication with Chuck Schaich, City of Torrance, June 23, 2014* • Proportions of imported water used by the City (50% SWP/50% CRA).
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In typical years, 50% of imported water supplies are from the SWP and 50% are from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with remediated groundwater will reduce demands on the Bay-Delta.	Over the years, the current groundwater well, Madrona Well, has been deteriorating due to damage of the well casing and screening. This caused a reduction in the amount of chloride being remediated from the WCB. Currently, after RO treatment the Madrona Well is producing approximately 3,027,420 lbs/year of chloride from the source water.	The imported water delivered consumes energy to transport from the Bay-Delta and the CRA at a higher rate than is required for remediating local groundwater.	The imported water delivered consumes energy to transport from the Bay-Delta and the CRA at a higher rate than is required for remediating local groundwater. This energy usage generates GHG emissions that cause climate change.
Description and Estimates of Without-Project Conditions	Without the Project, imported supplies would continue to be used, proportionally 50% SWP and 50% CRA.	Without the Project, 3,027,420 lbs/year of chloride would be produced with the existing well, as opposed to 15,452,166 lbs/year with the new wells.	Without the project, 7,185,933 kWh/year of excess energy would be used to convey imported water.	Without the project, 2,360 MT of excess CO_2 equivalents per year would be generated.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,757 AFY**	**15,452,166 lbs/year**	**7,185,933 kWh/year**	**2,360 MT/year**
Methods Used to Estimate the Physical Benefit	Estimates of reduced imported water use were determined by considering the potential expansion capacity of the Desalter as compared to existing capacity. Proportionally, 50% SWP and 50% CRA water was applied to the total imported water offset to determine reduced demands on the Bay-Delta.	Estimates of the improved water quality were based on the new wells that would be installed in lieu of the deteriorating well. The additional treatment capacity provided by the new wells will remove 15,452,166 lbs/year of chloride at a loading rate of 5,000 AFY.	The SWP and CRA imported water use volume and corresponding remediated groundwater volume was applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the project compared to imported water supplies was calculated.	The SWP and CRA imported water use volume and corresponding remediated groundwater volume was applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the project compared to imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.

Type of Physical Benefit:	Reduce Demands on the Bay-Delta	Improve Water Quality	Reduce Energy Usage	Reduce GHG Emissions
Amount:	**1,757 AFY**	**15,452,166 lbs/year**	**7,185,933 kWh/year**	**2,360 MT/year**
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Facilities: The expansion of the existing Desalter includes the addition of a new RO treatment train, installation of more efficient pumping, electrical and mechanical equipment and the drilling of two new source water brackish groundwater wells. Policies: The City of Torrance currently has a series of agreements with the WRD for the purchase of potable water from the Desalter and for operation and maintenance of the facility. Licensing agreements between the City and WRD for the development of the two new brackish groundwater wells has been approved by both the Torrance City Council and WRD Board of Directors. Actions: A new MOU between the City and WRD is pending, which will delineate the respective roles and responsibilities of the City and WRD with regard to Desalter expansion.	Facilities: The expansion of the existing Desalter includes the addition of a new RO treatment train, installation of more efficient pumping, electrical and mechanical equipment and the drilling of two new source water brackish groundwater wells. Policies: The City of Torrance currently has a series of agreements with the WRD for the purchase of potable water from the Desalter and for operation and maintenance of the facility. Licensing agreements between the City and WRD for the development of the two new brackish groundwater wells has been approved by both the Torrance City Council and WRD Board of Directors. Actions: A new MOU between the City and WRD is pending, which will delineate the respective roles and responsibilities of the City and WRD with regard to Desalter expansion.	Facilities: The expansion of the existing Desalter includes the addition of a new RO treatment train, installation of more efficient pumping, electrical and mechanical equipment and the drilling of two new source water brackish groundwater wells. Policies: The City of Torrance currently has a series of agreements with the WRD for the purchase of potable water from the Desalter and for operation and maintenance of the facility. Licensing agreements between the City and WRD for the development of the two new brackish groundwater wells has been approved by both the Torrance City Council and WRD Board of Directors. Actions: A new MOU between the City and WRD is pending, which will delineate the respective roles and responsibilities of the City and WRD with regard to Desalter expansion.	Facilities: The expansion of the existing Desalter includes the addition of a new RO treatment train, installation of more efficient pumping, electrical and mechanical equipment and the drilling of two new source water brackish groundwater wells. Policies: The City of Torrance currently has a series of agreements with the WRD for the purchase of potable water from the Desalter and for operation and maintenance of the facility. Licensing agreements between the City and WRD for the development of the two new brackish groundwater wells has been approved by both the Torrance City Council and WRD Board of Directors. Actions: A new MOU between the City and WRD is pending, which will delineate the respective roles and responsibilities of the City and WRD with regard to Desalter expansion.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Improve Water Quality**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,757 AFY**	**15,452,166 lbs/year**	**7,185,933 kWh/year**	**2,360 MT/year**
Any Potential Adverse Physical Effects	A Mitigated Negative Declaration has been completed for the project. Mitigation measures during construction include practices to reduce air pollution and noise and minimize construction impacts to water quality. The WRD and the City of Torrance will ensure safe handling of any mineral or archeological objects should they be uncovered on the well construction sites or pipeline pathways. Traffic abatement measures will be implemented to allow for installation of a pipeline underneath an asphalt roadway.	A Mitigated Negative Declaration has been completed for the project. Mitigation measures during construction include practices to reduce air pollution and noise and minimize construction impacts to water quality. The WRD and the City of Torrance will ensure safe handling of any mineral or archeological objects should they be uncovered on the well construction sites or pipeline pathways. Traffic abatement measures will be implemented to allow for installation of a pipeline underneath an asphalt roadway.	A Mitigated Negative Declaration has been completed for the project. Mitigation measures during construction include practices to reduce air pollution and noise and minimize construction impacts to water quality. The WRD and the City of Torrance will ensure safe handling of any mineral or archeological objects should they be uncovered on the well construction sites or pipeline pathways. Traffic abatement measures will be implemented to allow for installation of a pipeline underneath an asphalt roadway.	A Mitigated Negative Declaration has been completed for the project. Mitigation measures during construction include practices to reduce air pollution and noise and minimize construction impacts to water quality. The WRD and the City of Torrance will ensure safe handling of any mineral or archeological objects should they be uncovered on the well construction sites or pipeline pathways. Traffic abatement measures will be implemented to allow for installation of a pipeline underneath an asphalt roadway.

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project Name:** Goldsworthy Desalter Expansion Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Improve Water Quality • Reduce Energy Usage • Reduce GHG Emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Alternative methods have been considered.
	If no, why?	Not applicable
	If yes, list the methods (including the proposed project) and estimated costs.	1. Goldsworthy Desalter Expansion Alternative (proposed Project) – This alternative will expand the existing Goldsworthy Desalter from its present combined product water capacity of 2,500 AFY to 5,000 AFY. Five different site location options were identified. The proposed Project has an estimated cost of $23,574,092 2. Elm Avenue Desalter Alternative – This alternative involves the construction of a new 5,000 AFY desalter that would be located at the City of Torrance's Elm Avenue site. Three well-sites were considered. The estimated total initial cost including well siting for each site were $26,669,000, $27,317,000, and $27,483,000.
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.**	Not applicable. The Project is the least cost alternative.
Comments:		

City of Burbank Water and Power (BWP) Be a Water Saver Conservation Program Project (Project)

Project Description

(25 word) This Project will increase water conservation through the expansion of a comprehensive financial incentive program that will provide 393 AFY of immediate and sustainable savings.

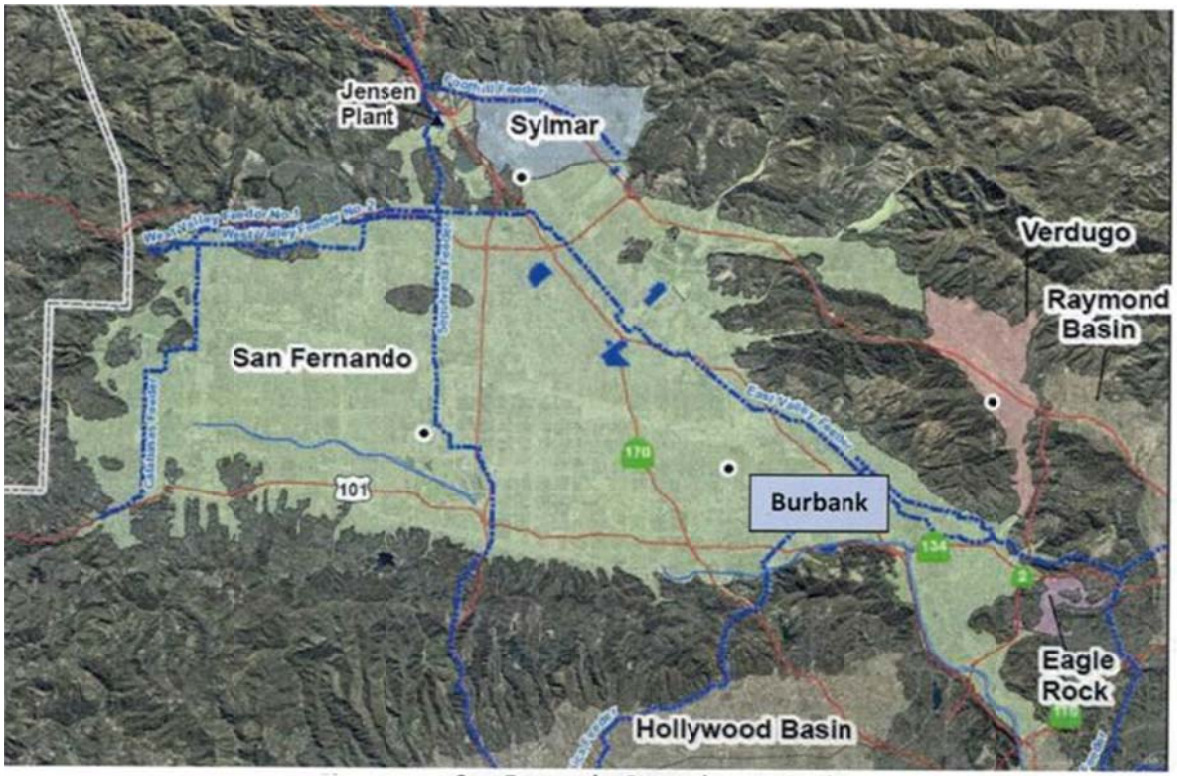
(Expanded) The BWP in partnership with MWD proposes to expand existing water conservation efforts three-fold to quickly address drought preparedness and reduce impacts on the State's finite water supply, conservatively between 9.5 and 393 AFY, depending on the year. The supply benefits vary over time because each project component has a different lifespan. The proposed program includes the following water conservation elements: (1) High-efficiency (HE) Toilet Rebates, (2) Green Home House Call Residential Water Audits and Direct Replacement Program, (3) Go Native! Turf Replacement, (4) Rain Water Harvesting Rain Barrel Rebates, (5) Increased Educational Outreach and Technical Training Workshops, and (6) Home Water Reports and Customer Web Portal. The HE Toilet Rebates Program will increase the number of HE toilet rebates to 1,300 and increase the rebate value to $150 in order to triple efforts to promote water savings within the BWP and achieve an accelerated rate of sustainable water savings (9 AFY). The Green Home House Call Program will include 500 landscape water audits annually and indoor water audits of kitchen aerators, bath aerators, and low-flow showerheads (100 AFY). The Go Native! Turf Replacement Program will increase the amount of funding available for customer rebates, which will help to conserve water by replacing turf with native plants and acceptable ground cover materials (40 AFY). The Rain Water Harvest Program will offer 400 rain barrel rebates in order to increase the quantity of stormwater captured (10 AFY). Educational outreach and technical training classes will be provided to support the Go Native! Turf Removal Program and will teach participants about native plants, turf removal, and landscape conservation tools. The Home Water Reports and Customer Web Portal Program will be implemented to compare and provide bi-monthly residential water use and efficiency measure reports. The program will include a web-based portal that customers can utilize to track their water usage rates (341 AFY). Collectively, these programs will conserve approximately 500 AFY of safe drinking water for customers in the BWP service area when combined with existing toilet rebate, house call, and turf rebate programs. Therefore, the net benefit provided by the Project is up to 393 AFY (see Annual Project Physical Benefit tables).

This Project provides immediate regional drought preparedness by offsetting up to 393 AFY of critical and drought diminished SWP water and other imported supplies. The MWD (BWP's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. Although the BWP's constituents have paid for water storage investments, BWP has maintained an aggressive conservation program during the drought. If drought conditions persist through 2014, it is anticipated that mandatory rationing within BWP's service area could go into effect by spring 2015.

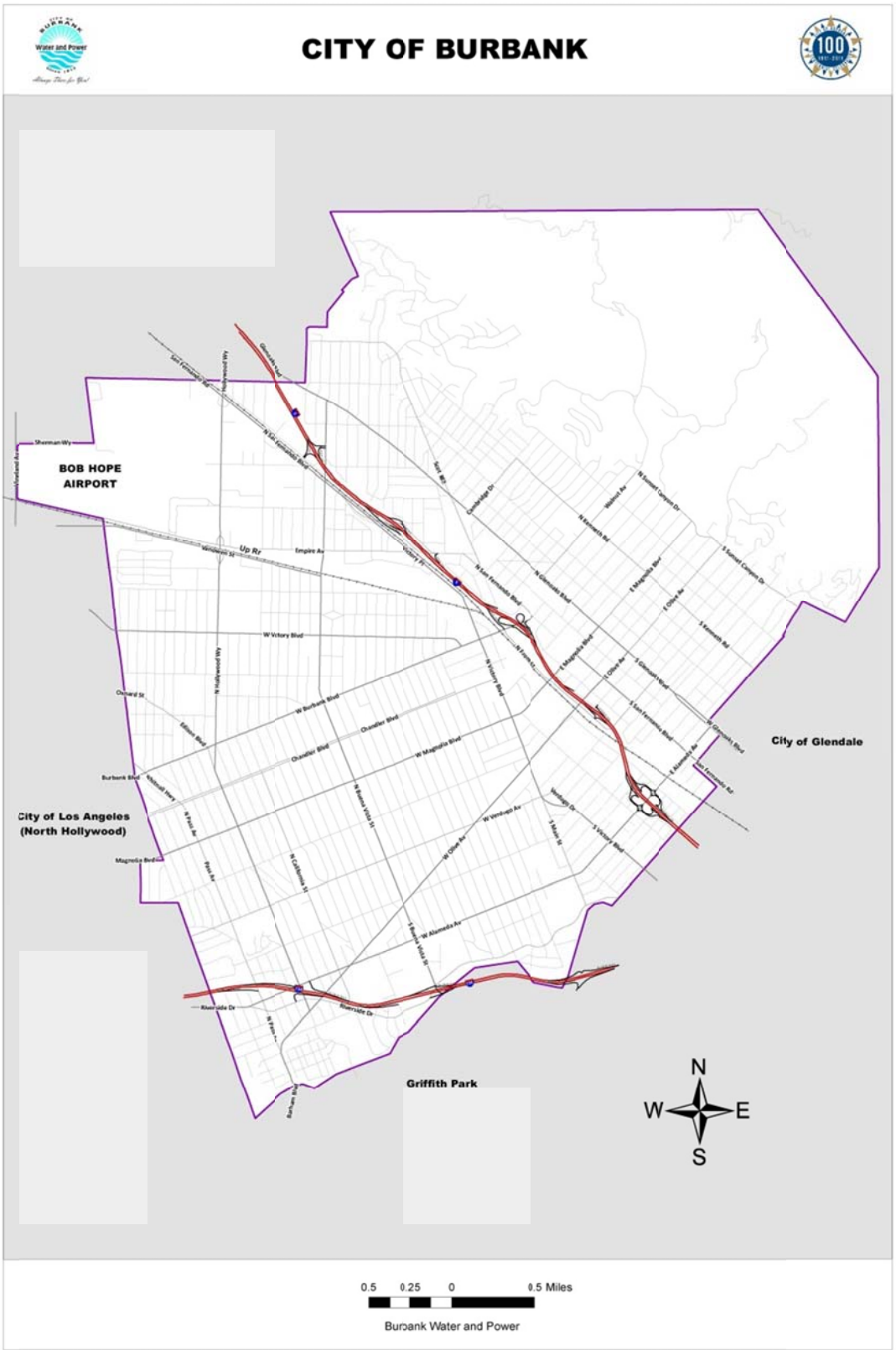
The Project increases local water supply reliability and the delivery of safe drinking water by reducing up to 393 AFY of imported water use and allowing more availability of local potable water. Increasing the number of HE toilets, indoor and outdoor water audits, native plants, rain barrels, and educational outreach will allow BWP and MWD to promote water savings and achieve an accelerated rate of sustainable water supply. BWP's ability to meet water demands is partially dependent upon the availability of imported water with 80% of the water supply provided from imported sources. Therefore, the implementation of the conservation measures will reduce the BWP's reliance upon imported water, improving local and regional water reliability. If this Project is not implemented, up to 393 AFY of potable water demand will continue to strain the imported supplies and groundwater basin both of which are already stressed from the previous drought of 2009-2011. Since groundwater is relied upon heavily during drought conditions and there has been a lack of imported replenishment supply, water conservation measures are needed to sustainably manage local demands.

Expedited funding is needed for this Project to immediately increase water conservation efforts and reduce demands on imported water from the SWP. The BWP is currently not at risk of not meeting existing drinking water demands; however, if the BWP's water allocation is reduced significantly, water rationing may be necessary to meet drinking water demands.

Project Map



San Fernando Groundwater Basin


CITY OF BURBANK
BOB HOPE AIRPORT
City of Glendale
City of Los Angeles (North Hollywood)
Griffith Park
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W
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0.5 0.25 0 0.5 Miles
Burbank Water and Power

Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Water Conserved and Decrease Dependence on Imported Water Supply
- Reduce Demands on the Bay-Delta
- Avoided Stormwater Runoff
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Water Conserved and Decrease Dependence on Imported Water Supply

This Project will increase the amount of water supply conserved within the San Fernando Basin and offset imported supplies from the SWP and CRA. The specific components of the Project that will accomplish this are:

- Green Home House Call Program – This program is a service provided for all Burbank residents allowing them to gain knowledge regarding the conservation measures BWP has implemented. It is a comprehensive program that results in free replacement of aerators and faucets for BWP customers, adjustment of sprinklers and controllers, and direct installation of toilets. This program is the "gateway" to all of the other conservation programs in the Project and provides a one-on-one mechanism to alert Burbank residents about opportunities to upgrade their toilets, obtain rain barrels, and replace turf. The Green Home House Call Program is the largest contributor to BWP's past conservation successes. This program is included in the overall Project because of these linkages, but there will be no change in benefits reported for this project component. In other words, the costs and benefits of the Green Home House Call Program will be the same, with or without the Project. This is reflected in the annual project physical benefits tables below and in the Work Summary, Budget, and Schedule. It is included here simply because without this program, the remaining programs would not be successful. This program is estimated to provide 100 AFY of supply benefits, both with and without the Project.
- Go Native! Turf Removal Program – Grant funding for this program measure will increase the amount of funding available for customer rebates in order to convert turf to native landscapes to conserve water and reduce non-point source pollutants associated with lawn care. It is projected to conserve approximately 40 AFY. This program has a 10-year life expectancy, based on the required amount of time residents must maintain the landscaping, and it is anticipated to begin implementation on July 1, 2014. It will be partially implemented in 2014 (20 AFY), with full implementation from 2015 through 2024 and partial implementation in 2025. Without the Project, this program is estimated to provide approximately 6 AFY of supply benefits.
- Home Water Reports and Customer Web Portal Program – This program will implement a web-based software application for customers to track their water use and efficiency. For the purpose of estimating the savings for this program, the East Bay Municipal Utility District conducted a year-long pilot project, which provided households with periodic information on their current water use and compared it to their past use, use by similar households, and efficiency rates. With a participate rate of 10,000 customers, this program will save approximately 341 AFY. This program will have a lifespan of 10 years and is anticipated to start on October 16, 2014. It will be fully implemented in 2014 for the entire lifespan of the Project (until 2024). This program currently does not exist and so would provide 0 AFY of supply benefits without the Project.
- HE Toilet Rebate Program – This program will increase the number of HE toilet rebates to 1,300, which will conserve approximately 9 AFY. Currently, 200 rebates are being provided to residents in the City of Burbank. This program has a 20-year lifespan and will begin on July 1, 2014. It will be partially implemented in 2014 (4.5 AFY), with full implementation from 2015 through 2035 and partial implementation in 2036. Without the Project, this program is estimated to provide approximately 1 AFY of supply benefits.
- Rain Water Harvesting Program – This program will offer 400 rain barrel rebates to conserve approximately 10 AFY of water. This program will have a life expectancy of 20 years and is anticipated to start on July 1, 2014. It will be partially implemented in 2014 (5 AFY), with full implementation from 2015 through 2035 and partial implementation in 2036. This program currently does not exist and so would provide 0 AFY of supply benefits without the Project.

Currently, the BWP has conservation measures in place include the Green Home House Call Program (100 AFY) with a 5-year lifespan, the Turf Removal Program (approximately 6 AFY) with a 10-year lifespan, and the HE Toilet Rebate Program (approximately 1 AFY) with a 20-year lifespan, totaling 107 AFY of existing conservation. Based on the BWP Water Conservation Programs Technical Memorandum, the five conservation programs discussed above would collectively conserve approximately 500 AFY in the BWP service area when combined with these existing toilet rebate, house call, and turf rebate programs. Therefore, this Project will conserve up to an additional 393 AFY. The AFY savings from each program, along with the anticipated start dates and lifespans, are indicated in the table below.

Table 5 - Annual Project Physical Benefits

Project Name: Be a Water Saver Conservation Program Project

Type of Benefit Claimed: Increase Water Conserved and Decrease Dependence on Imported Water Supply

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The volumes below show the increase in local water saved provided by the conservation measures. The estimated increase in local water conserved is based on a conservative 5-year lifespan for the Green Home House Call, a 10-year lifespan for the Home Water Reports and Customer Web Portal and Turf Removal Programs, and a 20-year lifespan for the HE Toilet Rebate and Rain Water Harvesting Programs. The AFY benefit contributed from each program is applied according to the first year of implementation. The table indicates a partial benefit in 2014 for all programs except Green Home House Call and Home Water Reports and Customer Web Portal, then full benefits from 2015 to 2024 for all programs except Green Home House Call. Then, partial benefits are indicated in 2025 for the Turf Removal Program (i.e., when half this program reaches the useful lifespan), and full benefits are indicated from 2015 to 2034 with partial benefit in 2035 for the HE Toilet Rebate and Rain Water Harvesting Programs (i.e., when half of the HE toilets and rain barrels reach their useful lifespan). Currently, Green Home House Call (100 AFY), Turf Removal (6 AFY), and the HE Toilet Rebate Programs (1 AFY) are in place with a 5 year, 10 year, and 20 year lifespan for each program, respectively, starting in 2014. For calculation purposes within the following tables, these figures were rounded to even numbers.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	100 (Green Home) + 6 (Turf Removal) + 1 (HE Toilets) = 107 (Total)	100 (Green Home) + 20 (Turf Removal) + 341 (Web Portal) + 4.5 (HE Toilets) + 5 (Rain Barrels) = 471 (Total) – Implementation	364
2015	100 + 6 + 1 = 107	100 + 40 + 341 + 9 + 10 = 500	393
2016	100 + 6 + 1 = 107	100 + 40 + 341 + 9 +10 = 500	393
2017	100 + 6 + 1 = 107	100 + 40 + 341 + 9 + 10 = 500	393
2018	100 + 6 + 1 = 107	100 + 40 + 341 + 9 + 10 = 500	393
2019	100 + 6 + 1 = 107	100 + 40 + 341 + 9 + 10 = 500	393
2020	0 + 6 + 1 = 7	0 + 40 + 341 + 9 + 10 = 400	393
2021	0 + 6 + 1 = 7	0 + 40 + 341 + 9 + 10 = 400	393
2022	0 + 6 + 1 = 7	0 + 40 + 341 + 9 + 10 = 400	393
2023	0 + 6 + 1 = 7	0 + 40 + 341 + 9 + 10 = 400	393
2024	0 + 6 + 1 = 7	0 + 40 + 341 + 9 + 10 = 400	393
2025	0 + 0 + 1 = 1	0 + 20 + 0 + 9 + 10 = 39	38
2026	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2027	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2028	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18

2029	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2030	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2031	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2032	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2033	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2034	0 + 0 + 1 = 1	0 + 0 + 0 + 9 + 10 = 19	18
2035	0	0 + 0 + 0 + 4.5 + 5 = 9.5	9.5

Comments:

- *City of Burbank Water and Power Water Conservation Programs Technical Memorandum (July 2014).*
  - Page 12 Table 3: provides a summary of the benefits the five program measures will provide.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, BWP's service area uses an imported water blend of 95% SWP, that comes from the Bay-Delta system, and 5% CRA. The values below reflect this proportion of reduced demands on the Bay-Delta. Based on the BWP Water Conservation Programs Technical Memorandum and the proportion of imported SWP water, approximately 373 AFY of demands from the Bay-Delta (95% of 393 AFY) could be offset by implementing these conservation programs in the BWP service area.

Table 5 - Annual Project Physical Benefits

Project Name: Be a Water Saver Conservation Program Project
Type of Benefit Claimed: Reduce Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The proportion of SWP water that is reduced with the Project will decrease demands on the Bay-Delta ecosystem and help address the CALFED Bay-Delta Program objectives. The volumes below show the reduction in demands on the Delta and are based on the same conservatively estimated lifespans as described under Benefit #1.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	373	346 – Implementation	27
2015 - 2024	373	0	373
2025	373	337	36
2026 - 2034	373	356	17
2035	373	364	9

Comments:

- *City of Burbank Water and Power Water Conservation Programs Technical Memorandum (July 2014).*
  - Page 12 Table 3: provides a summary of the benefits the five program measures will provide and the total amount of water savings provided.
- *Personal communication with Kapil Kulkarni, BWP.*
  - Proportion of imported water used by the BWP that is SWP water (95% SWP/5% CRA).

Benefit #3 – Avoided Stormwater Runoff

The stormwater capture through the use of rain barrels is a water conservation method that also contributes to improving water quality by decreasing the amount of stormwater runoff that can flow across polluted surfaces and contaminate surface water. Reducing the amount of rainwater that enters the stormwater conveyance system also helps to prevent erosion of creeks and streambeds, and it aids in protecting the diverse ecosystems that exist in Southern California. Harvesting rainwater will also allow for greater groundwater infiltration, due to the collected rainwater being diverted for outdoor water uses as opposed to draining into the stormwater system and out to the ocean. Based on the BWP Water Conservation Programs Technical Memorandum, the rain barrel program would prevent approximately 10 AFY of stormwater runoff in the BWP service area.

Table 5 - Annual Project Physical Benefits

Project Name: Be a Water Saver Conservation Program Project
Type of Benefit Claimed: Avoided Stormwater Runoff
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The volumes below show the increase in improved water quality through avoided stormwater runoff. This program will have a life expectancy of 20 years and is anticipated to start on July 1, 2014. It will be partially implemented in 2014 (5 AFY), with full implementation from 2015 through 2035 and partial implementation in 2036 (i.e., when half the rain barrels come to the end of their useful lifespan).

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	5 – Implementation	5
2015	0	10	10
2016 – 2035	0	10	10
2036	0	5	5

Comments:

- *City of Burbank Water and Power Water Conservation Programs Technical Memorandum (July 2014).*
  - Page 10: provides a description of the program and a calculation of the savings provided.

Benefit #4 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 95% SWP and 5% CRA) with water conservation measures. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, this results in an estimated 2,950 kWh/AF of energy consumption to provide imported supply to the BWP. For the combined lifespans of this Project, this totals approximately 12,071,400 kWh of reduced energy usage.

Table 5 - Annual Project Physical Benefits

Project Name: Be a Water Saver Conservation Program Project
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column (d) show the amount of energy saved thorough implementation of the Project. Energy saved results from saving imported water through the various conservation measures. The estimated reduced energy demands on the Bay-Delta are based on the conservatively estimated lifespans as described under Benefit #1.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,159,350	85,550 – Implementation	1,073,800
2015 – 2024	1,159,350	0	1,159,350
2025	1,159,350	1,047,250	112,100
2026 – 2034	1,159,350	1,106,250	53,100
2035	1,159,350	1,131,325	28,025

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water and CRA imported water.
- *Personal communication with Kapil Kulkarni, BWP*: Proportion imported water used by the BWP that is SWP water (95% SWP/5% CRA).
- *Water Saver Energy GHGs Calculations:* Energy calculations

Benefit #5 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting up to 393 AFY of imported water demand, the Project will avoid GHG emissions of approximately 381 MT of CO_2 equivalents per year to import water. For the lifespan of the Project, this totals approximately 3,963 MT of CO_2 equivalents per year.

Table 5 - Annual Project Physical Benefits

Project Name: Be a Water Saver Conservation Program Project
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT
Additional Information About this Benefit: The Project would avoid GHG emissions generated by conserving imported water. Values in column (d) show the amount of GHG saved thorough implementation of the Project. GHG emissions are reduced from saving imported water through the various conservation measures. The estimated reduced GHG emissions demands on the Bay-Delta are based on the conservatively estimated lifespans as described under Benefit #1.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	381	28 – Implementation	353
2015 – 2024	381	0	381
2025	381	344	37
2026 – 2034	381	364	17
2035	381	372	9

Comments:

- California Action Registry, General Reporting Protocol. Version 3.1, January 2009. Section 3. Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.
- *Personal communication with Kapil Kulkarni, BWP*: Proportion imported water used by the BWP that is SWP water (95% SWP/5% CRA).
- *Water Saver Energy GHGs Calculations:* Energy calculations

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Water Conserved and Decrease Dependence on Imported Water Supply **Amount:** 9.5-393 AFY	

Technical Basis of the Project	• *BWP Water Conservation Programs Technical Memorandum(July 2014)*
	  • Page 12 Table 3 – provides information regarding the conservation programs and the effect these programs will have on the potable water demand.
	  • This report also discusses the success of these conservation programs in previous years and the reduced demand resulting from these measures. These results were used to estimate the potential decreases in potable water use with further implementation of the programs within this Project.

Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	With the reduction of imported water supplies due to drought conditions, the BWP has implemented conservation programs to create a sustainable water source for the future. The growth of these conservation programs will further reduce water demands. If current drought conditions continue, additional mandatory water rationing will be required in the service area.
Description and Estimates of Without-Project Conditions	Without implementation of the Project, the BWP will need to purchase up to an additional 393 AFY of imported supply to meet demands. The imported water demands will continue at a rate of 95% SWP and 5% CRA.
Methods Used to Estimate the Physical Benefit	Different methods were utilized to estimate the amount of water which will be conserved over the lifespan of the programs as shown in the *BWP Water Conservation Programs Technical Memorandum*. 1. Green Home House Call Program – The estimated water savings are based on direct replacement of showerheads with 2 gallon flow rates and the replacement of bath and kitchen faucet aerators. The amount of benefit provided was established from historical data and continued customer interest. 2. Go Native! Turf Removal – The estimated water savings are based on MWD's calculation of 40.8 gal/year of water saved per sq. ft. of turf converted. Approximately 300,000 sq. ft. of turf will be converted to native landscapes. 40.8 gal/year x 300,000 sq. ft. x 1 AF/325,851 gal = 37.6 (40 AFY) 3. Home Water Reports –This pilot study received high participation rates, and an estimated 10,000 residents will be participating in this program.[1] The average potable water supply is 19,208.5 AF to 71% of the residential customers in the BWP service area. Approximately 50% of the households in the BWP service area will be participating with an anticipated 5% water savings per household. 19,208.5 AF x 0.71 = 13,638 AF 13,638 x 0.05 = 682 AF 682 AF / 0.50 households = 341 AF 4. HE Toilet Rebate Program – An assumption of 90% of the toilets being replaced are ultra-low flush and produce 1.6 gallons (gal) of water per flush was made and 10% of the toilets use a 3.5 or higher gal per flush rate (gpf) for an average of 1.79 gpf. It was estimated approximately 2,270.3 gal/year will be conserved. Increasing the number of

[1] Mitchell, David L. and Thomas W. Chesnutt, Ph.D, "Evaluation of East Bay MUD's Pilot of WaterSmart Home Water Reports", California Water Foundation/EBMUD, December 2013.

	rebates to 1,300 will amount to an estimated 9 AFY of water conserved. 2,270.3 gal/year x 1,300 rebates = 2,951,390 gal/year 2,951,390 gal/year x 1 AF/325,851 gal = 9 AFY 5. Rain Water Harvesting – The quantity of stormwater capture was based on an average annual rainfall of 16.29 inches (in) for the City of Burbank.[2] Based on data from the California Urban Water Conservation Council, it is possible to capture 934 gal of water from the rooftop of an average sized home of 1,500 sq. ft. for every one inch of rainfall. Each rain barrel is estimated to provide 100 gal of water. 934 gal x 16.29 in = 15,215 gal-in 15,215 gal-in x 0.55 capture efficiency/in of rainfall = 8,368.25 gal 8,368.25 gal x 400 rain barrels = 3,347,300 gal 3,347,300 gal x 1 AF/325,851 gal = 10 AFY
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Contract approval of the home water reports and web portal services.
Any Potential Adverse Physical Effects	None

[2] Burbank, California Average Rainfall. Western Regional Climate Center. Accessed 7/8/2014. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1194

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Avoided Stormwater Runoff**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**9-373 AFY**	**10 AFY**	**26,550-1,159,350 kWh/year**	**9-381 MT/year**
Technical Basis of the Project	• *City of Burbank Water and Power Water Conservation Program Technical Memorandum (July 2014).* o Page 12 Table 3: provides a summary of the benefits the five program measures will provide and the total amount of water savings provided. • *Personal communication with Kapil Kulkarni, BWP.* o Proportion of imported water used by the BWP that is SWP water (95% SWP/5% CRA).	• *City of Burbank Water and Power Water Conservation Program Technical Memorandum (July 2014).* • Page 10: provides a description of the program and a calculation of the savings provided.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007)* o Page 4: Estimates how much energy is used to provide SWP and CRA water. • *Personal communication with Kapil Kulkarni, BWP.* o Proportion of imported water used by the BWP that is SWP water (95% SWP/5% CRA). • *Water Saver Energy GHGs Calculations:* Energy calculations	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA water. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Document converts energy saved to a reduction in emissions of CO_2 equivalents • *Personal communication with Kapil Kulkarni, BWP.* o Proportion of imported water used by the BWP that is SWP water (95% SWP/5% CRA). • *Water Saver Energy GHGs Calculations:* Energy calculations
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In typical years, 95% of imported water supplies are from the SWP and 5% are from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with conserved local water will reduce demands on the Bay-Delta.	In typical storm events, stormwater is diverted to the ocean through a concrete channel allowing flow to be contaminated with dirt, oil, and grease resulting in polluted surface water resources.	The imported water delivered to the BWP requires energy to transport from the Bay-Delta and the CRA.	The imported water delivered to the BWP requires energy to transport from the Bay-Delta and the CRA. This energy usage generates GHG emissions that cause climate change.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Avoided Stormwater Runoff**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**9-373 AFY**	**10 AFY**	**26,550-1,159,350 kWh/year**	**9-381 MT/year**
Description and Estimates of Without-Project Conditions	Without the Project, imported supplies would continue to be used, proportionally 95% SWP and 5% CRA.	Without the Project, rainwater will not be infiltrated into the groundwater with outdoor water use and will drain into a stormwater system.	Without the Project, approximately 1,159,350 kWh/year of excess energy would be used to convey imported water.	Without the Project, up to 381 MT of excess CO_2 equivalents per year would be generated.
Methods Used to Estimate the Physical Benefit	The amount of reduced Delta demands is based on a 95% SWP and 5% CRA blend to the annual amount of imported water that would need to be purchased without implementation of the conservation programs.	The quantity of stormwater capture was based on an average annual rainfall of 16.29 in for the City of Burbank. Based on data from the California Urban Water Conservation Council, it is possible to capture 934 gal of water from the rooftop of an average sized home of 1,500 sq ft for every one inch of rainfall. Each rain barrel is estimated to provide 100 gal of water. 934 gal x 16.29 in = 15,215 gal/in 15,215 gal/in x 0.55 in of rainfall = 8,368.25 gal 8,368.25 gal x 400 rain barrels = 3,347,300 gal 3,347,300 gal x 1 AF/325,851 gal = 10 AFY	The annual SWP and CRA imported water use volume and corresponding demand reduction volume offset was applied to the energy use estimates (contained in the documents cited above) for conveying imported supply sources.	The SWP and CRA imported water use volume and corresponding water conserved volume was applied to the energy use estimates (contained in documents cited above) for conveying and treating imported supply sources. The difference between the energy needed for the project compared to imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Contract approval of the home water reports and web portal services.	Contract approval of the home water reports and web portal services.	Contract approval of the home water reports and web portal services.	Contract approval of the home water reports and web portal services.
Any Potential Adverse Physical Effects	None	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project Name:** Be a Water Saver Conservation Program Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Water Conserved and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Avoided Stormwater Runoff • Reduce Energy Usage • Reduce GHG Emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Alternative methods have been considered to achieve the same types and amounts of physical benefits.
	If no, why?	Not applicable
	If yes, list the methods (including the proposed project) and estimated costs.	1. Proposed Project – This alternative is a comprehensive program that offers a suite of opportunities to conserve water. The Project will allow conservation programs to be implemented that will increase the local water saved. This Project has an estimated cost of $1,565,722. 2. Recycled Water Alternative – This alternative would provide all of the benefits described above with the exception of avoiding stormwater runoff. It will require an increase in the distribution of recycled water to the BWP. However, the BWP has nearly completed its recycled water distribution networks, which has resulted in the annual distribution of approximately 2,100 AF of water. This alternative would cost BWP approximately $4,472,473 for a comparable amount of new local supply.
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.**	Not applicable. The proposed Project is the least cost alternative.
Comments:		

West Basin Municipal Water District (WBMWD) On-Site Recycled Water Retrofits Project (Project)

Project Description

(25 Word) The Project will design and construct laterals and on-site retrofitting to connect eight existing potable use sites to WBMWD's recycled water system.

(Expanded) This Project will design and construct laterals and on-site retrofitting to connect eight existing potable sites to WBMWD's existing recycled water distribution system to serve 206 AFY of recycled water for landscape irrigation. Recycled water use at the eight sites will be: Animo Charter Middle School (5 AFY), Jefferson Middle School (7 AFY), Dominguez Tech Center (95 AFY), Anderson Park (19 AFY), St. James School (5 AFY), Virco Manufacturing Corp. (5 AFY), Manhattan Village HOA (50 AFY), and Cal Trans – 105 and Western Ave (20 AFY). Each site is already situated adjacent to an existing WBMWD recycled water main line and will be served from WBMWD's Edward C. Little Water Recycling Facility.

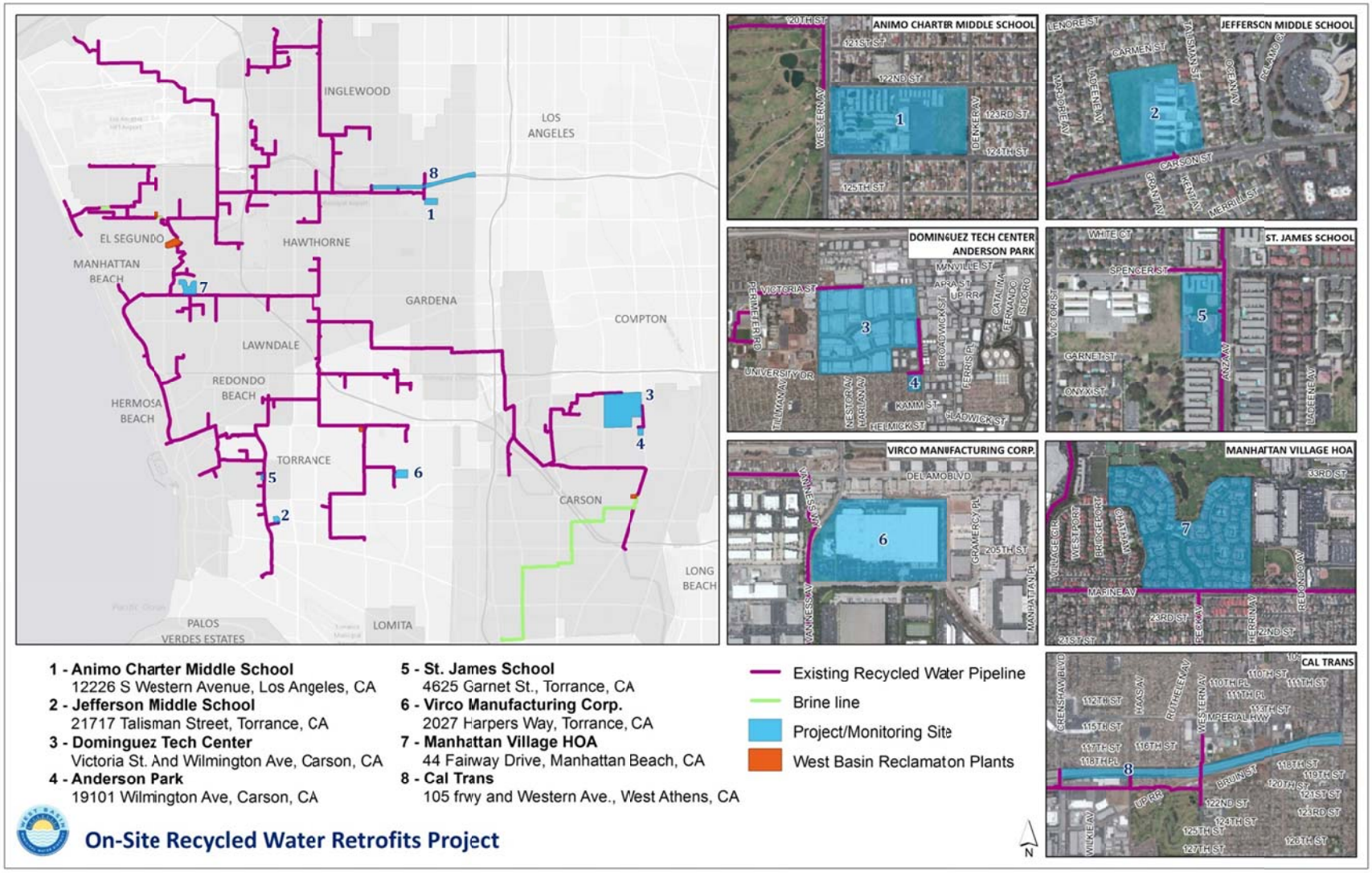
This Project provides immediate regional drought preparedness by offsetting 206 AFY of critical and drought diminished SWP and other imported supplies. Each of the eight sites currently receives potable water from various retail water agencies within WBMWD's service area. The potable water served is an average blend of about 80% imported water (purchased from WBMWD) and 20% West Coast Basin groundwater produced by each agency, but because imported water is significantly more expensive than groundwater, it is assumed that the reduction in potable water demand provided by this Project will lead to a 100% reduction in imported water. Given that the new recycled water customers have already agreed to implementing the retrofits (see attached support letters from the customers) and that the existing supply is available and proximate to these sites, the Project can be implemented rapidly and begin bringing critical local supplies on line as early as the end of December 2015.

The MWD (WBMWD's imported water wholesaler) is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. Although WBMWD's constituents have paid for water storage investments, WBMWD and its retail agencies have maintained an aggressive conservation program during the drought. If drought conditions persist through 2014, it is anticipated that mandatory rationing within WBMWDs service area could go into effect by spring 2015. This Project will assist WBMWD in meeting a portion of these demands despite reductions in imported water allocations and storage supplies.

The Project increases local water supply reliability and the delivery of safe drinking water by offsetting 206 AFY of potable imported water use with recycled water, a supply source that is not subject to seasonal fluctuations or reductions in times of drought. Investments in local supplies provide diversification to WBMWD's service area and increase overall supply reliability. If this Project is not implemented, this 206 AFY of potable water will continue to strain the imported supplies and groundwater basin, both of which are already stressed from the previous drought of 2009-2011. Since groundwater is relied upon heavily during drought conditions and there has been a lack of imported replenishment supply available, both direct and indirect recycled water supplies are needed to maintain West Coast Basin groundwater levels. Groundwater levels are of particular concern in the West Coast Basin as they are a necessary component for the West Coast Seawater Barrier to continue protection from sweater intrusion and overall Basin water quality.

Expedited funding is needed for this Project to bring the new recycled water customers on line as quickly as possible. All of the Project sites have yet to connect to the existing recycled water distribution system given the lack of funding that would be necessary to make it cost feasible. Funding from this grant will allow these customers to implement the recycled water retrofits necessary to access recycled water supplies.

Project Map


INGLEWOOD
LOS ANGELES
EL SEGUNDO
HAWTHORNE
MANHATTAN BEACH
GARDENA
COMPTON
LAWNDALE
REDONDO BEACH
HERMOSA BEACH
TORRANCE
CARSON
LONG BEACH
PALOS VERDES ESTATES
LOMITA
ANIMO CHARTER MIDDLE SCHOOL
JEFFERSON MIDDLE SCHOOL
DOMINGUEZ TECH CENTER
ANDERSON PARK
ST. JAMES SCHOOL
VIRCO MANUFACTURING CORP.
MANHATTAN VILLAGE HOA
CAL TRANS
1 - Animo Charter Middle School
12226 S Western Avenue, Los Angeles, CA
2 - Jefferson Middle School
21717 Talisman Street, Torrance, CA
3 - Dominguez Tech Center
Victoria St. And Wilmington Ave, Carson, CA
4 - Anderson Park
19101 Wilmington Ave, Carson, CA
5 - St. James School
4625 Garnet St., Torrance, CA
6 - Virco Manufacturing Corp.
2027 Harpers Way, Torrance, CA
7 - Manhattan Village HOA
44 Fairway Drive, Manhattan Beach, CA
8 - Cal Trans
105 frwy and Western Ave., West Athens, CA
Existing Recycled Water Pipeline
Brine line
Project/Monitoring Site
West Basin Reclamaton Plants
On-Site Recycled Water Retrofits Project
N

Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The table below provides information on of the benefit of increasing local water supplies and reliability by replacing potable water with drought resistant recycled water. It is assumed that the potable water reduction will offset 100% imported water rather than both imported water and groundwater since it is the more expensive supply.

Table 5 – Annual Project Physical Benefits

Project Name: On-Site Recycled Water Retrofits Project

Type of Benefit Claimed: Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The volumes below indicate the increase in local water supply provided by offsetting potable water with recycled water. It is assumed that the potable water reduction will offset 100% imported water rather than both imported water and groundwater since it is the more expensive supply. The AFY benefit contributed from each of 8 retrofit sites is applied according to the first year of operation for each site. This is reflected in the table below, which indicates no supply benefit for 2014-2015, a partial benefit for 2016, and full benefits from 2017 to 2056 (i.e., when all 8 sites will be operational).

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	0	0 – Award Contract	0
2015	0	0 – Construction	0
2016	0	152 – Construction	152
2017 – 2056	0	206	206

Comments:

- *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, West Basin Municipal Water District (June 2009), Page 3-18 through 3-22 (Table 3.4) and Page 9-12 (Table 9.3):* Document shows the demands at the customer sites and laterals for the Anderson Park (Dominguez Lateral), Dominguez Tech Center (Dominguez Lateral), Virco Manufacturing Corp. (Virco Lateral), CalTrans (CalTrans Lateral), Jefferson Middle School (Anza Lateral G), and St. James School (Anza Lateral G) sites. Some demand values have been refined and updated based on changes at the sites and the experience of WBMWD staff.
- *Manhattan Village Water Usage Data (2003-2009):* Used to estimate recycled water demand for Manhattan Village HOA site (not included in the CIMP).
- *Water Recycling Master Plan, West Basin Municipal Water District/Los Angeles Department of Water & Power (July 2000), Section IV – 20 and Exhibit 1-A*: Contains the potential recycled water demand for Amino Charter Middle School site (previously Clay Jr. High) that is not included in the CIMP. Demand was reduced based on current irrigation area as estimated using Google Earth.
- *Google Earth Aerial Imagery:* Used to measure irrigation area and refine previously documented potential recycled water demands.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, WBMWD's service area uses an imported water blend of 45% SWP, that comes from the Bay-Delta system, and 55% CRA. It is assumed that the potable water reduction will offset 100% imported water (45% SWP and 55% CRA) rather than both imported water and groundwater since it is the more expensive supply as noted in the previous benefit table.

Table 5 – Annual Project Physical Benefits

Project Name: On-Site Recycled Water Retrofits Project
Type of Benefit Claimed: Reduce Demands on the Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The Project will reduce the need to use of imported water, of which 45% is SWP water from the Bay-Delta. The volumes below show the reduction in demands on the Bay-Delta. The AFY benefit contributed from each of 8 retrofit sites is applied according to the first year of operation for each site. This is reflected in the table below, which indicates no supply benefit for 2014-2015, a partial benefit for 2016, and full benefits from 2017 to 2056 (i.e., when all 8 sites will be operational).

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	93	93 – Award Contract	0
2015	93	93 – Construction	0
2016	93	68 – Construction	25
2017 – 2056	93	0	93

Comments:

- *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, West Basin Municipal Water District (June 2009), Page 3-18 through 3-22 (Table 3.4) and Page 9-12 (Table 9.3):* Document shows the demands at the customer sites and laterals for the Anderson Park (Dominguez Lateral), Dominguez Tech Center (Dominguez Lateral), Virco Manufacturing Corp. (Virco Lateral), CalTrans (CalTrans Lateral), Jefferson Middle School (Anza Lateral G), and St. James School (Anza Lateral G) sites. Some demand values have been refined and updated based on changes at the sites and the experience of WBMWD staff.
- *Manhattan Village Water Usage Data (2003-2009):* Used to estimate recycled water demand for Manhattan Village HOA site (not included in the CIMP).
- *Water Recycling Master Plan, West Basin Municipal Water District/Los Angeles Department of Water & Power (July 2000), Section IV – 20 and Exhibit 1-A*: Contains the potential recycled water demand for Amino Charter Middle School site (previously Clay Jr. High) that is not included in the CIMP. Demand was reduced based on current irrigation area as estimated using Google Earth.
- *Google Earth Aerial Imagery:* Used to measure irrigation area and refine previously documented potential recycled water demands.
- *Personal communication with Leighanne Kirk, WBMWD*: Proportion imported water used by WBMWD that is SWP water (45% SWP/55% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (with a 45% SWP and 55% CRA blend) with 100% tertiary recycled water. Approximately 3,000 kWh per AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,450 kWh/AF of energy is used to provide imported supplies. WBMWD has estimated the energy to treat and convey tertiary treated recycled water to be 490 kWh/AF, therefore there is an energy savings benefit of 1,960 kWh/AF with the Project. Since the Project will offset 206 AFY of blended imported water with tertiary treated water, approximately 403,760 kWh/year of energy will be conserved. Over the 40-year lifespan of the Project, this totals 16,150,400 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits

Project Name: On-Site Recycled Water Retrofits Project

Type of Benefit Claimed: Reduce Energy Usage

Units of the Benefit Claimed: kWh

Additional Information About this Benefit: Values in column d show the amount of energy saved by implementing the Project. Energy saved results from replacing imported water from both SWP and CRA with WBMWD's recycled water. The energy benefit contributed from each of 8 retrofit sites is applied according to the first year of operation for each site. This is reflected in the table below, which indicates no energy benefit for 2014-2015, a partial benefit for 2016, and full benefits from 2017 to 2056 (i.e., when all 8 sites will be operational).

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	504,700	504,700 – Award Contract	0
2015	504,700	504,700 – Construction	0
2016	504,700	206,780	297,920
2017 – 2056	504,700	100,940	403,760

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007), Page 4*: Lists the kWh/AF associated with SWP imported water, CRA imported water, and WBMWD's tertiary treated recycled water.
- *Personal communication with Leighanne Kirk, WBMWD*: Noted the proportion of imported water used by WBMWD that is SWP water (45% SWP/55% CRA).

Benefit #4 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the additional need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting 206 AFY of blended imported water demand and creating an average energy savings of 1,960 kWh/AF, the Project will avoid GHG emissions of approximately 133 MT of CO_2 equivalents per year. Over the 40-year lifespan of the Project, this totals 5,320 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: On-Site Recycled Water Retrofits Project
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT of CO_2
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced as the results of replacing imported water from both SWP and CRA with recycled water. The GHG benefit contributed from each of 8 retrofit sites is applied according to the first year of operation for each site. This is reflected in the table below, which indicates no GHG benefit for 2014-2015, a partial benefit for 2016, and full benefits from 2017 to 2056 (i.e., when all 8 sites will be operational).

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	166	166 – Award Contract	0
2015	166	166 – Construction	0
2016	166	67 – Construction	99
2017 – 2056	166	33	133

Comments:

- *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009), Section 3*: Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water **Amount of Benefit:** 206 AFY	
Technical Basis of the Project	• *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, West Basin Municipal Water District (June 2009):* o The CIMP contains a comprehensive analysis of the potential users of recycled water. Project sites covered in this document include: Anderson Park, Dominguez Tech Center, Virco Manufacturing Corp., Cal Trans – 105 and Western Ave., Jefferson Middle School, and St. James School. o Table 3.4 (page 3-18 through 3-22) lists the potential recycled water customers and the estimated demand in AFY. Some demand values have been refined and updated based on changes at the sites and the experience of WBMWD staff. o Table 9.3 (page 9-12) lists the demand associated with the laterals. • *Manhattan Village Water Usage Data (2003-2009):* o Lists the AFY used at the Manhattan Village HOA site. Average usage used to estimate recycled water demand for Manhattan Village HOA site (which was not included in the CIMP). • *Water Recycling Master Plan, West Basin Municipal Water District/Los Angeles Department of Water & Power (July 2000), Section IV – 20 and Exhibit 1-A:* o Contains the potential recycled water demand for Amino Charter Middle School site (previously Clay Jr. High) that is not included in the CIMP. Demand was reduced based on current irrigation area as estimated using Google Earth. • *Google Earth Aerial Imagery:* o Used to measure irrigation area and refine previously documented potential recycled water demands.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The eight retrofit sites currently use potable water for irrigation at the following rates: 5 AFY at Animo Charter Middle School, 7 AFY at Jefferson Middle School, 95 AFY at Dominguez Tech Center, 19 AFY at Anderson Park, 5 AFY at St. James School, 5 AFY at Virco Manufacturing Corp., 50 AFY at Manhattan Village HOA, and 20 AFY at Cal Trans – 105 and Western Ave. The potable water distributed at these sites is currently an average of 80% imported water and 20% groundwater, though it is assumed that the Project will offset 206 AFY of 100% imported water since it is the more expensive supply and it is more likely a reduction in potable water need will lead to a full reduction of imported water purchases and not a reduction in groundwater use.
Description and Estimates of Without-Project Conditions	Without the Project, the eight sites would continue to use potable imported water, requiring that the imported water demands will continue at a rate of 45% SWP and 55% CRA.
Methods Used to Estimate the Physical Benefit	Estimates of water use are determined based on a combination of monthly and annual water use data, customer accounts of water use by the maintenance facility personnel and aerial imagery to determine per square foot area.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	New laterals and on-site retrofits will be required to be installed to connect the customer sites to the already existing recycled water main line. The facilities to treat and deliver the deliver the water to the main line are already in place.
Any Potential Adverse Physical Effects	None

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**93 AFY**	**403,760 kWh /year**	**133 MT /year**
Technical Basis of the Project	• *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, West Basin Municipal Water District (June 2009):* o Contains a comprehensive analysis of the potential users of recycled water. o Table 3.4 (page 3-18 through 3-22) lists the potential recycled water customers and the estimated demand in AFY. • P*ersonal communication with Leighanne Kirk, WBMWD:* o Provided proportion of imported water used by WBMWD that is SWP water (45% SWP/55% CRA).	• *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, WBMWD (June 2009):* o Page 9-12: Lists the volumes of potable water demand that will be offset with recycled water. • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA, and recycled water.	• *Capital Implementation Master Plan for Recycled Water Systems, Final Report, WBMWD (June 2009):* o Page 9-12: Lists the volumes of potable water demand that will be offset with recycled water. • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA, and recycled water. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Converts energy saved to a reduction in emissions of CO_2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Potable water is currently used at the eight retrofit sites. This potable supply is 80% imported water and 20% groundwater, though it is assumed that the Project will offset 206 AFY of 100% imported water since it is the more expensive supply. Of the imported water, 45% is from the SWP and 55% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with recycled water will reduce demands on the Bay-Delta.	The potable water delivered to the Project sites requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local recycled water.	The potable water delivered to the Project sites requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local recycled water. This energy usage results in GHG emissions cause climate change.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**93 AFY**	**403,760 kWh /year**	**133 MT /year**
Description and Estimates of Without-Project Conditions	Without the Project, the eight sites would continue to use potable imported water, requiring that the imported water demands will continue at a rate of 45% SWP	Without the Project, 504,700 kWh/year of energy would be used to serve imported water which is 403,760 kWh/year more than serving local recycled water.	Without the Project, 166 MT of CO_2 per year would be emitted to serve imported water which is 133 MT of CO_2 per year more than serving local recycled water.
Methods Used to Estimate the Physical Benefit	Estimates of water use are determined based on a combination of monthly and annual water use data, customer accounts of water use by the maintenance facility personnel and aerial imagery to determine per square foot of irrigation area and demand. The water savings produced by the Project were assumed to offset 100% imported water. A ratio of 45% SWP to 55% CRA water used was applied to the total imported water offset.	The SWP and CRA imported water use volume and corresponding recycled water volume offset was applied to the energy use estimates (contained in documents cited above) for conveying and treating all three supply sources. The difference between the Project and imported water supplies was calculated.	The SWP and CRA imported water use volume and corresponding recycled water volume offset was applied to the energy use estimates (contained in documents cited above) for conveying and treating all three supply sources. The difference between the Project and imported water supplies was calculated. The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved to a reduction in emissions of CO_2 equivalents.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	New laterals and on-site retrofits will be required to be installed to connect the customer sites to the already existing recycled water main line. The facilities to treat and deliver the deliver the water to the main line are already in place.	New laterals and on-site retrofits will be required to be installed to connect the customer sites to the already existing recycled water main line. The facilities to treat and deliver the deliver the water to the main line are already in place.	New laterals and on-site retrofits will be required to be installed to connect the customer sites to the already existing recycled water main line. The facilities to treat and deliver the deliver the water to the main line are already in place.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name:** On-Site Recycled Water Retrofits Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase local supplies/reliability and decrease dependence on imported water • Reduce demands on the Bay-Delta • Reduce energy usage • Reduce GHG emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	No, no alternative projects that could be operated under the jurisdiction of WBMWD are known that would increase the use of a locally-produced water supply, offset imported water, and provide the energy and GHG benefits.
	If no, why?	Potential customer sites are being considered for recycled water conversions on an ongoing basis. Conversions require a number of simultaneous actions to occur, including retrofit costs, proximity to recycled water pipelines, availability of supply, and the willingness and readiness of the customers themselves. The CIMP outlines the potential customers that were identified during WBMWD's planning process. The sites for this Project were selected because they are closest in proximity to the existing recycled water line, they are ready to implement immediately, and the customers need grant support in order to proceed. Customers typically pay for retrofit costs to connect to the recycled water distribution system; the eight sites included in the Project are customers that have not yet connected for financial reasons.
	If yes, list the methods (including the proposed project) and estimated costs.	Not Applicable
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.**	Not Applicable
Comments: • *Capital Implementation Master Plan (CIMP) for Recycled Water Systems, Final Report, WBMWD (June 2009)*		

Upper San Gabriel Valley Municipal Water District (USGVMWD) Recycled Water Program Expansion (Project)

Project Description

(25 Word) The Project will expand USGVMWD's existing recycled water distribution system to increase the use of recycled water and offset potable water use by 735 AFY.

(Expanded) The Project will implement the next recommended phase of expansions for USGVMWD's recycled water system to serve 735 AFY (supplied by the Sanitation Districts of Los Angeles County [Sanitation Districts]) in lieu of current potable water use in the following three areas:

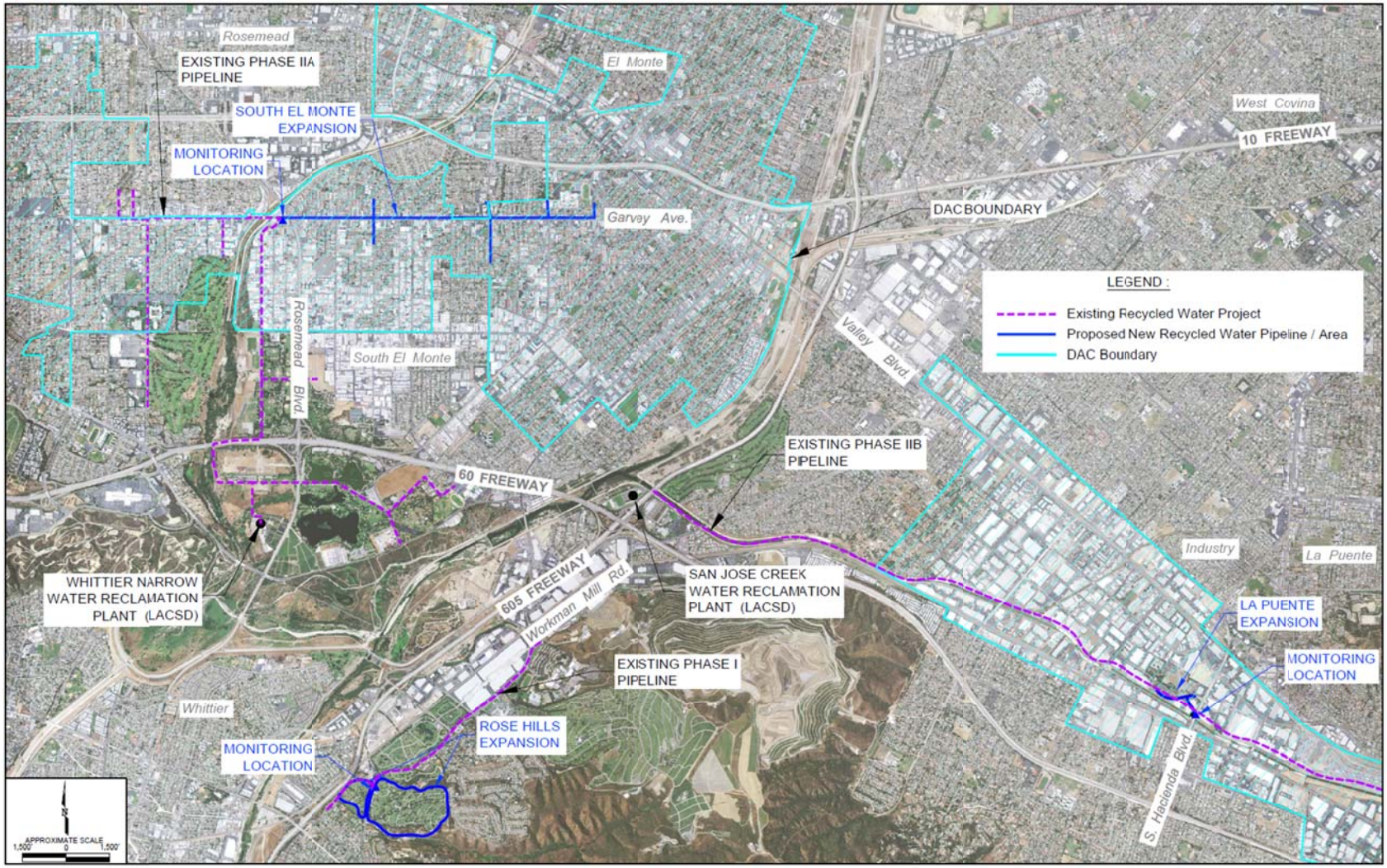
- ***La Puente Valley County Water District (LPVCWD) Expansion*** will design and construct approximately 2,300 linear feet of pipeline and onsite retrofits at 6 sites in the cities of La Puente and Industry to serve 52 AFY through USGVMWD's Phase IIB City of Industry Recycled Water Project.
- ***South El Monte Expansion*** will design and construct approximately 17,850 linear feet of pipeline and onsite retrofits at 10 sites in the cities of El Monte and South El Monte to serve 83 AFY through USGVMWD's Phase IIA Whittier Narrows Recycled Water System.
- ***Rose Hills Expansion*** will design and construct approximately 5,300 linear feet of pipeline and onsite retrofits at the Rose Hills Memorial Park and Cemetery to provide 600 AFY for irrigation through USGVMWD's Phase I Rose Hills Recycled Water System.

This Project provides immediate regional drought preparedness by decreasing the amount of Main San Gabriel Basin (Main Basin) groundwater that is pumped and then treated to drinking water standards to meet irrigation demands. The decreased need for groundwater pumping also decreases the amount of imported water that is needed to replenish the Basin to meet pumping demands. The Main Basin relies upon the SWP and CRA systems through the MWD for its imported water. In an average year, Upper District uses 100% SWP water to replenish groundwater pumped to meet local demands that are in excess of the Main Basin's safe yield. Due to the recent drought, local natural recharge of the Main Basin has decreased dramatically which has increased dependence on imported water to meet replenishment needs. MWD has indicated that if current drought conditions continue they may need to implement their Water Supply Allocation Plan as early as spring 2015 which would mean decreases in the amount of imported supplies available for recharging the Basin. This may result in the need for local supply agencies to implement mandatory rationing to limit potable demands. Using recycled water in place of potable supplies decreases the stress on the Main Basin and reduces dependence on imported supplies.

The Project increases local water supply reliability and the delivery of safe drinking water by reducing the need for potable groundwater to meet irrigation demands and thereby putting existing recycled water supplies to a higher beneficial use. The San Gabriel Valley is heavily dependent on groundwater from the Main Basin – pumping over 200,000 AFY to meet local demands. Recent years of drought have limited replenishment supplies – resulting in the lowest groundwater levels on record for the Main Basin. The further leveraging of recycled water supplies to meet non-potable demands is a critical part of improving Basin health and safe drinking water supply reliability.

Expedited funding is needed to allow immediate implementation of this phase of recycled water system expansions. With an existing backbone system and a treated supply, the funding can be used to improve the ability for all Project partners to rapidly implement the Project and achieve an immediate offset of 735 AFY of potable supply use. Without the funding, the Project could take longer to implement and groundwater will continue to be pumped for non-potable uses at these locations, requiring replenishment with imported water.

Project Map



PROJECT MAP - UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT RECYCLED WATER PROGRAM EXPANSION

Project Physical Benefit

The following physical benefits are claimed for the Project and are listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supply/Reliability and Decrease Demands on the Bay-Delta

The table below provides information on the water supply benefit of increasing local water supply and reliability by replacing potable groundwater use with drought-resistant recycled water. This increase in local supply will offset the need to purchase imported water to replenish the Main Basin.

Table 5 – Annual Project Physical Benefits

Project Name: USGVMWD Recycled Water Program Expansion

Type of Benefit Claimed: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The volumes below indicate the increase in local water supply provided by offsetting potable groundwater and imported water replenishment with recycled water. The AFY benefit contributed is applied according to when each piece of the expansion is completed and begins offsetting potable water. The Rose Hills Expansion will complete construction in October 2015, providing approximately 10% of the full AFY supply benefit that year, assuming more supply is utilized in summer months. The LPVCWD and South El Monte expansions will complete construction in February 2016, providing approximately 90% of their full AFY supply benefit in 2016, assuming more supply is utilized in summer months.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 - Design	0
2015	0	60 – Construction	60
2016	0	722 – Construction	722
2017 – 2064	0	735	735

Comments:

- *La Puente Valley County Water District Recycled Water Project Technical Memorandum, May 2014, Page 3 (Table 1)*: Document summarizes the customers and approximate recycled water use (AFY) for the LPVCWD Expansion portion of the Project. Original source: *La Puente Valley County Water District Recycled Water Feasibility Study Report, March 2012, Page 3-4 (Table 3-2).*
- *Feasibility Study for the Proposed South El Monte Recycled Water System, October 2013, Page 27 (Table 2-1, Package 1)*: Table shows estimated recycled water demand at the customer sites that will be a part of the South El Monte Expansion portion of the Project.
- *Letter Report on Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2, May 2014, Page 1*: Identification of 600 AFY water usage at Rose Hills Memorial Park and Cemetery.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. The increase in non-potable supplies provided by the Project will replace current groundwater pumping that is supported through the replenishment of imported water from the SWP system. Under average conditions, USGVMWD uses 100% untreated SWP imported water to replenish the Main Basin. The five year average (FY 2008-09 to FY 2012-13) imported water deliveries to the Main Basin by USGVMWD, San Gabriel Valley Municipal Water District, and Three Valleys Municipal Water District is approximately 57,700 AFY, with USGVMWD's purchases constituting approximately 39% of the total imported water deliveries. Since annual average imported water replenishment of Main Basin is in excess of 735 AFY, it can be assumed that the reduction in groundwater pumping would correlate to a direct reduction in the amount of imported water that would be purchased and replenished to meet pumping needs.

Table 5 – Annual Project Physical Benefits

Project Name: USGVMWD Recycled Water Program Expansion

Type of Benefit Claimed: Reduce Demands on the Bay-Delta

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The Project will reduce the need to use 735 AFY of imported water to replenish over-produced groundwater from the Main Basin, of which 100% is from the SWP and Bay-Delta. The volumes below show the change in demands on the Bay-Delta. The AFY benefit contributed is applied according to when each piece of the expansion is completed and begins offsetting potable water. The Rose Hills Expansion will complete construction in October 2015, providing approximately 10% of the full AFY supply benefit that year, assuming more supply is utilized in summer months. The LPVCWD and South El Monte sites will complete construction in February 2016, providing approximately 90% of their full AFY supply benefit in 2016, assuming more supply is utilized in summer months.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	735	735 – Design	0
2015	735	675 – Construction	60
2016	735	13 – Construction	722
2017 – 2064	735	0	735

Comments:

- *La Puente Valley County Water District Recycled Water Project Technical Memorandum, May 2014, Page 3 (Table 1)*: Document summarizes the customers and approximate recycled water use (AFY) for the LPVCWD Expansion portion of the Project. Original source: *La Puente Valley County Water District Recycled Water Feasibility Study Report, March 2012, Page 3-4 (Table 3-2)*
- *Feasibility Study for the Proposed South El Monte Recycled Water System, October 2013, Page 27 (Table 2-1, Package 1)*: Table shows estimated recycled water demand (AFY) at the customer sites that will be a part of the South El Monte Expansion portion of the Project.
- *Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2, Letter Report, February 2013, Page 1*: Identification of 600 AFY water usage at Rose Hills Memorial Park and Cemetery.
- *Personal communication with Reymundo Trejo, Upper District*: The average blend of imported water used by Upper District to recharge the Main San Gabriel Groundwater Basin is 100% untreated SWP water.

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the use of tertiary treated recycled water in place of groundwater pumped from the Main Basin that was replenished with 100% SWP imported water. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California. The average cost to pump groundwater in the Main Basin was $85/AF in 2006, which when updated to 2014 dollars is $106/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the Main Basin is approximately 596 kWh/AF. Therefore an estimated total of 3,596 kWh/AF is needed to replenish imported water from the SWP and then pump it out as groundwater from the Main Basin.

Since the recycled water supply is already being treated to tertiary levels, the only additional energy required to implement the Project is the conveyance of that supply to the USGVMWD's system. The estimated energy required to convey water from the San Jose Creek Water Reclamation Plant (WRP) to the Rose Hills Cemetery is 790 kWh/AF, from San Jose Creek WRP to LPVCWD is 280 kWh/AF, and from the Whittier Narrows WRP to South El Monte is 320 kWh/AF. Using these energy rates and the volumes of saved potable water from each of the three expansion sites, the Project will use 701 kWh/AF to deliver the recycled water to the three expansion locations after the three sites complete construction. This produces an energy savings benefit of approximately 2,895 kWh/AF once construction is complete. At 735 AFY of saved potable supply a year, the Project will result in about 2,127,940 kWh/year of conserved energy (see attached calculations). Over the 40-year lifespan of the Project, this totals to 85,117,600 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits

Project Name: USGVMWD Recycled Water Program Expansion
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column d show the amount of energy saved through implementation of the Project. The benefit contributed is applied according to when each piece of the expansion is completed and begins offsetting potable water. The Rose Hills Expansion will complete construction in October 2015, providing approximately 10% of the full benefit that year, assuming more supply is utilized in summer months. The LPVCWD and South El Monte sites will complete construction in February 2016, providing approximately 90% of their full benefit in 2016, assuming more supply is utilized in summer months.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	2,643,060	0 – Award Contract	0
2015	2,643,060	2,474,700 – Construction	168,360
2016	2,643,060	557,908 – Construction	2,085,152
2017 – 2064	2,643,060	515,120	2,127,940

Comments:

- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007* (p. 4): Lists the kWh/AF associated with SWP imported water, CRA imported water, and groundwater replenished with injected recycled water.
- MWD of Southern California, 2007. *Groundwater Assessment Study*. Report Number 1308. – Chapter IV, Table 7-3: Indicates groundwater pumping costs for the Main Basin of $85/AF in 2006.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles.
- *Personal communication with Reymundo Trejo, Upper District*: The average blend of imported water used by Upper District to recharge the Main San Gabriel Groundwater Basin is 100% untreated SWP water.
- *Personal communication with Jeff Helsley, Stetson Engineers:* Estimated energy usage to provide recycled water to customers for the South El Monte Expansion (320 kWh/AF), LPVCWD Expansion (280 kWh/*AF*), and Rose Hills Expansion (790 kWh/AF).
- *Spreadsheet of Calculations:* Contains the detailed breakdown of the energy calculations by expansion site.

Benefit #4 – Reduce GHG Emissions

The table below provides the estimated reduction in GHG emissions (GHG) provided by using tertiary treated recycled water in place of groundwater pumped from the Main Basin and replenished with an equal amount of SWP water. This value is calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh of energy used and converting to total MT of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting 735 AFY of groundwater pumped and imported water replenished, the Project will avoid GHG emissions of approximately 699 MT of CO_2 equivalents per year. Over the lifespan of the Project, this totals approximately 27,960 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: USGVMWD Recycled Water Program Expansion
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT of CO_2 Equivalents
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced from replacing imported replenishment water from SWP that is pumped as groundwater with recycled water. The benefit contributed is applied according to when each piece of the expansion is completed and begins offsetting potable water. The Rose Hills Expansion will complete construction in October 2015, providing approximately 10% of the full benefit that year, assuming more supply is utilized in summer months. The LPVCWD and South El Monte sites will complete construction in February 2016, providing approximately 90% of their full benefit in 2016, assuming more supply is utilized in summer months.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	868	868 – Award Contract	0
2015	868	813 – Construction	55
2016	868	183	685
2017 – 2064	868	169	699

Comments:

- *Personal communication with Reymundo Trejo, Upper District*: The average blend of imported water used by Upper District to recharge the Main San Gabriel Groundwater Basin is 100% untreated SWP water.
- *Personal communication with Jeff Helsley, Stetson Engineers:* Estimated energy usage to provide recycled water to customers for the South El Monte Expansion (320 kWh/AF), LPVCWD Expansion (280 kWh/*AF*), and Rose Hills Expansion (790 kWh/AF).
- *California Action Registry, General Reporting Protocol. Version 3.1, January 2009*: Used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.
- *Spreadsheet of Calculations:* Contains a breakdown of the GHG calculations.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water **Amount of Benefit**: 735 AFY	
Technical Basis of the Project	• *La Puente Valley County Water District Recycled Water Project Technical Memorandum, May 2014:* o *Page 3 (Table 1)*: Summarizes the recycled water customer use for the LPVCWD Expansion portion of the Project; other elements of the expansion site are summarized such as schedule and costs. • *La Puente Valley County Water District Recycled Water Feasibility Study Report, March 2012:* o *Page 3-4 (Table 3-2)*: Contains a more detailed list of potential customers that could be served by the LPVCWD Expansion: City of Industry (Roadway medians, parkways, and a park), Delta Products Corporation, Thermaltake, Inc., and Fibre Container. • *Feasibility Study for the Proposed South El Monte Recycled Water System, October 2013:* o *Page 27 (Table 2-1, Package 1) and Page 35 (Table 3-2, Package 1)*: Show estimated recycled water demand for Package 1 (those sites included in this Project): Cortada Elementary School, Potrero Intermediate School, New Lexington Elementary School, Wilkerson Elementary School, Miramonte Elementary School, Tony Arceo Memorial Park, El Monte High School, Superkleen Car Wash, Garvey Court Senior Apartments, and Bubble Bath Car Wash. • *Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2, Letter Report, February 2013:* o *Page 1:* Identifies water usage at Rose Hills Memorial Park and Cemetery. • *Rose Hills Memorial Park and Cemetery Supplemental Memorandum, May 2014:* o *Page 2 and 3:* Identifies preferred Alternatives 1 and 6 (based on February 2013 letter report) as the Rose Hills Expansion. • *Upper San Gabriel Valley Municipal Water District Recycled Water Program Expansion Technical Memorandum (June 2014)* o Summarizes the expansion phases chosen as part of the proposed Project.

Type of Physical Benefit: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water **Amount of Benefit**: 735 AFY	
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The proposed Project will be an expansion of the existing recycled water systems owned by USGVMWD that have delivered 14,800 AF of recycled water for beneficial reuse since 2002. Planning was conducted in the *Recycled Water Action Plan (2011)*, *Upper District's Integrated Resources Plan (January 2013), La Puente Valley County Water District Recycled Water Feasibility Study Report, (March 2012), Feasibility Study for the Proposed South El Monte Recycled Water System (October 2013), and Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2, Letter Report (February 2013)* to identify subsequent phases of recycled water expansions that could be implemented to further leverage existing supplies of recycled water from the Sanitation Districts for offsetting potable supply use. Given the recent drought conditions, USGVMWD completed the *La Puente Valley County Water District Recycled Water Project Technical Memorandum (May 2014), and Rose Hills Memorial Park and Cemetery Supplemental Memorandum (May 2014)* to determine which pieces of these recommended expansions could be most effectively and rapidly implemented under current conditions/interests. These chosen phases are summarized in the document *Upper San Gabriel Valley Municipal Water District Recycled Water Program Expansion Technical Memorandum (June 2014).* A combined 735 AFY of potential recycled water use for irrigation was identified through the implementation of three areas of expansion to serve the City of Industry (Roadway medians, parkways, and a park), Delta Products Corporation, Thermaltake, Inc., Fibre Container, Cortada Elementary School, Potrero Intermediate School, New Lexington Elementary School, Wilkerson Elementary School, Miramonte Elementary School, Tony Arceo Memorial Park, El Monte High School, Superkleen Car Wash, Garvey Court Senior Apartments, Bubble Bath Car Wash and the Rose Hills Memorial Park and Cemetery. Currently all of the sites use potable groundwater pumped from the Main Basin to meet the 735 AFY of their combined irrigation demands. As a result of the drought and limited replenishment supplies, the Main Basin is over-produced with groundwater levels having reached a historic low this year. With potential imported water cutbacks possible in 2015, there may be insufficient replenishment supply.
Description and Estimates of Without-Project Conditions	Without the implementation of the Project, 735 AFY of potable groundwater water will continue to be used for irrigation at the end user's sites. This will further reduce groundwater levels in the underlying groundwater basin which have reached historic low water elevations during the summer of 2014 due to drought conditions. The continued use of groundwater for irrigation without the Project will result in the continued need to use imported water to replenish Main San Gabriel Basin to replace the 735 AFY that is overproduced from the basin. The source of the recycled water supply for the Project is from both the Whittier Narrows Water Reclamation Plant and the San Jose Creek Water Reclamation Plant both of which are owned by the Los Angeles County Sanitation District. Without the implementation of the Project, 735 AFY of tertiary treated recycled water from the plants will continue to be discharged to the lined portion of San Gabriel River then to the ocean and not put to its highest beneficial use.
Methods Used to Estimate the Physical Benefit	Estimates of recycled water usage were based on historical water meter records for the proposed irrigation uses. In the event of missing data, an estimate based on irrigation usage by customers similar in size and capacity was used.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will include construction of new recycled water transmission pipelines, a booster pump, and retrofits of existing irrigation systems at the customer sites to convert from potable water to recycled water. No other facilities, policies, or actions are required.
Any Potential Adverse Physical Effects	None

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**735 AFY**	**2,127,940 kWh /year**	**699 MT /year**
Technical Basis of the Project	• Total volumes of imported replenishment water that would be offset through this Project are documented in the primary benefits table above. Additional resources used to calculate this benefit included: • *Personal communication with Reymundo Trejo, Upper District*: o Provided the average proportion of imported water used to recharge Main Basin that is SWP water (100% SWP).	• *Personal communication with Reymundo Trejo, Upper District:* o Provided the average proportion of imported water used to recharge Main Basin that is SWP water (100% SWP). • *Personal communication with Jeff Helsley, Stetson Engineers:* o Estimated energy usage to provide recycled water to customers for the South El Monte Expansion (320 kWh/AF), LPVCWD Expansion (280 kWh/AF), and Rose Hills Expansion (790 kWh/AF). • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP (3,000 kWh/AF) water. • *MWD of Southern California, 2007. Groundwater Assessment Study. Report Number 1308. – Chapter IV:* o *Table 7-3:* Indicates groundwater pumping costs for the Main Basin of $85/AF in 2006. • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*: o Page 2: Estimates an average of 17.8 cents per kWh paid for electricity in Los Angeles. • *Spreadsheet of Calculations* o Contains the detailed breakdown of the energy calculations by expansion site.	• Same references listed for the Reduce Energy Usage benefit to calculate energy usage. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Converts energy saved to a reduction in emissions of CO_2 equivalents. • *Spreadsheet of Calculations:* o Contains a breakdown of the GHG calculations.

Type of Physical Benefit:	Reduce Demands on the Bay-Delta	Reduce Energy Usage	Reduce GHG Emissions
Amount:	**735 AFY**	**2,127,940 kWh /year**	**699 MT /year**
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In addition to the background provided in the previous primary benefit table, USGVMWD has historically used 100% SWP water to replenish the Main Basin. Since the SWP's supplies are from the Bay-Delta, reducing SWP demands will help to reduce Bay-Delta demands.	In addition to the background provided in the previous primary benefit table, USGVMWD has historically used 100% SWP water to replenish the Main Basin. The energy consumed to convey the replenishment water and pump it as groundwater from the Main Basin is far less than the energy required to convey already treated local Sanitation Districts recycled water to the same end user.	Since the energy consumed to convey the replenishment water and pump it as groundwater from the Main Basin is far less than the energy required to convey already treated local Sanitation Districts recycled water to the same end user, the GHGs emitted by the Project are also much less.
Description and Estimates of Without-Project Conditions	Without the Project, USGVMWD would continue to need to import 735 AFY from the Bay-Delta to replenish groundwater that has been pumped from Main Basin for irrigation purposes.	Without the Project, 735 AFY would be pumped from Main Basin for irrigation purposes and require replenishment with imported water from the SWP, consuming on average 2,643,060 kWh/year. This is 2,127,940 kWh/year more than when conveying already treated recycled water with the Project.	Without the Project, 735 AFY would be pumped from Main Basin for irrigation purposes and require replenishment with imported water from the SWP, emitting 868 MT of CO_2 equivalents per year which is 699 MT of CO_2 equivalents per year more than with the Project.
Methods Used to Estimate the Physical Benefit	Estimates of recycled water usage were based on historical water meter records for the proposed irrigation uses when available. 100% of the 735 AFY of imported water required to replenish the over-pumped groundwater was assumed to originate from the Bay-Delta through the SWP based on the average imported water blend used by USGVMWD for replenishment.	100% SWP at 3,000 kWh/AF was assumed for the energy estimates for replenishment with imported water. The average cost to pump groundwater in the Main Basin ($85/AF in 2006) was updated to 2014 dollars ($106/AF) and the average cost of electricity in the Los Angeles area in 2014 ($0.178/kWh) was applied to approximate the energy required to pump groundwater in the Main Basin (596 kWh/AF). Combining these energy rates results in a total of approximately 3,596 kWh/AF to pump groundwater from the Main Basin and replenish it with imported water from the SWP.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy usage that would be reduced from the Project (calculated from the "Reduce Energy Usage" benefit to the left) to a reduction in emissions of CO_2 equivalents. A factor of 0.724 pounds of CO_2 equivalents per kWh resulted in 699 MT/year of GHG emission reductions.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The Project will include construction of new recycled water transmission pipelines, and retrofits of existing irrigation systems at the customer sites to convert from potable water to recycled water. No other facilities, policies, or actions are required.	The Project will include construction of new recycled water transmission pipelines, and retrofits of existing irrigation systems at the customer sites to convert from potable water to recycled water. No other facilities, policies, or actions are required.	The Project will include construction of new recycled water transmission pipelines, and retrofits of existing irrigation systems at the customer sites to convert from potable water to recycled water. No other facilities, policies, or actions are required.

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**735 AFY**	**2,127,940 kWh /year**	**699 MT /year**
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name:** USGVMWD Recycled Water Program Expansion		
Question 1	**Types of benefits provided as shown in Table 5**	• Increase local water supply/reliability and decrease imported water demands • Reduce demands on the Bay-Delta • Reduce energy usage • Reduce GHG emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	Yes. Each of the three expansion areas that are part of this Project are part of an even larger planned Expansion Program. These three Project expansion areas were selected for the next phase of implementation after evaluating alternative locations and expansion packages in the feasibility studies for LPVCWD, South El Monte, and Rose Hills.
	If no, why?	
	If yes, list the methods (including the proposed project) and estimated costs.	The Project includes expansion of recycled water infrastructure in three separate areas. Each of the currently proposed expansions was evaluated as part of larger expansion projects that can be implemented in additional future phases. The individual expansion evaluations included analysis of different alternatives for pipeline alignments and customers. • La Puente Valley County Water District Recycled Water Expansion: Four different alternatives were evaluated with an estimated cost of up to $11.4 million (LPVCWD Feasibility Study, Table 4-1, Page 4-3). An economic analysis was conducted to calculate cost/AF. Alternative 3 was chosen as the most cost-effective at $1,850/AF compared to the other 3 alternatives at $2,000/AF, $2,350/AF, and $2,280/AF (LPVCWD Feasibility Study, Page 4-4 to 4-5; Table 4-2 and Table 4-3). Phase 1 of this alternative is included in this Project. Phase 1 was evaluated and documented as the most feasible, economical, and beneficial in the technical memorandum dated May 22, 2014 on the LPVCWD Recycled Water Project. • South El Monte Recycled Water Expansion: Five separate packages were evaluated with an estimated cost of up to $24 million (South El Monte Feasibility Study, Table 3-1, Page 34). The South El Monte Expansion included in the Project is Package 1, which must be the first Package to be completed as it connects to the existing system that is being expanded. The most practical alignment for the piping to reach the customers was determined based on review of the customer locations and potential pipeline routes to get to the customers. The size (amount of pipe and number of customers) for this package was selected to create an acceptable size project for Upper District's project partner to fund at this time and to meet the project partners' schedule for implementing a first phase of the larger expansion. • Rose Hills Expansion: Six different alternatives were evaluated with an estimated cost of up to $1.7 million (Rose Hills Letter Report, Page 4-10). The Rose Hills Expansion included in the Project is the combination of Alternatives 1 ($154,000) and 6 ($200,000) that were determined to be the least cost (Rose Hills Letter Report, Page 11) and most feasible, economical, and

Table 6 – Cost Effective Analysis **Project name:** USGVMWD Recycled Water Program Expansion		
		beneficial through looking at construction costs and overall benefits. Supplemental analysis of the Alternatives is included in the supplemental memorandum dated May 22, 2014 on the Rose Hills Memorial Park and Cemetery Recycled Water Evaluation. The document updates the probable construction costs of the two preferred Alternatives.
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.**	Each of the three expansion sites for this Project were selected as being the next phases of the three most feasible, economical, and beneficial alternatives for those locations.
Comments: Details of the evaluation are contained in the attached feasibility studies, technical memoranda, and report (page numbers listed in text above): • *La Puente Valley County Water District Recycled Water Feasibility Study Report, March 2012* • *La Puente Valley County Water District Recycled Water Project Technical Memorandum, May 2014* • *Feasibility Study for the Proposed South El Monte Recycled Water System, October 2013* • *Rose Hills Memorial Park and Cemetery – Recycled Water Evaluation for Phase 2, Letter Report* • *Rose Hills Memorial Park and Cemetery Supplemental Memorandum, May 2014*		

Los Angeles County Flood Control District (LACFCD) West Coast Basin Barrier Project Unit 12 Injection and Observation Wells (Project)

Project Description

(25 Word) The Project will construct new wells to increase the injection of recycled water into the West Coast Basin for local supply and seawater intrusion prevention.

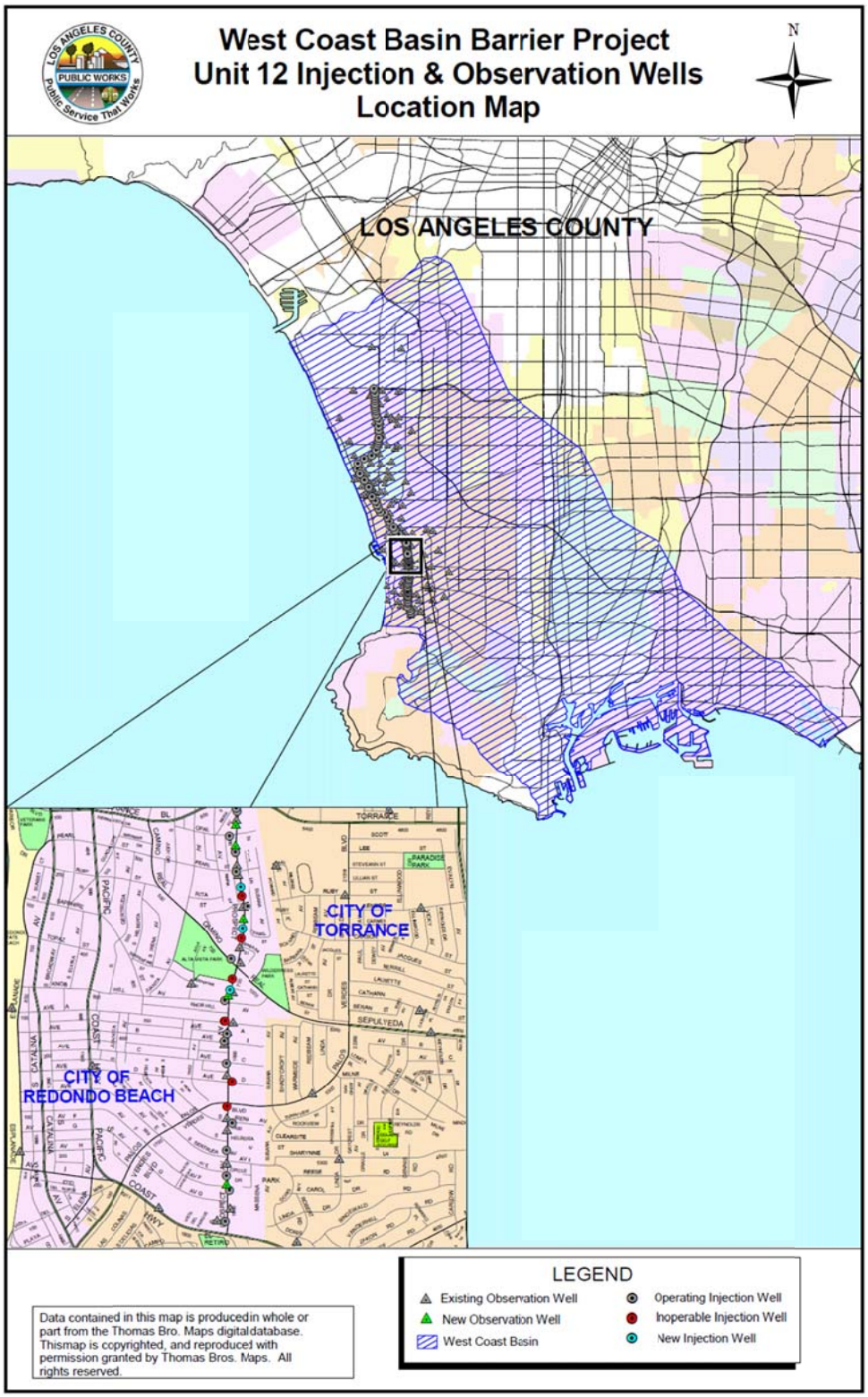
(Expanded) LACFCD, as part of the West Coast Basin Barrier (Barrier) Project (WCBBP), will construct three new injection wells to inject 100% advanced treated recycled water into the West Coast Basin. The Project will increase the current WCBBP injection capacity by 724 AFY to replenish local groundwater supply and protect groundwater quality from contamination due to seawater intrusion. The new wells will replace three existing injection wells that are no longer operable due to irreparable damage to the well casings. The reduced injection in this area has caused a weakening in the Barrier. The Project will also include construction of five new observation wells to measure groundwater and chloride levels near the Barrier, and to monitor the effectiveness of the injection. LACFCD owns an existing water supply pipeline with sufficient capacity that will be used to provide the recycled water for injection. The additional recycled water will be purchased by the WRD from the West Basin Municipal Water District (WBMWD).

This Project provides immediate regional drought preparedness by protecting groundwater quality and contributing to groundwater recharge using a reliable supply of drought resistant recycled water. Groundwater provides up to 40% of the drinking water supply in the West Coast Basin area, with the rest supplied by WBMWD through importation of water from the SWP and CRA. Since SWP allocations have dramatically decreased due to the drought, local water purveyors are trying to conserve imported supplies and rely more heavily on stored groundwater supplies. Increasing the capacity to replenish the West Coast Basin by approximately 724 AFY using a local supply source that is not impacted by drought conditions will allow more groundwater to be pumped and immediately reduce demand for limited imported supplies.

The Project increases local water supply reliability and the delivery of safe drinking water by protecting the West Coast Basin from seawater contamination while increasing the overall groundwater supply. The WCBBP helps protect 32 million AF of groundwater in the West Coast Basin that is pumped by local suppliers. Overall injection at the Barrier has increased over the past few years, yet the portion of the Barrier where the Project will take place has had limited injection capacity due to three inoperable wells. Despite nearby wells injecting at maximum capacity, groundwater elevations in this area are below protective elevations to prevent seawater intrusion. Installing the new injection wells will elevate the critical freshwater pressure ridge, protect the groundwater supplies from contamination and preserve the safety of local groundwater supplies. Additionally, the advanced treated recycled water that is injected into these wells will be available for pumping as needed even during drought conditions.

Expedited funding is needed for this Project to increase injection capacity at a weakened portion of the Barrier before groundwater quality drops. With groundwater elevations lower than protective elevations at this portion of the Barrier and the existing wells already operating at maximum capacity, continued pumping from the Basin is increasing the likelihood of drawing in seawater. The Project area already shows higher chloride levels than other portions of the Barrier. Funding from this grant will expedite the installation of the new wells that will increase the strength of the Barrier and add 724 AFY of new local water supplies.

Project Map


West Coast Basin Barrier Project
Unit 12 Injection & Observation Wells
Location Map
N
LOS ANGELES COUNTY
CITY OF TORRANCE
CITY OF REDONDO BEACH
LEGEND
Existing Observation Well
New Observation Well
West Coast Basin
Operating Injection Well
Inoperable Injection Well
New Injection Well
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Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water

The table below provides information on the water supply benefit of increasing local water supply and reliability through increasing injection into the West Coast Basin using recycled water, contributing to an increase in groundwater recharge/supplies and improved reliability by protecting groundwater quality at the Barrier. This increase in local supply will offset the need to purchase imported water to meet the same potable demands.

Table 5 – Annual Project Physical Benefits

Project Name: West Coast Basin Barrier Project Unit 12 Injection and Observation Wells

Type of Benefit Claimed: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The 3 new injection wells will be operating by the end of October 2015, resulting in approximately 2 months of injection in 2015, or 120 AFY. The wells will be fully operational for the remaining lifecycle of the Project.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2014	0	0 - Award Contract	0
2015	0	120 - Construction	120
2016 -2115	0	724	724

Comments:

- *LACFCD Seawater Barrier Database – Historical Injection Rate Data*: Contains historical injection rate information. Historical injection rates at the three now inoperable injection wells (0.41 cfs) and five nearby operating injection wells (0.37 cfs) were used to approximate injection rates at the three new wells. An even lower injection rate of 0.33 cfs was used to be conservative, resulting in a combined injection rate of approximately 1 cfs for the three new wells or 724 AFY.

Benefit #2 – Reduced Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. The increase in groundwater supplies through injection with recycled water can decrease dependence on imported water from the Bay-Delta through the SWP. The Project is within WBMWD's service area which uses on average an imported water blend of 45% SWP (that comes from the Bay-Delta) and 55% CRA.

Table 5 – Annual Project Physical Benefits

Project Name: West Coast Basin Barrier Project Unit 12 Injection and Observation Wells

Type of Benefit Claimed: Reduce Demands on the Bay-Delta

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The Project will reduce the need to use 724 AFY of imported water, of which 45% is SWP water from the Bay-Delta. The volumes below show the reduction in demands on the Bay-Delta. The 3 new injection wells will be operating by the end of October 2015, resulting in approximately 2 months of injection in 2015, or 120 AFY. The wells will be fully operational for the remaining lifecycle of the Project.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	326	326 – Award Contract	0
2015	326	272 – Construction	54
2016 -2115	326	0	326

Comments:

- *LACFCD Seawater Barrier Database – Historical Injection Rate Data*: Contains historical injection rate information. Historical injection rates at the three now inoperable injection wells (0.41 cfs) and five nearby operating injection wells (0.37 cfs) were used to approximate injection rates at the three new wells. An even lower injection rate of 0.33 cfs was used to be conservative, resulting in a combined injection rate of approximately 1 cfs for the three new wells or 724 AFY.
- *Personal communication with Leighanne Kirk, WBMWD*: Proportion imported water used by WBMWD that is SWP water (45% SWP/55% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of imported water (with a 45% SWP and 55% CRA blend) with advanced treated recycled water that has been injected then pumped as groundwater in the West Coast Basin. Approximately 3,000 kWh per AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, an estimated 2,450 kWh/AF of energy is used to provide imported supplies. WBMWD has estimated the energy required to advance treat recycled water and pump that water for use to be approximately 1,565 kWh/AF, therefore there is an energy savings of 885 kWh/AF with the Project. Since the Project will offset 724 AFY of blended imported water, about 640,740 kWh/year will be conserved. Over the 100-year lifespan of the Project, this totals approximately 64,074,000 kWh of reduced energy usage.

Table 5 – Annual Project Physical Benefits

Project Name: West Coast Basin Barrier Project Unit 12 Injection and Observation Wells
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column d show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from both SWP and CRA with groundwater that had been replenished with injected recycled water.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,773,800	1,773,800 – Award Contract	0
2015	1,773,800	1,667,600 – Construction	106,200
2016 -2115	1,773,800	1,133,060	640,740

Comments:

- *LACFCD Seawater Barrier Database – Historical Injection Rate Data*: Contains historical injection rate information. Historical injection rates at the three now inoperable injection wells (0.41 cfs) and five nearby operating injection wells (0.37 cfs) were used to approximate injection rates at the three new wells. An even lower injection rate of 0.33 cfs was used to be conservative, resulting in a combined injection rate of approximately 1 cfs for the three new wells or 724 AFY.
- *Personal communication with Leighanne Kirk, WBMWD*: Proportion imported water used by WBMWD that is SWP water (45% SWP/55% CRA).
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007 (p. 4): Lists the kWh/AF associated with SWP imported water, CRA imported water, and groundwater replenished with injected recycled water.

Benefit #4 – Reduce GHG Emissions

The table below provides the estimated reduction in GHG emissions provided through the offset of imported water (with a 45% SWP and 55% CRA blend) with advanced treated recycled water that has been injected then pumped as groundwater in the West Coast Basin. This value is calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting 724 AFY of imported water demand and creating an average energy savings of 885 kWh/AF, the Project will avoid GHG emissions of approximately 210 MT of CO_2 equivalents per year. Over the 100-year lifespan of the Project, this totals approximately 21,000 MT of avoided carbon emissions.

Table 5 – Annual Project Physical Benefits

Project Name: West Coast Basin Barrier Project Unit 12 Injection and Observation Wells
Type of Benefit Claimed: Reduce GHG Emissions
Units of the Benefit Claimed: MT of CO_2 Equivalents
Additional Information About this Benefit: Values in column d show the amount of GHGs reduced as the result of replacing imported water from both SWP and CRA with groundwater that had been replenished with injected recycled water

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	582	582 – Award Contract	0
2015	582	547 – Construction	35
2016 -2115	582	372	210

Comments:

- *LACFCD Seawater Barrier Database – Historical Injection Rate Data*: Contains historical injection rate information. Historical injection rates at the three now inoperable injection wells (0.41 cfs) and five nearby operating injection wells (0.37 cfs) were used to approximate injection rates at the three new wells. An even lower injection rate of 0.33 cfs was used to be conservative, resulting in a combined injection rate of approximately 1 cfs for the three new wells or 724 AFY.
- *Personal communication with Leighanne Kirk, WBMWD*: Proportion imported water used by WBMWD that is SWP water (45% SWP/55% CRA).
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007* (p. 4): Lists the kWh/AF associated with SWP imported water, CRA imported water, and groundwater replenished with injected recycled water.
- *California Action Registry, General Reporting Protocol. Version 3.1, January 2009*: Used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total tons of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water **Amount:** 724 AFY	
Technical Basis of the Project	*LACFCD Seawater Barrier Database – Historical Injection Rate Data (Historical flow rates at injection wells along the Barrier)*: • Tables of injection rates for the three inoperable injection wells (i.e., 9N (1966-1993), 9R (1966-1983), & 9U (1966-1989)) that will be replaced as part of this Project • Tables of injection rates for five operating injection wells [i.e., 9J1 (1976-2014), 9M1 (1991-2014), 9P (1976-2014), 9T1 (1976-2014), & 9V1 (1976-2014)] in the area that are screened in the same aquifer zone as the 3 new injection wells *LACFCD's Seawater Barrier Database – Observation Well Groundwater Elevation Data*: • Tables show measured groundwater elevations from 2009-2014 at three observation wells (i.e., 9EG, 9KN, and 9XY1) located near the inoperable wells and Project location as shown on the chloride contour map (cited below). *Map of Chloride Contours with labeled injection and observation wells*: • Map shows locations of injection and observation wells in the Project vicinity along the Barrier. The names of the injection and observation wells are labeled on the map. • Map shows the intruding chloride levels near the Project site.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Due to the high volume of pumping that occurred in the West Coast Basin in the 1900's, groundwater elevations dropped dramatically causing seawater intrusion and saline plumes. The WCBBP injects freshwater into the West Coast Basin to raise the freshwater pressure and prevent seawater from contaminating the local groundwater source. The line of more than 150 injection wells covers a distance of 9 miles and injects a combination of recycled water and imported water. Over 290 observation wells are used to monitor the WCBBP performance by measuring water elevations and depth-specific chloride levels. Three injection wells at the Project site in the City of Redondo Beach have become inoperable due to damage to the well casings (9N in 1993, 9R in 1983, and 9U in 1989), resulting in a decrease in injection at this location and a respective decrease in groundwater levels below the protective elevations. Chloride levels measured in this area have begun to show an increase as well. By replacing the wells, the total volume of recycled water that is injected at the Barrier can be increased to provide both water quality and potable supply benefits.
Description and Estimates of Without-Project Conditions	Without the Project, the Barrier will be unable to maintain the necessary freshwater elevation required to completely prevent sweater intrusion in this area. This will result in diminished water quality within this potable supply source. Local water supply agencies will also need to continue to purchase the same imported water supplies to meet demands instead of the additional groundwater supply afforded through this Project.
Methods Used to Estimate the Physical Benefit	• Injection rates for the three inoperable wells to be replaced, averaged over the lifespan of the wells, were used to calculate an average injection rate of 0.41 cfs. • Injection rates for the five closest wells that are operable, averaged over the lifespan of the wells as of 2014, were used to calculate an average injection rate of 0.37 cfs. • The physical benefit of adding 724 AFY of recycled water to the groundwater basin was estimated using the historical injection rates of the 3 inoperable injection wells being replaced and the injection rates of other wells currently operating in the vicinity. The average injection rates were assessed and a conservative estimate of 0.33 cfs per well was used. • To be conservative, an injection rate of 0.33 cfs for each well was used for a total of 1 cfs for all three wells combined.

Type of Physical Benefit: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water **Amount:** 724 AFY	
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The new facilities required to obtain the supply benefit include three new injection wells and five new observation wells that will be used to monitor the Project's performance. Since these will be replacement wells, the existing connection and conveyance/distribution structures will continue to be used. The existing recycled water supply line has the capacity to handle the additional demand of the three new injection wells. WBMWD's Edward C Little Water Recycling Facility has the advanced water treatment capacity necessary to produce the recycled water for injection.
Any Potential Adverse Physical Effects	None

Secondary Physical Benefit

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**326 AFY**	**640,740 kWh /year**	**210 MT /year**
Technical Basis of the Project	*LACFCD Seawater Barrier Database – Historical Injection Rate Data (Historical flow rates at injection wells along the Barrier)*: • Tables of injection rates for the three inoperable injection wells (i.e., 9N, 9R, & 9U) that will be replaced as part of this Project • Tables of injection rates for five operating injection wells (i.e., 9J1, 9M1, 9P, 9T1, & 9V1) in the area that are screened in the same aquifer zone as the 3 new injection wells • *Personal communication with Leighanne Kirk, WBMWD:* Proportion of imported water supply sources (45% SWP/55% CRA).	*LACFCD Seawater Barrier Database – Historical Injection Rate Data (Historical flow rates at injection wells along the Barrier)*: • Tables of injection rates for the three inoperable injection wells (i.e., 9N, 9R, & 9U) that will be replaced as part of this Project • Tables of injection rates for five operating injection wells (i.e., 9J1, 9M1, 9P, 9T1, & 9V1) in the area that are screened in the same aquifer zone as the 3 new injection wells • *Personal communication with Leighanne Kirk, WBMWD:* Proportion of imported water supply sources (45% SWP/55% CRA). • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA, and injected advanced treated recycled water pumped as groundwater.	*LACFCD Seawater Barrier Database – Historical Injection Rate Data (Historical flow rates at injection wells along the Barrier)*: • Tables of injection rates for the three inoperable injection wells (i.e., 9N, 9R, & 9U) that will be replaced as part of this Project • Tables of injection rates for five operating injection wells (i.e., 9J1, 9M1, 9P, 9T1, & 9V1) in the area that are screened in the same aquifer zone as the 3 new injection wells • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA, and injected advanced treated recycled water pumped as groundwater. • *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009):* o Section 3: Converts energy saved to a reduction in emissions of CO_2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In addition to the background provided in the previous primary benefit table, only about 45% of WBMWD's imported supplies are from the SWP. Since the SWP's supplies are from the Bay-Delta, reducing SWP demands will help to reduce Bay-Delta demands.	In addition to the background provided in the previous primary benefit table, WBMWD's imported supplies are a blend of from the 45% SWP and 55% CRA. The energy consumed to convey and treat these supplies is in excess of the energy needed to advance treat, inject and then pump the Project's recycled water supply.	In addition to the background provided in the previous primary benefit table, WBMWD's imported supplies are a blend of from the 45% SWP and 55% CRA. The GHGs emitted to convey and treat these supplies is in excess of the GHGs emitted to advance treat, inject and then pump the Project's recycled water supply.

Type of Physical Benefit:	Reduce Demands on the Bay-Delta	Reduce Energy Usage	Reduce GHG Emissions
Amount:	**326 AFY**	**640,740 kWh /year**	**210 MT /year**
Description and Estimates of Without-Project Conditions	Without the Project, local water supply agencies will also need to continue to purchase the same imported water supplies to meet demands instead of the additional groundwater supply afforded through this Project. This will result in no offset of SWP water and no benefit to the Bay-Delta.	Without the Project, 724 AFY of imported water will be used to meet demands and consume energy at a rate of 1,773,800 kWh/year which is 640,740 kWh/year more than serving the same volume of groundwater that had been replenished with injected recycled water.	Without the Project, 582 MT of CO_2 equivalents per year would be emitted to serve imported water which is 210 MT of CO_2 equivalents per year more than serving the same volume of groundwater that had been replenished with injected recycled water.
Methods Used to Estimate the Physical Benefit	Estimates of groundwater replenishment due to the Project were based on average injection rates in the Project vicinity provided by LACFCD. The 724 AFY was assumed to offset imported water purchases with 45% coming from the Bay-Delta through the SWP. Resulting in 326 AFY or 45% of 724 AFY.	The energy consumption of the 45% SWP and 55% CRA imported blend ratio was applied to the energy consumption estimates to serve each source of supply to Southern California – 3,000 kWh/AF for SWP and 2,000 kWh/AF for CRA. WBMWD has estimated the energy required to advance treat recycled water and pump that water for use as approximately 1,565 kWh/AF. Since the Project will offset 724 AFY of blended imported water, about 640,740 kWh/year will be conserved. Over the 100-year lifespan of the Project, this totals approximately 64,074,000 kWh of reduced energy usage.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy usage that would be reduced from the Project (calculated from the "Reduce Energy Usage" benefit to the left) to a reduction in emissions of CO_2 equivalents. A factor of 0.724 pounds of CO_2 equivalents per kWh resulted in 210 MT/year of GHG emission reductions.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Three new injection wells will be required to generate the benefits. Five observation wells will be used to monitor the Project's performance. The Project will use existing facilities such as an existing recycled water supply line and advanced water treatment plant to supply the recycled water and pumping facilities to access the supply.	Three new injection wells will be required to generate the benefits. Five observation wells will be used to monitor the Project's performance. The Project will use existing facilities such as an existing recycled water supply line and advanced water treatment plant to supply the recycled water and pumping facilities to access the supply.	Three new injection wells will be required to generate the benefits. Five observation wells will be used to monitor the Project's performance. The Project will use existing facilities such as an existing recycled water supply line and advanced water treatment plant to supply the recycled water and pumping facilities to access the supply.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name:** West Coast Barrier Project Unit 12 Injection and Observation Wells		
Question 1	**Types of benefits provided as shown in Table 5**	• Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Reduce Energy Usage • Reduce GHG Emissions
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?**	No alternative methods are known that will both prevent seawater intrusion and generate an additional potable supply to offset imported water.
	If no, why?	Other methods to prevent seawater intrusion have been investigated, such as a grout curtain wall and air injection, but neither are cost effective, nor do they provide the additional benefit of recharging groundwater. Alternative locations for injection along the Barrier were not assessed since the purpose of the Project is to strengthen the Barrier where the damaged wells have allowed groundwater levels to drop.
	If yes, list the methods (including the proposed project) and estimated costs.	Not Applicable
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.**	Not Applicable
Comments:		

Crescenta Valley Water District and Glendale Water and Power's Rockhaven Well Project (Project)

Project Description

(25 Word) The Project will activate a well and convey 484 AFY of previously unusable groundwater to an existing Nitrate Treatment Facility for treatment and potable use.

(Expanded) The Rockhaven Well Project is a joint project between Crescenta Valley Water District (CVWD) and Glendale Water & Power (GWP) to activate a groundwater well which was constructed by GWP but was previously considered unusable due to nitrate contamination. The Project will connect the existing GWP well to CVWD's Glenwood Nitrate Water Treatment Plant, which uses an ion-exchange process for nitrate removal. The Project will include installing a 400 gpm pump, onsite piping, a small building, an electrical and telemetry system, drain line for waste, on-site improvements, and 1,200 linear feet (LF) of 8-inch water main. By partnering to construct this connection, both CVWD and GWP will share in an additional 484 acre feet per year (AFY) of local groundwater supply that can now be pumped from the Verdugo Groundwater Basin to meet potable demands.

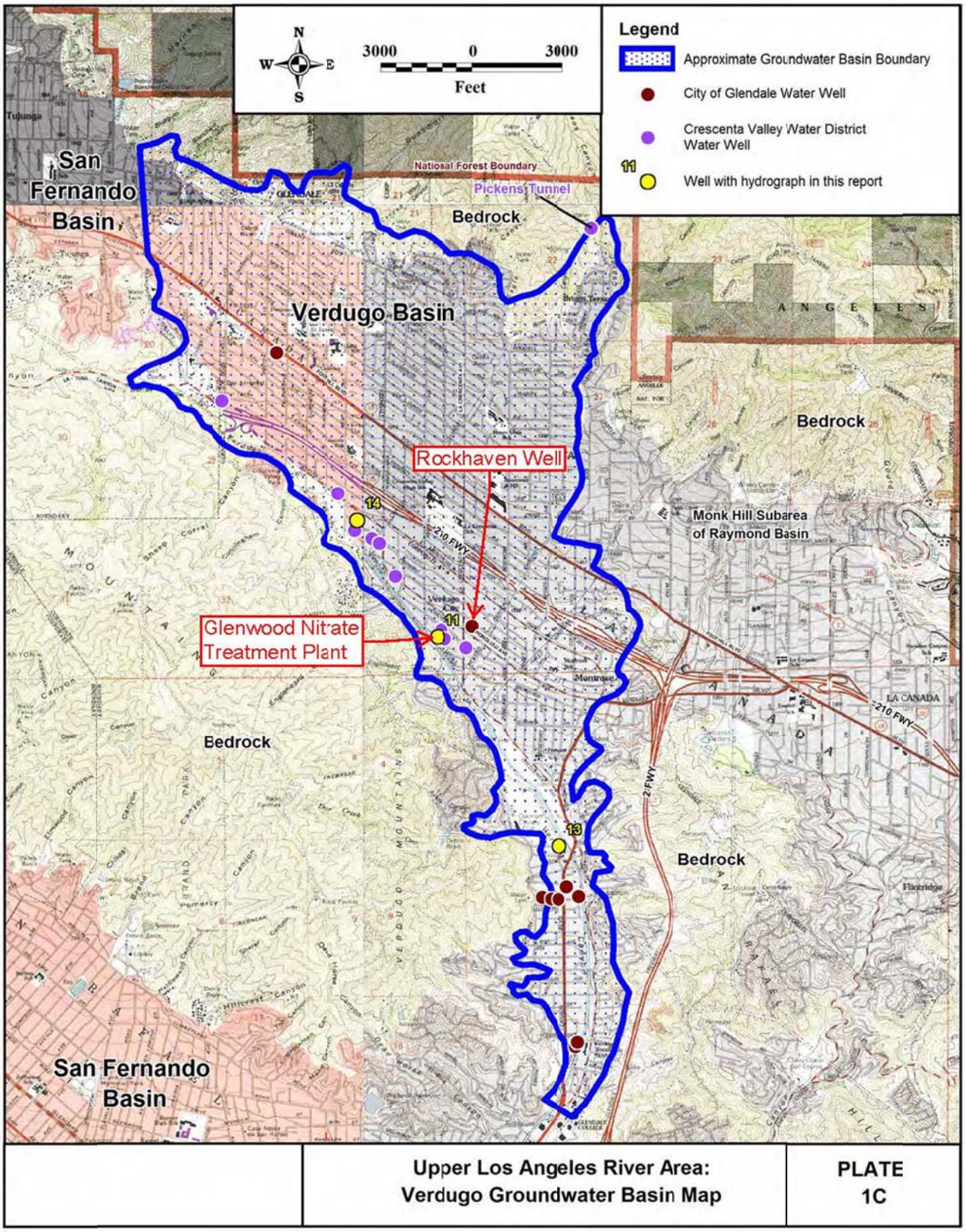
This Project provides immediate regional drought preparedness by offsetting 484 AFY of critical and drought diminished SWP and other supplies imported from the MWD. MWD is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. This Project will assist CVWD, GWP and MWD in meeting potable water demands despite a 95% reduction in SWP imported water allocations which has resulted in rapidly diminishing local and regional storage supplies. Since this Project uses existing facilities, it can be rapidly implemented to alleviate existing drought impacts as well potential further shortages if the drought continues and MWD's storage levels decline to a level that will soon require mandatory conservation. CVWD has adopted a Water Conservation Program consisting of 17 measures to reduce consumption and prohibit water waste for existing and new customers within the service area. In 2014 CVWD has implemented the Conservation Program's "Code Yellow" or "Extraordinary Conservation Alert" with additional measures to limit indoor water use and outdoor irrigation to three days per week.

The Project increases local water supply reliability and the delivery of safe drinking water by increasing the ability to produce more groundwater and better utilize adjudicated water rights in the Verdugo Basin. The Project will offset 484 AFY of potable imported water with locally produced groundwater from an untapped portion of Verdugo Basin that is less susceptible to seasonal fluctuations or reductions in times of drought. Investments in local supplies provide diversification to CVWD and GWP's service areas and an increase in overall supply reliability. If this Project is not implemented, this 484 AFY of potable water will continue to strain imported water supplies.

The Project provides the additional benefits of improving groundwater quality in the basin by removing nitrate contaminated water that will be replenished through natural recharge as well as maximizing the existing well and treatment facilities.

Expedited funding is needed for this Project since without it, the Project may take longer to implement and further delay the immediate drought benefits that can be achieved from its implementation.

Project Map


N
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Approximate Groundwater Basin Boundary
City of Glendale Water Well
Crescenta Valley Water District Water Well
11
Well with hydrograph in this report
San Fernando Basin
National Forest Boundary
Pickens Tunnel
Bedrock
Verdugo Basin
Rockhaven Well
14
210 FWY
Glenwood Nitrate Treatment Plant
11
Monk Hill Subarea of Raymond Basin
Bedrock
Bedrock
LA CANADA
210 FWY
2 FWY
13
Bedrock
San Fernando Basin
Upper Los Angeles River Area:
Verdugo Groundwater Basin Map
PLATE
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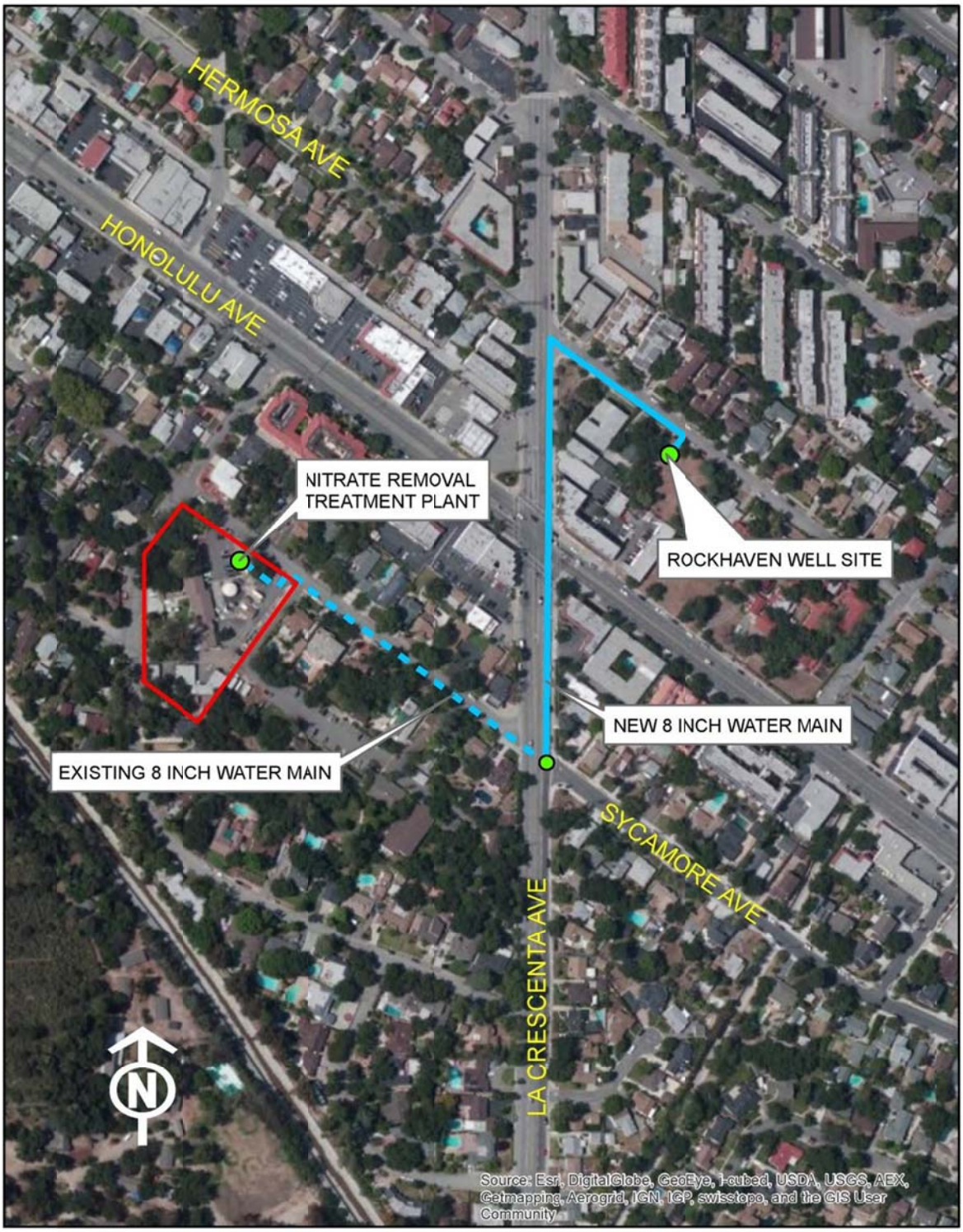


8" WATER MAIN FROM ROCKHAVEN WELL SITE TO GLENWOOD NITRATE TREATMENT PLANT

Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increased Local Water Supply/Reliability and Decrease Dependence on Imported Water
- Reduced Demands on Bay-Delta
- Reduced Energy Usage
- Reduced GHG Emissions

Benefit #1 – Increased Local Water Supply/Reliability and Decrease Dependence on Imported Water

The table below provides information on of the benefit of increasing local water supplies by pumping groundwater. This increase in local supplies will lead to a direct reduction in imported water demands since imported water is the more expensive water supply.

Table 5 - Annual Project Physical Benefits

Project Name: Rockhaven Well

Type of Benefit Claimed: Increased Local Water Supply/Reliability and Decrease Dependence on Imported Water

Units of Benefit Claimed: AF

Additional Information About this Benefit: The Project will be brought online in October 2015, resulting in local water production for 3 out of 12 months in 2015, then full production each subsequent year through the lifecycle of the well. This assumes that the well can produce 400 gpm on a daily basis and is in service about 75% of the time during the year, producing about 484 AFY.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 – Construction	0
2015	0	121	121
2016-2040	0	484	484

Comments:

- *Rockhaven Exploratory Well No. 1 Letter Report (June 24, 2011):* Page 2 -The memorandum shows that the Rockhaven Well could produce between 400 – 450 gpm and provides the assumptions used to calculate the AFY benefit.

Benefit #2 – Reduced Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, the Project service area uses an imported water blend of 46% SWP water that comes from the Bay-Delta system and 54% CRA water.

Table 5 - Annual Project Physical Benefits

Project Name: Rockhaven Well
Type of Benefit Claimed: Reduced Demands on Bay-Delta
Units of Benefit Claimed: AF
Additional Information About this Benefit: The volumes below show the reduction in demands on the Bay-Delta. The Project will be brought online in October 2015, resulting in reduced Bay-Delta demands 3 out of 12 months in 2015 and assuming that the well can produce 400 gpm on a daily basis and is in service about 75% of the time during the year, producing about 484 AFY of which 46% results in a decrease in Bay-Delta supplies.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	223	223 – Construction	0
2015	223	56	167
2016-2040	223	0	223

Comments:

- *Rockhaven Exploratory Well No. 1 Letter Report (June 24, 2011):* Page 2- Shows that the Rockhaven Well could produce between 400 – 450 gpm and assumptions used to calculate the AFY production.
- *MWD 2013 Water Quality Report:* Page 7- Weymouth Plant averages 46% SWP/54% CRA. CVWD receives imported water from Foothill Municipal Water District, which is a wholesale agency to MWD that imports water from MWD's Weymouth Plant.

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 46% SWP and 54% CRA) with Verdugo Basin groundwater. Approximately 3,000 kWh /AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, this results in an estimated 2,460 kWh/AF of energy consumption to provide imported supply to CVWD.

CVWD maintains a 10-year summary of electricity costs from So. Cal. Edison and GWP to pump water from its groundwater well and booster pumps. The average energy usage to pump and treat groundwater in 2014 was approximately 478 kWh /AF. Over the 25-year lifespan of the Project, this totals to 23,988,250 kWh of conserved energy.

Table 5 - Annual Project Physical Benefits

Project Name: Rockhaven Well
Type of Benefit Claimed: Reduced Energy Usage
Units of Benefit Claimed: kWh
Additional Information About this Benefit: Energy saved results from replacing imported water from both SWP and CRA with Verdugo Basin groundwater. The Project will be brought online in October 2015, resulting in reduced energy usage 3 out of 12 months in 2015.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,190,640	1,190,640-Construction	0
2015	1,190,640	950,758	239,883
2016-2040	1,190,640	231,110	959,530

Comments:

- *Rockhaven Exploratory Well No. 1 Letter Report (June 24, 2011):* Page 2- Shows that the Rockhaven Well could produce between 400 – 450 gpm and assumptions used to calculate the AFY production.
- *MWD 2013 Water Quality Report:* Page 7- Weymouth Plant averages 46% SWP/54% CRA. CVWD receives imported water from Foothill Municipal Water District, which is a wholesale agency to MWD that imports water from MWD's Weymouth Plant.
- *Personal communication with David Gould, CVWD (July 2014)*: Average energy usage for CVWD to pump and treat groundwater in 2014 is 478 kWh/AF.
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007:* Page 4 - Lists the kWh/AF associated with SWP imported water, CRA imported water conveyed to Los Angeles County

Benefit #4 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the additional need to transport imported water. This value was calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting a demand of 484 AFY of imported water, the Project will avoid GHG emissions of approximately 315 MT per year of CO_2 equivalents per year (391 MT per year to import water versus 76 MT per year to pump groundwater) after 2015. Over the 25-year lifespan of the Project, this totals approximately 7,878 MT of avoided carbon emissions.

Table 5 - Annual Project Physical Benefits

Project Name: Rockhaven Well
Type of Benefit Claimed: Reduced GHG Emissions
Units of Benefit Claimed: MT of CO_2 equivalents
Additional Information About this Benefit: The Project will be brought online in October 2015, resulting in reduced GHG emissions 3 out of 12 months in 2015 and assumes that the well can produce 400 gpm on a daily basis and is in service about 75% of the time during the year, producing about 484 AFY. A factor of 0.724 pounds of CO_2 equivalents per kWh was used.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	391	391 – Construction	0
2015	391	293	98
2016-2040	391	76	315

Comments:

- *Rockhaven Exploratory Well No. 1 Letter Report (June 24, 2011):* Page 2 - The memorandum shows that the Rockhaven Well could produce between 400 – 450 gpm.
- *MWD 2013 Water Quality Report:* Page 7- Weymouth Plant averages 46% SWP/54% CRA. CVWD receives imported water from Foothill Municipal Water District, which is a wholesale agency to MWD that imports water from MWD's Weymouth Plant.
- *Personal communication with David Gould, CVWD (July 2014)*: Average energy usage for CVWD to pump and treat groundwater in 2014 is 478 kWh/AF.
- *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009)*: Section 3 -Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence On Imported Water **Amount:** 484 AFY	
Technical Basis of the Project	*Rockhaven Exploratory Well No. 1 Letter Report*; by AMEC Geomatrix, June 24, 2011 • Page 2: Summarizes work performed by Bakersfield Well & Pump Company, which included well drilling, casing installation, and pump testing; and provides estimates on well production.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Overall the water levels in the Verdugo Basin have been decreasing, however, the Rockhaven Well will tap into an underutilized portion of the Basin to obtain CVWD and GWP adjudicated rights that were previously inaccessible due to water quality issues. CVWD and GWP have performed well rehabilitation on their existing wells, which are over 50 years old and have not shown improved results and/or increased well capacity – so there is no benefit to conducting further rehabilitation in-lieu of replacement. The Rockhaven Well will provide a more reliable local source to offset SWP and CRA supplies during the current drought and future droughts.
Description and Estimates of Without-Project Conditions	If the Rockhaven Well Project is not completed, then CVWD and GWP will need to continue meeting those demands through imported water purchases from MWD, reducing the availability of this critical supply to meet other demands.
Methods Used to Estimate the Physical Benefit	CVWD and GWP estimated the 484 AFY of new local supply to be generated by the Project based on the work completed in the *Rockhaven Exploratory Well No. 1 Letter Report*. It assumes the well will produce 400 gpm on a daily basis and is in service about 75% of the time during the year – thereby producing at a rate of 484 AFY [400 gpm X (60 min/hr X 24 hr/day X 365 day/yr) = 210 MG/yr = 645 AFY Assume the well is in service 75% of the year – 642 AFY X 75% = 484 AFY]
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Installation of a 400 gpm pump, onsite piping, a small building, an electrical and telemetry system, drain line for waste, on-site improvements, and 1,200 LF of 8-inch water main
Any Potential Adverse Physical Effects	None.

Secondary Physical Benefits

Type of Physical Benefit:	Reduce Delta Demands	Reduced Energy Usage	Reduce GHG Emissions
Amount:	**223 AFY**	**959,530 kWh/year**	**315 MT/year of CO_2 equivalent**
Technical Basis for the Project	• *Rockhaven Exploratory Well No. 1 Letter Report (June 24, 2011)*: o Page 2: Provides well production estimates • *MWD 2013 Water Quality Report:* • Page 7- Weymouth Plant averages 46% SWP/54% CRA. CVWD receives imported water from Foothill Municipal Water District, which is a wholesale agency to MWD that imports water from MWD's Weymouth Plant.	• *Personal communication with David Gould, CVWD (July 2014):* • Average energy usage for CVWD to pump and treat groundwater in 2014 is 478 kWh/AF. • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA.	• *Personal communication with David Gould, CVWD (July 2014):* Average energy usage for CVWD to pump and treat groundwater in 2014 is 478 kWh/AF. • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA. • *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009)* o Section 3: Converts energy saved to a reduction in emissions of CO2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Imported water is currently used to compensate for demands not met through groundwater production. Of the imported water, on average 46% is from the SWP and 54% is from the CRA. The portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with local groundwater will reduce demands on the Bay-Delta.	The energy cost incurred by the CVWD to import water from the Bay-Delta and the Colorado River is higher than the energy cost to produce local groundwater.	The energy cost incurred by CVWD to import water from the Bay-Delta and the Colorado River is higher than the energy cost to produce local groundwater. The decrease in energy usage will result in GHG emission reductions thereby mitigating their contribution to effecting climate change.
Description and Estimates of Without-Project Conditions	If the Rockhaven Well Project is not completed, then CVWD will continue meeting those demands through imported water purchases from MWD, reducing the availability of SWP critical supply to meet Bay-Delta demands.	Without the Project, an additional 24 million kWh of energy will be consumed.	Without the Project, an additional 7,878 MT of CO_2 equivalents will be emitted.

Type of Physical Benefit:	Reduce Delta Demands	Reduced Energy Usage	Reduce GHG Emissions
Amount:	**223 AFY**	**959,530 kWh/year**	**315 MT/year of CO_2 equivalent**
Methods Used to Estimate the Physical Benefit	The amount of reduced Bay-Delta demands was calculated by applying an estimated 46% SWP blend to the annual amount of imported water that would need to be purchased without the Project – or 46% of 484 = 223 AFY.	The existing 46% SWP and 54% CRA blend of imported water use and corresponding groundwater volume of offset was applied to the energy consumption estimates (contained in documents cited above) to produce each of the sources. The difference between current imported water-related energy consumption and groundwater-related energy consumption was calculated as 1,190,640 kWh/year – 231,110 kWh/year = 959,530 kWh/year.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved (calculated as the previous benefit) to a reduction in emissions of CO2 equivalents. This resulted in a 391 MT/year – 76 MT/year = 315 MT/year reduction in GHG emissions.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Installation of a 400 gpm pump, onsite piping, a small building, an electrical and telemetry system, drain line for waste, on-site improvements, and 1,200 LF of 8-inch water main.	Installation of a 400 gpm pump, onsite piping, a small building, an electrical and telemetry system, drain line for waste, on-site improvements, and 1,200 LF of 8-inch water main.	Installation of a 400 gpm pump, onsite piping, a small building, an electrical and telemetry system, drain line for waste, on-site improvements, and 1,200 LF of 8-inch water main.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project Name:** Rockhaven Well Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increased Local Water Supply/Reliability and Decrease Dependence on Imported Water • Reduced Demands on Bay-Delta • Reduced Energy Usage • Reduced GHG Emissions
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 Crescenta Valley area's water sources are limited to groundwater or imported water. The only alternative would be to import water from another groundwater basin. No other alternate groundwater production projects were evaluated that could use the same existing facilities. And no other alternatives are available that produce all of the benefits listed above.
	If yes, list the methods (including the proposed project) and estimated costs.	Not Applicable
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.**	Not Applicable
Comments:		

Las Virgenes Municipal Water District (LVMWD) Water Budget Based Rates Implementation (Project)

Project Description

(25 Word) The Project will reduce LVMWD demands by implementing a rate structure with parcel-specific water budgets based on household size, irrigated area, and local microclimate.

(Expanded) This Project will develop and implement a parcel-specific, water budget-based rate system for about 70,000 residents and businesses in the LVMWD service area, aimed at cumulatively reducing water use by at least 5,250 AF over the 7-year lifespan of the Project. Customers will receive water budgets based on indoor use, irrigated area and local microclimate, with structured financial disincentives in the form of steeply inclined tiered pricing for over-irrigation and other inefficient water use practices. Those identified as over-users will be targeted to participate in conservation programs such as turf replacement and rebates on water efficient devices. Over-users that don't participate will generate the funds needed to enhance rebate programs for all customers. Project implementation consists of obtaining color-infrared aerial imagery, landscape delineation, financial cost of service analysis, rate structure development, and a billing system upgrade to accommodate individual budgets calculated with actual evapotranspiration.

This Project provides immediate regional drought preparedness by offsetting at least 5,250 AF of critical and drought diminished SWP water imported from the MWD. MWD is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions; however, given localized supply constraints, LVMWD has had mandatory conservation measures in place since 2008. Absent this Project, there is a very real risk of mandatory water rationing in the service area, especially if current drought conditions continue. In earlier droughts, voluntary water conservation measures did not reduce water demands sufficiently to avoid implementation of monetary penalties.

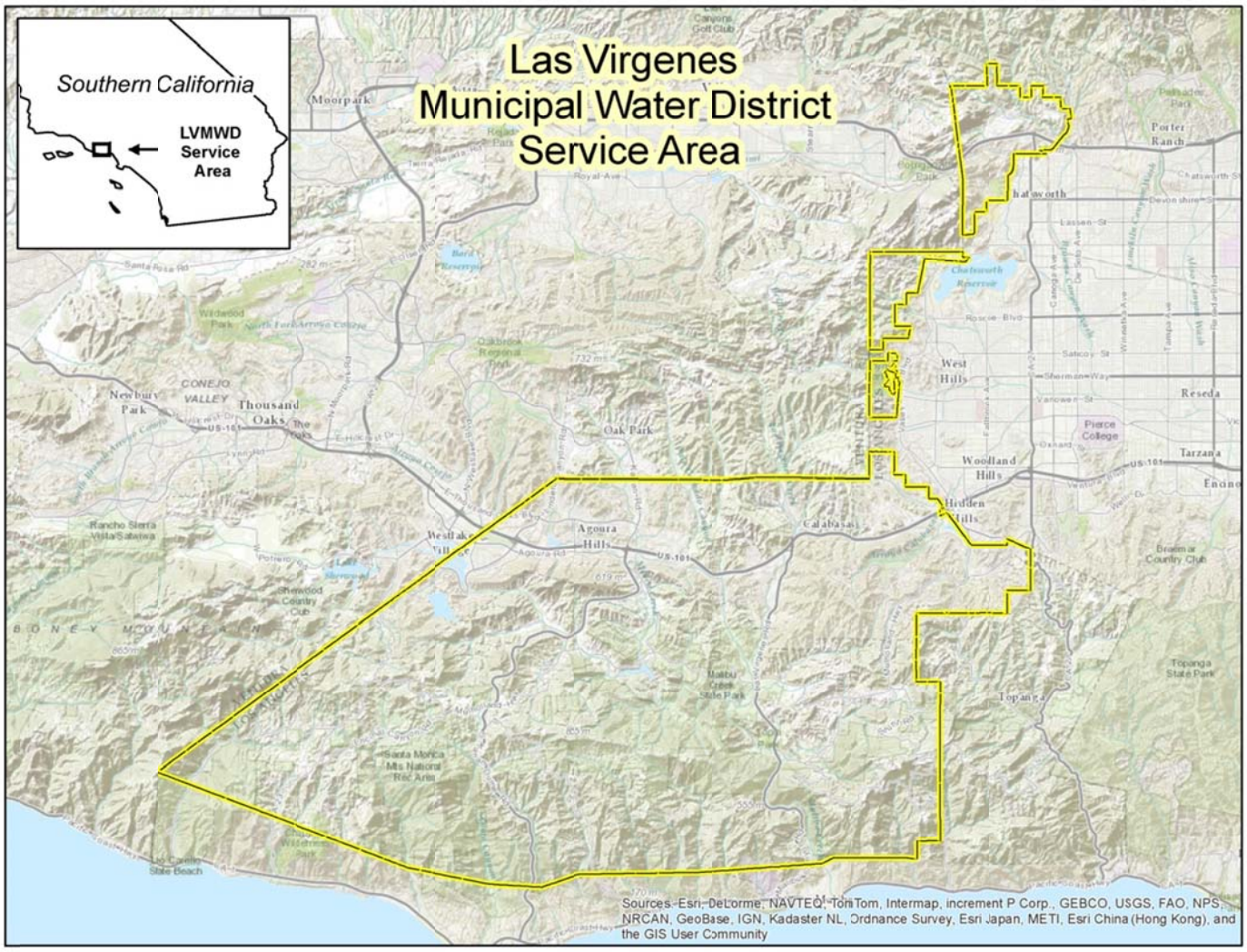
The Project increases local water supply reliability and the delivery of safe drinking water by reducing domestic demand and offsetting 5,250 AF of imported SWP water. Since the LVMWD area does not have a local water source, such as groundwater basins for local supply or storage, the ability to tap into alternate sources or otherwise respond to drought conditions is challenging. As a result, permanent demand management is a critical tool for LVMWD to mitigate existing and projected future demands (from anticipated population growth) and improve supply reliability. If this Project is not implemented, LVWMD will continue to depend on the 5,250 AF of potable imported supply and will continue to strain an already critically reduced supply.

Since LVWMD is required to maintain environmental flows within Malibu Creek for endangered Steelhead trout, the Project also reduces potential ecosystem conflicts created by the drought. Offsetting potable imported water through demand management (especially during the peak summer season when both outdoor water use and stream flow augmentation are needed), would increase the supply available for LVMWD to augment Malibu Creek flows and reduce the potential for conflict between domestic and habitat demands for the same source of supply. Reduced landscape irrigation will also help eliminate runoff, protecting watershed water quality.

This Project will be the first implementation of water budget based rates in the Greater Los Angeles County IRWMP Region and will be published as a case study for use by other agencies and presented within the GLAC IRWM Region.

Expedited funding is needed to implement a Project that will result in reduced sales of water and therefore reduced revenue to finance implementation. Grant funding would support the one-time costs to permanently transition to customer-specific water budget based rates.

Project Map


Las Virgenes
Municipal Water District
Service Area
Southern California
LVMWD
Service
Area
Moorpark
Simi Valley
Thousand Oaks
Newbury Park
CONEJO VALLEY
Oak Park
Agoura Hills
Westlake Village
Calabasas
Hidden Hills
Woodland Hills
West Hills
Chatsworth
Porter Ranch
Reseda
Tarzana
Encino
Pierce College
Topanga
Topanga State Park
Malibu Creek State Park
Rancho Sierra Vista/Satwiwa
Sherwood Country Club
Brentwood Country Club
Santa Monica Mts National Rec Area
Point Mugu State Park
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supply/Reliability and Decreased Dependence on Imported Water
- Reduce Demands on Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water

The table below provides information on the benefit of reducing demand through water budget based rates. This increase in conserved supply will lead to a direct reduction in imported water use and dependence.

Table 5 - Annual Project Physical Benefits

Project Name: Water Budget Based Rates Implementation

Type of Benefit Claimed: Increase Local Water Supply/Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The Project will implement the new budget based rate structure in May 2016 and demand reductions (listed below as conserved supply) will increase incrementally over three years as over-users reduce demands and participation in other conservation programs increases. There is potential for both more rapid and greater increases in conserved supply than the conservative estimates provided here.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 – Implementation	0
2015	0	0– Implementation	0
2016	0	250	250
2017	0	750	750
2018	0	1,250	1,250
2019-2020	0	1,500	1,500

Comments:

- *Las Virgenes MWD Memorandum - Post-Drought Water Demand,* April 2012: Page 1 – LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction from 2007 to 2010. This Project assumes a 20% demand reduction is achievable; 20% of the 22,500 AFY ten-year average potable water use is 4,500 AFY. Since demand reduction is based on customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, LVWMD conservatively estimates that at least one third of this demand reduction will be achieved (1,500 AFY) by 2019.
- The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. LVMWD's blend of MWD imported water supply is traditionally 100% SWP water that comes from the Bay-Delta system.

Table 5 - Annual Project Physical Benefits

Project Name: Water Budget Based Rates Implementation
Type of Benefit Claimed: Reduce Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: Reduced demand for SWP water will reduce demands on the Bay-Delta ecosystem and help address the CALFED Bay-Delta Program objectives. The volumes below show the same very conservatively estimated reduction in demands on the Delta scaled as described under Benefit #1.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,500	1,500 - Implementation	0
2015	1,500	1,500 - Implementation	0
2016	1,500	1,250	250
2017	1,500	750	750
2018	1,500	250	1,250
2019-2020	1,500	0	1,500

Comments:

- *Las Virgenes MWD Memorandum - Post-Drought Water Demand,* April 2012: Page 1 – LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction from 2007 to 2010. This Project assumes a 20% demand reduction is achievable; 20% of the 22,500 AFY ten-year average potable water use is 4,500 AFY. Since demand reduction is based on customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, LVWMD conservatively estimates that at least one third of this demand reduction will be achieved (1,500 AFY) by 2019. The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- *Personal communication with Jan Dougall, LVMWD (July 2014)*: LVMWD gets 100% SWP water from MWD.

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (100% SWP) through water demand reduction. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California. Using this value, it can be conservatively estimated that the energy required to import SWP water to LVMWD, totals to 15,750,000 kWh of over the 7-year lifespan of the Project.

Table 5 - Annual Project Physical Benefits

Project Name: Water Budget Based Rates Implementation
Type of Benefit Claimed: Reduce Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column (d) show the amount of energy saved thorough implementation of the Project. Since no other supply will be used to offset the imported water demand, the energy reduced is equivalent to the energy consumed to import the offset imported water.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	4,500,000	4,500,000 - Implementation	0
2015	4,500,000	4,500,000 - Implementation	0
2016	4,500,000	3,750,000	750,000
2017	4,500,000	2,250,000	2,250,000
2018	4,500,000	750,000	3,750,000
2019-2020	4,500,000	0	4,500,000

Comments:

- *Las Virgenes MWD Memorandum - Post-Drought Water Demand,* April 2012: Page 1 – LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction from 2007 to 2010. This Project assumes a 20% demand reduction is achievable; 20% of the 22,500 AFY ten-year average potable water use is 4,500 AFY. Since demand reduction is based on customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, LVWMD conservatively estimates that at least one third of this demand reduction will be achieved (1,500 AFY) by 2019. The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- *Personal communication with Jan Dougall, LVMWD*: LVMWD imports 100% SWP water
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water.

Benefit #4 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by transporting and treating imported water for potable use. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO_2 equivalents (1 MT = 2,204.6 lbs), based on the California Action Registry, General Reporting Protocol. By offsetting 5,250 AF of imported water demand, the Project will avoid GHG emissions of approximately 5,173 MT of CO_2 equivalents over the lifespan of the Project.

Table 5 - Annual Project Physical Benefits

Project Name: Water Budget Based Rates Implementation

Type of Benefit Claimed: Reduce GHG Emissions

Units of the Benefit Claimed: MT of CO_2 equivalents

Additional Information About this Benefit: Values in column (d) show the amount of GHG emissions reduced thorough implementation of the Project. Since no other supply will be used to offset the imported water demand, the GHG emissions reduced is equivalent to the GHG emissions generated to import the offset imported water.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,478	1,478 - Implementation	0
2015	1,478	1,478 - Implementation	0
2016	1,478	1232	246
2017	1,478	739	739
2018	1,478	246	1,232
2019-2020	1,478	0	1,478

Comments:

- *Las Virgenes MWD Memorandum - Post-Drought Water Demand,* April 2012: Page 1 – LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction from 2007 to 2010. This Project assumes a 20% demand reduction is achievable; 20% of the 22,500 AFY ten-year average potable water use is 4,500 AFY. Since demand reduction is based on customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, LVWMD conservatively estimates that at least one third of this demand reduction will be achieved (1,500 AFY) by 2019. The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- The lifespan of the Project is based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time. So this is a conservative lifespan estimate of the potential savings from budget based rates.
- *Personal communication with Jan Dougall, LVMWD*: LVMWD imports 100% SWP water
- California Action Registry, General Reporting Protocol. Version 3.1, January 2009. Section 3. Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total MT of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence On Imported Water **Amount:** 5,250 AF	
Technical Basis of the Project	*LVMWD Memorandum - Post-Drought Water Demand;* April 2012 • Page 1 – Provides information regarding the effect on potable water demand from mandatory conservation measures implemented by LVMWD during previous droughts. • Reduced demand resulting from such measures were used to estimate the potential decreases in potable water use – in particular, from 2007 to 2010, the parcel size block-based budgets implemented with mandatory conservation and over-use surcharges resulted in about a 30% demand reduction.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	The *Las Virgenes MWD Memorandum* cited above was developed to determine the effectiveness of implementing mandatory drought measures and to determine the period in which potable water demand might recover to a pre-drought level following such measures. The methods used to generate the demand reductions cited above (2007-2010) over-allocated water to large parcels that were not completely landscaped and under-allocated water to households with many occupants or other needs. These methods were the best available at the time given data and technology constraints and will be improved upon by implementing this Project. The results showed that financial disincentives for overuse result in direct reductions in water use. Rather than implementing a temporary rate based drought measure, this Project intends to modify the rate structure, providing more accurate, parcel-specific water budgets than previous reduction incentive methods that will yield benefit beyond the drought period.
Description and Estimates of Without-Project Conditions	Without this Project LVMWD will need to cumulatively purchase an additional 5,250 AF of imported supply from MWD to meet these demands. There are no other sources of supply that could be used in lieu of imported water to meet residential and commercial demands. Thus, decreasing the actual demand is the only way to offset the need to purchase this supply.
Methods Used to Estimate the Physical Benefit	Between 2007 and 2010, LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction. This Project assumes a conservative 20% demand reduction since demand has not fully recovered from such measures. Based on previously implemented drought measures, it is estimated that post drought demand recovery takes approximately six years in this LVMWD's service area. 20% of 22,500 AFY (ten year average potable water use) is 4,500 AFY. Since the degree of demand recovery reached by the time budget based billing begins is unknown, and since demand reduction is based on customer response to price signals, which is expected to vary somewhat depending on the drought conditions in any given year, LVWMD conservatively assumes that at least one third of this demand reduction will be achieved (1,500 AFY) within 3 years after new rates are introduced in 2016. Since the Project will implement the new rates beginning May 2016, reduced demands will increase incrementally as customers respond to the steeply tiered rates and as targeted over-users' participation in conservation programs increases. The net result of decreased demand over the 7-year Project life is 5,250 AF.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	No new facilities are required. The Las Virgenes MWD code will need to be revised to accommodate the new rate structure.
Any Potential Adverse Physical Effects	None anticipated

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Delta Demands**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	5,250 AF	15,750,000 kWh	5,173 MT of CO_2 equivalent
Technical Basis for the Project	• *Las Virgenes MWD Memorandum - Post-Drought Water Demand,* April 2012: Page 1 – LVMWD implemented parcel size block-based budgets with mandatory conservation and over-use surcharges resulting in about a 30% demand reduction from 2007 to 2010. This Project assumes a 20% demand reduction is achievable. 20% of 22,500 AFY (average potable water use) is 4,500 AFY. Since demand reduction is based on the degree of demand recovery reached by the time budget based billing begins and customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, LVWMD conservatively estimates that at least one third of this demand reduction will be achieved (1,500 AFY) within 3 years after new rates are introduced in 2016. • The Project will implement the new rates in May 2016. Reduced demands will increase incrementally as customers respond to the steeply tiered rates and as targeted over-users' participation in conservation programs increases. The net result of decreased demand over the 7-year Project life is 5,250 AF.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP water. • The Project will be completed in May 2016. Reduced demands will increase incrementally as customers respond to the steeply tiered rates and as targeted over-users' participation in conservation programs increases. The net result of reduced energy consumption from reduced imported water demands over the life of the Project is 15,750,000 kWh.	• *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA, and recycled water. • *California Action Registry, General Reporting Protocol. Version 3.1, January 2009* o Section 3: Documents conversion of energy saved to a reduction in emissions of CO_2 equivalents.

Type of Physical Benefit:	**Reduce Delta Demands**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	5,250 AF	15,750,000 kWh	5,173 MT of CO_2 equivalent
	• *Personal communication with Jan Dougall, LVMWD*: LVMWD imports 100% SWP water		
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	On average 100% of LVMWD water delivered is from the SWP, which impacts the Bay-Delta. The offset of SWP imported water supply through conservation will reduce demands on the Bay-Delta.	The imported water delivered to the City requires energy to transport from the Bay-Delta and there is no energy required to reduce local water demands.	The imported water delivered to LVMWD requires energy to transport from the Bay-Delta and there is no energy required to reduce local water demands. This energy usage results in GHG emissions that contribute to climate change.
Description and Estimates of Without-Project Conditions	Without the Project, LVMWD would continue to use SWP supplies at 100% of the total imported water use totaling 5,250 AF.	Without the Project, an additional 15.8 million kWh of energy would be consumed.	Without the Project, an additional 5,173 MT of CO_2 would be emitted.
Methods Used to Estimate the Physical Benefit	The amount of reduced Delta demands is based on a 100% imported SWP water that would need to be purchased without the Project – or 5,250 AF.	The volume of imported SWP water offset by the Project (5,250 AF) was applied to the energy use estimates (contained in documents cited above) for conveying SWP water. The difference between the Project and imported water supplies was calculated as 15,750,000 kWh – 0 kWh = 15,750,000 kWh.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved (calculated as the previous benefit) to a reduction in emissions of CO_2 equivalents. This resulted in a 5,173 MT – 0 MT =5,173 MT reduction in GHG emissions.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	Project consists of obtaining color-infrared aerial imagery, landscape delineation, financial cost of service analysis, rate structure development, and a billing system upgrade to accommodate individual budgets calculated with actual evapotranspiration.	Project consists of obtaining color-infrared aerial imagery, landscape delineation, financial cost of service analysis, rate structure development, and a billing system upgrade to accommodate individual budgets calculated with actual evapotranspiration.	Project consists of obtaining color-infrared aerial imagery, landscape delineation, financial cost of service analysis, rate structure development, and a billing system upgrade to accommodate individual budgets calculated with actual evapotranspiration.

Type of Physical Benefit:	**Reduce Delta Demands**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	5,250 AF	15,750,000 kWh	5,173 MT of CO_2 equivalent
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project Name:** Budget Based Rates Implementation		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Decrease Demands on the Bay-Delta • Reduce Energy Usage • Reduce GHG Emissions
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?	Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs.	• A mandatory 27% percent water use reduction with penalties for non-compliance was implemented from February 1991 to March 1992. This effort resulted in a 28% reduction in water use (4,933 AF, District records) and cost at least $549,081 in 2014 dollars. Thus, the current day cost is calculated as: $549,081 / (4,933AF x 14months/12months)= $95/AF/Y. • Implementing Water Budget Based Rates: Cost =$679,733 for a minimum of 5 years. Considering the minimum 1,500 AFY estimated demand reduction after three years (cumulative 5,250 AF over 5 years), the unit cost is calculated as $679,733/5,250AF=$129/AF. However, the 1,500 AFY by 2019 estimate is the low end of the estimated range. At the high end estimate of 4,500 AFY by 2019, each year's estimated savings would be 3 times as much for a total Project savings of 15,750 AF. The unit cost of this high estimate is calculated as $679,733/15,750AF=$43/AF. The Project would need to attain a 2019 reduction of 2,044 AFY (cumulative 7,155 AF over 5 years) to match the 1991-1992 unit cost of $95/AF. This is calculated as $679,733/7,155AF=$95/AF. Unit cost is less than $95/AF for the upper 55% of the estimated range of conservation and exceeds this cost for lower 45% of the estimated range, but with an effort that will be sustained for a minimum of 5 years and not just 14 months.

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 other method is a temporary measure: The proposed Project has a lifespan based on the period in which the adopted rate structure will be in place. The actual rate structure developed in this Project could change following 2020, however it is likely that budget based rates will persist far beyond this time, in which case the low end estimated water savings of this Project will become the least cost alternative in the year 2022 after meeting a cumulative conservation of 7,155 AF in the 16th month after stated Project life. Demand reduction is based on customer response to price signals, which is expected to be variable depending on the drought conditions in any given year, therefore LVWMD conservatively assumes that at least one third of the projected demand reduction (4,500 AFY) will be achieved (1,500 AFY) within 3 years after new rates are introduced in 2016. The projected 4,500 AFY demand reduction, if achieved over 3 years, could result in a cumulative conservation of 15,750 AF over the life of the Project, which equates to $43/AF. This is calculated as $679,733/15,750AF=$43/AF. The Project is the least cost alternative for almost half the estimated range from 1,500 AFY by 2020 to 4,500 AFY by 2020. The Project would be the least cost alternative if customer response is in alignment with previously implemented parcel size block-based budget rates. This Project is also preferred since it more accurately identifies the ability of certain customers to conserve supplies and is therefore anticipated to have a better ability to maintain conservation rates over a longer period of time.
Comments:		

City Of Inglewood (City) Well No. 2 Rehabilitation Project (Project)

Project Description

(25 word) The Project improves production of an existing well, thereby increasing the ability to access currently unused pumping rights in the West Coast Basin.

(Expanded) The Project will rehabilitate the existing City Well No. 2 to restore production to previous levels. The well rehabilitation will include removal of the pump assembly, removal of well encrustation through wire brushing, jetting, removal of swab, BoreBlast, and chemical treatment of the well casing. After rehabilitation, the well will be tested to determine its potential yield. Based on previous rehabilitation work performed on Well No. 2, an estimated average of 400 AFY or 248 gpm could be produced over a period of seven years before rehabilitation may become necessary again. The additional groundwater pumped at this well will be conveyed, treated and distributed using existing infrastructure.

This Project provides immediate regional drought preparedness by alleviating the need to purchase additional Tier 2 imported water supplies from the MWD through the West Basin Municipal Water District (WBMWD). The City's imported water is comprised of approximately 40% SWP and 60% CRA water based on an average year annual average. As opposed to waiting to replace the well, which is a more lengthy process, this Project will provide a response to current drought issues by immediately eliminating the need for an additional 240 AFY of extremely limited SWP supply.

MWD is experiencing an unprecedented reduction in supplies from the SWP due to drought conditions. Although WBMWD's constituents have paid for water storage investments, WBMWD and its retail agencies have maintained an aggressive conservation program during the drought. If drought conditions persist through 2014, it is anticipated that mandatory rationing within WBMWD's service area could go into effect by spring 2015. This Project will assist the City and WBMWD in meeting a portion of these demands despite reductions in imported water allocations and storage supplies.

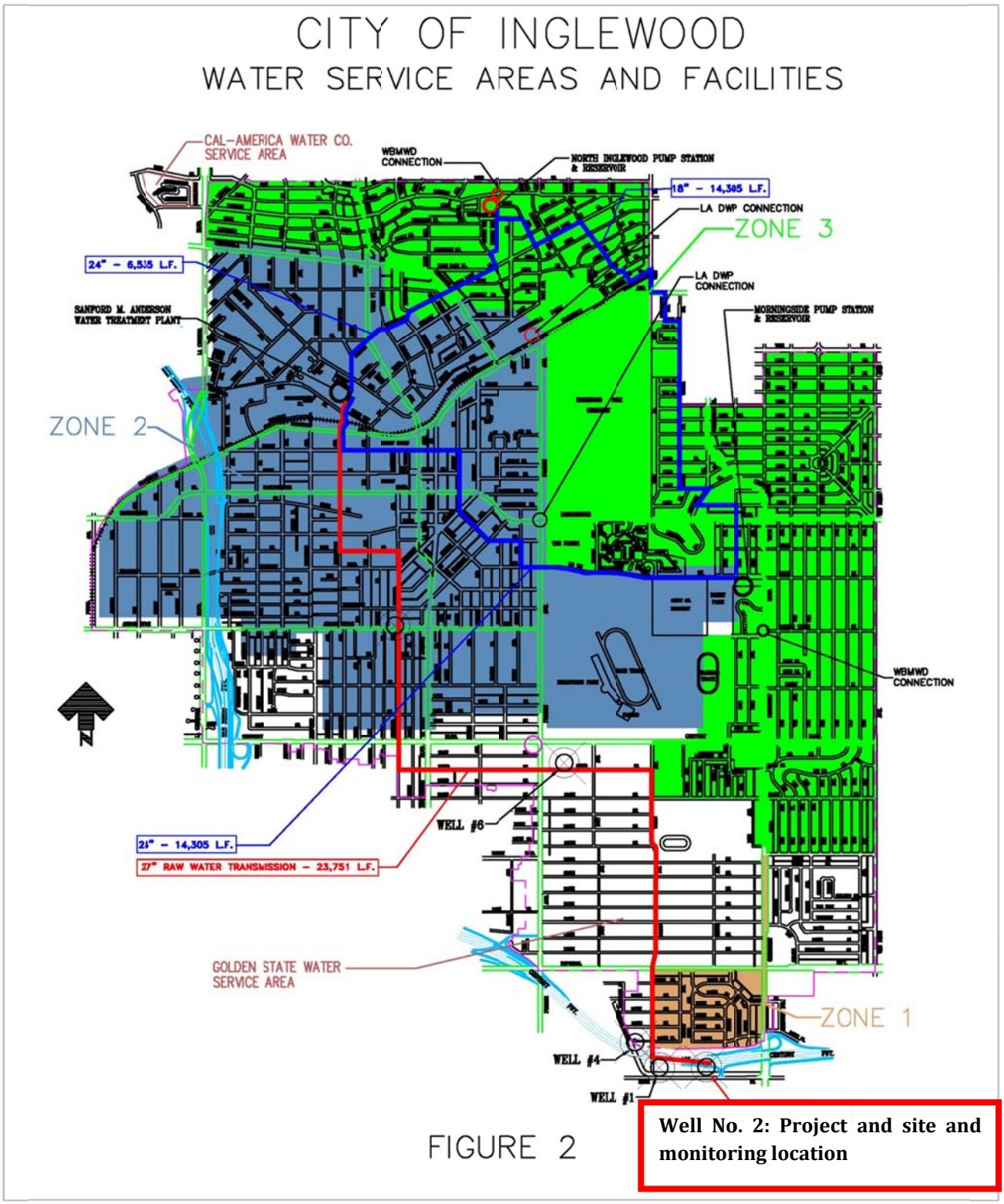
The Project increases local water supply reliability and the delivery of safe drinking water by increasing the ability to extract more groundwater and better utilize the City's adjudicated water right in the West Coast Basin. This additional supply reduces dependence on more costly imported water from MWD at Tier 2 rates. The City is allotted 8,000 AFY at Tier 1 rates and exceeded this limit paying Tier 2 rates for the first time in 2013 as a result of performance problems and decommissioning Well No. 2 that same year.

The City's Well No. 2 was recently taken out of service since production has decreased to less than 1% of its 2,500 gpm design capacity due to age and plugging from encrustation. Richard C. Slade & Associates LLC to completed the *Preliminary Evaluation of Downwell Conditions Technical Memorandum (March 21, 2014)* which recommends that the City construct a new well at a different location, while providing specific rehabilitation measures to restore some portion of Well No. 2's specific capacity. The City has identified a new well site; however the Project is not shovel ready and cannot bring immediate drought relief. In the interim, this Project will provide an average of 400 AFY of groundwater and offset an equal amount of Tier 2 water over the next seven years while the replacement well is being constructed.

Expedited funding is needed for this Project since without it, the City would need to continue to conserve its limited financial resources for the well replacement project and be dependent on Tier 2 imported supply for at least a few more years. As a disadvantaged community, the City has struggled to implement projects due to limited funding. This grant request would make a real difference to the City's ability to take meaningful step toward offsetting the crippling cost of Tier 2 rates.

Project Map

Figure 1



Well No. 2: Project and site and monitoring location

Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water
- Reduce Demands on the Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The table below provides information regarding the water supply benefit of increased groundwater supply. This increase in local supplies will lead to a direct reduction in imported water demands since imported water is the more expensive water supply.

Table 5 - Annual Project Physical Benefits

Project Name: Well No. 2 Rehabilitation

Type of Benefit Claimed: Increase Local Water Supplies/Reliability and Decrease Dependence On Imported Water

Units of the Benefit Claimed: AF

Additional Information About this Benefit: The Project will be brought online in May 2015, resulting in local water production for 8 out of 12 months in 2015 (400 AF). The volumes below show a decrease in production starting in 2018 as the well becomes encrusted again.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 - Construction	0
2015	0	400	400
2016-2017	0	600	600
2018	0	500	500
2019	0	400	400
2020	0	200	200
2021	0	100	100

Comments:

- *Inglewood Water Monthly Production Reports (February2010-January 2011)* – This summarizes actual monthly well production following similar rehabilitation in 2009 through 2013. The annual yield after rehabilitation was approximately 820 AFY. The City has made the conservative estimate that a yield of 600 AFY is initially attainable and that the performance will begin to diminish following its third year of production.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, the City uses an imported water blend of 40% SWP, which comes from the Bay-Delta system and 60% CRA.

Table 5 - Annual Project Physical Benefits

Project Name: Well No. 2 Rehabilitation
Type of Benefit Claimed: Reduce Demands on Bay-Delta
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The proportion of SWP water that is reduced with the Project will reduce demands on the Bay-Delta ecosystem and help address the CALFED Bay-Delta Program objectives. The volumes below show the reduction in demands on the Delta.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	240	240 - Construction	0
2015	240	80	160
2016-2017	240	0	240
2018	240	40	200
2019	240	80	160
2020	240	160	80
2021	240	200	40

Comments:

- *Inglewood Water Monthly Production Reports (February2010-January 2011)* – This summarizes actual monthly well production following similar rehabilitation in 2009 through 2013. The annual yield after rehabilitation was approximately 820 AFY. The City has made the conservative estimate that a yield of 600 AFY is initially attainable and that the performance will begin to diminish following its third year of production.
- *Per WRD via personal communication with Thomas Lee and Barmeshwar Rai, City of Inglewood:* Proportion imported water used by City that is SWP water (40% SWP/60% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 40% SWP and 60% CRA) with West Coast Basin groundwater. Approximately 3,000 kWh/AF are required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, this results in an estimated 2,400 kWh/AF of energy consumption to provide imported supply to the City.

The average cost to pump groundwater in the West Coast Basin was $65/AF in 2007, which is updated to 2014 dollars as $81/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the West Coast Basin is 454 kWh/AF. City records indicate that 535 kWh/AF is required for groundwater treatment, which results in approximately 989 kWh/AF for the City to pump and treat groundwater. Over the 7-year lifespan of the Project, this totals to 3,951,729 kWh of conserved energy.

Table 5 - Annual Project Physical Benefits

Project Name: Well No. 2 Rehabilitation
Type of Benefit Claimed: Reduced Energy Usage
Units of the Benefit Claimed: kWh
Additional Information About this Benefit: Values in column show the amount of energy saved thorough implementation of the Project. Energy saved results from replacing imported water from both SWP and CRA with West Coast Basin groundwater. Column (c) accounts for energy consumption related to the portion of imported water as well as locally produced groundwater for that year.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,440,000	1,440,000 - Construction	0
2015	1,440,000	875,467	564,533
2016-2017	1,440,000	593,201	846,799
2018	1,440,000	734,334	705,666
2019	1,440,000	875,467	564,533
2020	1,440,000	1,157,734	282,266
2021	1,440,000	1,298,867	141,133

Comments:

- *Inglewood Water Monthly Production Reports (February2010-January 2011)* – This summarizes actual monthly well production following similar rehabilitation in 2009 through 2013. The annual yield after rehabilitation was approximately 820 AFY. The City has made the conservative estimate that a yield of 600 AFY is initially attainable and that the performance will begin to diminish following its third year of production.
- *Personal communication with Thomas Lee and Barmeshwar Rai, City of Inglewood*: Proportion imported water used by City that is SWP water (40% SWP/60% CRA).
- *City of Inglewood Sanford Anderson Water Treatment Plant Energy Consumption per Water Production, City of Inglewood*: 535 kWh/AF is required to treat groundwater
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter IV, page IV-4-7, Table 4-3: Indicates groundwater pumping costs for West Coast Basin of $65/AF.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*. – Page 2: 17.8 cents per kWh paid for electricity in Los Angeles
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007. Page 4:* Lists the kWh/AF associated with SWP imported water and CRA imported water conveyed to Los Angeles County.

Benefit #4 – Reduce GHG Emissions

The Project would avoid GHG emissions generated by the additional need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total MT of CO2 equivalents (1 MT = 2,204.6 lbs), based on the California Action Registry, General Reporting Protocol. By offsetting 600 AFY of blended imported water demand in 2016/2017, the Project will avoid GHG emissions of approximately 278 MT per year of CO_2 equivalents per year (473 MT per year to import water versus 195 MT per year to pump and treat groundwater). Over the lifespan of the Project, this totals 1,345 MT of avoided carbon emissions.

Table 5 - Annual Project Physical Benefits

Project Name: Well No. 2 Rehabilitation
Type of Benefit Claimed: Reduced GHG Emissions
Units of the Benefit Claimed: MT of CO_2 equivalent
Additional Information About this Benefit: The Project would avoid GHG emissions generated by transporting imported water.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	473	473 - Construction	0
2015	473	241	232
2016-2017	473	195	278
2018	473	241	232
2019	473	288	185
2020	473	380	93
2021	473	426	47

Comments:

- *Inglewood Water Monthly Production Reports (February2010-January 2011)* – This summarizes actual monthly well production following similar rehabilitation in 2009 through 2013. The annual yield after rehabilitation was approximately 820 AFY. The City has made the conservative estimate that a yield of 600 AFY is initially attainable and that the performance will begin to diminish following its third year of production.
- *Personal communication with Thomas Lee and Barmeshwar Rai, City of Inglewood*: Proportion imported water used by City that is SWP water (40% SWP/60% CRA).
- *City of Inglewood Sanford Anderson Water Treatment Plant Energy Consumption per Water Production, City of Inglewood*: 535 kWh/AF is required to treat groundwater
- *California Action Registry, General Reporting Protocol*. Version 3.1, January 2009. Section 3. Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents. Applied a factor of 0.724 pounds of CO_2 equivalents per kWh and converted the quantity to total tons of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increase Local Water Supplies/Reliability and Decrease Dependence On Imported Water **Amount:** 2,800 AF (average of 414 AFY)	
Technical Basis of the Project	Inglewood Monthly Production Reports(February-December 2010) • Sheets 2009-10 & 2011-13 of *WRD Payment Summary Spreadsheet*: Provides Well No. 2 production rates following a similar rehabilitation completed in 2009 for use in calculating production estimates as a result of this Project.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	In 2009, Well No. 2's well casing was wire-brushed and bailed to remove the iron residual waste. New pump & motor assemblies were installed. As a result of this rehabilitation, the well produced 820 AFY in its first year. It is assumed that by providing a similar rehabilitation that a more conservative maximum of 600 AFY can be achieved (but potentially more) prior to the well again diminishing production due encrustation issues.
Description and Estimates of Without-Project Conditions	Without total rehabilitation, including wire-brush, jetting, and chemical treatment, the well will remain out of service. As a result, the only other supply available to the city to meet these demands is the higher cost, unallocated Tier 2 imported supply.
Methods Used to Estimate the Physical Benefit	The production rates estimated for Well No. 2 after the Project is implemented are based upon the annual Well No. 2 rates of production after a similar rehabilitation was completed in 2009. The records show that by June 2013, production dropped to 240 AFY from a high of 820 AFY in 2009. It is assumed that production may be less than that achieved in 2009 due to aquifer sanding and the groundwater level dropping 11 feet. Conversely, the proposed well jetting and chemical treatment processes may improve production since these are additional measures that were not taken in 2009. Due to this combination of factors, the City has made a conservative estimate that the well would produce a maximum of 600 AF in 2016-2017, but would then begin to decrease production rates at the same rate shown in historic production records. The Project will be brought online in May 2015, resulting in local water production for 8 out of 12 months in 2015 (400 AF).
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The rehabilitation measures that will be implemented at the well include removal of the pump assembly, removal of well encrustation through wire brushing and jetting, removal of swab, chemical treatment, and surging of the well casing.
Any Potential Adverse Physical Effects	None

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,120 AF**	**3,951,729 kWh**	**1,345 MT**
Technical Basis for the Project	• *Inglewood Water Monthly Production Reports (February2010-January 2011)* – This summarizes actual monthly well production following similar rehabilitation in 2009 through 2013. The annual yield after rehabilitation was approximately 820 AFY. The City has made the conservative estimate that a yield of 600 AFY is initially attainable and that the performance will begin to diminish following its third year of production. • *Personal communication with Thomas Lee and Barmeshwar Rai, City of Inglewood*: Proportion imported water used by City that is SWP water (40% SWP/60% CRA).	• *Groundwater Assessment Study. Chapter 4 – Groundwater Basin Reports, Central Basin. Report Number 1308.* (MWD, *2007).* o Table 3-3: Provides an estimated cost to pump local groundwater • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* o Page 1: Provides and estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA water.	• *Groundwater Assessment Study. Chapter 4 – Groundwater Basin Reports, Central Basin. Report Number 1308.* (MWD, *2007).* o Table 3-3: Provides an estimated cost to pump local groundwater • *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County.* o Page 1: Provides and estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP and CRA water. • *California Action Registry, General Reporting Protocol. Version 3.1, January 2009* o Section 3: Documents converts energy saved to a reduction in emissions of CO2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Imported water is currently used to compensate for demands not met through groundwater production. Of the imported water, on average 40% is from the SWP and 60% is from the CRA. The	The imported water delivered to the City requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater.	The imported water delivered to the City requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater. This energy usage results in GHG emissions that contribute to

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce GHG Emissions**
Amount:	**1,120 AF**	**3,951,729 kWh**	**1,345 MT**
	portion of imported water that is currently served from the SWP impacts the Bay-Delta. The offset of this SWP portion of the imported water supply with local groundwater will reduce demands on the Bay-Delta.		climate change.
Description and Estimates of Without-Project Conditions	Without the Project, the City would continue to use SWP supplies at 40% of the total imported water use totaling 620 AF.	Without the Project, an additional 3.9 million kWh of energy would be consumed.	Without the Project, an additional 1,345 MT of CO_2 equivalents would be emitted.
Methods Used to Estimate the Physical Benefit	The amount of reduced Delta demands was calculated by applying an estimated 40% SWP blend to the total amount of imported water that would need to be purchased without the Project – or 40% of 2,800 = 1,120 AFY	The SWP (1,120 AF) and CRA (1,680 AF) imported water use volume and corresponding groundwater volume (2,800 AFY) offset was applied to the energy use estimates (contained in documents cited above) for conveying all three supply sources. The difference between the Project and imported water supplies was calculated as 10,080,000 kWh – 6,128,271 kWh = 3,951,729 kWh.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved (calculated as the previous benefit) to a reduction in emissions of CO_2 equivalents. This resulted in a 3,311 MT – 1,966 =1,345 reduction in GHG emissions
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	The rehabilitation measures that will be implemented at the well include removal of the pump assembly, removal of well encrustation through wire brushing and jetting, removal of swab, chemical treatment, and surging of the well casing.	The rehabilitation measures that will be implemented at the well include removal of the pump assembly, removal of well encrustation through wire brushing and jetting, removal of swab, chemical treatment, and surging of the well casing.	The rehabilitation measures that will be implemented at the well include removal of the pump assembly, removal of well encrustation through wire brushing and jetting, removal of swab, chemical treatment, and surging of the well casing.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project Name:** Well No. 2 Rehabilitation Project		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water • Reduce Demands on the Bay-Delta • Reduce Energy Usage • Reduce GHG Emissions
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?	Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs.	**Well No. 7 Construction:** This would be a new well construction project at a different site to replace Well No. 2 instead of rehabilitating it now. The well No. 2 rehabilitation Project is, however, the only immediate method to achieving the benefits described previously since the City has not yet completed the design of the No. 7 Well. The City is however, planning to construct Well No. 7 in the future as a replacement for Well No. 2 after the lifecycle of the rehabilitation is complete. The conceptual cost of the Well No. 7 project is $2-2.5 Million[1]
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.**	Not Applicable
Comments: [1]*Well Site Feasibility and Preliminary Well Design Report For Proposed Well No. 7*.		

Puente Basin Water Agency (PBWA) Pomona Basin Regional Groundwater Project (Project)

Project Description

(25 Word) The Project will deliver 1,856 AFY of previously unused groundwater by reactivating wells and blending with imported water to reduce nitrate within existing regional pipelines.

(Expanded) The Project will reactivate two wells that have been decommissioned due to nitrate contamination and inject produced water into the Pomona Walnut and Rowland Joint Water Line (PWR-JWL) for blending with imported water in order to meet potable water quality standards. Implementing the Project will provide a local water supply of 1,856 acre feet per year (AFY) pumped from Ganesha and Pomona Basins (two basins within the larger Six Basins Groundwater Basin) for PBWA, a joint powers authority formed by Rowland Water District (RWD) and Walnut Water Valley Districts (WVWD). The Project provides the added benefit of improving groundwater quality in these basins by removing nitrate contaminated water that will be replenished through natural recharge. The Project consists of the following components:

1. **PWR- JWL Improvements:** PBWA will make improvements at each well site to facilitate the blending of well water in the PWR-JWL. The work consists of installing isolation valves in the PWR-JWL and bypass piping equipped with flow control/measurement capability. Extracted well water will tie into this bypass piping at the Durward Well Site for injection into the PRW-JWL.
2. **Durward Well Site:** PBWA will install a new well, pump, motor and wellhouse structure equipped with chloramines disinfection and tie it into the piping constructed under PWR-JWL Improvements.
3. **Old Baldy Well Site:** PBWA will make yard piping improvements and construct a 2,400 linear foot (LF) transmission line from the Old Baldy Well Site for conveying flow to the Durward Well Site where it is tied into the piping constructed under PWR-JWL Improvements.

These three Project components above make up the first two of four phases of a long term plan for PBWA to produce an additional 3,000 to 5,000 AFY of local groundwater as outlined in the *Pomona Basin Regional Groundwater Project Final Technical Memorandum, November, 2012*. Once implemented, this Project (phases 1 and 2) will also provide some of the necessary infrastructure for implementation of phases 3 & 4 that will bring even further added benefits.

This Project provides immediate regional drought preparedness by offsetting 1,856 AFY of critical and drought diminished SWP and other imported supplies. RWD & WVWD are currently 100% dependent on supplies imported to Three Valleys Municipal Water District (TVMWD) by the MWD. As a result of existing drought conditions, MWD is experiencing an unprecedented reduction in supplies from the SWP and has had to deplete regional storage by 1 million AF this year. If drought conditions persist, MWD has indicated that it may need to implement its Water Shortage Allocation Plan in Spring 2015, which would reduce existing allocations available to RWD and WVWD. With no other potable supplies available, this could result in insufficient supplies to meet demands. By accessing a local supply to meet this demand, this Project will assist PBWA in meeting potable water demands without using critical imported supply.

The Project increases local water supply reliability and the delivery of safe drinking water by using 1,856 AFY of local groundwater that was previously unusable due to nitrate concentrations. By enhancing and leveraging existing well and conveyance facilities and unused water rights from the City of La Verne and the Golden State Water Company, PBWA will be improving the overall water supply reliability and diversification. Groundwater is less susceptible to seasonal fluctuations and reductions in times of drought. This added unit of local groundwater supply is improved by blending with PBWA's existing imported supply as a means to improve water quality. Also, pumping nitrates from the Basin prevents contaminants from spreading in the aquifer and improves overall water quality for all basin users. If this Project is not implemented, PBWA will need to continue its dependence on strained imported potable supplies.

Expedited funding is needed for this Project since without it, the Project may take longer to implement and further delay the immediate and long term drought benefits while other financing is developed.

Project Map

The following map shows the regional system and how the two wells will be connected. The two figures after the map show the new facilities that the Project will implement (in red) at each Project site.

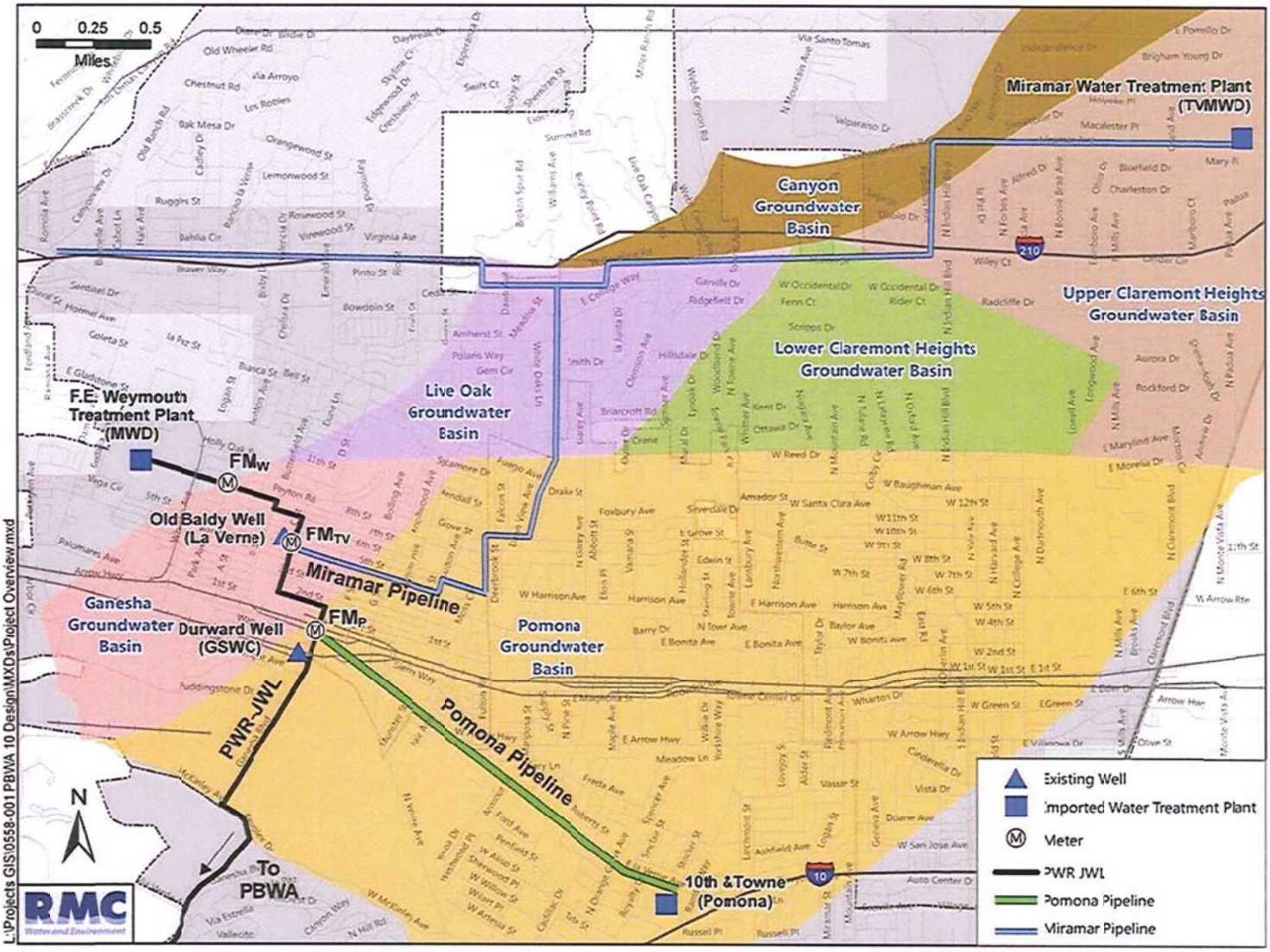


Figure 5-4: Durward Well Site Plan and Old Baldy Point of Connection

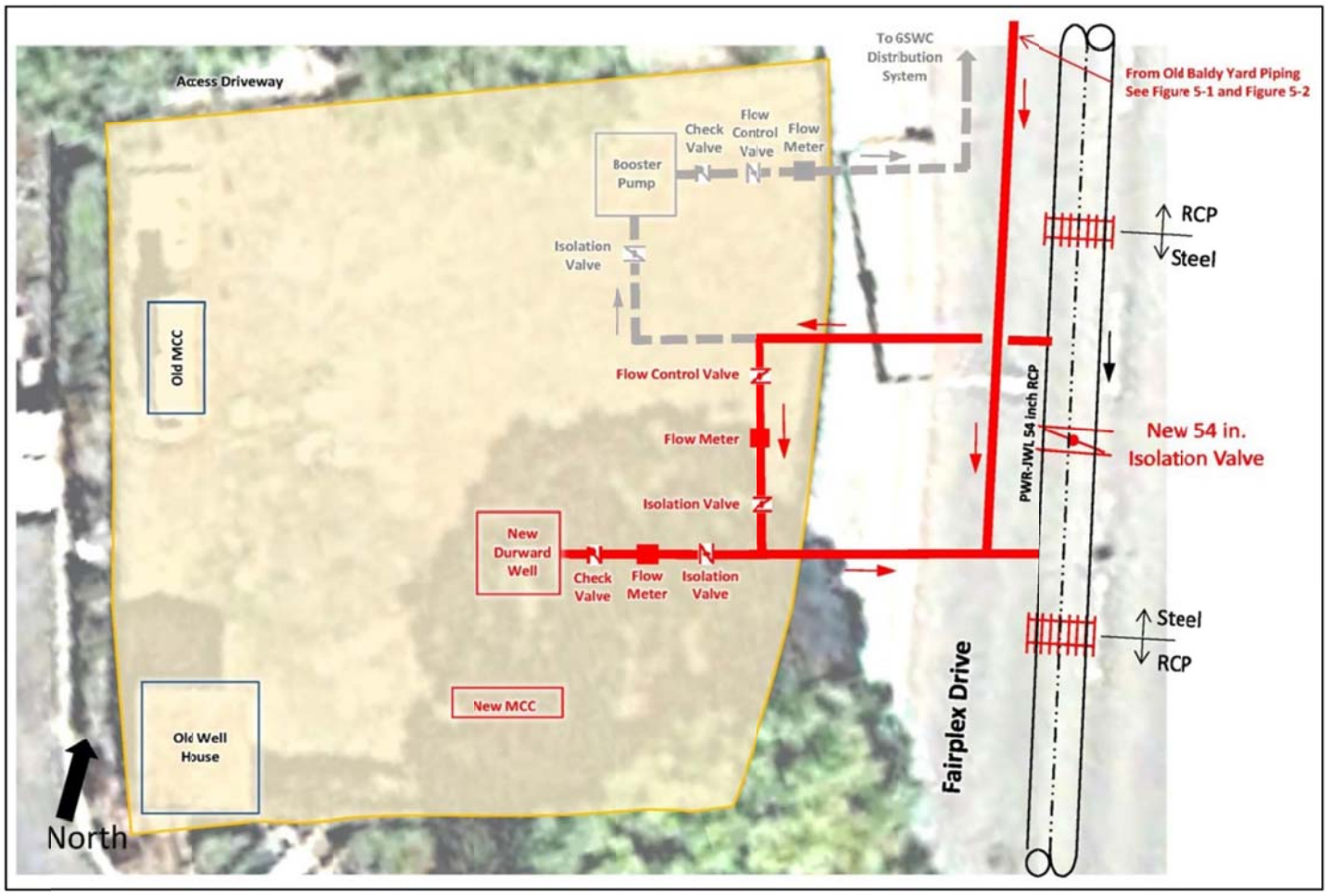
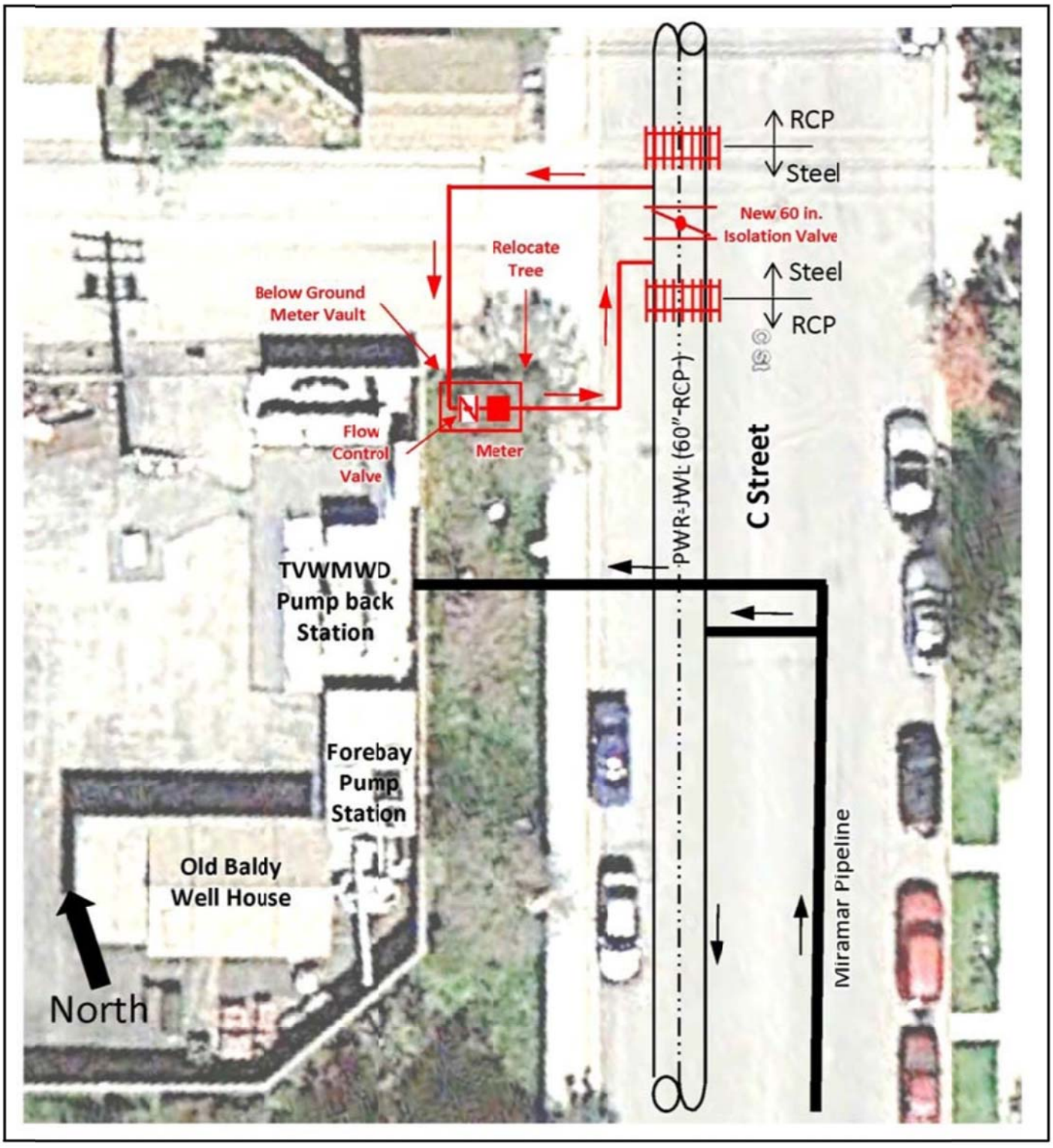


Figure 5-6: PWR-JWL By-Pass at Old Baldy



Project Physical Benefit

The following physical benefits are claimed for the Project and listed in the tables below.

- Increase Local Water Supply/Reliability and Decrease Dependence On Imported Water
- Reduce Demands on Bay-Delta
- Reduce Energy Usage
- Reduce GHG Emissions

Benefit #1 – Increase Local Water Supplies/Reliability and Decrease Dependence on Imported Water

The table below provides information on the benefit of increasing local water supplies by pumping groundwater. This increase in local supplies will lead to a direct reduction in imported water demands since imported water is the only other potable supply available to meet demands.

Table 5 - Annual Project Physical Benefits

Project Name: Pomona Basin Regional Groundwater Project
Type of Benefit Claimed: Increased Local Water Supply/Reliability and Decrease Dependence On Imported Water
Units of the Benefit Claimed: AF
Additional Information About this Benefit: The Project will be brought online in May 2016, resulting in local water production for 8 out of 12 months in 2016. The AFY benefit in 2016 is therefore lower than in subsequent years.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0	0 – Construction	0
2015	0	0 – Construction	0
2016	0	1,237	1,237
2017-2040	0	1,856	1,856

References:

- *Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013* - Page 12: The Old Baldy well pumping capacity is 650 gpm (1,049 AFY). Page 34: The replacement of Durward Well is rated at 500 gpm (807 AFY). Combined, the two wells will produce 1,856 AFY.

Benefit #2 – Reduce Demands on Bay-Delta

The table below provides information regarding the benefit of reducing demands on the Bay-Delta. On average, PBWA's service area uses an imported water blend of 50% SWP water that comes from the Bay-Delta system and 50% CRA water. The table below provides information regarding reduced demands on the California Bay-Delta.

Table 5 - Annual Project Physical Benefits

Project Name: Pomona Basin Regional Groundwater Project
Type of Benefit Claimed: Reduce Demands on Bay-Delta
Type of Benefit Claimed: AF
Additional Information About this Benefit: The volumes below show the reduction in demands on the Bay-Delta. The Project will be brought online in May 2016, resulting in resulting in reduced Bay-Delta demands 8 out of 12 months in 2016 and assuming it could produce 1,856 AFY of which 50% results in decreased in Bay-Delta supplies. The AFY benefit in 2016 is therefore lower than in subsequent years.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	928	928 – Construction	0
2015	928	928 – Construction	0
2016	928	619	309
2017-2040	928	0	928

References:

- *Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013* - Page 12: The Old Baldy well pumping capacity is 650 gpm (1,049 AFY). Page 34: The replacement of Durward Well is rated at 500 gpm (807 AFY). Combined, the two wells will produce 1,856 AFY.
- *Personal communication with Erik Hitchman, WVWD (June 2014)*: Proportion imported water in the PWR-JWL that is SWP water (50% SWP/50% CRA).

Benefit #3 – Reduce Energy Usage

The table below provides information regarding energy conservation provided through the offset of treated imported water (blend of 50% SWP and 50% CRA) with groundwater from Ganesha and Pomona Basins. Approximately 3,000 kWh/AF is required for conveyance and pumping of SWP water to Southern California and 2,000 kWh/AF for CRA water. Based on the ratio of these supplies, this results in an estimated 2,500 kWh/AF of energy consumption to provide imported supply to the City.

The average cost to pump groundwater in the Ganesha and Pomona Basins was $125/AF in 2006, which is updated to 2014 dollars as $155/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2014 is $0.178/kWh. Using these values, it can be estimated that the energy required to pump groundwater in the Pomona and Ganesha basins is approximately 872 kWh/AF. Over the 25-year lifespan of the Project, this totals to 75,518,850 kWh of conserved energy.

Table 5 - Annual Project Physical Benefits

Project Name: Pomona Basin Regional Groundwater Project

Type of Benefit Claimed: Reduce Energy Usage

Type of Benefit Claimed: kWh

Additional Information About this Benefit: Energy saved results from replacing imported water from both SWP and CRA with groundwater from Ganesha and Pomona Basins. The Project will be brought online in May 2016, resulting in resulting in reduced energy usage 8 out of 12 months in 2016. The energy benefit in 2016 is therefore lower than in subsequent years.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	4,640,000	4,640,000 – Construction	0
2015	4,640,000	4,640,000 – Construction	0
2016	4,640,000	2,626,706	2,013,294
2017-2040	4,640,000	1,619,246	3,020,754

References:

- *Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013* - Page 12: The Old Baldy well pumping capacity is 650 gpm (1,049 AFY). Page 34: The replacement of Durward Well is rated at 500 gpm (807 AFY). Combined, the two wells will produce 1,856 AFY.
- *Personal communication with Erik Hitchman, WVWD (June 2014)*: Proportion imported water in the PWR-JWL that is SWP water (50% SWP/50% CRA).
- *Metropolitan Water District of Southern California, 2006*. *Groundwater Assessment Study*: Page IV-9-7, Table 9-3- Indicates groundwater pumping costs for Ganesha and Pomona Basins of $125/AF.
- *Bureau of Labor Statistics, 2014. Average Energy Prices, Los Angeles-Riverside-Orange County*: Page 2- 17.8 cents per kWh paid for electricity in Los Angeles
- *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD, March 2007:* Page 4 - Lists the kWh/AF associated with SWP imported water, CRA imported water conveyed to Los Angeles County

Benefit #4 – Reduce GHG Emissions

The Project would reduce GHG emissions generated by the additional need to transport imported water. This value may be calculated by applying a factor of 0.724 pounds of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol. By offsetting the demand of 1,856 AF of imported water, the Project will avoid GHG emissions of approximately 1,469 MT per year of CO_2 equivalents per year (1,524 MT per year to import water versus 532 MT per year to pump groundwater). Over the 25-year lifespan of the Project, this totals approximately 24,800 MT of avoided carbon emissions.

Table 5 - Annual Project Physical Benefits

Project Name: Pomona Basin Regional Groundwater Project
Type of Benefit Claimed: Reduce GHG Emissions
Type of Benefit Claimed: MT of CO_2 equivalent
Additional Information About this Benefit: GHG emissions reduction results from replacing imported water from both SWP and CRA with groundwater from Ganesha and Pomona Basins. The Project will be brought online in May 2016, resulting in resulting in reduced GHG emissions 8 out of 12 months in 2016. The GHG benefit in 2016 is therefore lower than in subsequent years.

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	1,524	1,524 – Construction	0
2015	1,524	1,524 – Construction	0
2016	1,524	862	662
2017-2040	1,524	532	992

References:

- *Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013* - Page 12: The Old Baldy well pumping capacity is 650 gpm (1,049 AFY). Page 34: The replacement of Durward Well is rated at 500 gpm (807 AFY). Combined, the two wells will produce 1,856 AFY.
- *Personal communication with Erik Hitchman, WVWD (June 2014)*: Proportion imported water in the PWR-JWL that is SWP water (50% SWP/50% CRA).
- *California Action Registry, General Reporting Protocol. Version 3.1 (January 2009)*: Section 3 -Document used to convert amount of energy saved to a reduction in emissions of CO_2 equivalents.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

Type of Physical Benefit: Increased Local Water Supply/Reliability and Decrease Dependence On Imported Water **Amount**: 1,856 AFY	
Technical Basis of the Project	*Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013:* The final document from the conceptual design phase of the Project. • Page 12: The Old Baldy well pumping capacity is 650 gpm. • Page 34: The replacement of Durward Well is rated at 500 gpm. • The 1,856 AFY developed under this Project is based on Old Baldy and Durward well historical records. Old Baldy capacity is 650 gpm or 1,049 AFY. Durward capacity is 500 gpm or 807 AFY. Combined, the two wells will produce 1,856 AFY
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	RWD and WVWD (together as PBWA) are 100% dependent upon imported water supplies from SWP and CRA. To look at options to diversify their supply and increase reliability, PBWA completed the *Pomona Basin Regional Groundwater Project Final Technical Memorandum* in November 2012. This effort identified four phases of supply development that could be used by PBWA to offset imported supplies. The first two phases (using existing old Baldy and Durward well sites) were linked together into one project for implementation since the supplies generated had nitrate levels that could be reduced to potable water standards through the use of the existing PWR-JWL supplies and facilities. This would allow immediate benefits to be realized. Subsequent phases 3 and 4 will require further groundwater treatment and new well sites to generate the supply benefits and so will move into design following this Project. The Project has completed 10% design (*Pomona Basin Regional Ground Water Project Final Engineering Report*) which further developed the Project details, received California Department of Public Health preliminary support and provided the basis for determining that 1,856 AFY of potable supply could be generated. The 100% design phase is currently underway along with finalizing agreements between PBWA and the Golden State Water company and City of La Verne that currently own both the water rights and wells that will be used by PBWA to generate the supply benefits.
Description and Estimates of Without-Project Conditions	Without the Project, no local groundwater will be produced and PBWA will need to continue relaying on purchases of imported water from SWP and CRA in order to meet those demands.
Methods Used to Estimate the Physical Benefit	The *Pomona Basin Regional Ground Water Project Final Engineering Report* used historical pumping records were used to determine each well's production potential as well as water qualities. The Old Baldy Well capacity is 650 gpm or 1,049 AFY. Durward capacity is 500 gpm or 807 AFY. Combined, the two wells will produce 1,856 AFY. Blending calculations were developed to determine the amount of imported water that would be needed to meet potable water standards, which was far less than the amount that is already supplied within the PWR-JWL.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	1. **PWR- JWL Improvements:** PBWA will make improvements at each well site to facilitate the blending of well water in the PWR-JWL. The work consists of installing isolation valves in the PWR-JWL and bypass piping equipped with flow control/measurement capability. Extracted well water will tie into this bypass piping at the Durward Well Site for injection into the PRW-JWL. 2. **Durward Well Site:** PBWA will install a new well, pump, motor and wellhouse structure equipped with chloramines disinfection and tie it into the piping constructed under PWR-JWL Improvements. 3. **Old Baldy Well Site:** PBWA will make yard piping improvements and construct a 2,400 linear foot (LF) transmission line from the Old Baldy Well Site for conveying flow to the Durward Well Site where it is tied into the piping constructed under PWR-JWL Improvements. Agreements with City of Laverne and Golden State Water Company will also be finalized.
Any Potential Adverse Physical Effects	None have been discovered to date.

Secondary Physical Benefits

Type of Physical Benefit:	**Reduce Demands on the Bay-Delta**	**Reduce Energy Usage**	**Reduce Greenhouse Gas Emissions**
Amount/ Volume and Unit:	**928 AFY**	**3,020,754 kWh per year**	**992 MT of CO_2 equivalents per year**
Technical Basis of The Project	• *Pomona Basin Regional Ground Water Project Final Engineering Report, October 14, 2013* o Page 12: The Old Baldy well pumping capacity is 650 gpm (1,049 AFY). o Page 34: The replacement of Durward Well is rated at 500 gpm (807 AFY). o Combined, the two wells will produce 1,856 AFY. • *Personal communication with Erik Hitchman, WVWD (June 2014)*: Proportion imported water in the PWR-JWL that is SWP water (50% SWP/50% CRA).	• *Metropolitan Water District of Southern California, 2006. Groundwater Assessment Study*: o Page IV-9-7, Table 9-3- Indicates groundwater pumping costs for Ganesha and Pomona Basins of $125/AF. • *Average Energy Prices, Los Angeles-Riverside-Orange County, Bureau of Labor Statistics (2014).* o Page 1: Provides and estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA.	• *Metropolitan Water District of Southern California, 2006. Groundwater Assessment Study*: Page IV-9-7, Table 9-3- Indicates groundwater pumping costs for Ganesha and Pomona Basins of $125/AF. • *Average Energy Prices, Los Angeles-Riverside-Orange County, Bureau of Labor Statistics (2014).* o Page 1: Provides and estimated average cost of energy in Los Angeles County • *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District, WBMWD (March 2007):* o Page 4: Estimates how much energy is used to provide SWP, CRA. • *California Action Registry, General Reporting Protocol. Version 3.1, (January 2009)* o Section 3: Converts energy saved to a reduction in emissions of CO2 equivalents.
Recent and Historical Conditions that Provide Background for the Benefit Being Claimed	Of the imported water used by PBWA, on average 50% is from the SWP and 50% is from the CRA. The portion of imported water that is currently served from the SWP will be offset as a result of this Project and will reduce impacts the Bay-Delta.	The potable water delivered to the PBWA service area requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater.	The potable water delivered to the PBWA service area requires energy to transport from the Bay-Delta and the Colorado River at a higher rate than local groundwater. The decrease in energy usage results in greenhouse gas emission reductions that help militate against further climate change.
Description and Estimates of Without-Project Conditions	If the Project is not completed, then PBWA will need to continue meeting those demands through imported water purchases, originating in the Bay-Delta.	Without the Project, an additional 3,020,754 kWh of energy would be consumed annually.	Without the Project, an additional 992 MT of CO_2 equivalents would be emitted annually.

Type of Physical Benefit:	Reduce Demands on the Bay-Delta	Reduce Energy Usage	Reduce Greenhouse Gas Emissions
Amount/ Volume and Unit:	**928 AFY**	**3,020,754 kWh per year**	**992 MT of CO_2 equivalents per year**
Methods Used to Estimate the Physical Benefit	The amount of reduced Bay-Delta demands was calculated by applying an estimated 50% SWP blend to the annual amount of imported water that would need to be purchased without the Project – or 50% of 1,856 = 928 AFY.	The existing 50% SWP and 50% CRA blend of imported water use and corresponding groundwater volume of offset was applied to the energy consumption estimates (contained in documents cited above) to produce each of the sources. The difference between current imported water energy consumption and groundwater use was calculated as 4,640,000 kWh/year – 1,619,246 kWh/year = 3,020,754 kWh/year.	The California Action Registry, General Reporting Protocol was used to correlate the amount of energy saved (calculated as the previous benefit) to a reduction in emissions of CO_2 equivalents. This resulted in a 1,524 MT/year – 532 MT/year = 992 MT/year reduction in GHG emissions.
New Facilities, Policies, and Actions Required to Obtain Physical Benefit	PWR-JWP Improvements including isolation valves and bypass piping. Well site improvements including a new well, pump, motor, wellhouse, chloramines disinfection system, yard piping, and 2,400 LF of transmission line.	PWR-JWP Improvements including isolation valves and bypass piping. Well site improvements including a new well, pump, motor, wellhouse, chloramines disinfection system, yard piping, and 2,400 LF of transmission line.	PWR-JWP Improvements including isolation valves and bypass piping. Well site improvements including a new well, pump, motor, wellhouse, chloramines disinfection system, yard piping, and 2,400 LF of transmission line.
Any Potential Adverse Physical Effects	None	None	None

Cost Effectiveness Analysis

Table 6 - Project Analysis		
Question 1	**Types of benefits provided as shown in the Annual Project Physical Benefits Section (above)**	• Increased Local Water Supply/Reliability and Decrease Dependence On Imported Water • Reduce Demands on Bay-Delta • Reduce Energy Usage • Reduce Greenhouse Gas Emissions
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?	Not applicable
	If yes, list the methods (including the proposed project) and estimated costs.	PBWA completed the *Pomona Basin Regional Groundwater Project Final Technical Memorandum* in November 2012, summarizing a comprehensive alternatives evaluation that looked at 12 alternatives targeting a yield of 5,000 AFY with total unit costs that ranged from $590/AF to $1,170/AF and capital unit costs ranging from $460/AF to $1,090/AF. The Preferred Alternative is not any one of the alternatives described in the TM, but a hybrid alternative developed by PBWA after reviewing the evaluation results. This Project proved to be the most cost effective while providing the additional benefit of future expansion, which results in a capital unit cost of $340/AF and total unit cost of $540/AF.
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.**	Not applicable
Comments:		