Attachment 2

Greater Los Angeles County Region

IRWM Implementation Grant Proposal

Project Justification

Attachment 2: Project Justification provides a summary of the proposed projects; the estimated physical benefits of the projects; justifies how the projects are technically feasible; describes how the projects can achieve the claimed level of benefits; and explains whether the benefits will be attained thought the least cost alternative. Attachment 2 is divided into the following sub-sections:

- **Project Summary Table**
- **Regional Map**
- Individual Projects (with the following subsections for each project)
    - **Project Description**
    - **Project Map**
    - **Project Physical Benefits**
    - **Technical Analysis of the Physical Benefits Claimed**
    - **Direct Water-Related Benefit to a DAC**
    - **Project Performance Monitoring Plan**
    - **Cost Effectiveness Analysis**

The *Greater Los Angeles County IRWM 2015 Solicitation Implementation Grant Proposal* (Proposal) involves implementation of 20 projects to meet the Region's water management needs:

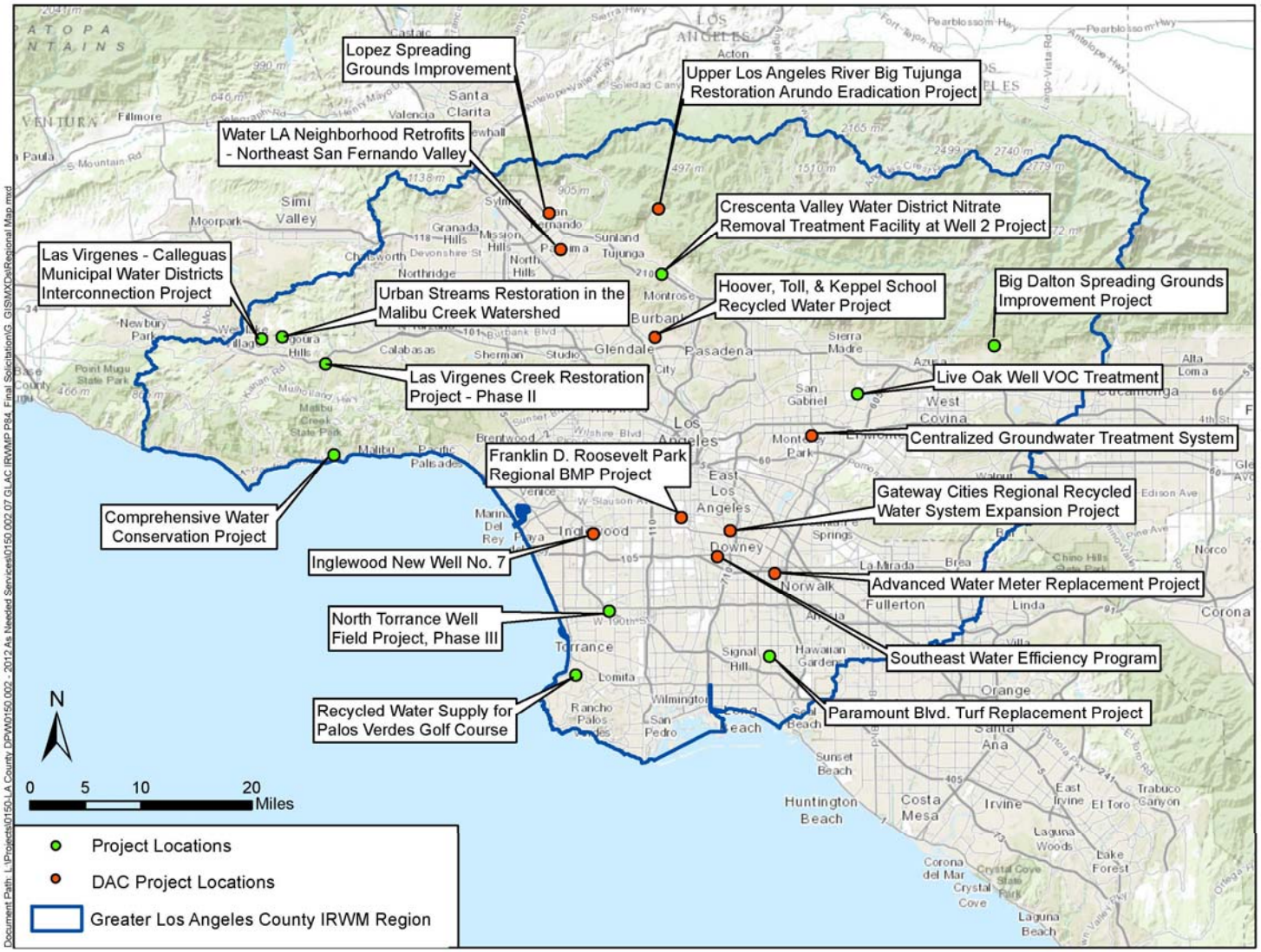
1. Franklin D. Roosevelt Park Regional Best Management Practices Project
2. Advanced Water Meter Replacement Project
3. Gateway Cities Regional Recycled Water System Expansion Project
4. Paramount Boulevard Turf Replacement Project
5. Las Virgenes Creek Restoration Project – Phase II Project
6. Calleguas-Las Virgenes Municipal Water Districts Interconnection Project
7. Comprehensive Water Conservation Project
8. Urban Streams Restoration in the Malibu Creek Watershed Project
9. Inglewood New Well No. 7 Project
10. Recycled Water Supply for Palos Verdes Golf Course Project
11. North Torrance Well Field Project, Phase III
12. Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project
13. Nitrate Removal Treatment Facility at Well 2 Project
14. Hoover, Toll, & Keppel School Recycled Water Project
15. Lopez Spreading Grounds Improvement Project
16. Big Dalton Spreading Grounds Improvement Project
17. Live Oak Well VOC Treatment Facility Project
18. Centralized Groundwater Treatment System Project
19. Southeast Water Efficiency Program Project
20. Water LA Neighborhood Retrofits Project

Project Summary Table (Pages 2-2 through 2-3)

	Project No.	1	2	3	4	5	6	7	8	9	10
	IRWM Project Element	**Franklin D. Roosevelt Park Regional BMP Project**	**Advanced Water Meter Replacement Project**	**Gateway Cities Regional Recycled Water Expansion**	**Paramount Boulevard Turf Replacement Project**	**Las Virgenes Creek Restoration Project – Phase III**	**Calleguas – Las Virgenes Municipal Water Districts Interconnection Project**	**Comprehensive Water Conservation Project**	**Urban Streams Restoration in the Malibu Creek Watershed**	**Inglewood New Well No. 7**	**Recycled Water Supply for Palos Verdes Golf Course**
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X	X		X	X		X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management	X			X			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					X			X		X
IR.4	Non-point source pollution reduction, management, and monitoring	X	X		X	X			X		
IR.5	Groundwater recharge and management projects	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
IR.7	Water banking, exchange, reclamation, and improvement of water quality			X		X	X		X		
IR.8	Planning and implementation of multipurpose flood management programs					X			X		
IR.9	Watershed protection and management	X		X		X			X		
IR.10	Drinking water treatment and distribution						X			X	
IR.11	Ecosystem and fisheries restoration and protection					X			X		X

		11	12	13	14	15	16	17	18	19	20
	IRWM Project Element	**North Torrance Well Field Project, Phase III**	**Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project**	**Nitrate Removal Treatment Facility at Well 2 Project**	**Hoover, Toll & Keppel School Recycled Water Project**	**Lopez Spreading Grounds Improvement Project**	**Big Dalton Spreading Grounds Improvement Project**	**Live Oak Well VOC Treatment Facility**	**Centralized Groundwater Treatment System Project**	**Southeast Water Efficiency Program**	**Water LA Neighborhood Retrofits Project**
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X	X	X	X	X	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management					X	X				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		X								
IR.4	Non-point source pollution reduction, management, and monitoring									X	X
IR.5	Groundwater recharge and management projects	X	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		
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	
IR.10	Drinking water treatment and distribution	X		X				X	X		
IR.11	Ecosystem and fisheries restoration and protection		X								

Regional Map



Franklin D. Roosevelt Park Regional BMP Project

<u>Project 1</u>: Franklin D. Roosevelt Park Regional Best Management Practices (BMP) Project (Project)
<u>Implementing Agency</u>: County of Los Angeles, Department of Public Works (LACDPW)
<u>Project Description</u>

(25 Word) The Project will reduce stormwater runoff, increase groundwater supply and improve DAC recreational amenities by installing stormwater capture and infiltration facilities and educational features.

(Expanded) The Project will capture and treat stormwater from a 190.5 acre drainage area in the Disadvantaged Community (DAC) of Florence-Firestone to reduce zinc in local water bodies. The capture and infiltration of stormwater will also produce 127 acre-feet per year (AFY) of water supply to the Central Groundwater Basin. The Project is a top-tier priority project for the Upper Los Angeles River Enhanced Watershed Management Program (EWMP) that addresses the primary strategy to divert, capture, and infiltrate stormwater and urban runoff through soil layers. LACDPW is the lead agency partnering with the County of Los Angeles Department of Parks and Recreation to improve the quality of stormwater and urban runoff flowing to Compton Creek, a tributary of the Los Angeles River in the Los Angeles River Watershed.

The major physical components of the Project include the construction of three stormwater infiltration galleries with volumes of 375,600 cubic feet (CF), 57,000 CF, and 46,200 CF at Franklin D. Roosevelt Park (FDR Park) in the unincorporated community of Florence-Firestone. Nutrient Separating Box pre-treatment systems will be installed at the inlet of each of the three infiltration galleries. A total of 1,600 linear feet of 24" reinforced concrete pipe will be installed to divert flows from existing storm drains surrounding the Project site to the three infiltration galleries. Roof runoff from Park facilities will be captured in a newly constructed catch basin and diverted to the most downstream infiltration gallery (Gallery #3) through the existing storm drain network. A series of bioswales will be constructed and the Project construction site will be re-vegetated with drought tolerant landscape. Additional park improvements include walkway improvements using decomposed permeable granite and educational signage to teach the community about the stormwater BMPs.

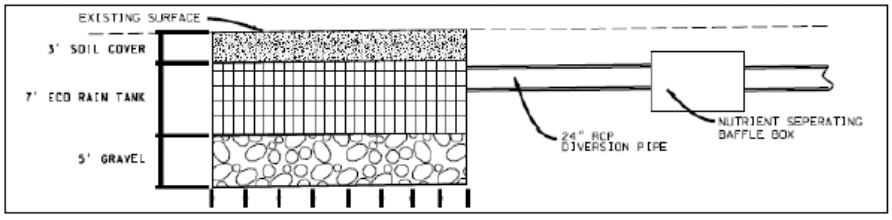
The anticipated physical benefits of the Project are to improve water quality in the Compton Creek by reducing the peak concentration of zinc by 0.572 mg/L in stormwater and urban runoff from the Project drainage area within the Florence-Firestone Community. While zinc is the targeted pollutant for contaminant reductions by this Project, it is expected that other contaminants including copper, lead, bacteria, and nutrients, will also be reduced to meet water quality objectives set by the Los Angeles Regional Water Quality Control Board (LARWQCB). A secondary benefit of the Project is to increase local water supply by infiltrating approximately 127 AFY of urban runoff (which would otherwise flow to the ocean) to increase groundwater supply in the Central Groundwater Basin.

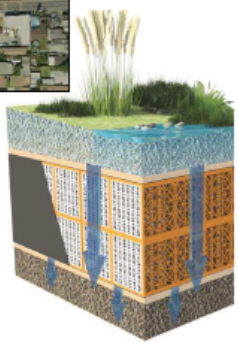
The Project addresses a current need of the region by improving surface water quality by decreasing stormwater and urban runoff to Compton Creek and Los Angeles River. The LARWQCB identified stormwater and urban runoff as one of the leading sources of pollutants to surface waters in Southern California, including the Los Angeles River (Basin Plan Amendment for nitrogen, trash, metals, and bacteria). The Greater Los Angeles County (GLAC) Region identified improving surface water quality through the development of stormwater capture projects as one of the objectives of the Region (GLAC Integrated Regional Water Management (IRWM) Plan, 2014). In addition, the Project will help reduce dependence on energy intensive imported water to the GLAC Region by increasing water supply and therefore, improving local water supply reliability, and adapting to and mitigating against climate change impacts.

The intended outcome of the Project is to improve water quality in Compton Creek and Los Angeles River by capturing and treating stormwater and urban runoff that is contributing zinc and other pollutants. The Project will increase groundwater recharge to the Central Groundwater Basin by infiltrating treated stormwater and urban runoff that would otherwise be diverted to the ocean via flood control channels.

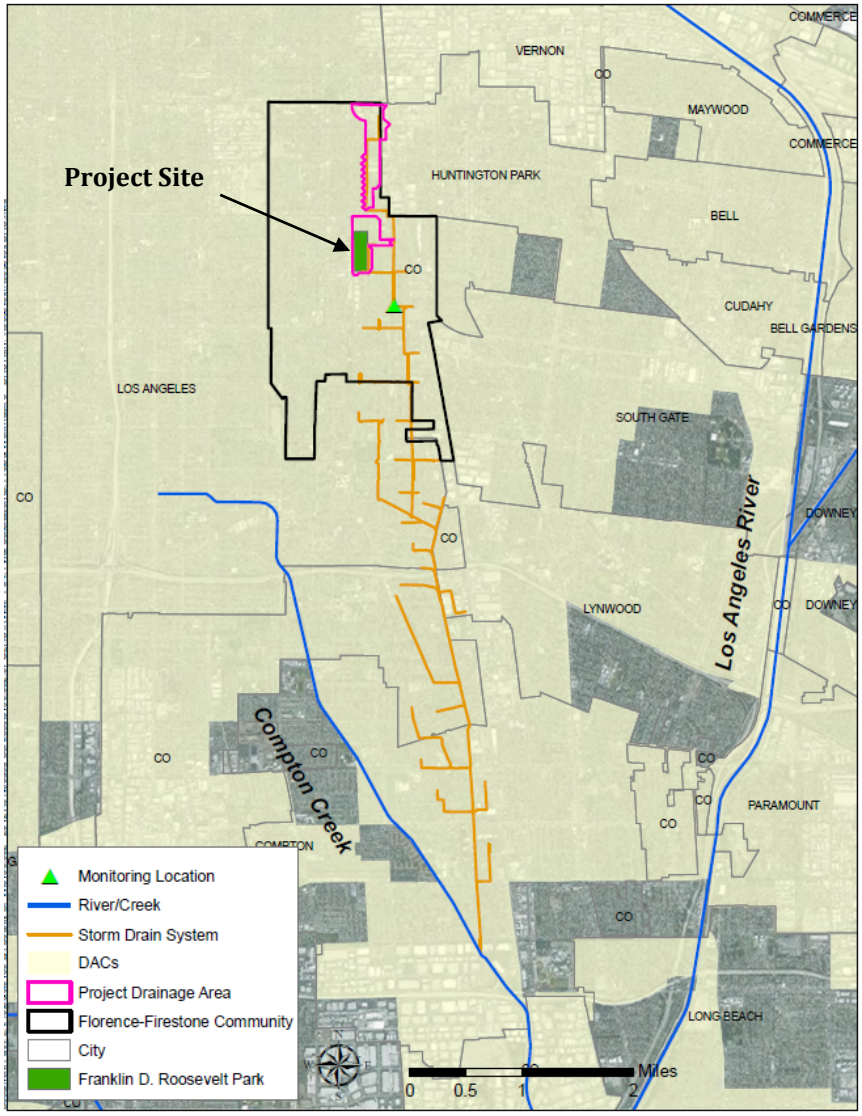
Project Map

Project Location, Work Boundaries and Facilities





Project Location, Monitoring Location, Water Resources Impacted by the Project and DACs



Groundwater Basins

Project Physical Benefits

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

- Primary Benefit –Water Quality Improved through Zinc Reduction
- Secondary Benefit – Water Supply Produced

The Project is designed to capture and treat the necessary volume of stormwater and urban runoff to reduce peak zinc concentrations originating from the Project's drainage area by 81%, thereby improving water quality in downstream flows. Zinc is the controlling pollutant in the Los Angeles River Watershed because BMPs designed to reduce zinc concentrations to meet water quality standards will also reduce other contaminants beyond the required amounts to reach their individual water quality standards. As a result, the Project will also improve stormwater and urban runoff water quality from the drainage area for other constituents, including copper, lead, nutrients, bacteria, and trash. The Project provides a secondary benefit of water supply produced by infiltrating treated stormwater and urban runoff to the Central Groundwater Basin.

Other benefits of the Project, not quantified as the Primary or Secondary benefits in the tables below include increased supply reliability, decreased energy consumption and greenhouse gas emissions by decreasing dependence on imported water, and recreational and educational enhancements at a local park benefitting a DAC.

Primary Benefit – Water Quality Improved through Zinc Reduction

The table below provides information on the benefit of water quality improvements through the reduction of zinc concentration in stormwater and urban runoff from the Project drainage area within the Florence-Firestone Community of the Los Angeles River Watershed. For the purposes of this grant application, the water quality benefit is quantified in the tables below as the reduction in the peak zinc concentration in stormwater and urban runoff from the Project drainage area. Peak concentrations occur during the first flush of the wet season at the beginning of the fall, so the Project will begin capturing peak concentrations in 2019 throughout the Project's useful life of 20 years.

Table 5 – Annual Project Physical Benefits

Project Name: Franklin D. Roosevelt Park Regional BMP Project
Type of Benefit Claimed: Primary Benefit – Water Quality Improved through Zinc Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 20+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015-2018	0	0	0
2019-2038	0	0.572	0.572

Comments:

- *Watershed Management Modeling System, Critical Condition Timeseries*: Model runs estimated the peak concentration in runoff from the Project drainage area (Subwatershed 602683) to be 0.706 mg/L. The Project BMP capacity was designed to capture the volume of stormwater required to reduce zinc concentration from the modeled peak of 0.706 mg/L to below the water quality objective of 0.159 mg/L for a final runoff concentration of 0.134 mg/L (a 0.572 mg/L reduction from the peak). The peak concentration was used since the goal of the BMP is to ensure runoff concentrations do not exceed the water quality objective, so the BMP was designed to reduce the peak concentration by 0.572 mg/L.
- *Draft EWMP Plan for the Upper Los Angeles River Watershed Management Group, June 2015 (Appendix 7, Page 7.A.85, Table 7A-48)*: Water quality modeling was conducted for the drainage area of the Project (Subwatershed 602683), with the *Watershed Management Modeling System* (http://dpw.lacounty.gov/wmd/wmms/) in 2015, a water quality monitoring system approved by the LARWQCB. Results of the modeling are specified in *Table 7A-48* of the EWMP. The table specifies an optimal zinc load reduction of 81% for the subwatershed and an estimated design capacity of 8.6 acre-feet (AF) for the regional BMP to achieve the water quality objective.
- The actual design capacity for the Project is approximately 11 AF (8.6 AF for Gallery #1, 1.3 AF for Gallery #2, and 1.1 AF for Gallery#3), which was determined to be the optimal design capacity to capture the actual 85th percentile, 24-hr storm based on site-specific hydrology and geotechnical studies. The additional capacity will allow for a potentially higher stormwater capture and zinc reduction.
- The actual amount of zinc load and concentration reduction will be determined through water quality monitoring. However, is estimated that there will be an 81% reduction in zinc concentration since the Project is designed conservatively to capture the 85th percentile, 24 hour storm (Attachment F of NPDES Permit No. CAS04001), which according to the model will reduce the zinc concentration in stormflows out of this subwatershed to below the water quality objective.
- *Eco-Rain Tank Systems of America, Inc. Product Warranty*: Useful Life of the Project is shown based on the manufacture warranty for the infiltration tanks. An example product with Eco-Rain Tank Systems of America, Inc. provides a 20 year warranty, though it is expected that the Project will continue to provide benefits beyond the 20 years.
- The water quality benefit is expected to begin in 2019 as the infiltration basins will be fully constructed and operational by June 2019 which will allow the Project to capture, treat, and infiltrate stormwater and urban runoff flows including flows that have the peak zinc concentration for the year.

Secondary Benefit – Water Supply Produced

The table below provides information regarding the benefit of water supply produced through stormwater and urban runoff capture and infiltration to the Central Groundwater Basin. The Project will become operational in June 2019, so a partial benefit is expected for that year, with a full water supply benefit by 2020. Over the 20+ year useful life of the Project, approximately 2,603.5 AF of supply will be produced.

Table 5 – Annual Project Physical Benefits

Project Name: Franklin D. Roosevelt Park Regional BMP Project
Type of Benefit Claimed: Secondary Benefit – Water Supply Saved through Capture and Infiltration
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 20+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-18	0	0	0
2019	0	63.5	63.5
2020-2039	0	127	127

Comments:

- *Draft Enhanced Watershed Management Program (EWMP) Plan for the Upper Los Angeles River Watershed Management Group, June 2015 (Appendix 6, Pages 6.A.2 and 6.A.14)*: The average annual rainfall was estimated at 9.46 inches using the monthly hydrographs for precipitation measured at the rain gauge nearest the Project drainage area (LACFCD F37B, Compton Creek near Greenleaf Drive) from October 1, 2002 to September 30, 2011. Since the BMP will be sized to capture all 85th percentile, 24-hour storm events, it is assumed that 8.04 inches will be captured.
- The drainage area for the Project is 190.5 acres. Multiplying 8.04 inches, which is the annual rainfall from the nearest rain gauge, by 190.5 acres results in 127 AFY. The BMP is designed to capture and infiltrate the entire 127 AFY.
- *Eco-Rain Tank Systems of America, Inc. Product Warranty*: Useful Life of the Project is shown based on the manufacture warranty for the infiltration tanks. An example product with Eco-Rain Tank Systems of America, Inc. provides a 20 year warranty, though it is expected that the Project will continue to provide benefits beyond the 20 years.
- The full supply benefit is expected to begin in 2020, with a partial benefit in 2019 as the infiltration basins will become operational in mid-2019. It was assumed approximately half the supply benefit would be produced in 2019 because the Project would capture half the wet season.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Quality Improved through Zinc Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The Compton Creek is an open channel that is tributary to the Los Angeles River and discharges into the lowest reach of the Los Angeles River. This reach of the Los Angeles River (Los Angeles River Reach 1 (Estuary to Carson Street)) is listed on the State's 2010 303(d) list as impaired for metals (including zinc), nutrients, bacteria, and trash. Compton Creek itself is also listed as impaired for metals, bacteria, and trash. High density urbanization in this area of the watershed has contributed to the contamination in the surface water bodies through both point and nonpoint source pollution. As a result, the LARWQCB has adopted Basin Plan Amendments to regulate the Total Maximum Daily Loads (TMDLs) for trash, bacteria, nutrients, and metals for the Los Angeles River. Stormwater flows out of the subwatershed have a peak zinc concentration of approximately 0.706 mg/L which is 0.547 mg/L above the Basin Plan Water Quality Objective of 0.159 mg/L for surface water bodies. In 2007, a TMDL for the Los Angeles River and its tributaries was adopted for metals including zinc in Reach 1 of the Los Angeles River.

In 2012, the Municipal Separate Storm Sewer System (MS4) Permit for Los Angeles County (NPDES Permit No. CAS04001) provided a compliance option through the development of an EWMP that allows permittees to implement water quality improvement requirements on a watershed scale through customized strategies, control measures, and best management practices. As a result, permitees in the Upper Los Angeles River Watershed, including Los Angeles County Unincorporated Areas, joined an EWMP Group to collaboratively develop a watershed scale program in 2013. The Draft Upper Los Angeles River EWMP Plan was released in June 2015 with this Project identified as a priority regional project to reduce pollutant loading to the Los Angeles River. In addition to downstream impacts, poor water quality can impact communities surrounding the water body by limiting their ability to interact with the water body in a safe way.

This Project is needed because it will capture and detain stormwater and urban runoff which carries concentrations of zinc and other major pollutants and prevent these contaminants from reaching the Compton Creek and Lower Los Angeles River. In addition to reducing the pollutant loading, this Project will act as an example for future IRWM and EWMP projects based on lessons learned and water quality effectiveness data gathered.

2) Estimates of Without Project Conditions

Under the EWMP, there are other Projects in the Region that are planned for improving water quality in the Lower Los Angeles River, but without this Project, stormwater flowing from the drainage area within the Florence-Firestone Community will continue to have pollutant concentrations at current levels. Specifically, zinc concentrations in the runoff flowing from the drainage area to the Compton Creek will remain at approximately 0.706 mg/L on average which is 0.572 mg/l higher than they will be with the implementation of the Project that aims to reduce peak zinc concentrations in the runoff to 0.134 mg/L. Furthermore, without the Project, it is expected concentrations of zinc in flows to the Compton Creek from the larger subwatershed 602683 will not achieve the LARWQCB's water quality objective of 0.159 mg/L.

3) Descriptions of Methods Used to Estimate Physical Benefits

The Watershed Management Modeling System (WMMS), which is an approved water quality estimation modeling system by the LARWCQB (*Subpart 5 on page 63 of Order No. R4-2012-0175, Waste Discharge Requirements for MS4 Discharges within the Coastal Watersheds of Los Angeles County [NPDES Permit No. CAS04001]*), was used to conduct the Reasonable Assurance Analysis (RAA) for the EWMP. The RAA demonstrates the calibrated modeling system is able to accurately predict flows and pollutant concentration in the Los Angeles River watershed. The WMMS analyzed

millions of BMP scenarios and selected the most cost-effective solutions to meet water quality targets in the watershed. The model was used to determine the peak zinc concentration from stormwater and urban runoff from the Project's drainage area as well as what size BMP would be necessary to attain the water quality target concentration in runoff from this subwatershed. The model determined that to meet the water quality objectives for the Los Angeles River Reach 1, an optimal 81% reduction in zinc for this subwatershed was required.

To reduce the zinc concentration from the subwatershed by 81%, the FDR Park BMP would need to be sized to capture the 85th percentile, 24-hour storm events (*Attachment F of NPDES Permit No. CAS04001*). The three infiltration galleries for this Project are sized to capture this volume of stormwater and urban runoff from the subwatershed. By capturing the 85th percentile, 24-hour storm events, the WMMS estimates an 81% reduction in zinc from the peak modeled concentration of 0.572 mg/L (81%) (from 0.706 mg/L to 0.134 mg/L) through implementation of the Project.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

Three infiltration galleries will be installed under the FDR Park. These will be approximately 375,600 cubic feet (CF), 57,000 CF, and 46,200 CF in size. Three Nutrient Separating Boxes that reduce total suspended solids (TSS), sediment, debris, organic material, hydrocarbons, and trash will be installed, one at each of the three infiltration galleries. Additionally, 1,600 linear feet of 24" reinforced concrete pipe will be installed to divert the stormwater and urban runoff to the infiltration galleries, and a 5 CF catch basin will be installed near the FDR Park facility. These installations will allow the capture, treatment, and infiltration of the stormwater and urban runoff to reduce zinc (and other pollutant) concentrations in the water exiting the subwatershed. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented as part of the Project. Because FDR Park is owned and operated by the County of Los Angeles Department of Parks and Recreation, a partnership between the County Departments of Public Works and Parks and Recreation has been established to allow installation of the infiltration galleries on the FDR Park land.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Typical noise, air quality, and visual impacts associated with the construction of the infiltration galleries may occur, but will be mitigated through typical construction BMPs. Additionally, a SWPPP will be implemented to prevent other water quality issues. The Project will not have adverse impacts on downstream water quality as it will be removing the peak concentrations of pollutants in stormwater and urban runoff flowing out of the drainage area.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While the physical benefit of improving water quality does not specifically address long-term drought preparedness, the Project as a whole does. To achieve the primary benefit of improving water quality, stormwater and urban runoff will be treated and infiltrated into the groundwater basin which addresses long-term drought preparedness by contributing to an increase in local water supply and reliability during water shortages. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(1) Conjunctive use
(2) Efficient groundwater basin management
(3) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater and urban runoff and infiltrating it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin for use. The Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. The Project offers a new water supply source by capturing and treating stormwater and

urban runoff that would otherwise be lost to the ocean, adding to the potable water supply in the Central Groundwater Basin.

Secondary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Throughout the Western United States and especially within the State of California, drought is increasing in frequency, severity, and duration. Drought conditions and federal regulations have had a significant impact on the availability of imported surface water deliveries. The Greater Los Angeles County Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the State Water Project (SWP) supplies from the Bay Delta. The significant cutbacks in SWP supplies require local groundwater purveyors to increase pumping of the Central Groundwater Basin supplies without normal imported water replenishment necessary to maintain groundwater levels. In addition, the Project area is highly urbanized with very little open space and permeable area, which significantly limits natural infiltration of surface water flows into groundwater basins.

For these reasons, exploring local water supply development has become more important than ever. Groundwater is a reliable local water supply in times of drought. Increasing stormwater replenishment to local basins is viewed as a critical form of new supply for the entire GLAC Region that can offset imported water supplies, minimize pumping impacts on the structural integrity of the Central Groundwater Basin, and improve overall water supply reliability and sustainability in the Region.

2) Estimates of Without Project Conditions

Without the Project, the 127 AFY of stormwater that will be diverted to the Project site for infiltration to the groundwater basin will instead flow through storm drains for eventual discharge into the Pacific Ocean and not be made available as a source of supply. While other water quality BMP projects are planned through the EWMP throughout the Los Angeles River Watershed Region, the ability to use those flows for a water supply benefit is limited to this type of conjunctive use project.

3) Descriptions of Methods Used to Estimate Physical Benefits

The average annual rainfall was estimated at 9.46 inches using the monthly hydrographs for precipitation measured at the rain gauge nearest the Project drainage area (*LACFCD F37B, Compton Creek near Greenleaf Drive*) from October 1, 2002 to September 30, 2011 (*Draft EWMP Plan for the Upper Los Angeles River Watershed Management Group, June 2015, Appendix 6, Pages 6.A.2 and 6.A.14*). The Project is sized to capture all 85th percentile, 24-hour storm events which equates to 8.04 inches of rainfall. This 8.04 inches of rainfall over the 190.5 acre drainage area annually equals 127 AFY for capture and infiltration for future groundwater supply.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

Three infiltration galleries will be installed under the FDR Park. These will be approximately 375,600 cubic feet (CF), 57,000 CF, and 46,200 CF in size. Three Nutrient Separating Boxes that reduce Total Suspended Solids, sediment, debris, organic material, hydrocarbons, and trash will be installed, one at each of the three infiltration galleries. Additionally, 1,600 linear feet of 24" reinforced concrete pipe will be installed to divert the stormwater and urban runoff to the infiltration galleries, and a catch basin will be installed near the FDR Park facility. These installations will allow the capture and infiltration of the stormwater and urban runoff to increase groundwater recharge to the Central Groundwater Basin. A Storm Water Pollution Prevention Plan will be prepared and implemented as part of the Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Typical noise, air quality, and visual impacts associated with the construction of the infiltration galleries may occur, but will be mitigated through typical construction BMPs. Additionally, a SWPPP will be implemented to prevent other water quality issues. The Project will not have adverse impacts on downstream water quality as it will be removing the peak concentrations of pollutants in stormwater and urban runoff flowing out of the drainage area.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

To achieve the benefit of producing water supply, stormwater and urban runoff will be infiltrated into the groundwater basin which addresses long-term drought preparedness by contributing to an increase in local water supply and reliability during water shortages. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(1) Conjunctive use
(2) Efficient groundwater basin management
(3) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater and urban runoff and infiltrating it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin for use. The Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. The Project offers a new water supply source by capturing and treating stormwater and urban runoff that would otherwise be lost to the ocean, adding to the potable water supply in the Central Groundwater Basin.

Direct Water-Related Benefit to a DAC

The entire 190.5 drainage area of the Project is located within a DAC as shown in Attachment 7. The area generally lacks green space and green infrastructure as a whole. Stormwater and urban runoff from this community picks up pollutants including metals, nutrients, bacteria and trash and then empties into the Compton Creek and Los Angeles River. In addition, approximately 45% of the area within 0.5 miles of the downstream reaches of the Compton Creek and Los Angeles River are DACs. This area is assumed to represent those residents that would have the greatest occasion to come in contact with the surface water bodies and will benefit most from the water quality improvements provided by the Project. Attachment 7 shows that both the community of Florence-Firestone and the geographic area surrounding the Compton Creek and Reach 1 of the Los Angeles River are more than 25% DAC.

The direct water-related need of the DACs is that constituent concentrations in local stormwater runoff are contributing to water quality issues in the Compton Creek and Los Angeles River. As a result, the communities surrounding Compton Creek and Los Angeles River are exposed to degraded water quality on a daily basis posing which causes smells, trash clogging the storm drain outlets, and the potential health impact to wildlife, domestic animals, and people that come in contact with the water.

The Project provides a direct water-related benefit by capturing and infiltrating the stormwater and urban runoff from the Florence-Firestone DAC and improving water quality in the lower reaches of the Compton Creek and Los Angeles River, downstream of where runoff from DAC discharges into the Compton Creek. The areas surrounding the water bodies are largely DACs and will benefit from the improved water quality in the surface water. The Project will reduce pollutant loading and improve the safety and aesthetic features of Compton Creek and Los Angeles River for local residents in the communities surrounding the Compton Creek and Los Angeles River. The infiltration of stormwater and urban runoff to increase water supply in the Central Basin will also benefit DACs that depend on water supply from the basin.

Additional water-related needs in the Project area include support for implementation and education on water efficient landscaping, and green infrastructure and stormwater management in the community. **The Project will address this need by** re-vegetating project construction areas with native and drought tolerant plants as well as installing Low Impact Development (LID) features including bioswales. These improvements will serve to educate and provide awareness to these types of projects. Since Franklin D. Roosevelt (FDR) Park is heavily used by thousands of children in sports programs, interpretive signage will be installed to maximize educational outreach opportunities.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Franklin D. Roosevelt Park Regional BMP Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Quality Improved through Zinc Reduction	Reduce the peak concentration of zinc in stormwater flows exiting the Project drainage area by 0.572 mg/L	Tools and Methods: Grab samples and/or auto-samplers will be used to collect water quality samples. Samples will be collected at a minimum of one dry and one wet weather event per year to measure water quality of the stormwater and urban runoff existing in the Project drainage area. Samples will be sent to a lab under contract with LACDPW for analysis. Locations: Water quality monitoring will occur at a downstream location from FDR Park to collect stormwater that has passed through the drainage area and the Project site. The current location of this site is on Crockett Blvd. Between 81st St. and 83rd St. Data to be Collected: Water quality data will be collected for metals (zinc, copper, lead, mercury), bacteria (*E. coli*), nutrients (Ammonia-N, TKN, Nitrate-N, Nitrite-N, Total Nitrogen), and conventionals (temperature, pH, dissolved oxygen, conductivity, total dissolved solids, and hardness) **The monitoring tools and targets are appropriate for the benefits claimed because** the samples will show the concentration of zinc in the stormwater and urban runoff exiting the Project drainage area. **The monitoring data will be used to measure performance by** comparing zinc concentration from samples collected to the baseline peak concentration of 0.706 mg/L and the water quality standards established for zinc.
Secondary Benefit – Water Supply Produced	127 AFY stormwater infiltrated	Tools and Methods: Flow will be measured using sensors at the inlets of the infiltration basins. The sensors will be programmed to read flow data every 15 minutes. As flow will be minimal during dry weather conditions, manual flow measurements may be needed if the sensors are unable to read data. The flow entering the galleries will be converted to the total AFY infiltrated. This volume is assumed to infiltrate through the gallery system and into the aquifer. A full year of monitoring data will be used to determine the actual AFY infiltrated.

Table 6 – Project Performance Monitoring Plan **Project:** Franklin D. Roosevelt Park Regional BMP Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
		Locations: Flow will be measured at locations near the inlets to each of the 3 infiltration galleries. Data to be Collected: Flow measurements will be automatically recorded in cubic feet per second (CFS) and converted to total AFY after one year. **The monitoring tools and targets are appropriate for the benefits claimed because** the flow meters will record the flows of stormwater and urban runoff diverted to the galleries. The flows will be retained in the galleries until completely infiltrated into the ground. **The monitoring data will be used to measure performance by** converting flow data recorded to volume of stormwater and urban runoff infiltrated. This is an accurate depiction of the volume that is infiltrating to the groundwater basin because any overflow will exit through existing storm drains. This will be compared to the target of 127 AFY saved through stormwater and urban runoff capture and infiltration.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Franklin D. Roosevelt Park Regional BMP Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Quality Improved through Zinc Reduction • Secondary Benefit – Water Supply Produced
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. Constructing green streets and bio-swales along corridors in the right-of-way was considered as an alternative to constructing infiltration galleries under FDR Park. The alternative could provide similar water quality and water supply benefits by capturing, treating, and infiltrating stormwater but on a much smaller scale. The cost to construct a green street is estimated to be approximately $57.599 per square feet (Table 6-10, page 6-24 of Draft EWMP Plan for the Upper Los Angeles River Watershed Management Group, June 2015). In order to capture and treat the same volume of 8.6 AF of stormwater, approximately 374,620 SF of green streets would be required costing a total of $21.5 million, or 4.7 times the cost of the Project. The Project has a lower cost of $4.5 million to provide the same water quality and water supply benefits, therefore is the least cost alternative.
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: *Draft EWMP Plan for the Upper Los Angeles River Watershed Management Group, June 2015 – Table 6-10, page 6-24*: Cost of BMPs for green streets per BMP footprint in square feet.	

Project 2: Advanced Water Meter Replacement Project (Project)
Implementing Agency: Gateway Water Management Authority (GWMA)

Project Description
(25 Word) This Project will increase water conservation by installing 6,600 Advanced Meter Reading units to achieve approximately 665 AFY of sustainable water supply saved.
(Expanded) This Project will save 665 AFY of water supply within the service areas of the 12 participating Gateway Water Management Authority (GWMA) cities and water purveyors (Agencies) by replacing 6,600 customer service water meters with Advanced Meter Reading (AMR Units). The Project is the next phase of an existing GWMA program to reduce water loss from leaking systems. The AMR units will automatically provide meter readings from mobile receivers so that water use data can be queried and analyzed on a frequent basis without manually reading each site. Some Agencies already have receivers from ongoing meter replacement projects and others will be supplying meter reading systems on their own. After the AMR units are installed, the participating agencies and cities will review data to determine potential leaks. The ability to obtain and read accurate water use data is critical to being able to reduce overall water consumption and waste. Once potential leaks are detected, they will be repaired either by the agency (for leaks at the service connection) or the customer (for leaks downstream of the service connection). For those leaks needing customer response, agencies will notify and work with customers to promptly fix leaks and ensure that water savings is achieved. Agencies will follow-up to verify whether leaks are repaired, and track this number on an annual basis for GWMA. The participating GWMA Agencies include the cities of Bellflower, Cerritos, Commerce, Downey, Lakewood, Norwalk, South Gate, Vernon, and Whittier, as well as the Pico Rivera Water Authority, Long Beach Water Department and the Pico Water District.

The major components of the Project include the installation of the 6,600 smart meters to allow leakage detection and subsequent leak repair activities.

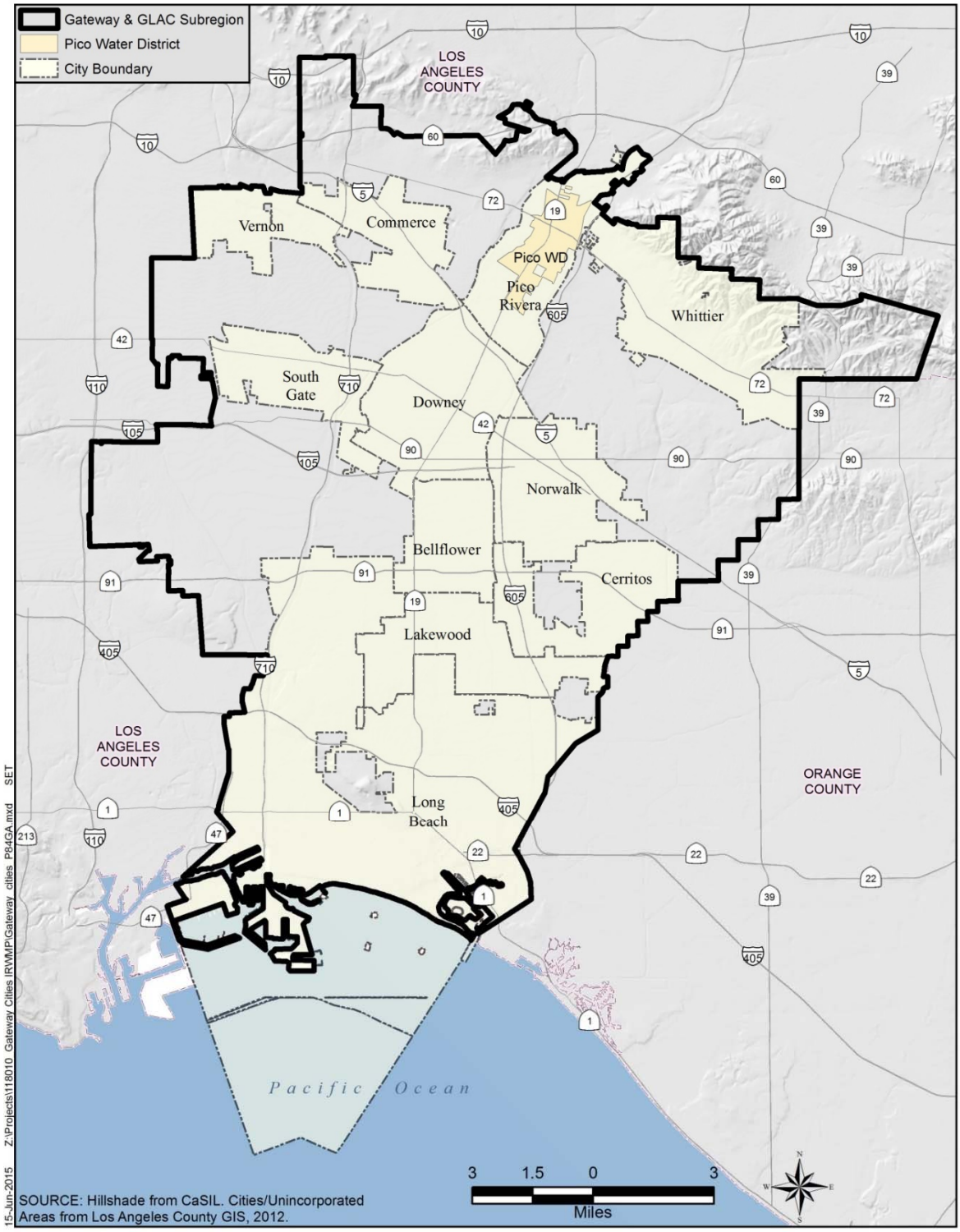
The anticipated physical benefits of the Project include potable water supply conserved, energy savings, and greenhouse gas reductions. In the GWMA area, over 90% of existing water meters have surpassed their expected life, resulting in an operational inefficiency, which leads to undetected leaks. It is estimated that installation of the 6,600 AMR units throughout the GWMA area will result in water demand reduction of about 665 acre-feet per year (AFY), when fully implemented, of conserved water supply. Reduced demand for potable water will also result in reduced energy used to convey and treat potable water supplies. Specifically, this Project will reduce the use of energy intensive imported water supplies by the participating agencies, thereby, reducing energy demands associated with importing water as well as the greenhouse gas emissions.

The Project addresses a current need of the region by reducing water supply demands and improving the sustainability of potable supply sources. As noted in the Greater Los Angeles County (GLAC) Integrated Regional Water Management Plan (IRWMP), the Region's access to imported water has been limited due to both environmental concerns in the San Francisco Bay Delta as well as drought conditions. This Project supports the GLAC IRWMP's regional as well as local objectives to improve water supply reliability through increased conservation and offsetting imported water. Additionally, this Project will help to mitigate against climate change impacts by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions. The Project's regional approach to AMR Unit installation allows for a more cost-effective method to achieve water reliability and improved efficiency in an area with disadvantaged communities that often struggle to fund program implementation.

The intended outcome of the Project is to decrease water demands by 665 AFY, save energy and reduce greenhouse gas emissions. Through the implementation of this Project, approximately 1,599,990 kilowatt-hours per year and 444,797 kilograms (kg) of CO_2 equivalents per year will be saved and reduced, respectively.

Project Map

The map below shows the participating Agencies within the GWMA area (which corresponds to the "Gateway & GLAC Subregion" on the map below). The Long Beach Water Department is shown as the City of Long Beach. Project monitoring will occur at the newly 6,600 AMR units installed throughout the Project area.



Project Physical Benefits

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

- Primary Benefit – Water Supply Saved
- Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

Other benefits not quantified as primary or secondary include the improved water quality through the reduction of contaminants transported as runoff from leaking systems. By repairing leaks and reducing runoff, contaminates like nutrients from fertilized lawn and heavy metals from roadways may also be reduced

Primary Benefit – Water Supply Saved

The table below provides information on the benefit of water supply saved. The Project's participating Agencies primary source of supply is groundwater pumped from the Central Groundwater Basin (which is replenished with imported water), but they also receive imported water for direct use. It can be assumed that any water saved by this Project will offset the more costly imported supply. The Project will begin installation of the AMR Units in July 2016 and complete installation by July 2018. Over the 27 year lifespan of the Project, a total of approximately 16,959 AF of potable water will be saved.

Table 5 – Annual Project Physical Benefits
Project Name: Advanced Water Meter Replacement Project
Type of Benefit Claimed: Primary Benefit - Water Supply Saved through AMR Unit Installations
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 25 years per meter and 27 years for program

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2015	0	0	0
2016	0	333	333
2017	0	499	499
2018 – 2040	0	665	665
2041	0	499	499
2042	0	333	333

Table 5 – Annual Project Physical Benefits

Project Name: Advanced Water Meter Replacement Project
Type of Benefit Claimed: Primary Benefit - Water Supply Saved through AMR Unit Installations
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 25 years per meter and 27 years for program

Comments:

- 25 year expectant service life of Badger brand meters: http://www.badgermeter.com/Badger-Files/PDFs/Water-Utility/RD-W-2-EN.pdf?
- *DWR California Water Plan Update, 2013, Chapter 3, page 21* – Water loss accounts for approximately 10% of urban water use.
- *Environmental Protection Agency (EPA): http://water.epa.gov/infrastructure/sustain/wec_wp.cfm* - National studies indicate that, on average, 14% of the water treated by water systems is lost to leaks. Accounting for water and minimizing water loss are critical functions for any water utility that wants to be sustainable.
- *Final California Water Plan, Department of Water Resources, 2013:* The median system water loss was found to be between 1.4 gallons per capita per day (gpcd) and 3.9 gpcd. The average of these two numbers is 2.65 gpcd. Based on the GWMA's Regional 10-year baseline gpcd (ending December 31, 2010) it was estimated that the average use is 113.3 gpcd. The resulting percentage based on the average system water loss and GWMA's average use was estimated to be 2%.
- *City of Bellflower Municipal Water System, 2014 Annual* Report: The City of Bellflower's Municipal Water System serves about 10% of the City of Bellflower.
- *City of Downey 2010 Urban Water Management Plan (UWMP):* Downey is served by the California Water Company, East Los Angeles (ELA) District. ELA per capita values were used to estimate Downey water use.
- If baseline per capita water use was not available from a 2010 UWMP, then the value was calculated based on 2010 water use and 2010 population.
- 2016 – 2017 reflects an implementation rate of 1,650 AMR unit installations every 6 months until all 6,600 AMR units have been installed.
- Anticipated water savings calculated assumes current system water losses of 10% to 14%. These numbers were obtained from data published by DWR and the EPA, respectively (references cited above). In order to be conservative, the average of these two references was used (12% system was loss).

Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

The table below provides information on the benefit of energy saved and greenhouse gas reduced as a result of a reduction in imported supply use. Reductions in water use will directly result in a reduction of energy demand and greenhouse gas emissions. The imported supplies currently provided by the Central Basin Municipal Water District (Central Basin) are a blend of 20% SWP water, which comes from the Bay-Delta system, and 80% Colorado River Aqueduct water. Based on DWR's energy intensities for imported water, approximately 4,126 kilowatt hours per acre-foot (kWh/AF) is required for conveyance and pumping of SWP water (to Southern California), and approximately 1,976 kWh/AF is required for the Colorado River Aqueduct water. The ratio of these supplies results in an estimated 2,406 kWh/AF of energy consumption to provide imported water supply. It is expected that energy consumption will be greater, since the energy necessary to treat and distribute these imported water supplies is not included in the energy intensity estimate above.

The Project would avoid greenhouse gas emissions generated by transporting imported water for potable use. This value was calculated using the conversion factor from Guidelines and Proposal Solicitation Package from DWR's WaterEnergy Grant. This factor is 0.278 kilograms (kg) of carbon dioxide equivalents (CO_2e) per kWh. Using this factor and the ratio of SWP water and Colorado River Aqueduct water imported, the amount of greenhouse gas reduction was calculated.

The Project will begin implementation of the AMR units in July 2016 and complete installation by July 2018, therefore, the energy savings for these two years are proportionate to the amount of water conserved as more AMR units are installed and leaks fixed. Over the 27 year lifespan of the Project, a total of approximately 40,803,354 kWh of energy will be saved and 11,343,332 kg of CO_2 equivalents will be reduced.

Table 5 – Annual Project Physical Benefits

Project Name: Advanced Water Meter Replacement Project
Type of Benefit Claimed: Secondary Benefit – Energy Saved and Greenhouse Gas Avoided
Units of the Benefit Claimed: kWh of Energy saved and kg of CO_2 equivalents (CO_2e) avoided
Anticipated Useful Life of Project (years): 25 years per meter and 27 years for program

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2015	0	0	0
2016	0	Energy Saved: 801,198 CO_2e Reduced: 222,733	Energy Saved: 801,198 CO_2e Reduced: 222,733
2017	0	Energy Saved: 1,200,594 CO_2e Reduced: 333,765	Energy Saved: 1,200,594 CO_2e Reduced: 333,765
2018 – 2040	0	Energy Saved: 1,599,990 CO_2e Reduced: 444,797	Energy Saved: 1,599,990 CO_2e Reduced: 444,797
2041	0	Energy Saved: 1,200,594 CO_2e Reduced: 333,765	Energy Saved: 1,200,594 CO_2e Reduced: 333,765
2042	0	Energy Saved: 801,198 CO_2e Reduced: 222,733	Energy Saved: 801,198 CO_2e Reduced: 222,733

Table 5 – Annual Project Physical Benefits
Project Name: Advanced Water Meter Replacement Project **Type of Benefit Claimed:** Secondary Benefit – Energy Saved and Greenhouse Gas Avoided **Units of the Benefit Claimed:** kWh of Energy saved and kg of CO_2 equivalents (CO_2e) avoided **Anticipated Useful Life of Project (years):** 25 years per meter and 27 years for program
Comments: • *Personal Communication with Central Basin Municipal Water District, July 13, 2015:* Central Basin imported 20% SWP water and 80% Colorado River Aqueduct water in 2014. • *DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7:* Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF) (nearest West Branch SWP pumping plant to the GLAC Region). • *California Public Utilities Commission (CPUC) Study, page 64*: Energy associated with conveying Colorado River Aqueduct Water (1,976 kWh/AF) (as listed in the DWR 2014 Water Energy Grant Guidelines and PSP). • *U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*: The annual total-output statewide emission rate of 0.278 kg of CO2e/kWh was used to convert energy savings to a reduction in CO_2e. • The full annual benefit is expected to begin in 2018. A partial benefit was estimated for 2016 - 2017 according to the Project schedule as explained for the water supply produced benefit.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Saved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Water supplies in much of California have been severely limited due to drought conditions, diminished water storage levels, and regulatory restrictions on water deliveries from northern California. Drought conditions and federal regulations have had a significant impact on the availability of imported surface water deliveries to GLAC Region and the Project area. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the SWP supplies from the Bay Delta. With the reduction in precipitation and State mandates, the GWMA intends to continue to improve water management and water conservation practices for their water participating Agencies within the Lower San Gabriel/Los Angeles River Sub-region of the GLAC Region. This Project will provide a much needed pathway toward further water conservation savings for the area.

It is estimated that over 95% of the regional water losses are due to undetected water leaks. The California Urban Water Conservation Council (CUWCC) has identified leak detection and repair as one of the most effective methods of saving water. This project will replace existing manual read water meters with AMR units that will help identify water leaks early so that leak repair can be quick and efficient.

The cost to replace existing ineffective meters with AMR units is expensive and often cost prohibitive for Agencies with a high proportion of DACs. As such, GWMA has received funding from other sources for initial phases of their overall AMR unit installation program. However, additional funding is needed for GMWA to expand this successful program to further facilitate an average reduction in annual water lost to leaks and save 665 AFY of water supply.

More accurate meter reading will also aid in long-term water management by providing time of use and volumetric data.

2) Estimates of Without Project Conditions
Without this Project, GWMA would not be able to monitor water usage effectively enough to identify leaks for repairs. The GWMA estimated that approximately 16,040 AF of potable water could continue to be lost due to unidentified leaks over the useful life of the Project. This is based on the calculation that approximately 12% of water is lost through leakage for all of the 12 participating Agencies

3) Descriptions of Methods Used to Estimate Physical Benefits
Projected water losses from the participating agencies were calculated by multiplying the total water distributed by each participating agency in 2010 (as reported in existing Urban Water Management Plans) by an average annual loss rate of 12%. This loss rate was assumed using the average annual loss rates published by DWR and the EPA, 10% and 14%, respectively.

Estimated Savings (shown in the table below) was developed to show the anticipated water savings associated with AMR unit installation and leak repairs for each participating Agency using this methodology. The calculations show that if 6,600 AMR units are installed across the participating agencies as indicated, it is anticipated that 665 AFY of water supply savings can be achieved when installation is completed by assuming a 2% reduction in water losses as a result of the Project.

Estimated Savings

Agency	No. of Units	Total Connections (2010)	2010 Water Use (AFY)	Without-Project Water Loss, 12% (AFY)	With-Project Water Loss (AFY)	Estimated Water Savings
Bellflower	500	1,823	672	81	62	18
Cerritos	500	15,934	8,340	1,001	975	26
Commerce	500	2,206	1,410	169	137	32
Downey	500	22,548	15,419	1,850	1,816	34
Lakewood	800	20,421	8,492	1,019	986	33
Long Beach Water	800	88,361	63,448	7,614	7,556	57
Norwalk	500	4,497	2,329	279	254	26
Pico Rivera	500	9,401	5,509	661	632	29
Pico Water District	500	5,300	3,300	396	365	31
South Gate	500	15,555	8,403	1,008	981	27
Vernon	500	1,400	8,898	1,068	750	318
Whittier	500	11,328	7,448	894	861	33
Total	**6,600**	**198,774**	**133,668**	**16,040**	**15,375**	**665**

With-Project Water Loss values were calculated using the following equation:

$$\frac{(Total\ Connections - No.\ of\ Units)}{Total\ Connections}\ x\ Without - Project\ Water\ Loss + \left(\frac{No.\ of\ Units}{Total\ Connections}\right) x\ 2010\ Water\ Use\ x\ 2\%\ Improvement\ of\ System\ Water\ Loss$$

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will install 6,600 AMR units in place of existing meters in the 12 Agency service areas. Each Agency will be responsible for providing and installing facilities needed to remotely read the AMR units and provide leak repair services in public rights-of-way. Customers will be responsible for leak repairs on private property. No new policies or other actions are anticipated to be needed.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Potential adverse physical effects are not anticipated since the installation of the AMR units will occur on Agency property at the service connection box and replace existing meters. This Project has been determined to be categorically exempt under CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This Project will make significant contributions to improve the sustainability of regional and local supplies. Water supply saved through conservation efforts will offset the need for imported supplies allowing these supplies to be conserved for future use. The Project will also provide near-term current drought assistance by rapidly targeting system leaks so that water waste can be immediately reduced. The Agencies participating in this Project will be able to make timely adjustments to account for drought conditions by closely monitoring water use.

Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(1) Promote water conservation

(2) Achieve long-term reduction of water use

The Project promotes water conservation by installing AMR units at service connections within the service areas of the GWMA's participating Agencies and repairing leaks that currently contribute to unnecessary water demands and waste. Receiving water usage data electronically allows for early detection of unusual water usage so that leaks can be identified and repaired. Additionally, the Project will most likely improve overall water use efficiency as customers can better track their own water usage. GWMA also expects to see additional longer-term reduction of water use after the useful life of the Project's AMRs, since it is likely that the AMR units will be replaced with similar or better systems in the future.

Secondary Physical Benefit: Energy Saved and Greenhouse Gas Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Generating the energy needed to produce, convey, and distribute water also produces carbon dioxide emissions that contribute to global warming, which itself threatens California's water supply. The State has committed to reducing its emissions by 15% by 2020 under AB-32, the Global Warming Solutions Act of 2006. Decreasing the amount of energy required to produce water supply is an Objective of the California Water Action Plan, and decreasing the emission of greenhouse gases is a Planning Target of the GLAC IRWMP.

As the result of a recent climate change vulnerability analysis, the GLAC IRWM Region has identified the need to adapt to and mitigate against further climate change. The Region's objectives support projects like conservation that reduce energy consumption and greenhouse gas emissions. The Project will reduce energy consumption by 1,599,990 kWh per year and avoid greenhouse gas emissions of approximately 444,797 kg of CO_2e per year once fully implemented, thereby helping to mitigate against climate change as well as adapt to climate change through demand reduction.

2) Estimates of Without Project Conditions
Without the Project, an additional 1,599,990 kWh/year of energy would be consumed and 444,797 kg/year of CO_2 equivalents would be emitted through the use of imported water within the service areas of the 12 participating GWMA Agencies.

3) Descriptions of Methods Use to Estimate Physical Benefits
The Project will offset local imported water (blend of 20% SWP and 80% CRA) use by conserving water supply. According to DWR, approximately 4,126 kilowatt-hours per acre-foot (kWh/AF) is required for conveyance and pumping of SWP water to the Oso Pumping Plant (DWR Bulletin B-132-10, 2013), which is the nearest SWP pumping plant to the GLAC Region. Similarly, approximately 1,976 kWh/AF is required to convey CRA water to the GLAC Region (CPUC Study, page 64). Based on the ratio of these supplies, an estimated 2,406 kWh/AF of energy is used to provide imported supplies to Southern California. A water supply savings of 665 AFY resulting from implementation of this Project, will offset demands for imported water and save 1,599,990 kWh per year of energy once fully implemented.

Additionally, the Project will avoid greenhouse gas emissions generated by the energy used to import water. This value was calculated by applying the annual total-output statewide emission rate of 0.278 kg of CO_2 equivalents (CO_2e) per kWh from the U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region. By offsetting the demand of 665 AFY of blended imported water, the Project will avoid greenhouse gas emissions of approximately 444,797 kg of CO_2e per year once fully implemented.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will install 6,600 AMR units in place of existing manually read meters in 12 service areas as shown in Table A. Each Agency will be responsible for providing and installing facilities needed to remotely read the AMR units and provide leak repair services in public rights-of-way. Customers will be responsible for leak repairs on private property. No new policies or other actions are anticipated to be needed.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Potential adverse physical effects are not anticipated since the installation of the AMR units will occur on Agency property at the service connection box and replace existing meters. This Project has been determined to be categorically exempt under CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While not directly addressing long-term drought preparedness, the secondary benefit will help in making significant contributions by reducing energy use and greenhouse gases. This Project will make significant contributions to improving the sustainability of regional and local supplies by offsetting imported water use which will allow supplies to be conserved for future use. The agencies participating in this Project will be able to make timely adjustments to account for drought conditions by closely monitoring water use.

Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(1) Promote water conservation
(2) Achieve long-term reduction of water use

The Project promotes water conservation by installing AMR units at service connections within the service areas of the GWMA's participating Agencies and repairing leaks that currently contribute to unnecessary water demands and waste. Receiving water usage data electronically allows for early detection of unusual water usage so that leaks can be identified and repaired. Additionally, the Project will most likely improve overall water use efficiency as customers can better track their own water usage. GWMA also expects to see additional longer-term reduction of water use after the useful life of the Project's AMRs, since it is likely that the AMR units will be replaced with similar or better systems in the future.

Direct Water-Related Benefit to a DAC

This Project provides direct water-related benefits to DACs. 25 percent of the Project area is considered a DAC, as determined by geographic coverage of the area (See Attachment 7). The Project will install AMR units within the service areas of 12 participating GWMA Agencies. AMR unit installation will ensure that accurate meter readings are obtained by each participating Agency and identify potential leaks. Leak repairs can then be prioritized and fixed, thereby reducing unnecessary water loss. The reduction in water loss can provide decreases in customer water bills and provide an overall decrease in in the cost of service for the entire Agency.

The water-related need of the DACs will be addressed by decreasing the amount of water lost through leakage, thereby reducing the volume of water purchased and paid for by the customer. Water bills can be a significant cost for low income households (DACs). For those households that will have the AMR units installed there will be a faster procedure for identifying and remediating potential leaks. These households will show reductions in water use, energy use, and greenhouse gas production once the leaks are fixed or the water use efficiency issues are resolved. The DAC households in the Project area will receive the direct and meaningful benefit of lower utility costs as they will have the opportunity to reduce water usage caused by leaks that go undetected.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Advanced Water Meter Replacement		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Water Supply Saved	665 AFY of water saved	Tools and Methods: AMR unit water use readings before and after leak repairs will be used to determine water savings at each site. Locations: Information will be gathered from the AMR unit installed at each site. Data to be Collected: Customer water use data **The monitoring tools and targets are appropriate for the benefits claimed because** it will allow the participating Agencies to examine water use at individual locations at any time. Water savings for each AMR unit will be compiled into an overall project database to show overall Project water savings.
Energy Saved and Greenhouse Gas Avoided	1,599,990 kWh/year of energy 444,797 kg of CO_2e/year	Tools and Methods: From every AFY of water saved (as reported from the newly installed AMR unit), an energy savings and greenhouse gas reduction rate will be applied. The water savings at each site will be used to estimate the associated energy usage for that volume of water and compared against the energy usage for that volume to be imported through the SWP and CRA using the kWh/AF factors. A greenhouse gas emission rate of 0.278 kgCO_2e will be applied to estimate the GHG reduction with the Project. Locations: Water savings information will be gathered from the installed AMR units. Data to be Collected: Water savings estimations will be calculated for each site and aggregated for the entire Project. An energy and greenhouse gas reduction will be calculated based on the total AFY of water saved through the Project. The *DWR Bulletin B-132-14* and *CPUC Study* will be used to estimate the amount of energy saved, and the *U.S. EPA Emissions and Generation Resource Integrated Database for the CAMX sub-region* will be used for the statewide emission rate. **The monitoring tools and targets are appropriate for the benefits claimed because** the calculations will show the amount of energy saved and greenhouse gas reduced.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Advanced Water Meter Replacement	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Saved • Secondary Benefit – Energy Saved and Greenhouse Gas Reduced
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** GWMA conducted a review of urban water conservation efforts available to water purveyors to reduce water demand in the Project area.
	If no, why? Not applicable.
	If yes, list the methods (including the proposed project) and estimated costs. The results of the review found that most of the "traditional" efforts such as replacing toilets with ultra-low-flush devices and rebates for low water use washing machines, etc. have already been employed in the region as part of the State's 20 x 2020 program and previous water saving efforts. Therefore, it was determined that the AMR unit installation program is the best alternative to achieving new conserved supplies and reducing energy needed and greenhouse gas emissions. This Project is the best alternative to achieving new conserved water supplies in the GWMA Sub-region. The estimated cost of this Project is $2,349,830.
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 cost effective way to achieving additional water conservation increments.
Comments: California Urban Water Conservation Council, Annual Report Year 2005. Table 1 discusses Urban Water Conservation Best Management Practices.	

Project 3: Gateway Cities Regional Recycled Water System Expansion Project (Project)
Implementing Agency: City of South Gate (City)
Project Description
(25 Words) The Project provides 453 AFY of water savings and water quality improvement by completing planning, design, and CEQA for recycled water pipelines to three cities.

(Expanded) The City of South Gate, in partnership with the City of Bell Gardens, the City of Lynwood, and the Central Basin Municipal Water District (CBMWD) will provide 453 acre-feet per year (AFY) of water savings, and water quality improvement by preparing planning, design, and environmental documentation for pipelines that will extend the CBMWD recycled water system. The Project will provide 453 AFY of recycled water to irrigate nine parks and schools, thus reducing the need for potable water supply at these facilities. The Project[1] includes a California Environmental Quality Act (CEQA) analysis and the development of plans, specifications, and cost estimates for the construction of the recycled water pipelines. The new customers that will be served include parks and schools in the three cities' Disadvantaged Community (DAC) areas. The proponent does not intend to fund construction activities with this grant solicitation.

The major physical components of the Project include developing studies, plans and specifications, as well as all environmental work necessary to construct the recycled water pipelines. The Construction Project[1] will consist of approximately 2,950 feet of 16-inch diameter pipe, 24,240 feet of 12-inch pipe, 2,090 feet of 8-inch pipe, with all necessary valves, connections, appurtenances, and restoration.

The anticipated physical benefits of the Project include the primary benefit of 453 AFY of water supply recycled that will be the result of extending the existing system to nine parks and schools preserving 127 acres of open space. This benefit also reduces the region's reliance on less reliable imported water supplies. A secondary benefit is improved water quality in the San Gabriel River that is the result of reduced loadings of constituents to the San Gabriel River by diverting 453 AFY of recycled water to irrigation uses at the nine new sites. Finally, open space habitat will be preserved; and the offset of imported water will save energy and reduce greenhouse gas (GHG) emissions.

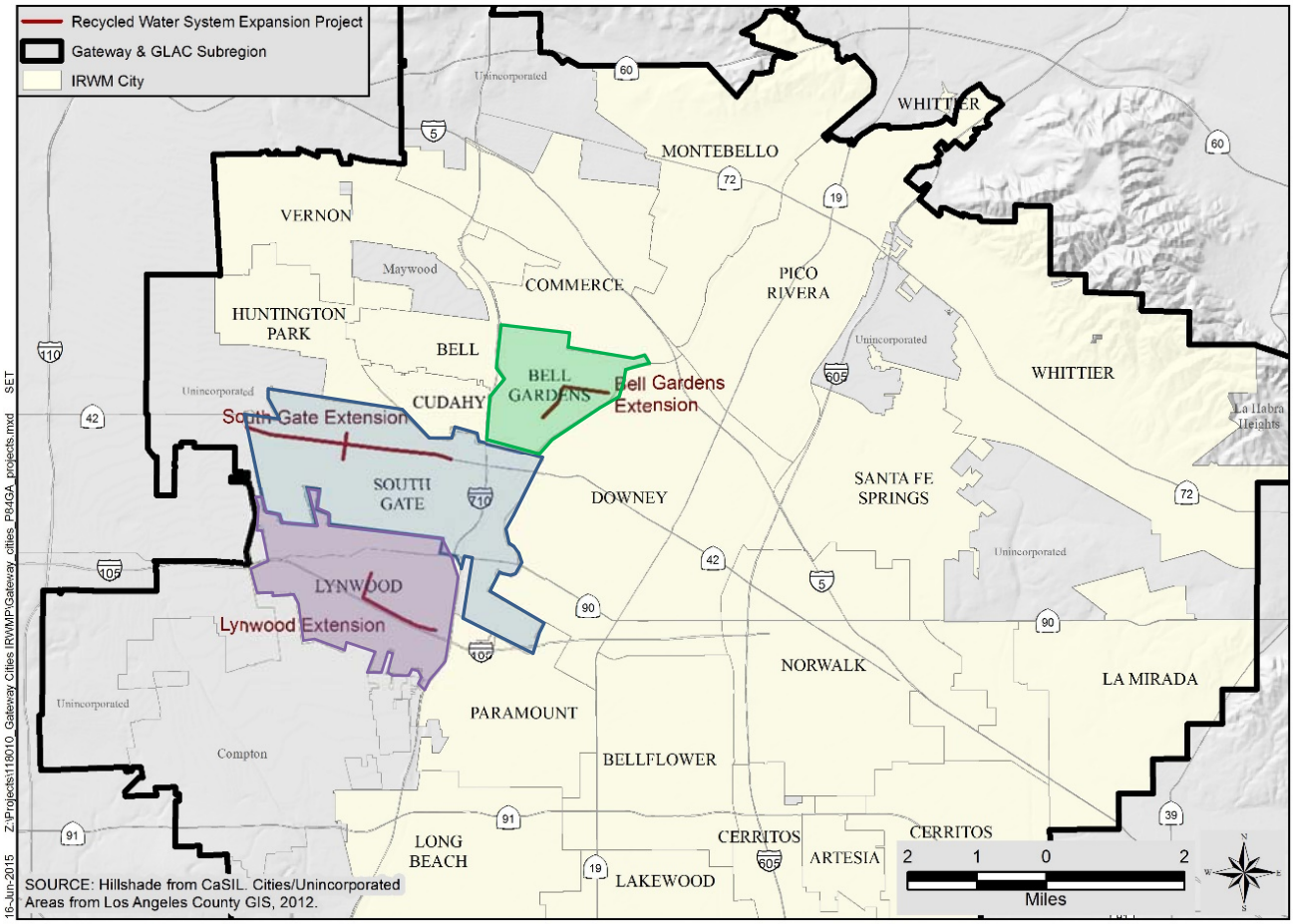
The Project addresses a current need of the region by supporting the objectives of the Greater Los Angeles County (GLAC) Integrated Regional Water Management Plan (IRWMP). First, the Project will optimize local water resources to reduce the region's reliance on imported water (Improve Water Supply). Second, the Project will improve surface water quality by removing a source of various constituents from the San Gabriel River (Improve Surface Water Quality). Third, the Project will increase watershed-friendly recreational space for communities (Enhance Open Space and Recreation). And finally, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to **e**xpand a regional recycled water system to serve three DACs with an aggregate population of over 200,000 residents. If the cities do not take action to move forward with developing facilities that serve recycled water, they will have difficulty meeting the water conservation targets set by the State and will also be faced with a challenge of maintaining the little open space habitat left in a densely populated urban region.

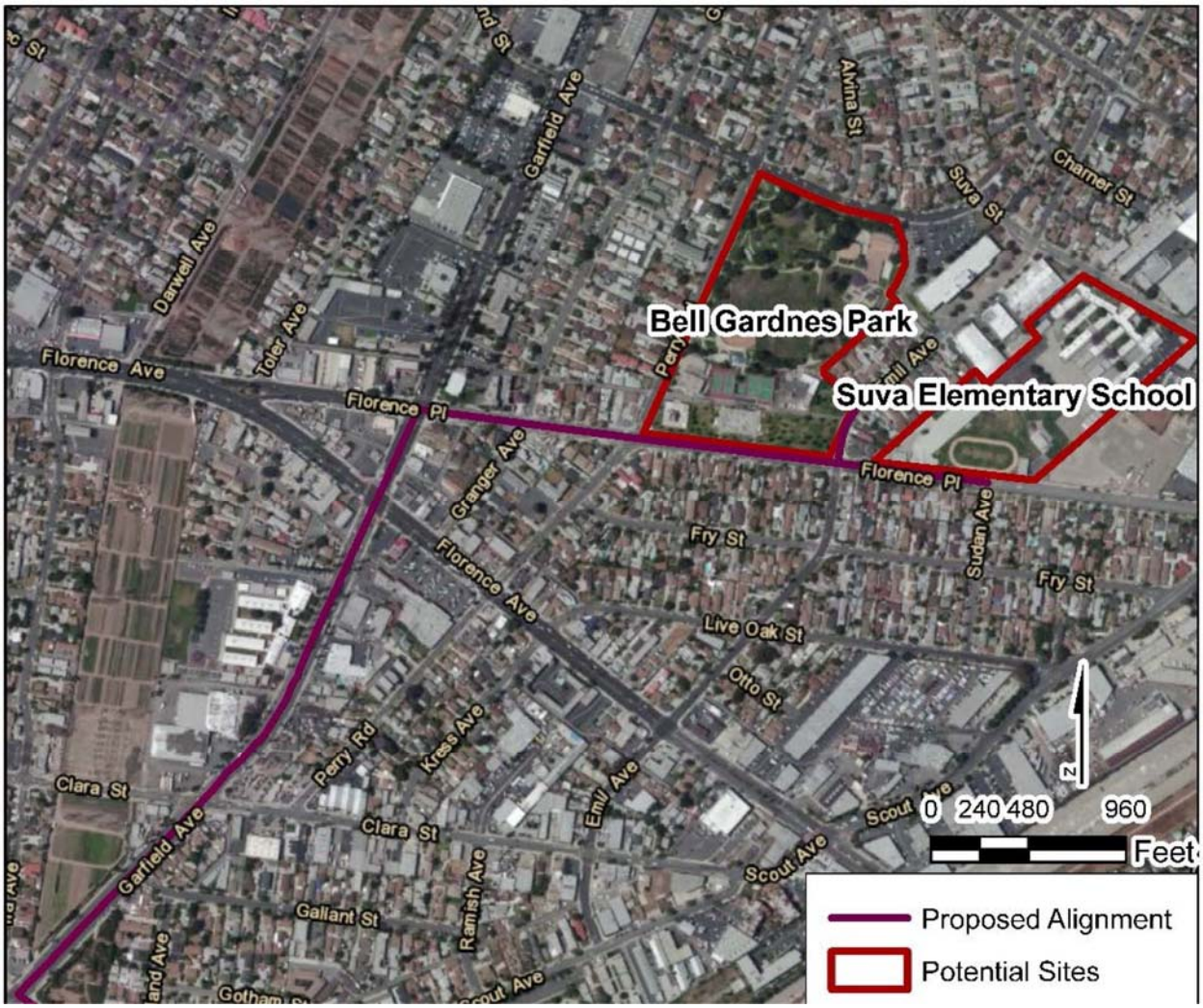
[1] For the purposes of this grant application, the term "Project" is used to refer to the design and environmental work that is seeking funding under the Proposition 84, Final Solicitation Round. The term "Construction Project" is used to refer to the construction phase, which will occur later and is not seeking funding under this round.

Project Map

South Gate, Bell Gardens, and Lynwood (Gateway Cities)



Bell Gardens Recycled Water Customers



Lynwood Recycled Water Customers

South Gate Recycled Water Customers

Project Physical Benefits

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

- Primary Benefit – Water Supply Recycled
- Secondary Benefit – Water Quality Improved

Primary Benefit – Water Supply Recycled

The primary benefit of the Construction Project would be water supply recycled. This would be accomplished by completing planning, design, and CEQA for an extension to CBMWD's existing recycled water pipeline system. If grant funding for the Project is received (for planning, design, and CEQA), the physical benefits of the Construction Project could begin as early as 2018 since the Construction Project would be anticipated to be complete in 2017. The benefits would then continue for the presumed 60-year lifespan of the Project.

This Project is a planning/design/environmental project that serves a DAC area. As such, there is no requirement to quantify the physical benefits claimed. Only a qualitative characterization is needed. Table 5 shows information related to the benefit of recycled water supply. The estimated irrigation water for the nine new sites is calculated using the formula provided in the *Model Landscape Ordinance, California Code of Regulations, Title 23, Division 2, Chapter 2.7, Section 492.4.* The estimated total water use for the nine sites was estimated as 453 AFY. The methodology compares the estimated total water use per year to the maximum applied water allowance per year and utilizes the lesser of the two values; the methodology is documented in a technical memorandum entitled, *Determination of Irrigation Water Demand for Facilities to be Served with Recycled (Title 22) Water in the Cities of Bell Gardens, Lynwood, and South Gate.*

Table 5 – Annual Project Physical Benefits
Project Name: Gateway Cities Regional Recycled Water System Expansion Project
Type of Benefit Claimed: Primary Benefit – Water Supply Recycled
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) - (b)**
2015	0	0 [planning]	0
2016	0	0 [planning/design]	0
2017	0	0 [construction]	0
2018 – 2076	0	453	453

Comments:

- *Sources: Central Basin Municipal Water District Recycled Water Master Plan*, Chapter 2, Fig. 2-2, 2-3, 2-4, 2-5;
- *Determination of Irrigation Water Demand for Facilities to be Served with Recycled (Title 22) Water in the Cities of Bell Gardens, Lynwood, and South Gate, pp. 1-4.*
- Estimated Lifetime Benefit = 27,180 AF
- Note: The timing of physical benefits shown in the table are dependent on receiving grant funding for planning, design, and CEQA for the Project. The physical benefits shown are for the Construction Project.

Secondary Benefit – Water Quality Improved

The secondary benefit of the Project is water quality improved. This benefit consists of reduced loadings of constituents to the San Gabriel River by diverting 453 AFY of recycled water to irrigation uses at the nine new sites. If grant funding for the Project is received (for planning, design, and CEQA), the physical benefits of the Construction Project could begin as early as 2018 since the Construction Project would be anticipated to be complete in 2017. The benefits would then continue for the presumed 60-year lifespan of the Project.

Since this project serves a DAC area, only a qualitative characterization of the physical benefits is needed. As such, there is no requirement to quantify the physical benefits claimed. Since information related to the water quality improved benefit is not readily available, a qualitative description is provided.

Water quality benefits will be estimated as concentrations of various constituents, such as chloride, total dissolved solids, metals, etc., that are present in the 453 AFY of recycled water and that would not be discharged to the San Gabriel River as a result of the Construction Project. Since the recycled water would be diverted to irrigation uses, the measureable values (in milligrams per liter) of these constituent loadings to the San Gabriel River will effectively become zero. Thus, the water quality improved benefit will be the avoidance of constituent loadings (expressed as concentrations) entering the San Gabriel River.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Recycled

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The State of California is currently experiencing one of the most severe droughts on record, which has severely depleted statewide water supplies. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting State Water Project (SWP) supplies from the Bay-Delta. The results of these still recent drought conditions can be seen throughout the Region as an increased implementation of local supply development projects and conservation measures and ordinances. With only one wet year in 2011, the Region is in the middle of yet another multiple year drought.

The cities of Bell Gardens, Lynwood, and South Gate are located in the Central Basin hydrologic watershed. The CBMWD serves an area of over 220 square miles with a population of two million plus residents. Approximately seventy (70%) percent of the water supply in the area is obtained locally and approximately thirty (30%) percent is obtained from imported water. With the continued growth of the region and a fixed or reduced supply of available potable water, it is necessary to find alternatives to meet the water demand. One of these alternatives is conservation; the cities have implemented successful conservation programs in the area. These water conservation efforts can be enhanced by using recycled water in place of potable water for irrigation purposes.

2) Estimates of Without Project Conditions

Without the Project, 453 AFY of potable water will continue to be used to irrigate the nine park and school sites, which could alternately be offset by using recycled water. During times of drought, these potable supplies for irrigation can be curtailed due to emergency cutback measures, leaving the parks and other recreational spaces to go un-irrigated and lose their functionality for local communities. Additionally, statewide imported water supplies will continue to be taxed by irrigation usage since CBMWD is part of the regional MWD and statewide SWP water supply system. And finally, discharges of treated effluent, containing various constituents, will continue to affect the water quality of the San Gabriel River.

3) Descriptions of Methods Used to Estimate Physical Benefits

Since this project serves a DAC area, only a qualitative characterization of the physical benefits is needed As such, there is no requirement to quantify the physical benefits claimed. Since some information is available, Table 5 shows quantitative information related to the benefit of recycled water supply. The estimated irrigation water for the nine new sites is calculated using the formula provided in the *Model Landscape Ordinance, California Code of Regulations, Title 23, Division 2, Chapter 2.7, Section 492.4.*

The estimated water use formula that determines the Estimated Total Water Use (ETWU) in gallons per year is:

$$ETWU = (ET_o)\ (.62)\ [PF \times HA/IE + SLA]$$

Where: ET_o = effective evapotranspiration rate (in/yr)
PF = Plant Factor
HA = Hydrozone Area (square feet)
SLA = Special Landscape Areas (square feet)
IE = irrigation efficiency (0.71 minimum)

The methodology compares the ETWU per year to the maximum applied water allowance per year and utilizes the lesser of the two values. In this case the lesser of the two values for the nine sites was estimated as 453 AFY. The methodology is documented in a technical memorandum entitled, *Determination of Irrigation Water Demand for Facilities to be Served with Recycled (Title 22) Water in the Cities of Bell Gardens, Lynwood, and South Gate.*

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project proponents will need to first design the recycled water pipelines with all ancillary facilities to extend the existing recycled water system to schools, parks and other uses. Once the plans and specifications, as well as all environmental work are completed, the Project proponents will have to budget for, and construct the recycled water lines. Construction will consist of approximately 2,950 feet of 16-inch diameter pipe, 24,240 feet of 12-inch diameter pipe, 2,090 feet of 8-inch diameter pipe, valves, appurtenances, restoration, and all other work necessary for a complete installation.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no known physical adverse impacts of the Project implementation. Adverse physical effects from the Project are possible during the Construction Project. California Environmental Quality Act (CEQA) requirements will be addressed through the appropriate documentation.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The supply benefit and the Project as a whole will address long-term drought preparedness by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

(1) Promote water recycling

The estimated lifetime benefit of water supply recycled is approximately 27,180 AF over 60 years.

Secondary Physical Benefit: Water Quality Improved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Recycled water is consistently produced to Title 22 tertiary standards with nitrification at the Los Angeles County Sanitation District's San Jose Creek Water Reclamation Plant and the Los Coyotes Water Reclamation Plant. Both plants provide recycled water to various distribution systems, and they discharge unused recycled water to the adjacent San Gabriel River. Though the water quality produced from this treatment process is adequate for either non-potable uses or discharge to a receiving water body, there is still a loading of some constituents associated with recycled water (e.g, nitrogen, total dissolved solids, chloride, etc.). The Project will ultimately lead to the diversion of recycled water from river discharge to irrigation beneficial uses.

2) Estimates of Without Project Conditions

Without the Project, discharges of treated effluent, containing various constituents, will continue to the San Gabriel River.

3) Descriptions of Methods Used to Estimate Physical Benefits

Since the Project serves a DAC area, only a qualitative characterization of the physical benefits is needed. As such, there is no requirement to quantify the physical benefits claimed. Once the Project reaches the implementation stage, a Performance Monitoring Plan will be developed that incorporates measured values of various selected constituents in the recycled water discharges to the San Gabriel River. The Project will ultimately lead to the diversion of these discharges to irrigation beneficial uses.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project proponents will need to first design the recycled water pipelines with all ancillary facilities to extend existing recycled water system to schools, parks and other uses. Once the plans and specifications, as well as all environmental work are completed, the Project proponents will have to budget for, and construct the recycled water lines. Construction will consist of approximately 2,950 feet of 16-inch diameter pipe, 24,240 feet of 12-inch diameter pipe, 2,090 feet of 8-inch diameter pipe, valves, appurtenances, restoration, and all other work necessary for a complete installation.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no known physical adverse impacts of the Project implementation. Adverse physical effects from the Project are possible during the Construction Project. California Environmental Quality Act (CEQA) requirements will be addressed through the appropriate documentation.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The water quality benefit does not specifically address long-term drought preparedness; but the Project as a whole does by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

(1) Promote water recycling

The Project will increase urban water use efficiency measures through water recycling

Documentation of the Presence and Needs of a Disadvantaged Community (DAC)

The Project[2] will ultimately provide water-related benefits to an area that is entirely comprised of a DAC. The Project is comprised of planning, design and environmental activities for a series of recycled water pipeline extensions to parks and schools, in the Cities of South Gate, Bell Gardens, and Lynwood. The construction phase is expected to occur later, after funding is obtained for design and environmental documentation.

Direct Water-Related Need of the DACs: The Project will provide 453 AFY of safe, affordable water for drinking, bathing, sanitation, and cooking for DACs. This potable water would otherwise be used for irrigation purposes within the service area. By reducing the demand for potable water this project will moderate future increases in the cost of water which is a significant financial strain on the household budgets of the area's residents. Water affordability is a fundamental human right recognized by the state of California which requires that the issue of affordability be addressed in disadvantaged communities (CWC Section 100004.8).

The water supply for the three cities consists of both local and imported water sources. The local water supply is groundwater from the Central Basin, an adjudicated basin that is naturally and artificially replenished. Because the local groundwater supply is not sufficient to meet the region's demand, it is augmented with imported water provided by the CBMWD, a member agency of MWD. Population increase, arid climate, and the region's growing economy increase the need for a reliable and affordable water supply. The construction of these recycled water pipelines will extend the existing CBMWD regional recycled water system to high-volume non-potable water use sites within the three cities.

[2] For the purposes of this grant application, the term "Project" is used to refer to the design and environmental work that is seeking funding under the Proposition 84, Final Solicitation Round. The term "Construction Project" is used to refer to the construction phase, which will occur later and is not seeking funding under this round.

In addition, the proponent DAC cities have very limited open space for recreation and are densely populated (the range is 13,000-17,000 resident/square mile). The average ratio of open space area per 1,000 people is less than 2 acres, as compared to a nation-wide median of 8.9 acres of open space per 1,000 people (See National Recreation and Parks Association website). The existing parks and fields are heavily used for both passive and active recreational purposes. It is critical that this limited resource be maintained with reliable sources of irrigation water. By offsetting imported water supplies with a more reliable, locally-generated supply, the cities will be able to continue to provide attractive, functional open space to the DACs.

This Project will provide access to physical activity, and promote the health and wellbeing of community members. Availability of park space has been proven to support critical health issues in the communities they serve such as obesity, heart disease and stroke, Type 2 diabetes and metabolic syndrome, colon and breast cancer, endometrial cancer, and lung cancer.

DAC Coverage: DACs were identified using DWR's Disadvantaged Communities Mapping Tool. The DAC layer for the map was derived from the U.S. Census American Community Survey (ACS) 5-year data set (2009 – 2013), with a California median household income (MHI) of $61,094 and a calculated DAC threshold of $48,875 (80% of the State's MHI). The Project Area is considered to be the area enclosed within the city boundaries for South Gate, Lynwood, and Bell Gardens. This area encompasses 100 percent DACs.

Project Performance Monitoring Plan

This Project is a planning/design/environmental project that serves a DAC area, therefore there is no requirement to provide a Project Performance Monitoring Plan at this time.

Cost Effectiveness Analysis

This Project is a planning/design/environmental project that serves a DAC area, therefore there is no requirement to provide a Cost Effectiveness Analysis at this time.

Project 4: Paramount Boulevard Turf Replacement Project (Project)
Implementing Agency: City of Lakewood (City)
Project Description *(25 Words)* This Project will provide 165 acre-feet of water savings and improved water quality by replacing turf with drought-tolerant landscape, biofiltration swales, and drip irrigation system.

(Expanded) The City is implementing a Project to provide 165 acre-feet (AF) of water savings and improved water quality by replacing turf with water-efficient and drought-tolerant landscaping, installing a water efficient irrigation system, and installing biofiltration swales along several roadway medians. The 100,000 square feet (ft^2) of median islands on Paramount Boulevard from Del Amo Boulevard to Carson Street are currently landscaped with traditional mounded turf and Indian Laurel Fig trees. These median areas are irrigated with municipal potable water, however, many trees are exhibiting poor health partly due to the drought conditions and problematic irrigation systems. The Project's conversion of these medians to drought-tolerant landscape with inverted biofiltration swales will improve water use efficiency and water quality in the San Gabriel Watershed.

The major physical components of the Project includes the:

- Replacement of 70% (70,000 ft^2) of existing turf grass with drought-tolerant planting material;
- Replacement of 30% (30,000 ft^2) of existing turf grass with permeable non-planting landscape material, including cobblestone dry steam bed, natural boulders, decomposed granite, and pavers;
- Replacement of declining Indian Laurel Fig trees with drought-tolerant trees;
- Replacement of existing inefficient conventional overhead spray irrigation system with new 90% efficient point-source bubblers and subterranean drip irrigation system;
- Installation of curb cuts to allow approximately 1.86 AF of stormwater runoff from the adjacent roadways to channel into the medians and biofiltration swales to capture, filter and infiltrate runoff into the groundwater basin.

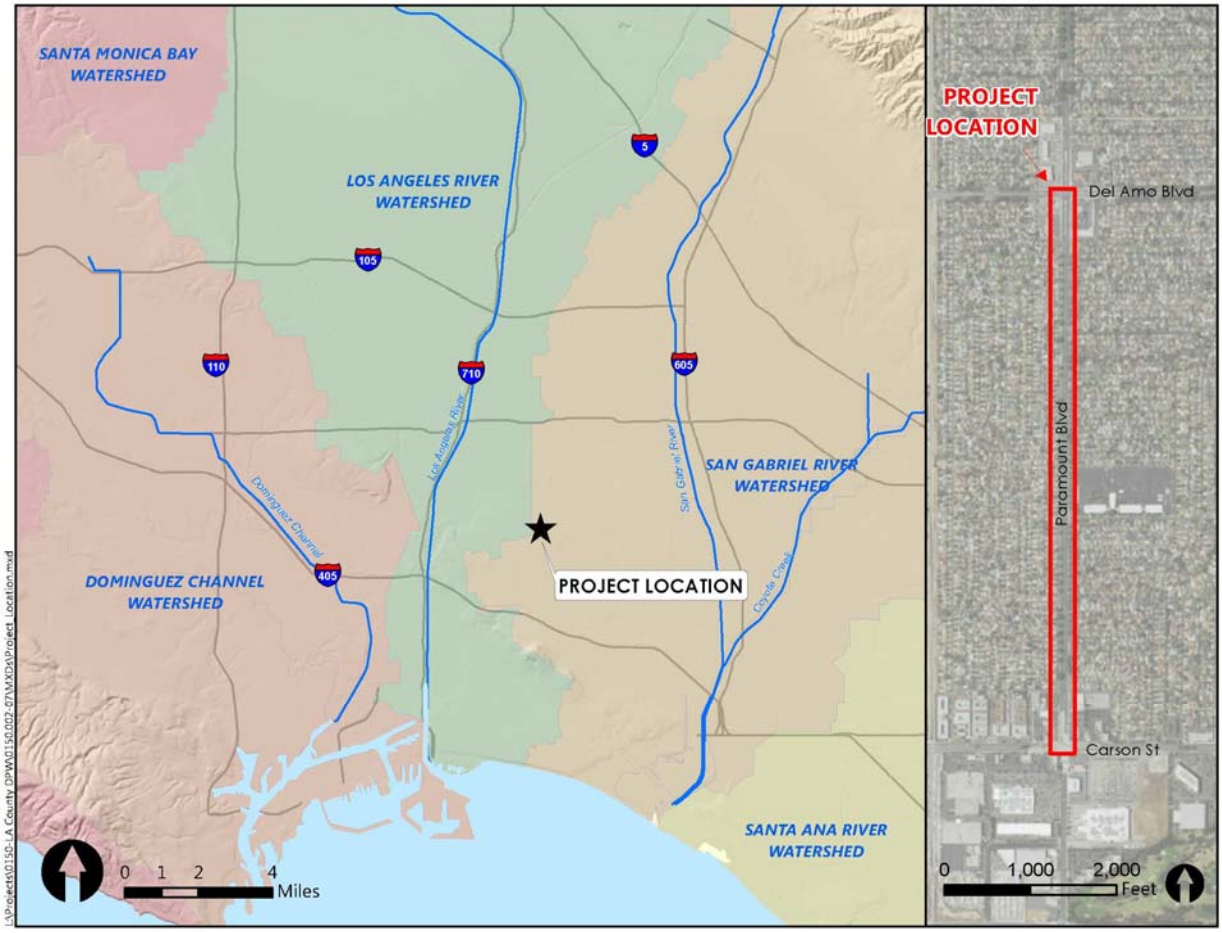
The new irrigation system will include weather and moisture level sensing technology that irrigates only when the root zone of the plants require moisture and includes a rain shut-off and high-flow breakage monitoring devices capable of deactivating the irrigation system during a rain event or pipe breakage.

The anticipated physical benefits of the Project include a primary benefit of 6.7 AF per year (AFY) of water supply savings by replacing high water demand turf with drought-tolerant landscape. The secondary benefit of the Project is improvement of water quality by reducing zinc concentrations in stormwater runoff by 0.10 milligrams per liter (mg/L) per year. This will be accomplished by diverting flows from the adjacent roadway into new biofiltration swales installed on the median as part of the Project. Any stormwater flows that are captured and infiltrated in the medians will transport contaminants away from local surface water bodies to instead be cleaned through biofiltration and infiltrate into the Central Groundwater Basin.

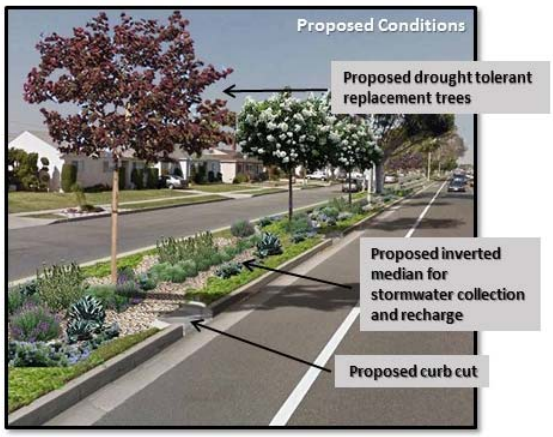
The Project addresses the current need of the GLAC Region by decreasing the Region's reliance on imported water and optimizing local water supplies through conservation measures and improved surface water quality by reducing contaminants in urban runoff. As noted in the GLAC IRWMP, the Region's access to imported supply is limited due to both environmental concerns in the Bay Delta as well as drought conditions. Water conservation is key to achieving an increase in water supply reliability and sustainability. It is also an effective method for reducing urban runoff and improving water quality for both Central Basin and the Region. Additionally, the Project will mitigate further climate change impacts to the Region by reducing the energy needed to meet demands in the service area and thereby reducing greenhouse gas emissions.

The intended outcome of the Project is a water supply savings of 6.7 AFY to reduce long-term demand and facilitate increased regional and local water supply reliability and surface water quality by reducing zinc concentrations by 0.10 mg/L per year.

Project Map



Project Facilities



Project Physical Benefits

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

- Primary Benefit – Water Supply Saved
- Secondary Benefit – Water Quality Improved through Zinc Reduction

Other benefits provided by the project are the potential increase in groundwater supply in the Central Groundwater Basin from the infiltration and recharge of urban runoff at the biofiltration swales at the Project site. The water supply value, however is not included as a quantified primary or secondary benefit.

Primary Benefit – Water Supply Saved

The table below provides information on the benefit of water supply saved each year by replacing turf in the project site medians with water-efficient and drought-tolerant landscape and replacing the existing inefficient spray irrigation system with a new 90% efficient point-source bubblers and subterranean drip irrigation system. Currently, the median uses approximately 9.4 AFY of potable water for irrigation. With the implementation of the Project, the average potable water use will be 2.7 AFY. Therefore, the new landscaping and irrigation systems will save a total of approximately 165 AF of potable water over the anticipated useful life of 25 years.

Table 5a – Annual Project Physical Benefits

Project Name: Paramount Boulevard Turf Replacement Project
Type of Benefit Claimed: Primary Benefit – Water Supply Saved
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 25 years for the components and 26 years for the program

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2015	0	0	0
2016	0	2.2	2.2
2017 – 2040	0	6.7	6.7
2041	0	2.2	2.2

Comments: The following documents were used to estimate this benefit:

- The anticipated useful life of the components is 25 years, however, taking into considering the first year of implementation, the Project will require 26 years to allow full benefits to be seen.
- *Estimated Total Water Use (Irrigation Water Demand) - Department of Water Resources http://water.ca.gov/wateruseefficiency/docs/WaterBudget101.xls:* The total area that will be converted to drought tolerant planting material (70,000 ft^2) was entered in order to get the estimated total water use for turf based on reference evapotranspiration from Appendix A in the Model Water Efficiency Landscape Ordinance (ETWU = (ET_o) x (0.62) x [(PF x HA/IE) + SLA])
- *Average Annual Rainfall in California http://average-rainfall.findthebest.com/d/d/California:* This reference was used in order to get the average precipitation for the City.
- Based on the Project's implementation schedule, water supply savings benefits will begin in August 2016 and then continue through July 2041 based upon a 25 year useful life.

Secondary Benefit – Water Quality Improved Through Zinc Reduction

The table below provides information regarding the anticipated benefit of water quality improvements through the reduction of zinc levels in urban runoff. This will be accomplished by routing roadway urban runoff flows to the newly constructed median biofiltration swales. Although several contaminant constituents will most likely also be reduced, zinc was selected as the representative constituent for heavy metals that typically occur in runoff from roadways. This Project will begin implementation in August 2016, and therefore, approximately 0.10 mg/L of zinc will be removed beginning in this year. The new landscaping and irrigation systems have an anticipated useful life of 25 years and so it is assumed that the reduction of zinc will begin in 2016 and end in 2041.

Table 5b – Annual Project Physical Benefits

Project Name: Paramount Boulevard Turf Replacement Project
Type of Benefit Claimed: Secondary Benefit – Water Quality Improvement through Zinc Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 25 years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2015	0	0	0
2016 – 2041	0	0.10	0.10

Comments:

- *Modeling Storm Water Mass Emissions to the Southern California Bight, Drew Ackerman and Kenneth Schiff, 2001* - This paper provides a breakdown of modeled pollutant values in the Southern California Bight watersheds by land use as included in Table 3. The arithmetic mean of commercial land use value for zinc was used.
- *Best Management Practices (BMPs) Bioretention (Rain Gardens), Environmental Protection Agency* – This study documented the amount of pollutant removed with bioretention areas on parking lot islands or in small pockets of residential land use. Table 2 in this study provided values for the pollutant removal effectiveness of two bioretention areas and assumed that bioretention swales behave similarly to biofiltration swales. http://water.epa.gov/polwaste/npdes/swbmp/Bioretention-Rain-Gardens.cfm

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Saved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Throughout the Western United States and especially within the State of California, drought is increasing in frequency, severity, and duration. Drought conditions and federal regulations have had a significant impact on the availability of imported surface water deliveries. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the State Water Project (SWP) supplies from the Bay Delta. The current drought has resulted in significant SWP cutbacks and limitations on the imported water supplies available for direct use as well as the imported supplies used to replenish the Central Groundwater Basin. As a result, groundwater levels have been declining to historic levels. Groundwater is a reliable local water supply in times of drought and recharging this supply is of great importance in order to keep groundwater levels at sustainable levels and to minimize pumping impacts on the structural integrity of the aquifer.

The existing City medians reflect a traditional philosophy of green grass roadway medians and large shade canopy street trees. In the past, the annual average rainfall was sufficient to augment a permanent irrigation system for a high water use landscape such as turf medians, and the need for water conservation efforts was not a priority. With the recent State of Emergency proclaimed by Governor Edmund G. Brown of California due to the fourth continuous year of drought in California, the traditional philosophy of green grass roadway landscaping no longer applies. The current priority is to decrease irrigation demands through the use of water-efficient drought-tolerant landscape and efficient irrigation systems.

The Project will provide near-term drought relief by decreasing existing demands during the ongoing drought as well as help to provide long-term supply reliability through conservation efforts. Additionally, the Project will be considered as a pilot project for other sites within the City as well as the surrounding cities with similar conditions. The Project is needed because, presently, the landscaped median islands use potable water for the conventional irrigation systems which has a 60%-70% efficiency rate, based on an irrigation efficiency study prepared by Texas A&M[3]. The installation of the new irrigation system is suitable for minimal use of water-utilizing point-source bubblers and subterranean drip irrigation that offers a 90% efficiency rate[4].

2) Estimates of Without Project Conditions

Without the Project, 6.7 AFY of potable water will continue to be used to irrigate the City medians to prevent the existing turf and trees from declining further.

3) Descriptions of Methods Used to Estimate Physical Benefits

To determine the annual volume of water currently used for irrigating the medians, the City reviewed recent utility bills and water meter tabulation records. To determine the estimated annual volume of water usage to irrigate the proposed drought-tolerant landscaping, the published Estimated Total Water Usage Spreadsheet from DWR was used. This spreadsheet utilized the evapotranspiration of the total landscape area to calculate the estimated total water usage (ETWU), using the following equation.

$$ETWU = (ET_o)x\ (0.62)x\ [\left(PF\ x\ \frac{HA}{IE}\right) + Special\ Landscape\ Area]$$

[3] Texas A&M: http://agrilifecdn.tamu.edu/urbantarranthorticulture/files/2012/03/Irrigation-Efficiency.pdf
[4] http://www.omirritech.com/news/efficiency-of-drip-irrigation-system.html

ETWU – Estimated total water used per year (gallons)
ET_o – Reference Evapotranspiration (in/year)
PF – Plant Factor
HA – Hydrozone area (High: 0.7 – 1.0, Medium: 0.4 – 0.6, Low: 0.1 – 0.3)
IE – Irrigation Efficiency (0.71)

$$ETWU = (47.37)x\ (0.62)x\ \left[\left(0.3\ x\ \frac{70{,}000}{0.71}\right) + 0\right] = 868{,}672\ gallons\ (or\ 2.7\ AF)$$

The general soil type within the City is either loam or sandy loam[5]. This type of soil has a permeability rate of approximately 30 minutes/inch (moderate)[6]. Depending on the soil type and texture of the proposed inverted biofiltration in the median, the infiltration rate for this area is between 0.3 to 1 inches per hour.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
No new policies or actions will be required to obtain this physical benefit. The new facilities and components that will be necessary for this benefit includes

- Replacement of 70% (70,000 ft^2) of existing turf grass within the Project area with drought-tolerant planting material;
- Replacement of 30% (30,000 ft^2) of existing turf grass with permeable non-planting landscape material, including cobblestone dry steam bed, natural boulders, decomposed granite, and pavers;
- Replacement of declining Indian Laurel Fig trees with drought tolerant trees;
- Replacement of existing inefficient conventional overhead spray irrigation system with a new 90% efficient point-source bubblers and subterranean drip irrigation system;

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
This Project will install several components to achieve the benefit; however, no adverse physical effects are anticipated. Typical traffic impacts from median work associated with this Project are expected, but a traffic control plan will be developed to mitigate for this effect.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The primary benefit of this Project will contribute to providing sustainability of local supplies, which will allow water to be conserved for future use. Specifically, from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(3) Promote water conservation
(4) Improve landscape irrigation efficiencies
(5) Achieve long-term reduction of water use

The Project promotes water conservation by replacing existing turf with water-efficient drought-tolerant landscape. Additionally, the Project improves the landscape irrigation efficiencies by replacing inefficient spray irrigation with a new 90% efficient point-source bubblers and subterranean drip irrigation system. Through the implementation of this Project, the City expects to see additional long-term reduction of water use since it will set the example in the effort of conserving water resources for future generations.

[5] http://ldas.gsfc.nasa.gov/nldas/images/NLDAS_STATSGO_soiltexture.gif
[6] http://www.dnrec.state.de.us/water2000/Sections/GroundWat/Library/Regs/EXHIBIT%20W.pdf

Secondary Physical Benefit: Water Quality Improved through Zinc Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The Los Angeles Regional Water Quality Control Board (RWQCB) has set a total maximum daily load for heavy metals such as zinc in the impaired Los Angeles River Watershed, which is within the GLAC Region. The Project is needed because Los Angeles RWQCB Resolution No. R15-004 establishes goals for the Region to reduce the amount of zinc being transported through the watershed a runoff from local streets and roads. The release of zinc and heavy metals in the watershed can accumulate over time and cause serious health effects on aquatic wildlife and on soil quality[7].

This Project can play a key role in helping to meet the surface water quality needs and objectives for the Region. Through the installation of curb cuts to route roadway runoff to biofiltration swales in the roadway median, both wet and dry weather urban runoff from local roadways transporting zinc to local water bodies in the GLAC Region will be reduced. The flows that are currently transporting these concentrations will instead be captured, treated naturally and infiltrated into the ground. For this Project, zinc was chosen as a representative constituent that would be reduced as a result of this Project. Other contaminant concentrations may also be reduced due to the capture and treatment of urban runoff from this Project.

2) Estimates of Without Project Conditions

Without this Project, the mitigation of pollutants from roadway stormwater runoff may be possible through other methods such as installation of filters at storm drain inlet locations. However, the results and benefits from mechanical filters may not be as effective and desirable as the implementation of this Project since mechanical filters at drain inlets require a higher level of maintenance to remain effective.

3) Descriptions of Methods Used to Estimate Physical Benefits

In order to estimate the amount of zinc concentration that could be reduced as a result of the Project, the *BMPs Biorentention Rain Gardens* study was used which listed pollutant removal estimates (in percentage) for BMPs of stormwater. In this study, nine pollutants were analyzed in two bioretention areas and their pollutant removal effectiveness were estimated; it was assumed that bioretention systems behave similarly to biofiltration swales. A second technical resource, *Modeling Storm Water Mass Emissions to the Southern California Bight*, by Drew Ackerman and Kenneth Schiff *(Ackerman, D. and Schiff, K., 2001)* provided a breakdown of modeled pollutant values by land use. These values were used to estimate the amount of pollutants that could be removed by the Project's proposed biofiltration swale system. Using Water Quality Analyses *(Table 3 of Ackerman and Schiff)* and the percentages provided by the EPA, pollutant removal was calculated for commercial land use, which is representative of the Project's area, as shown in Project Table A. Using zinc as the representative constituent, the Project can be assumed to remove approximately 0.10 mg/L from the system calculated as the average of 0.08 and 0.12.

[7] http://www.atsdr.cdc.gov/phs/phs.asp?id=300&tid=54

Table A: Commercial Land Use Pollutant Analysis

Constituent	Mean Before Project (mg/L)	Pollutant Removed from the System (mg/L)	Pollutant Left in the System (mg/L)
Ammonia	0.70	0.37 – 0.49	0.21 - 0.33
Cadmium	0.0004	0.0002 – 0.0003	0
Chlorpyrifos	0	0	0
Chromium	0.0075	0.004 – 0.005	0
Copper	0.0326	0.017 – 0.023	0.01 - 0.02
DDT	0	0	0
Diazinon	0	0	0
Lead	0.0122	0.007 – 0.009	0 - 0.01
Mercury	0	0	0
Nickel	0.0021	0.0011 – 0.0014	0
Nitrate	0.11	0.058 – 0.076	0.03 - 0.05
Phosphate	0.5500	0.291 – 0.381	0.17 - 0.26
Selenium	0.0004	0.0002	0
Suspended Solids	118.00	62.5 – 81.9	36.06 - 55.46
Zinc	**0.2330**	**0.08-0.12**	**0.007 – 0.05**

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

No new policies or actions will be required to obtain this physical benefit. The existing mounded turf medians along Paramount Boulevard will be re-designed and converted to inverted shape medians with biofiltration swales capable of capturing stormwater runoff from the adjacent roadway. In addition, curb cuts along the boulevard will be done to allow water to channel into the inverted medians. Installation of curb cuts will allow runoff from precipitation events to channel into the medians newly installed biofiltration swales that can capture stormwater runoff from the adjacent roadways. In order to quantify the exact volume of stormwater runoff infiltration, a soil test will be conducted to determine the site soil type and the percolation rate.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

One possible adverse physical effect this Project may have is the accumulation of heavy metals (above the government standards) that can remain in the inverted medians after a storm event. This will be mitigated by scheduling periodic maintenance (including soils testing) where the heavy metals are identified. The addition of soil amendment products will be used as necessary to mitigate the toxicity levels.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While not directly addressing long-term drought preparedness, the secondary benefit will help make significant contributions by improving the water quality in the runoff being transported in local waterways. The primary purpose of this Project is to contribute to the reduction of water use in the landscape as well as provide an agent for water quality management in an urban setting. As mentioned above, this Project will make significant contributions to providing sustainability of local supplies, which will allow more water to be conserved for future use. Specifically, from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(1) Promote water conservation
(2) Improve landscape irrigation efficiencies
(3) Achieve long-term reduction of water use

The Project promotes water conservation by replacing existing turf with water-efficient drought-tolerant landscape. Additionally, the Project improves the landscape irrigation efficiencies by replacing inefficient overhead spray irrigation with a new 90% efficient point-source bubblers and subterranean drip irrigation. Through the implementation of this Project, the City expects to see additional long-term reduction of water use since it will set the example in the effort of conserving water resources for future generations.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Paramount Boulevard Turf Replacement Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Water Supply Saved	6.7 AFY of water supply saved	Tools and Methods: Baseline water use for median irrigation will be updated and confirmed using monthly water use data from existing meter connections. These meters will be read on a monthly basis after project implementation and compared against the baseline use to determine overall water savings. Locations: Meters connected to the median irrigation system Data to be Collected: Water use data will be collected from the installed irrigation system. **The monitoring tools and targets are appropriate for the benefits claimed because** it will allow the City to examine the water use on the medians. **The monitoring data will be used to measure performance by** showing the volume of water being saved through the new irrigation system. The amount of water being used prior to construction will be compared to the results after the Project is implemented.
Water Quality Improvement	0.10 mg/L of zinc concentration reduced	Tools and Methods: Water quality samples will be collected at a storm inlet location along the Project site. Samples will be collected prior to construction, during the first period post-construction, and will continue annually. The soil on the planting areas and bioswales will also be tested for heavy metal accumulation to determine if mitigation will be needed. Locations: Stormwater runoff will be collected at a designated storm inlet location on the project site. Data to be Collected: Zinc concentrations of water quality samples collected at the monitoring location pre- and post-project. The monitoring tools and targets are appropriate for the benefits claimed because the testing will show changes in zinc concentrations pre- and post-Project. The monitoring data will be used to measure performance by comparing the sampling results taken prior to construction in order to estimate the zinc reduction in concentration. Clean stormwater runoff overflow will be drained to a nearby storm drain inlet, which is where the samples will be taken and sent to an environmental laboratory, such as Advanced Technology Laboratory, for heavy metals detection testing.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Paramount Boulevard Turf Replacement Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Saved • Secondary Benefit – Water Quality Improved through Zinc Reduction
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. Construction of a recycled water delivery system is an alternative that would achieve similar water supply saved benefits as the proposed Project. This alternative would carry recycled water from a nearby water reclamation plant to the Project site for landscape irrigation purposes. However, the estimated construction cost for this alternative is estimated at approximately $5 million dollars. Additional costs that would need to be considered for the implementation of this alternative would include the relocation of other unknown facilities to accommodate the recycled water line alignment. This cost was not included as the other facilities cannot be verified until construction. In addition, the recycled water alternative would not provide the additional water quality benefit through onsite zinc reduction, so technically there is no other Project alternative that could provide both the water supply saved and the water quality improved benefits as this Project. The proposed Project has a lower cost ($2,040,979) than the alternative and it provides the same water supply and water quality benefits, therefore it is the least cost alternative.
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: Based on the cost analysis of previous construction projects which involved the installation of reclaimed water distribution pipelines and related facilities, the average cost for one mile of pipe is about $800,000. Currently, reclaimed water supply pipes and facilities are not existing near the proposed Project site. The nearest water reclamation plant is Los Coyotes, which is owned and operated by Central Basin Municipal Water District. The distance from this plant to the Project site is approximately six miles, following the major arterial streets.	

Project 5: Las Virgenes Creek Restoration Project – Phase II (Project)
Implementing Agency: City of Calabasas (City)

Project Description

(25 Word) The Project will restore 27 acres of habitat along Las Virgenes Creek. The restoration includes, removing concrete liners, removing invasive Crayfish, and replanting native vegetation.

(Expanded) The Project will restore 27 acres of riparian and riverine habitat along a 1.5 mile reach of the Las Virgenes Creek as part of Phase II of the Las Virgenes Creek Restoration Project and will remove invasive crayfish for species protection. Restoring this section will expand on the previous success of Phase I of the Las Virgenes Creek Restoration Project, which was completed in 2008. This Project is led by the City of Calabasas (City) in partnership with the Mountains Restoration Trust (MRT). MRT will be completing the crayfish removal component of the Project. The Project site begins at Agoura Road, continues south, and ends at the Lost Hills Road culvert across from Juan Bautista De Anza Park. The restoration will include removal of non-native plant species, removal of concrete liners and other flood flow obstructions, re-engineering of channels, enhancement of fish passage with weirs and pools, planting native vegetation and removal of the non-native Red Swamp Crayfish (Crayfish). As part of the restoration effort, recreational trails will be constructed that will connect with regional trail systems, and informational signage will be installed.

The major physical components of the Project include removal of invasive species from approximately 27 acres in and along the banks of Las Virgenes Creek and from approximately 1.5 miles of Las Virgenes Creek itself. All invasive plant species within the Project area are of concern; but greatest among them are Eucalyptus and pepper trees, which consume a large volume of water and occupy a large geographical footprint. Palms and pampas grass are also concerns because they create biomass debris and contribute to a less diverse understory. Once the site is cleared, the Project will re-establish native species, including approximately 500 willow stakes, and an additional 500 native plants such as grasses, shrubs, and other trees. To improve bank stability and protect riverine species, approximately 400 feet of concrete liner will be removed from the channel, the creek bed will be terraced with weirs and pools, and invasive Crayfish will be removed. Additional elements include the development of 1.2 miles of public access trails and installation of 10 recycling receptacles.

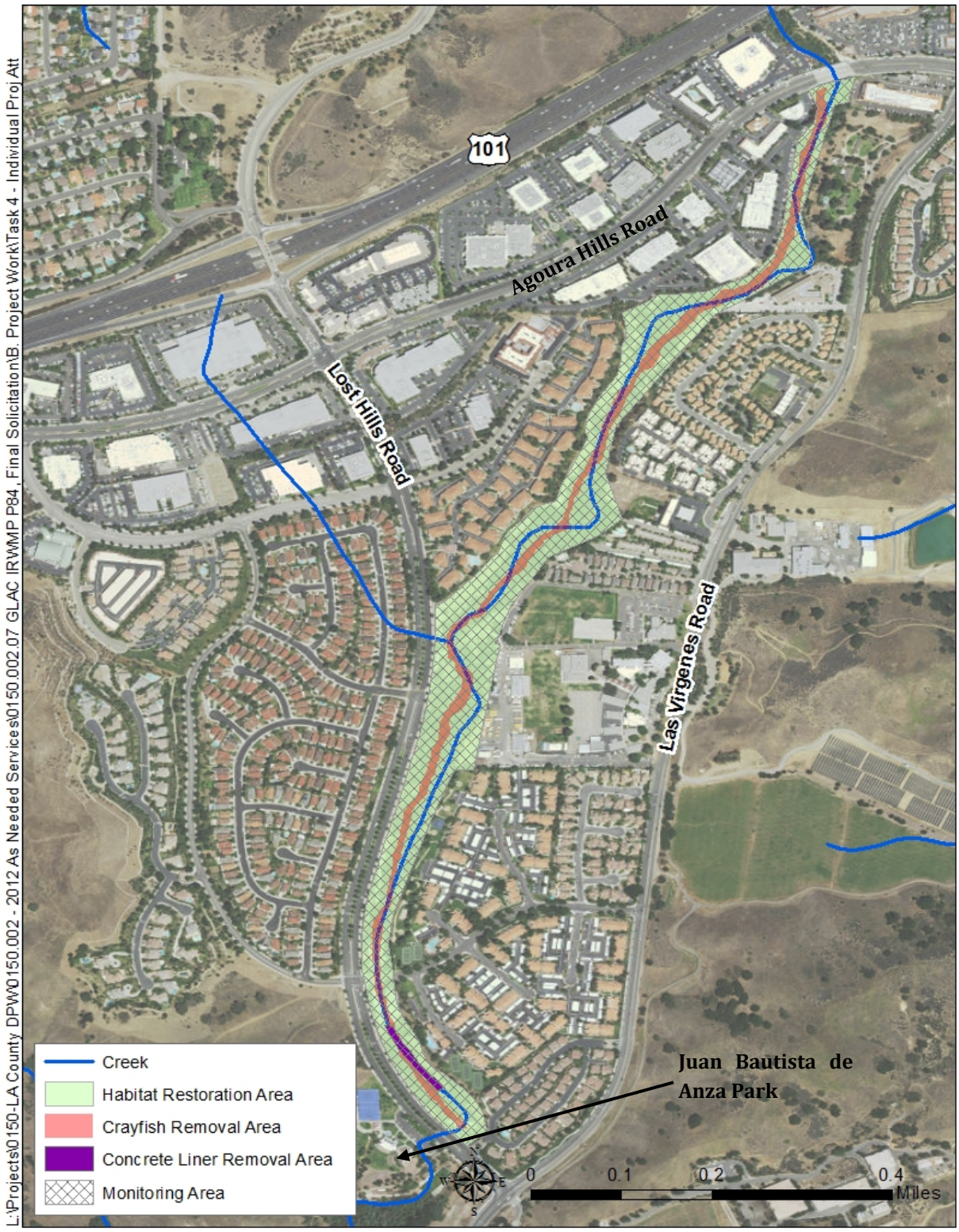
The anticipated physical benefits of the Project include the primary benefit of restoring 27 acres of riparian and riverine habitat along a 1.5 mile reach of Las Virgenes Creek. Restoring this section will expand on the previous success of Phase I of the Las Virgenes Creek Restoration Project. The secondary benefit of the Project will be the protection of seven native species, including the Baja California Treefrog; California Newt[8]; California Treefrog; Dragonfly larvae; Arroyo Chub[1]; and the California Red-legged Frog[1]; and the Southern Steelhead trout[1].

The Project addresses a current need of the region by supporting the following objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP): protect, restore, and enhance natural processes and habitats (Enhance Habitat), increase watershed friendly recreational space for all communities (Enhance Open Space and Recreation), reduce flood risk in flood prone areas (Reduce Flood Risk), and comply with water quality regulations by improving the quality of stormwater (Improve Surface Water Quality).

The intended outcome of the Project is to restore the Project area to its natural state by removing invasive non-native species (vegetation and Crayfish), planting native vegetation, removing concrete liners, and creating a terraced creek bed with weirs and pools for fish passage.

[8] Listed as either threatened, endangered, or species of special concern.

Project Map


101
Agoura Hills Road
Lost Hills Road
Las Virgenes Road
Juan Bautista de Anza Park
Creek
Habitat Restoration Area
Crayfish Removal Area
Concrete Liner Removal Area
Monitoring Area
0
0.1
0.2
0.4
Miles
L:\Projects\0150-LA County DPW\0150.002 - 2012 As Needed Services\0150.002.07 GLAC IRWMP P84_Final Solicitation\B. Project Work\Task 4 - Individual Proj Att

Project Physical Benefits

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

- Primary Benefit – Habitat Restored
- Secondary Benefit – Species Protected

Habitat restored and species protection are the primary and secondary benefits that will be achieved through Project implementation. When complete, the Project will restore 27 acres of habitat by replacing invasive plant species with native plant species; and it will protect seven native animal species by removing the invasive Crayfish. By restoring the Creek bed and banks, the Project will help attenuate and retain periodic flood flows, contributing to groundwater recharge and reduction of contaminants mobilized by flood flows. Additional benefits include improved water quality from reducing sedimentation in the Creek caused by channelization and enhanced open space and recreation opportunities provided by creating new public trails and corridors.

The following tables list and quantify the primary and secondary benefits of the Las Virgenes Creek Restoration Project – Phase II.

Primary Benefit – Habitat Restored

The table below provides information on the benefit of habitat restored. The Project Schedule dictates that this benefit begins in 2017 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Las Virgenes Creek Restoration Project – Phase II
Type of Benefit Claimed: Habitat Restored
Units of the Benefit Claimed: acres
Anticipated Useful Life of Project (years): 100 (see comment box below)

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0	0
2016	0	0	0
2017	0	27	27
2018 – 2116	0	27	27

Comments:

- The amount of habitat restored is calculated as the sum of the acres of land between Agoura Road and Lost Hills that is owned by the City of Calabasas, Steeplechase HOA, and Calabasas Tech Center. It is assumed that all of the area would be cleared of invasive plant species.
- It is reasonable that the restored habitat benefit of this Project would last, in effect, forever. However, for the purposes of this application, it was assumed benefits would last for 100 years.

Secondary Benefit – Species Protected

The table below provides information regarding the species protected benefit. The Project Schedule dictates that this benefit begins in 2017 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Las Virgenes Creek Restoration Project – Phase II
Type of Benefit Claimed: Species Protection
Units of the Benefit Claimed: number of species
Anticipated Useful Life of Project (years): 100 (see comment box below)

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015-2018	0	0	0
2019-2022	0	6	6
2022-2118	0	7	7

Comments:

- Malibu Creek Watershed: Ecosystem on the Brink. A Scientific Roadmap for Protecting a Critical Natural Resource. Heal the Bay. Pg 121.
- Relationship between Crayfish and California Newt eggs: Gamradt, Kats, and Anzalone. "Aggression by Non-Native Crayfish Deters Breeding in California Newts" June 1997. pg. 795.
- "Before" and "after" Crayfish removal numbers showing the correlation between reduction of Crayfish numbers and increase in native species numbers: Santa Monica Bay Restoration Project. "Trancas Creek Amphibian Restoration Final Report" pg. 4.
- Initial stream survey of protected species has not yet been completed for the Project site, but the base numbers in the table have been extrapolated from survey work done in nearby sections of the Creek.
- It is assumed that the species protection benefit of this Project would last, in effect, forever. However, for the purposes of this application, it was assumed benefits would last for 100 years.
- The Rindge Dam is located downstream of the Project location and Steelhead trout cannot pass above the Dam. Thus, it is important to note that the species protection benefit for Steelhead trout depends on the removal of Rindge Dam. Rindge Dam is currently being processed for removal by the California Department of Parks and Recreation and the U.S. Army Corps of Engineers. The Rindge Dam removal is in the Environmental Impact Report development stage. It is anticipated that the dam removal will take seven years to be completed. For this reason, species protection benefits for Steelhead trout are shown to begin in 2023.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Habitat Restored

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Historically, this reach of Las Virgenes Creek was a pristine wildlife corridor that allowed for the movement of native species between the Santa Susana Mountains and the Santa Monica Mountains. Due to limited obstructions within the Creek, Steelhead trout could migrate far upstream to spawn. The expansive riparian habitat was home to dozens of bird species, including both migratory and special status species, as well as riverine species such as the California Tree Frog and California Newt.

Many of the existing natural habitats in the Region have been adversely affected by land use practices and the introduction of invasive and nonnative species, which impact the local watersheds and water resources. There is a need for preservation and restoration of these areas to enhance their value as native habitat and provide functional linkages between the remaining areas of native habitat to preserve long-term species diversity. Las Virgenes Creek in particular has been significantly altered from its natural state through realignment and straightening of the natural channel geometry and the installation of concrete liners. Failed and broken concrete liners are impeding fishery flow, causing sedimentation and creating flood hazards. This is most notable downstream of Meadow Creek Lane where the Project will take place.

In general, the fixed banks and high velocity flows generated by the channelized concrete sections have contributed to bank erosion and instability, along with sedimentation, nutrient loading from geomorphic sources, and the deposition of organic material within enclosed flood plains contributing to even greater flood events. In one area, a concrete liner has diverted flow against the opposite bank, resulting in significant bank erosion and creating a barrier to upstream fish movement. Additionally, invasive species have moved into the project area, edging out native plant and animal species. The invasive Red Swamp Crayfish was likely first introduced to creeks in the area by fishermen who used them as fishing bait. The Crayfish, and other invasive species, outcompete native species for limited resources, including water, food, sunlight, and breeding grounds. Invasive plant species within the area do not provide the same soil stabilization as native plant species. Invasive plants also increase wildfire risk, as they tend to have more biomass, thus creating more fuel for these fires.

The Project would restore native plants to the area, which, when established within the root zone, will stabilize the soils. Stabilized soils are more secure and are less likely to erode, and they will also decrease the likelihood of catastrophic bank failure associated with a major flood event. Habitat restoration, along with invasive species removal, will reduce fuel loads for fires. Restoring native plants will increase the amount of habitat available for native wildlife species, including local and migratory birds. The Project would also restore riverine habitat for Steelhead trout and other aquatic species by removing obstructions and broken concrete pieces from the channel bed.

2) Estimates of Without Project Conditions
Without the Project, the proposed Project area would not be restored to a more natural state. Currently, the Creek banks are not stable and are subject to erosion due to invasive, non-native plant species. Invasive plant species within the area do not provide the same soil stabilization as native plant species. Without the Project, invasive species would continue to outcompete the native species, and the banks would continue to destabilize and contribute to Creek turbidity. The concrete liners that are currently in the Creek would remain and continue to block migration of Steelhead salmon. Restoration efforts along the Las Virgenes Creek would be limited to a one-day, annual creek clean up event attended by approximately 30 individuals. While this clean up does remove invasive species and plant

native species, there would be little long-term impact on Creek habitat and bank stability. No other projects are planned to restore the reach, so the habitat would not be restored.

3) Descriptions of Methods Used to Estimate Physical Benefits
The physical benefit of habitat restoration was quantified in acres of restored habitat. To calculate the total area of the Project site, GovClarity GIS was used to calculate the perimeter and area of the Creek between Agoura Road and the Lost Hills Road culvert that is owned by the City of Calabasas, Steeplechase HOA, and Calabasas Tech Center (See Project Map). The total area that will undergo habitat restoration is 27 acres.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
The physical benefit of habitat restored will be realized once the invasive plant species are removed and replaced with native species, concrete liners are removed, Creek banks are stabilized, Creek beds terraced and pools constructed for fish passage, and Crayfish removed. The actions required include identifying the invasive species within the Project area, removing the identified invasive species, planting native seeds, and disposing of the invasive species.

The following permits will need to be obtained to complete the Project: a California Department of Fish and Wildlife (CDFW) permit for in-stream work, a 401 Water Quality Certification, and a Section 1600 Streambed Alteration Agreement. In addition, the following permits may be required: a Flood Control Permit, a Section 404 National Wetlands Fill Permit, and a Section 10 Consultation with the U.S. Fish and Wildlife Service. The Section 404 Permit would only be required if wetlands are affected and the Section 10 Consultation would only be required if federally protected species are potentially impacted. A Storm Water Pollution Prevention Plan (SWPPP) will be produced as part of the requirements for the Regional Water Quality Control Board permit.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
It is likely that the re-vegetation and creek restoration components of the Project will take place during the migratory bird season, which could disturb native, migratory sensitive, or special status bird species. This potential adverse effect is being mitigated by obtaining a permit from the United States Fish and Wildlife Service and the CDFW that will enable the City of Calabasas to prepare the project site, prior to migratory bird season, in ways that would lessen potential impacts to native or migratory nesting birds. These activities may include netting potential nesting areas, including bridges, and removing dead tree stands to prevent nesting during restoration activities. This permit would be secured by December 2015, so that preparing the site could begin by early 2016. By preparing the project site prior to migratory bird season, any potential adverse impacts to sensitive or special status bird species are mitigated.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The habitat restoration benefit of the Project does not directly address long-term drought preparedness. However, indirectly it does. All invasive plant species within the Project area are of concern; but greatest among them are Eucalyptus and pepper trees, which consume a large volume of water and occupy a large geographical footprint. Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines lists "improve landscape irrigation efficiencies" as one way to contribute to sustainable water supply and reliability during water shortages. To the extent that invasive plant species are replaced by native plant species that consume less water, this represents an indirect improvement in irrigation efficiency.

Secondary Physical Benefit: Species Protection

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Historically, Las Virgenes Creek, as a tributary of Malibu Creek, acted as one of the spawning reaches for Steelhead

trout in the North Santa Monica Bay region. The large unfettered corridors of riparian forest provided feeding and/or breeding grounds for hundreds of bird species. The Creek was home to a number of amphibian and reptile species and larger mammals relied on the habitat for food and water.

Las Virgenes Creek has been significantly altered from this natural state, including realignment and straightening of the natural channel geometry to a trapezoidal concrete-lined channel and the introduction of the Crayfish. The channel is not structurally stable and failing in several areas, notably downstream of Meadow Creek Lane. In general, the fixed banks and high flows generated by the channelized concrete sections have contributed to bank erosion and instability, along with sedimentation, nutrient loading from geomorphic sources, and the deposition of organic material within enclosed flood plains contributing to even greater flood events. In one area, a concrete liner has diverted flow against the opposite bank, resulting in significant bank erosion and creating a barrier to upstream fish movement. Steelhead trout, now designated as an endangered species in the Malibu Creek Watershed, struggle to find shelter, food, and breeding grounds in this changed landscape.

The landscape and ecosystem were further changed by the introduction of the Crayfish, likely by fishermen who used them as fishing bait. This voracious, non-native predator feeds on aquatic plants and macro-invertebrates, and amphibian and fish eggs, thus disrupting the entire aquatic and riparian ecosystem. Because the Crayfish, as a non-native species, has no natural predator within the Malibu Creek Watershed, it has flourished and overtaken many of the region's native species.

This Project will restore a 1.5 mile-long reach of the Creek, which will help return the Creek to a more natural condition. This will be achieved by removing concrete liners, restoring riverine habitat, and removing the invasive Crayfish. In completing these actions, native animal species, including the Baja California Treefrog (*Pseudacris hypochondriaca*); California Newt (*Taricha torosa*); California Treefrog (*Pseudacris cadaverina*); Dragonfly larvae (*order Odonata*); Arroyo Chub (*Gila orcuttii*); California Red-legged Frog (*Rana darytonii*); and the Southern Steelhead trout (*Oncorhynchus mykiss*) will begin to reestablish within the Creek and contribute to a more vibrant and healthy riparian corridor.

2) Estimates of Without Project Conditions

Without this Project, the unstable banks surrounding the fish passage area would not be immediately secured and major obstructions to steelhead trout movement would remain. Without this Project the current riparian habitat footprint would remain the same. Additionally, given the predatory nature of the Crayfish, native species will continue to be preyed upon and will be unable to reestablish within the area. Crayfish will continue to proliferate without an intensive, systematic removal effort. Without support for this Project, the area will continue to suffer reduced numbers of native aquatic species and macro-invertebrates. Other funding would need to be secured to restore native species and reduce the possibility of major bank failure during a large storm and flooding event, which could potentially destroy sections of viable creek habitat. Without this Project, the seven native wildlife species, including the Baja California Treefrog (*Pseudacris hypochondriaca*); California Newt (*Taricha torosa*); California Treefrog (*Pseudacris cadaverina*); Dragonfly larvae (*order Odonata*); Arroyo Chub (*Gila orcuttii*); California Red-legged Frog (*Rana darytonii*); and the Southern Steelhead trout (*Oncorhynchus mykiss*) would not be protected.

3) Descriptions of Methods Used to Estimate Physical Benefits

Each of the seven species that this Project will protect is native to the Malibu Creek Watershed, of which Las Virgenes Creek is a part. A Heal the Bay report on the state of the Malibu Creek Watershed titled *Malibu Creek Watershed Ecosystem on the Brink*, names each of these species as native to the area and studies show a correlation between the

decrease in Crayfish numbers and the increase in native macro-invertebrates, amphibians and fish[9]. In removing the Crayfish, mortality among the native species will decrease. By stabilizing the banks and removing failed concrete liners, Steelhead trout and other aquatic species are protected from obstructions and turbidity.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The physical benefits of species protection will be realized once the creek restoration, including concrete liner removal, Creek bank stabilization, construction of terraced Creek beds and pools for fish passage, and Crayfish removal is complete. A Streambed Alteration Agreement from CDFW has already been obtained for the Crayfish removal component of the Project. Physical benefits are realized after Crayfish traps are purchased, installed, and cleared of caught Crayfish. The systematic removal of Crayfish will be done from upstream down, using existing and temporary manmade in-stream barriers[10]. MRT will be responsible for the Crayfish removal component, and the City of Calabasas will be responsible for the vegetation and creek restoration components.

The following permits will need to be obtained to complete the Project: a CDFW permit for in-stream work, a 401 Water Quality Certification, and a Section 1600 Streambed Alteration Agreement. In addition, the following permits may be required: a Flood Control Permit, a Section 404 National Wetlands Fill Permit, and a Section 10 Consultation with the U.S. Fish and Wildlife Service.

The species protection benefit for Steelhead trout depends on the removal of Rindge Dam downstream from the Project location. Rindge Dam is currently being processed for removal by the California Department of Parks and Recreation and the U.S. Army Corps of Engineers. The Rindge Dam removal is in the Environmental Impact Report development stage and removal of the dam is anticipated to take seven years to complete.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

It is likely that components of the Project will take place during the migratory bird season, which could disturb native or migratory sensitive or special status bird species. This potential adverse effect is being mitigated by obtaining a permit from the United States Fish and Wildlife Service and the CDFW that will enable the City of Calabasas to prepare the project site, prior to migratory bird season, in ways that would lessen potential impacts to native or migratory nesting birds. These activities may include netting potential nesting areas, including bridges, and removing dead tree stands to prevent nesting during restoration activities. This permit would be secured by December 2015, so that preparing the site could begin by early 2016. By preparing the project site prior to migratory bird season, any potential adverse impacts to sensitive or special status bird species are mitigated.

A potential adverse physical effect of the Project would be the foot traffic of the Crayfish trappers as they access the Creek sections. However, due to the proximity of homes in the area, there are numerous social trails to the Creek which will allow the Crayfish trappers to reach the Creek without causing any added disturbance to the native vegetation. Crayfish trappers will be working in the creek. Species other than Crayfish could be caught in the Crayfish traps, which would be mitigated by purchasing traps that are designed specifically for capturing Crayfish. If any other species are inadvertently caught in the traps, they would be removed and set free. All trapped Crayfish are counted, measured, and sexed to add to scientific data. Crayfish that are removed are frozen and then given to California Wildlife Center, a wildlife rehabilitation center in Calabasas, to be fed to raccoons.

[9] Global Invasive Species Database: Impact Information for *Procambarus clarkii*. Accessed 6 July 2015. http://issg.org/database/species/impact_info.asp?si=608&fr=1&sts=&lang=EN.

[10] Kerby, Riley, Kats, and Wilson. 1 August 2005. "Barriers and flow as limiting factors in the spread of an invasive crayfish (*Procambarus clarkii*) in southern California streams. Pgs. 403, 405-408.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The species protection benefit of the Project does not actively address long-term drought preparedness. However, indirectly the habitat restoration work does. All invasive plant species within the Project area are of concern; but greatest among them are Eucalyptus and pepper trees, which consume a large volume of water and occupy a large geographical footprint. Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines lists "improve landscape irrigation efficiencies" as one way to contribute to sustainable water supply and reliability during water shortages. To the extent that invasive plant species are replaced by native plant species that consume less water, this represents an indirect improvement in irrigation efficiency.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC, nor does it provide direct water-related benefits to a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Las Virgenes Creek Restoration Project – Phase II		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Habitat Restored	27 acres restored habitat	Tools and Methods: Aerial mapping and on-ground surveys will be conducted annually. Locations: Entire Project area. Data to be Collected: Acreage of habitat restored and growth of planted native species. **The monitoring tools and targets are appropriate for the benefit claimed because** the purpose of the mapping and on-ground surveys will be to determine the acreage of restored habitat. **The monitoring data will be used to measure performance by** determining the extent to which the Project restored acres of habitat.
Secondary Benefit – Species Protection	7 species protected	Tools and Methods: On-ground biological surveys will be conducted annually. Locations: Entire project area. Data to be Collected: Numbers of species and density of each of the 7 species. Numbers of Crayfish. **The monitoring tools and targets are appropriate for the benefit claimed because** the purpose of the on-ground biological surveys will be to determine the number of species and density of each species, as well as the overall density of Crayfish on the site. Research shows that by decreasing the number of Crayfish within a habitat, native species are protected and return to the area[11]. **The monitoring data will be used to measure performance by** determining the extent to which the Project protected species have increased and the extent to which Crayfish have been removed from the Project area. Numbers of species and density of each of the 7 species after Project implementation will be compared to pre-Project conditions. Crayfish numbers pre-Project and Crayfish numbers post-Project will be compared to determine overall Crayfish reduction.

[11] Santa Monica Bay Restoration Project. "Trancas Creek Amphibian Restoration Final Report" pg. 4.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Las Virgenes Creek Restoration Project – Phase II	
Question 1	Types of benefits provided as shown in Table 5 • Primary Benefit – Habitat restored • Secondary Benefit – Species protection
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 have been considered.
	If no, why? There are no other alternatives that achieve the same habitat restored benefit, while simultaneously achieving a species protection benefit. Additionally, Phase I of the Las Virgenes Creek Restoration Project has proved successful in restoring habitat.
	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: Not Applicable	

Calleguas – Las Virgenes Municipal Water Districts Interconnection Project

Project 6: Calleguas-Las Virgenes Municipal Water Districts Interconnection Project (Project)
Implementing Agency: Las Virgenes Municipal Water District (LVMWD)

Project Description

(25 Word) This Project constructs a potable intertie pipeline for up to 2,170 AFY of increased water supply availability and a recycled water pipeline serving 13 AFY.

(Expanded) The Las Virgenes Municipal Water District (LVMWD) is partnering with the Calleguas Municipal Water District (CMWD/Calleguas) to construct an intertie pipeline between the two respective potable water service areas, located in west Los Angeles County and east Ventura County. The new intertie will allow the exchange of water of up to approximately 870 acre-feet per year (AFY) and will also enable LVMWD to fill the Las Virgenes Reservoir by an additional 1,300 AF each year. In addition, the Project includes construction of a recycled water pipeline extension along the same alignment as the intertie component of the Project to serve Landino Park with 13 AFY for irrigation. The Project will provide potable supply reliability benefits to both the Greater Los Angeles County (GLAC) IRWM Region and the Watersheds Coalition of Ventura County (WCVC) IRWM Region through the intertie, but this application is only seeking funding for the GLAC portion (i.e., the LVMWD portion).

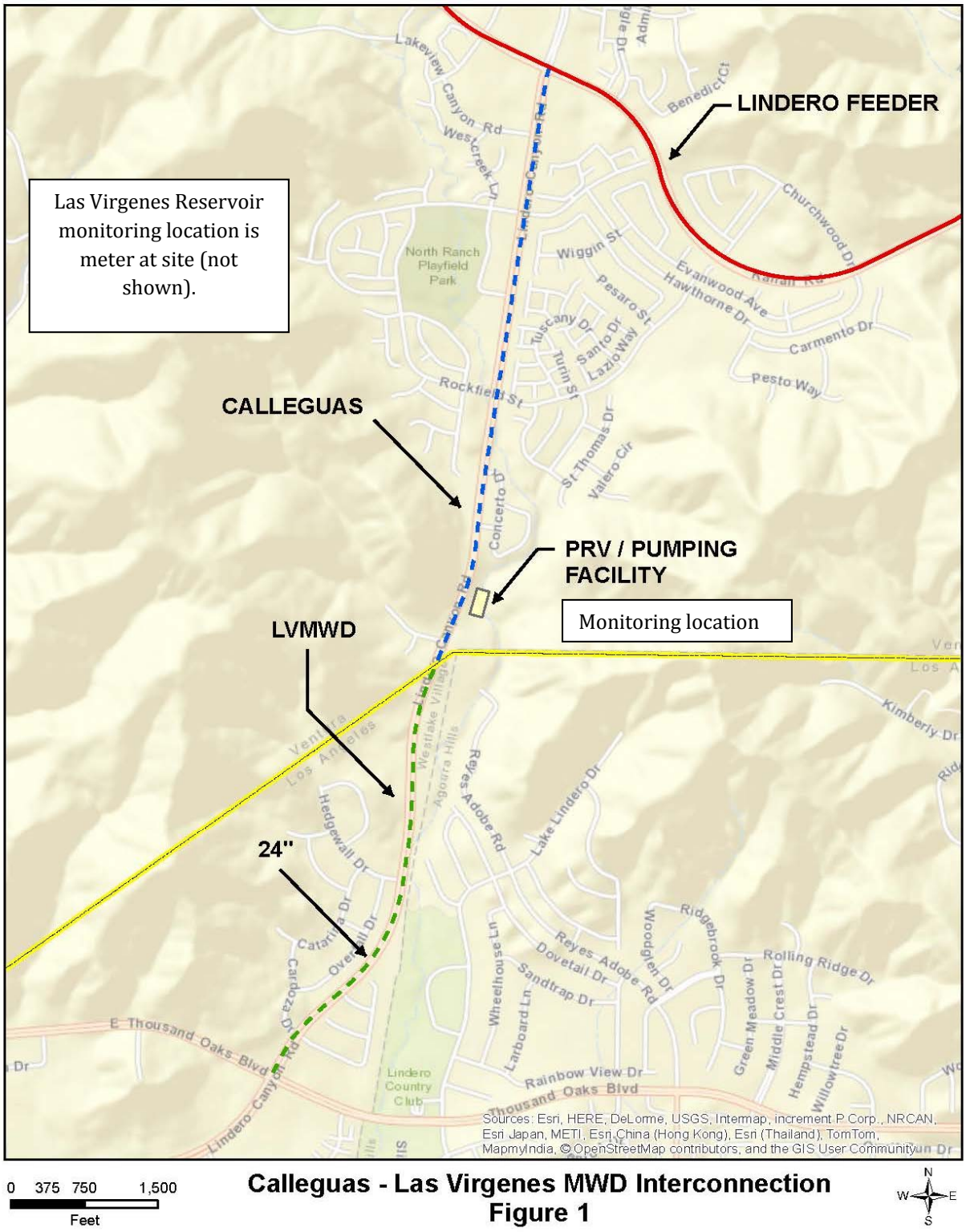
The major physical components of the Project include the installation of 5,600 linear feet of 24-inch pipe in the LVMWD service area from Thousand Oaks Boulevard heading north on Lindero Canyon Road to the county line, a pressure reducing valve (PRV), pipe connections, and other appurtenances. The PRV will be co-located with a pump station in a single building on the Ventura County side. The cost of preliminary design, environmental review, and construction of 5,600 linear feet of the 24-inch pipeline within the LVMWD service area and the PRV will be funded by LVMWD as part of this grant application. CMWD, on the Ventura County side, will fund the remaining portion of the intertie pipeline, including the pump station; and this portion is not seeking funding in this application. The CMWD costs are, however, included as matching funds. The recycled water extension will consist of a 6-inch pipeline that follows the same alignment as the potable water intertie.

The anticipated physical benefits of the Project include the primary benefit of increased water supply availability and recycled providing increased water supplies consisting of three types: (1) 10 cubic feet per second (cfs) of backup supply (for both planned and unplanned outages), equivalent to 595 AFY, on average, when typical planned outages occur (and more in years when unplanned outages occur); (2) 13 AFY of recycled water; and (3) 1,300 AFY of additional operational storage capacity in Las Virgenes Reservoir that can be used to supply the western service area. A secondary benefit is reduction of energy use and greenhouse gas (GHG) emissions by offsetting energy-intensive imported water with locally-produced recycled water.

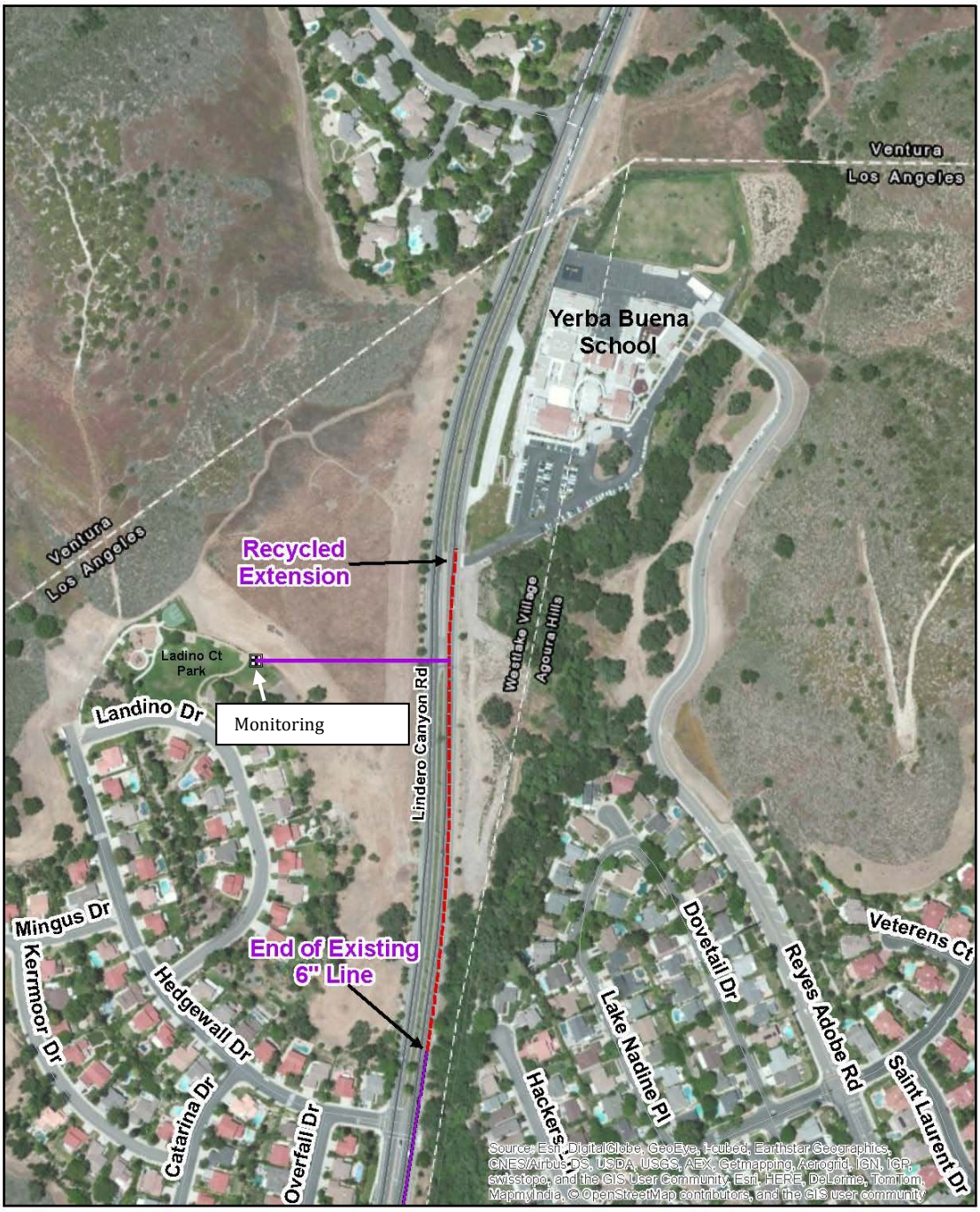
The Project addresses a current need of the region by supporting the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). First, the Project optimizes local water resources by increasing reliability during imported water outages, optimizing the use of the Las Virgenes Reservoir, and increasing the use of recycled water (Improve Water Supply). The Project will also help to adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to provide access to emergency supplies of potable water during shutdowns of the imported water supply main, facilitate winter refill of Las Virgenes Reservoir, increase the use of locally-produced recycled water, and reduce energy usage and greenhouse gas emissions.

Project Map



Calleguas - Las Virgenes MWD Interconnection
Figure 1



LVMWD - Recycled Water Extension
Figure 2

Project Physical Benefits

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

- Primary Benefit – Water Supply Availability Increased
- Secondary Benefit – Energy Saved and GHG Avoided

The primary benefit is water supply availability increased, and this benefit is composed of three types of supply: (1) backup supply of 595 AFY for planned and unplanned outages (available through the intertie on a periodic basis); (2) recycled water supply of 13 AFY (available year round on a continuous basis); and (3) operational storage reliability (consists of greater flexibility to use an additional 1,300 AFY of water stored in Las Virgenes Reservoir in the western portion or the service area). The Project Schedule dictates that these benefits begin in 2017 as the Project will complete construction at the end of 2016; the benefits will continue for the presumed 50-year lifespan of the Project. The benefit for the "unplanned" backup supply is presumed to occur three times during the Project lifespan, or about once every 15-20 years.

Primary Benefit – Water Supply Availability Increased

The quantities and timing of these supplies are shown below as a combined benefit in Table 5, and the explanation for how each type of supply was quantified is provided in the Technical Analysis (below).

Table 5 – Annual Project Physical Benefits
Project Name: : Calleguas-Las Virgenes Municipal Water Districts Interconnection Project
Type of Benefit Claimed: : Water Supply Availability Increased (includes backup supply, recycled water, and operational storage reliability)
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	0 [design] 0 0 0	0 0 0 0
2016	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	0 [construction] 0 0 0	0 0 0 0
2017	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 0 13 1,300	595 0 13 1,300
2018-2024 (yrs. w/o unplanned outages)	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 0 13 1,300	595 0 13 1,300
2025	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 275 13 1,300	595 275 13 1,300

Table 5 – Annual Project Physical Benefits

Project Name: : Calleguas-Las Virgenes Municipal Water Districts Interconnection Project

Type of Benefit Claimed: : Water Supply Availability Increased (includes backup supply, recycled water, and operational storage reliability)

Units of the Benefit Claimed: AFY

Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2026-2044 (yrs. w/o unplanned outages)	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 0 13 1,300	595 0 13 1,300
2045	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 275 13 1,300	595 275 13 1,300
2046-2064 (yrs. w/o unplanned outages)	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 0 13 1,300	595 0 13 1,300
2065	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 275 13 1,300	595 275 13 1,300
2066 (yr. w/o unplanned outages)	Backup Planned: 0 Backup Unplanned: 0 Recycled Water: 0 Operational Storage: 0	595 0 13 1,300	595 0 13 1,300

Comments:

***Potable Supply Reference*:**

- *Las Virgenes Calleguas Interconnection Study* 2014 by Kennedy/Jenks Consultants:
  - Backup Supply – planned and unplanned (pages 2 and 6)
  - Operational Storage Reliability (pages 7 – 8)

Recycled Supply Reference:

- *Recycled Water Master Plan Update 2014* by Kennedy/Jenks Consultants: Areas to serve an estimated usage based on acreage, Section 3.5.7 (pages 22 – 23), and Figure 5-10 (page 64). Actual irrigation meter data for Landino Park was also used to verify the projected demands of 13 AFY.

Secondary Benefit – Energy Saved and GHG Avoided

The secondary benefit is energy saved and greenhouse gases avoided by offsetting imported water supplies with locally-produced recycled water. The table below shows the energy and GHG benefit from offsetting 13 AFY of imported water from the Metropolitan Water District of Southern California (MWD) with recycled water for irrigation. Per LVMWD, the agency receives 100 percent of their imported water supply from the SWP through MWD. The Project Schedule dictates that this benefit begins in 2017 as the Project will complete construction at the end of 2016. The explanation for how the energy and GHG benefits were quantified is provided in the Technical Analysis (below).

Table 5 – Annual Project Physical Benefits
Project Name: : Calleguas-Las Virgenes Municipal Water Districts Interconnection Project
Type of Benefit Claimed: : Energy Saved and Greenhouse Gases Avoided
Units of the Benefit Claimed: kWh saved and kg of CO_2 equivalents reduced
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	Energy: 0 CO_{2e}: 0	0 [Design] 0	0 0
2016	Energy: 0 CO_{2e}: 0	0 [Construction] 0	0 0
2017	Energy: 0 CO_{2e}: 0	53,638 14,911	53,638 14,911
2018-2066	Energy: 0 CO_{2e}: 0	53,638 14,911	53,638 14,911

Comments:

Energy savings are based on the following sources:

- *DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7:* Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF), which is the nearest SWP pumping plant to the GLAC Region on the West Branch.
- *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 West Coast Basin of $65/AF in 2007. This value was projected out to 2015 dollars as $83/AF.
- *Bureau of Labor Statistics, May 2015. Average Energy Prices, Los Angeles-Riverside-Orange County.* – Page 1: 21.7 cents per kWh paid for electricity in Los Angeles.

GHG Emissions savings are based on the following source:

- *DWR 2014 Water-Energy Grant program Guidelines and Solicitation Package*: 0.278 kg CO_2e/kWh

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Availability Increased

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The State of California is currently experiencing one of the most severe droughts on record, which has severely depleted statewide water supplies. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting SWP supplies from the Bay-Delta. The results of these still recent drought conditions can be seen throughout the Region as an increased implementation of local supply development projects and conservation measures and ordinances. With only one wet year in 2011, the Region is in the middle of yet another multiple year drought.

The CMWD and LVMWD each have only one transmission pipeline from MWD to its geographic service area. The Project is needed because the proposed interconnection would tie the transmission systems together to facilitate reliability during planned shutdowns of the sole MWD pipelines to each agency. The intertie can also provide emergency supply reliability to both LVMWD and CMWD in the event that the transmission facilities from their respective MWD connections fail. Both agencies rely on transmission mains and critical storage and pumping facilities to move water east to west from their MWD connection. For the purposes of this grant application, the supply benefits are quantified for LVMWD only. There are three types of supply that make up the Water Supply Availability Increased benefit:

1. Backup Supply

For the first type of supply benefit, backup, it is important to understand the frequency and volume of both planned and unplanned outages that may be experienced by LVMWD.

Planned Outages - LVMWD experiences planned outages due to inspection, maintenance and repair of (1) MWD transmission mains and appurtenances, (2) the MWD Jensen Water Treatment Plant, and (3) LVMWD transmission mains and critical storage and pumping facilities. The MWD transmission mains serving LVMWD and CMWD are pre-stressed concrete cylinder pipes (PCCP) which, under certain conditions are prone to failure. MWD has undertaken a comprehensive proactive program to inspect and repair aging PCCP in their system. As a part of that program MWD informed LVMWD that extended, 45-day, shutdowns of the only water transmission main to LVMWD are scheduled in both 2018 and 2019 due to necessary repairs and maintenance for aging water mains. In addition, records of outages have been maintained by LVMWD; and these records indicate that planned outages averaged 17 days per year over the past eleven years. These types of planned outages are expected to continue on a periodic basis in the years to come.

Unplanned Outages – In addition to planned outages, LVMWD experiences unplanned outages of the transmission pipeline from MWD due to pipe breaks and other emergency events. An example of such an event was the Northridge earthquake in 1994, when the MWD Jensen Water Treatment Plant was taken offline. For the purposes of this grant application, it is assumed that an event of this nature could occur once every 20 years for a duration of approximately one week (7 days). It is assumed that the event would prevent LVMWD from receiving water from MWD but would not prevent an exchange through the proposed intertie pipeline from CMWD. Though these events are likely rare, LVMWD's reliance on imported water for 100 percent of their potable supplies demands that this level of reliability be provided.

2. Recycled Water Supply

The second type of supply benefit is increased use of recycled water. LVMWD currently recycles up to 9 million gallons per day (MGD) from the Tapia Water Reclamation Facility. The recycled water is used for irrigating golf courses, parks, school grounds, highway landscapes and common areas of certain housing developments. In recent years, approximately 20 percent of the total water served by LVMWD is tertiary-treated Title-22 compliant water, reducing the Region's dependence upon imported water. LVMWD's recycled water system consists of three tanks, three pumping stations, two reservoirs and 66 miles of pipeline. The additional customer that would be served by the recycled water pipeline portion of the Project, Landino Park, was identified by staff at LVMWD.

3. Operational Storage Reliability

The third type of supply benefit, operational storage reliability, does not directly represent new water supply but rather a higher degree of operational reliability within the potable distribution system. This reliability comes from increased flexibility in the use of storage volume in the existing Las Virgenes Reservoir. The Las Virgenes Reservoir has a capacity of approximately 10,000 AF; it is primarily used in the summer and fall seasons each year to meet peak demands. Currently, the ability to replenish the Las Virgenes Reservoir each winter is hindered by limited transmission main and pumping capacity from LVMWD's MWD connection.

Specifically, LVMWD is limited to drawing 3,000 AFY from the Las Virgenes Reservoir because the distribution system does not have the capacity to replenish more than 3,000 AFY during the winter. If distribution capacity existed, LVMWD would be able to draw (and replenish) more potable water from the reservoir on an annual basis. Based on the *LVMWD/CMWD Interconnection Study*, the proposed interconnection would provide sufficient capacity to replenish up to an additional 1,300 AF per year above current capacity (for a total of 4,300 AF per year) to the reservoir over 120 days at a rate of 10 cfs. This represents an additional 1,300 AF of operational storage that can be utilized each year.

2) Estimates of Without Project Conditions

Without the proposed interconnection, LVMWD and CMWD would likely have to construct costly parallel and redundant infrastructure, such as more storage tanks, reservoirs, and/or transmission mains to achieve the same supply benefits. These benefits include providing greater system supply reliability by being able to provide potable water during planned and unplanned shutdowns of the MWD imported water lines. The intertie can also provide emergency supply to CMWD if their transmission facilities from their MWD connection fail. The same is true for LVMWD who relies on transmission mains and critical storage and pumping facilities to move water east to west from their MWD connection. According to the *Interconnection Study* (page 7), the new intertie will allow the exchange of water of up to approximately 870 AFY (595+275), during years when unplanned and planned outages both occur) and will also enable LVMWD to fill the Las Virgenes Reservoir by an additional 1,300 AF each year; this reservoir is used during the summer and fall months to meet peak demands. The seasonal storage volume in the Las Virgenes Reservoir would be optimized by increasing the water available to refill the reservoir during the winter. LVMWD currently draws no more than 3,000 AF per year from the reservoir because the system does not have the capacity to replace more than 3,000 AF per year during the winter. LVMWD could draw up to 4,300 AF per year (an increase of 1,300 AF per year) from the reservoir with the additional flexibility provided by this intertie. Also without the Project, potable water will continue to be used for park irrigation in the amount of 13 AFY.

3) Descriptions of Methods Used to Estimate Physical Benefits

A hydraulic model was used to estimate the amount of physical benefit of increased water supply availability from the intertie portion of the Project. The values used to estimate the quantified benefits are documented in the *2014 Potable/Recycled Water Master Plan Update* and *Las Virgenes-Calleguas Interconnection Study*, 2014 by Kennedy Jenks Consultants. The information used to estimate the recycled water supply benefit was obtained in the *2014 Recycled Water Master Plan Update*.

1. Backup Supply

Planned Outages - Based on Table 3-2, Water Balance Calculations, (page 7) in the Interconnection Study, 10 cfs has been selected to represent an estimate for the anticipated average water supply availability benefit from planned outages. This is based on a design capacity of 20 cfs planned for winter months and 5 cfs planned for summer months. Ten cfs (7,240 AFY) multiplied by an assumed average length of a typical planned outage (30 days per year, based on the historical average of 17 days/year and 2018/2019 outages planned for 45 days each) yields approximately 595 AF of backup supply in a given year. It is anticipated that planned outages of a similar nature and duration will continue to occur, on average, every year throughout the 50-year lifespan of the Project, so the backup supply for planned outages is assumed to be 595 AFY. The estimated lifetime benefit is approximately 30,000 AF.

Unplanned Outages – It is assumed that a flow rate of 20 cfs (the maximum capacity) would be required for a presumed one-week outage caused by an infrequent failure/shutdown of major MWD facilities. This is equivalent to approximately 275 AFY for a presumed 7-day shutdown. Staff members at LVMWD anticipate that unplanned outages of a similar length could occur, on average, approximately every 15-20 years for the 50-year lifespan of the Project (assumed to occur three times between 2017 and 2066); the estimated lifetime benefit is approximately 825 AF. The periodic nature of this benefit is reflected in the Benefits Table (Table 5) above.

2. Recycled Water Supply

The savings of 13 AFY of potable water is based on the *2014 Recycled Water Master Plan Update* and existing potable water irrigation meter readings for the past year at Landino Park.

3. Operational Storage Reliability

Currently, LVMWD can replenish approximately 3,000 AFY to Las Virgenes Reservoir. Based on the *LVMWD/CMWD Interconnection Study*, the proposed interconnection would provide sufficient capacity to replenish approximately 4,300 AFY to the reservoir over 120 days at a rate of 10 cfs. This represents an additional 1,300 AF of operational storage that could be utilized each year. This would occur during winter months and then the additional water would be utilized for peak periods during summer months. The proposed interconnection would eliminate other costly infrastructure, such as parallel pipelines from MWD, which would achieve the same objective of providing system reliability and emergency needs. It is assumed that the Project will make available approximately 1,300 AFY of additional supply, on average, for every year of the 50-year Project lifespan.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The proposed facilities for this grant request include 5,600 feet of 24-inch diameter pipeline installation including valves, connections, trenching, backfill, restoration, and all other work for a complete installation for LVMWD. Both the LVMWD and CMWD Board of Directors have approved the Project which enables staff to move forward with planning, design and construction. CMWD will construct approximately 6,400 linear feet of pipe and a booster station. The terms of the agreement between LVMWD and CMWD are documented in the *Agreement Between Las Virgenes Municipal Water District and Calleguas Municipal Water District for the Interconnection Between their Potable Water Systems*, approved in March 2015, that establishes the roles and responsibilities for each party in terms of

implementing the Project. A California Environmental Quality Act (CEQA) Initial Study and Mitigated Negative Declaration must be prepared for the Project as well. Costs for the CMWD portion of the Project are included in Attachment 4 – Budget. The agreement between the agencies serves as verification that CMWD's portion of the Project in Ventura County will be implemented.

The recycled water main will include 1,260 feet of 6-inch diameter pipe. A preliminary design report and CEQA study are being prepared, followed by engineering design and construction. An encroachment permit is needed from the City of Westlake Village before construction.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are minimum short term adverse physical effects in the areas of traffic impact since all of the proposed construction will be along the roadways under existing pavement. Since the proposed intertie pipeline will be located in the same alignment as the recycled water main extension, the construction of the two pipelines together will lessen the impact to the public. A traffic study is being conducted to quantify the impacts, and recommendations will be made to mitigate these impacts. Mitigation measures and best management practices will be implemented during construction to address any adverse effects.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This Project will enhance local water resources by increasing reliability during imported water outages, optimizing storage in the Las Virgenes Reservoir, and increasing the use of recycled water. The supply benefit and the Project as a whole will address long-term drought preparedness as described in Table 1 - Statewide Priorities, for the IRWM Grant Program as follows:

1) Establish system interties (between LVMWD and CMWD)
2) Promote water recycling

Secondary Physical Benefit: Energy Saved and GHG Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

According to the California Energy Commission, about 4 percent of the energy consumed in California is used to produce, transport, treat, and distribute water. These energy costs make up a substantial part of the budget of water suppliers, who must raise their water rates when the price of electricity increases. Between 2006 and 2012, the price of energy in California rose 30 percent, and the Federal Energy Regulatory Commission predicts that it will rise another 47 percent by 2030 as renewable sources replace less expensive coal power. The rising costs of both energy and water negatively impact residential customers.

Generating the energy needed to produce, convey, and distribute water also produces carbon dioxide emissions that contribute to global warming, which also threatens California's water supply reliability. The state has committed to reducing its emissions by 15 percent by 2020 under AB-32, the Global Warming Solutions Act of 2006.

Decreasing the amount of energy required to produce water supply is an Objective of the California Water Action Plan, and decreasing the emissions of GHGs is a Planning Target of the Greater Los Angeles County IRWMP. This project will contribute to both goals by reducing the amount of energy used to import water to LVMWD along with the associated GHG emissions.

Reductions in the amount of water used by consumers directly equates to reduced energy consumption and greenhouse gas released as less water would be treated, pumped, and delivered. Energy savings and greenhouse gas

reductions for this Project will directly result by using less imported water from the MWD.

2) Estimates of Without Project Conditions
The additional park and school irrigation with recycled water will reduce dependence on imported water, which will reduce energy usage and greenhouse gas emissions. Without the Project, 53,638 kWh/year of energy would be consumed and 14,911 kg/year of CO_2 equivalents would be emitted through the use of imported water.

3) Descriptions of Methods Used to Estimate Physical Benefits
The Project will offset imported water from the State Water Project by providing locally produced recycled water. The energy offset was calculated by using the energy intensities for imported water based on DWR's energy intensities. It was approximated that 53,638 kWh/year is required for conveyance and pumping. Using the amount of imported water supply offset from the recycled water delivered, the amount of energy saved was calculated in kWh.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
Approximately 1,260 feet of 6-inch diameter recycled water main extension is needed. A preliminary design report is being prepared followed by CEQA, engineering design, and construction. An encroachment permit is needed from the City of Westlake Village before construction.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
There are minimum short term adverse physical effects in the areas of traffic impact since all of the proposed construction will be along the roadways under existing pavement. Since the proposed recycled water main pipeline will be located in the same alignment as the extension intertie, the construction of the two pipelines together will lessen the impact to the public. A traffic study is being conducted to quantify the impacts, and recommendations will be made to mitigate these impacts.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The energy and GHG benefits do not specifically address long-term drought preparedness; but the Project as a whole does. Specifically, it will address long-term drought preparedness as described in Table 1 - Statewide Priorities, for the IRWM Grant Program as follows:

1) Establish system interties (between LVMWD and CMWD)
2) Promote water recycling

Direct Water-Related Benefit to a DAC
The Project area does not encompass a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Calleguas-Las Virgenes Municipal Water District Interconnection Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Water Supply Availability Increased	Three Types of Supply: 1. ***Emergency Backup***: • *Planned Outages*: 595 AF • *Unplanned Outages*: 275AFY (Assumed every 15 to 20 years) 2. ***Recycled Water***: 13 AFY 3. ***Storage Reliability***: 1,300 AFY	Tools & Methods, Locations, & Data to be Collected: ***Backup***: Meter totalizer measurements will be collected and recorded. The meter location for the intertie pipeline will be at the proposed pump station. ***Recycled Water***: The recycled water customer will be metered and recorded. The meter will be located at the park. ***Operational Storage Reliability***: Fill and draw cycles of the Las Virgenes Reservoir will be metered, recorded, and documented in accordance with current practices. The location of the meter is at the Westlake Pump Station located at the base of the main dam of the reservoir. **The monitoring tools and targets are appropriate for the benefits claimed because** metering will accurately measure the volume of water that contributes to new supply.
Energy Saved and GHGs Avoided	***Energy***: 53,638 kWh per year ***GHG***: 14,911kg CO_{2e} per year	Tools and Methods: For every additional AFY of recycled water supply delivered (as measured by metering), an energy savings and greenhouse gas reduction rate will be applied. Locations: Water savings information will be gathered as described under the "Water Supply Availability Increased" benefit above Data to be Collected: Additional recycled water supplies delivered will be measured in AFY by metering and then converted to energy savings and GHG avoided based on the methodology described above for the Energy Savings and GHG Reduction benefit in the Technical Analysis. **The monitoring tools and targets are appropriate for the benefits claimed because** the calculations will provide an accurate estimation of the amount of energy saved and GHG avoided.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Calleguas-Las Virgenes Municipal Water District Interconnection Project	
Question 1	**Types of benefits provided as shown in Table 5:** • Primary Benefit – Water Supply Availability Increased • Secondary Benefit – Energy Saved/GHGs Avoided
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. The 2007 and 2014 *Potable and Recycled Water Master Plan* updates along with the 2014 *Las Virgenes-Calleguas Interconnection Study* by Kennedy Jenks Consultants provided various options to achieve the targets. The cost for an alternative 30-inch diameter transmission main is $10.40 million based on Section 10.3 of the 2007 master plan document adjusted using the 2015 Los Angeles Construction Cost Index. However, this alternative would not provide the emergency backup supply benefit that the Project provides. The proposed Project will cost $9.15 million, including the CMWD (Ventura) portion, and was determined to be the lowest cost alternative, and will provide the most benefits.
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: *Potable and Recycled Water Master Plan* updates along with the 2014 *Las Virgenes-Calleguas Interconnection Study*, 2007 & 2014, Kennedy Jenks Consultants	

Project 7: Comprehensive Water Conservation Project (Project)
Implementing Agency: City of Malibu (City)

Project Description

(25 Word) This Project will provide 88.2 AFY of water savings by implementing a comprehensive water conservation program and reducing reliance on energy-intensive imported water supplies.

(Expanded) The City is partnering with West Basin Municipal Water District (West Basin), the local water wholesale agency, and Los Angeles County Waterworks District 29 (District 29), the local water retail agency, to reduce potable water consumption by an estimated 88.2 acre-feet per year (AFY) in the Project area. This Project will leverage and expand existing incentive programs to meet the reduction goals for the current drought and ensure long-term savings, and improve water supply reliability. The Project will promote the use of water-efficient devices from a suite of high-efficiency technologies and promote water conservation practices to offset the use of potable water supply (indoor and outdoor). The Project can increase water use efficiency to provide near-term drought relief as well as improve overall regional water supply reliability over the long-term.

The major components of the Project will include creating an effective education campaign to promote water conservation practices and encourage customers to install water conservation devices. Residents within the Project area will be educated through classes, workshops, and individual consultations. This Project will directly provide 1,000 showerheads with automatic temperature sensor shut-off, 400 drip irrigation kits and 1,000 rain barrels (50 gallons) for customer use as well as install 400 smart meter tracking devices to allow leakage detection and subsequent repair by the customers and two large (10,000 gallons) rainwater harvesting cisterns (at Trancas Canyon Park and Las Flores Canyon Park). The Project will also provide rebates for customers to purchase 100 high-efficiency clothes washers, 100 hot water on-demand systems, 1,000 ultra-high-efficiency toilets, 25 graywater reuse systems, and 25 small (350 gallons) rainwater harvesting cisterns. Additionally, the rebate program will offer an incentive to property owners to remove up to 200,000 square feet (ft^2) of high water demanding turf. West Basin will be using existing rebates for efficient water conservation devices, currently offered through Metropolitan Water District of Southern California's (MWD) SoCal Water Smart rebate program to augment this Project.

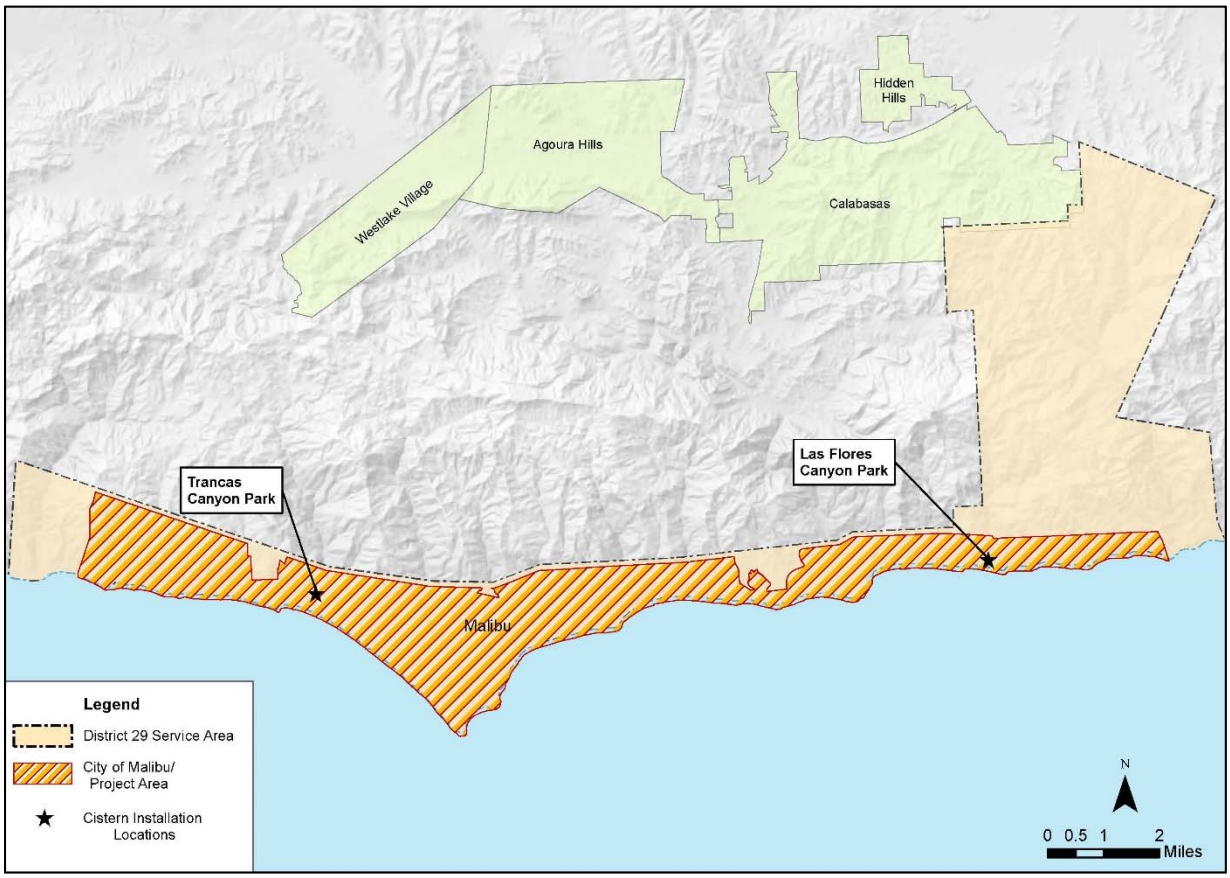
The anticipated physical benefits of the Project include a primary benefit of an estimated 88.2 AFY of potable water supply saved to meet current and future demands. Reduced demand for potable water will also result in reduced energy used to convey and treat potable water supplies. Thus, a secondary benefit of this Project is a maximum annual energy savings of 289,958 kilowatt-hours (kWh), and reduce greenhouse gas emissions by 80,608 kilograms (kg) of carbon dioxide CO_2 equivalents (CO_2e).

The Project addresses a current need of the region by supporting the Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Plan as well as local objectives to improve water supply reliability through increased conservation and reduce reliance on energy-intensive imported water supplies. The Region's access to imported water has been limited due to both environmental concerns in the Sacramento Bay Delta as well as drought conditions. Additionally, this Project will help to mitigate against climate change vulnerabilities (identified in the GLAC IRWM Plan) by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions.

The intended outcome of the Project is to offset imported potable water use and increase water conservation savings by an estimated 88.2 AFY, energy savings of 289,958 kWh, and reduce greenhouse gas emissions by 80,608 kg of CO_2e.

Project Map

As shown in the figure below, this Project are is contiguous with the service area of District 29. This City of Malibu is located completely within the District 29 boundary. Project monitoring will be done through the review of customer potable use data at participating customer sites throughout the Project area including the Trancas Canyon and Las Flores Canyon parks (where cisterns are located).



Project Physical Benefits

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

- Primary Benefit – Water Supply Saved
- Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

Primary Benefit –Water Supply Saved

The table below provides information on the benefit of potable water supply saved through the last year of useful life of the Project (2038). Since the Project is a composite of components with various useful lives between 5 to 20 years, the total annual benefit will depend upon which components are assumed to be within their useful lives. The Project will begin rebate distribution and/or device installation in May 2016 and complete installation by August 2018. Since it is unknown which components will be implemented during the three year implementation window, a conservative assumption is that full annual benefits from every project component will be begin in 2019. Since it is likely that many of the devices could be installed prior to 2019, a portion of these estimated benefits could be achieved earlier.

As a result of the shortest five year useful life for some components, the maximum annual benefit for the Project occurs in the first five years (2019 – 2023). After 2023, the useful lives of some of the devices begin to expire and the annual benefit begins to decrease as well. A total of approximately 1,191 AF of water savings is estimated over the 20-year Project life.

Table 5 – Annual Project Physical Benefits

Project Name: Comprehensive Water Conservation Project
Type of Benefit Claimed: Primary Benefit –Water Supply Saved
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 20 years for the Project and a range of 5-20 years for individual components

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project
2016 – 2018	0	0	0
2019 – 2023	0	88.2	88.2
2024 – 2028	0	76.7	76.7
2029 – 2033	0	37.6	37.6
2034 – 2038	0	35.6	35.6

Table 5 – Annual Project Physical Benefits

Project Name: Comprehensive Water Conservation Project
Type of Benefit Claimed: Primary Benefit –Water Supply Saved
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 20 years for the Project and a range of 5-20 years for individual components

Comments:

- The annual benefit reflects the number of Project component in operation during their useful life: showerheads, drip irrigation kits, and rain barrels – 5 years; clothes washers, water conserving turf, smart meter devices, and small cisterns – 10 years; and high-efficiency toilers, graywater reuse retrofit systems, and large cisterns – 20 years.
- A conservative assumption that all components will begin providing benefits by 2019 is used.
- *Metropolitan Water District SoCal Water Smart Program:* The estimated savings were established by MWD's methods to derive the savings for each device implemented by the provided rebates. MWD's water savings methodologies for the SoCal Water Smart Program include studies completed by member and retail agencies, studies done by agencies outside of the service area, national studies and standards, and energy utilities.
- *The United States Environmental Protection Agency's Water Audits and Water Loss Control for Public Water Systems Report:* It was estimated that a water agency can reduce water loss due to leaks by approximately 6.6%. A pilot study of 400 volunteers who regularly monitored their water usage and reported leaks was analyzed which resulted in a 6.6% reduction in water usage. This was an 11-fold increase in the amount of reported leaks.
- *City of Malibu 52-year Rainwater Data, Geosyntec Consultants*: The benefit estimates for the large cisterns are based on 52 years of rainwater data collected for the City of Malibu by Geosyntec Consultants and reasonable professional assumptions about the size of the collection area and the days separating rainfall events. The Santa Monica Mountains coastal watersheds' event projections utilized hourly data from Los Angeles Airport (COOP ID 045114) with a scaling factor of 1.17 based on correlations made to Malibu precipitation datasets.
- *Instant Hot Water Delivery System Pilot Project: Avoiding Water Waste with Convenience, City of San Diego, 2005, Page 15:* This report evaluates the potential water savings of instant hot water recirculating systems. It estimated that reducing wait time for hot water to arrive at the fixture resulted in the reduction of 17 gallons per day (or 0.02 AFY).
- *American Water Works Association Residential End Uses of Water Study, Mayer, P.W., et al, 1999:* This document discusses the end uses of water in single-family homes and provides details about how graywater reuse can be beneficial.
- *Graywater – A Potential Source of Water, Cohen, Y., 2009:* This report discusses the various types of graywater and how treatment and reuse of graywater can provide a California with a new source of water.

Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

The table below provides information on the benefit of energy saved and greenhouse gas reduced as a result of a reduction in imported water supply use. The imported supplies currently provided by West Basin to District 29 are a blend of 61% State Water Project (SWP) water from the Sacramento Bay-Delta system, and 39% Colorado River Aqueduct water. Based on DWR's energy intensities for imported water, approximately 4,126 kWh per AF (kWh/AF) is required for conveyance and pumping of SWP water from the Bay Delta to the Oso pumping plant, which is the nearest SWP pumping plant to the GLAC Region on the West Branch, and approximately 1,976 kWh/AF is required for the Colorado River Aqueduct water. The ratio of these supplies results in an estimated 3,288 kWh/AF of energy consumption to provide imported water supply. It is assumed that no additional energy is needed to either conserve water through water use efficiency and/or non-potable water offset devices and practices implemented through this program.

The Project would also avoid greenhouse gas emissions generated from transporting and treating imported water for potable use. Greenhouse emissions value was calculated using the conversion factor of 0.278 kg CO_2e per kWh obtained from the Guidelines and Proposal Solicitation Package from DWR's Water Energy Grant. .

It is assumed that the procurement and installation of all Project devices will take place over three years. After 2018, full benefits will be seen for each of the components until the useful life ends (which varies between devices). Over the 20 year lifespan of the Project, a total of approximately 3,913,769 kWh of energy will be saved and 1,088,028 kg of CO_2e will be reduced.

Table 5 – Annual Project Physical Benefits

Project Name: Comprehensive Water Conservation Project
Type of Benefit Claimed: Energy Saved and Greenhouse Gas Avoided
Units of the Benefit Claimed: kWh of Energy Saved and kg of CO_2e of Greenhouse Gas Avoided
Anticipated Useful Life of Project (years): 20 years for the Project distributed over 5-20 years depending of the lifespan of each component

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2016 – 2018	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0
2019 – 2023	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 289,958 CO_2e Reduced: 80,608	Energy Saved: 289,958 CO_2e Reduced: 80,608
2024 – 2028	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 252,151 CO_2e Reduced: 70,098	Energy Saved: 252,151 CO_2e Reduced: 70,098
2029 – 2033	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 123,610 CO_2e Reduced: 34,364	Energy Saved: 123,610 CO_2e Reduced: 34,364
2034 – 2038	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 117,035 CO_2e Reduced: 32,536	Energy Saved: 117,035 CO_2e Reduced: 32,536

Table 5 – Annual Project Physical Benefits

Project Name: Comprehensive Water Conservation Project
Type of Benefit Claimed: Energy Saved and Greenhouse Gas Avoided
Units of the Benefit Claimed: kWh of Energy Saved and kg of CO_2e of Greenhouse Gas Avoided
Anticipated Useful Life of Project (years): 20 years for the Project distributed over 5-20 years depending of the lifespan of each component

Comments:

- This benefit reflects the useful life of each Project component: showerheads, drip irrigation kits, and rain barrels – 5 years; clothes washers, water conserving turf, smart meter devices, and small cisterns – 10 years; and high-efficiency toilers, graywater reuse retrofit systems, and large cisterns – 20 years.
- *Personal communication with Jon Lambeck, MWD:* MWD has imported a blend of 61% SWP and 39% CRA based on a 10-year average.
- *DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7:* Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF), which is the nearest SWP pumping plant to the GLAC Region on the West Branch.
- *California Public Utilities Commission (CPUC) Study, page 64*: Energy associated with conveying Colorado River Aqueduct Water (1,976 kWh/AF) (as listed in the DWR 2014 Water Energy Grant Guidelines and PSP).
- *U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*: The annual total-output statewide emission rate of 0.278 kg of CO2e/kWh from this source was used to convert the energy savings to a reduction in CO_2e.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Saved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Throughout the Western United States and especially within the State of California, drought is increasing in frequency, severity, and duration. Drought conditions and federal regulations have had a significant impact on the availability of imported surface water deliveries to the GLAC Region and the Project area. The GLAC Region has experienced significant cutbacks to imported water supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the SWP supplies from the Bay Delta. The City and District 29 do not have locally available water supplies and solely depend on imported water, therefore they are particularly vulnerable to droughts.

In response to the severity of the California's current drought, the Project area's local water retailer, District 29, has been mandated by the State Water Resources Control Board to reduce total water use by 36%, which is the highest percentage in the state. This Project will supplement District 29's ongoing efforts to meet this mandate. This Project will immediately help to meet near-term drought water use reductions through public education, individual outreach, rebates, and the installation of water use efficiency devices. The Project will also help to enhance long-term water supply reliability through the use of both water use efficiency measures and non-potable supplies. The Project will implement a program to educate the public on their water use and conduct special outreach targeting exceptionally high water users, and provide a wide range of water conservation measures that will help reduce potable water use.

2) Estimates of Without Project Conditions

Without the Project's water conservation educational outreach, rebate incentives and direct-assistance, customers will not be as likely to upgrade outdated equipment, replace water-intensive landscapes, and install graywater systems or stormwater capturing devices resulting in either a significant delay or loss in water savings. Thus current high water use levels will be maintained and further deplete existing limited resources.

3) Descriptions of Methods Used to Estimate Physical Benefits

The Project will provide rebates and assume installation of all the Project's high-efficiency devices and water conservation practices that improve indoor and outdoor water use and offset the use of potable supplies by 2019. The calculation of benefit for each project component was determined from existing documents as cited below.

Component 1: High-Efficiency Clothes Washers Rebates: Rebate incentives for customers to purchase new high-efficiency clothes washers, which use 55% less water compared to older machines[12]. This will result in 100 units being replaced, saving 3.4 AFY and 34 AF over the 10-year useful life of the machine *(MWD SoCal Water Smart Program Estimates).*

Component 2: Low-Flow Showerheads: Devices will be provided for customers to replace old showerheads with 1,000 improved low flow showerheads. This component will save approximately 7.8 AFY and 39 AF over the 5-year useful life *(MWD SoCal Water Smart Program Estimates).*

Component 3: Ultra High-Efficiency Toilets Rebates: Rebate incentives will be provided to customers in order to replace high-volume toilets with high-efficiency EPA WaterSense approved toilets with a flush rate of 1.28 gallons per flush[1]. This component will include 1,000 units being replaced, saving 33.6 AFY and 672 AF over the 20-year useful life *(MWD SoCal Water Smart Program Estimates).*

[12] Metropolitan Water District's SoCal WaterSmart Program. http://socalwatersmart.com/?page_id=3007

Component 4: Turf Replacement Rebates: Turf will be replaced by residents in order to convert 200,000 ft^2 of water-thirsty landscapes into water conserving landscapes. By removing turf and converting to drought tolerant landscape and synthetic turf, water usage will be reduced by up to an estimated 60%[1]. This will provide 27.0 AFY of water savings and 270 AF over the 10-year useful life *(MWD SoCal Water Smart Program Estimates).*

Component 5: Drip Irrigation Kits: This component will provide efficient drip irrigation kits to help customers replace the inefficient spray irrigation. This will result in 400 units being provided for a water savings benefit of 1.8 AFY and 9 AF over the 5-year useful life *(MWD SoCal Water Smart Program Estimates).*

Component 6: Smart Meter Device Attachments: The Project will convert current water meters to smart meters, which will improve the efficiency of water use for the highest water users in the area, 400 smart meter devices will be installed by District 29 staff. Installation of these devices will enable customers to track their water use and understand their water consumption habits, as well as help them identify water leaks. District 29 will have access to customer usage data and will use software to help identify leaks and possible water waste. Leak repair will be done by individual customers by tracked and enforced by District 29. This will result in a water savings of 8.4 AFY and 84 AF over the 10-year useful life of the meter *(U.S. EPA's Water Audits and Water Loss Control for Public Water Systems Report).*

Component 7: Graywater Reuse Retrofits Rebates: Rebates will be provided to customers to retrofit their homes for graywater reuse. This component will result in 25 rebates being provided for a water savings of 1.2 AFY and 24 AF over the 20-year useful life. Studies in California and Australia have shown that graywater reuse can meet a significant portion of outdoor water demand *(MWD SoCal Water Smart Program Estimates).*

Component 8: Rain Barrel Rebates: Rebates will be provided for 1,000 50-gallon rain barrels to customers for stormwater capture. Collecting and re-using rainwater from gutters and downspouts for lawns and gardens minimizes the amount of water flowing into the storm drains, sewer systems, and local waterways. This will achieve a water savings of 1.9 AFY and 9.5 AF over the 5-year useful life *(MWD SoCal Water Smart Program Estimates).*

Component 9: Large Rainwater Harvesting Cisterns: Two 10,000 gallon rainwater harvesting cisterns will be installed to provide a potable water savings of 0.8 AFY and 16 AF over the 20-year useful life. The collected non-potable stormwater will be used in lieu of existing potable supplies to irrigate the surrounding park (*Geosyntec Consultants).*

Component 10: Small Rainwater Harvesting Cistern Rebates: Rebates will be provided for the installation of 25 small 350-gallon cisterns that will provide approximately 0.3 AFY of stormwater capture and 3 AF over the 10-year useful life to be used in lieu of potable supplies for landscape irrigation *(MWD SoCal Water Smart Program Estimates).*

Component 11: Hot Water On-Demand System Rebates: Rebates will be provided for the installation of 100 hot water on-demand systems that will provide a water savings of 2 AFY and 30 AF over the 15-year useful life (*City of San Diego, 2005)*.

As indicated above, the benefit estimates for rebate components are derived from calculations conducted previously by MWD. MWD uses a variety of studies, reports, and industry standards to calculate the amount of water savings including those completed by member agencies, retail agencies, agencies outside of the MWD service area, national studies and standards, and energy utilities.

The projected customer demand for graywater and rainwater harvesting systems is based on increased resident

permitting inquiries and, well-attended workshops in Malibu and Topanga on these subjects. The community has shown strong interest in the current drought and the individual's role in water use reduction.

The table below summarizes the benefits calculated for each Project component.

Summary of Water Savings Estimates

Project Component	Number of Units	Useful Life	Maximum Annual Water Savings (AFY)	Lifetime Savings (AF)
1. High Efficiency Clothes Washers	100	10	3.4	34
2. Showerheads	1,000	5	7.8	39
3. High Efficiency Toilets	1,000	20	33.6	672
4. Turf Replacement (ft^2)	200,000	10	27.0	270
5. Drip Irrigation Kits	400	5	1.8	9
6. Smart Meter Device Attachments	400	10	8.4	84
7. Graywater Reuse Retrofits	25	20	1.2	24
8. Rain Barrels – 50 gallons	1,000	5	1.9	9.5
9. Large Cisterns – 10,000 gallons	2	20	0.8	16
10. Small Cisterns – 350 gallons	25	10	0.3	3
11. Hot Water On-Demand	100	15	2.0	30
Total Water Savings			**88.2**	**1,191**

These water savings summaries from the table above were used to create cumulative component calculations based on component useful lives and shown in the table below. To be conservative, it was estimated that full annual benefits will not be seen until 2019, since the rebates and/or installations will occur between May 2016 and August 2018.

Component Yearly Benefit Calculation

Year	1	2	3	4	5	6	7	8	9	10	11	Total Savings
2016	0	0	0	0	0	0	0	0	0	0	0	**0**
2017	0	0	0	0	0	0	0	0	0	0	0	**0**
2018	0	0	0	0	0	0	0	0	0	0	0	**0**
2019	3.4	7.8	33.6	27.0	1.8	8.4	1.2	1.9	0.8	0.3	2.0	**88.2**
2020	3.4	7.8	33.6	27.0	1.8	8.4	1.2	1.9	0.8	0.3	2.0	**88.2**
2021	3.4	7.8	33.6	27.0	1.8	8.4	1.2	1.9	0.8	0.3	2.0	**88.2**
2022	3.4	7.8	33.6	27.0	1.8	8.4	1.2	1.9	0.8	0.3	2.0	**88.2**
2023	3.4	7.8	33.6	27.0	1.8	8.4	1.2	1.9	0.8	0.3	2.0	**88.2**
2024	3.4		33.6	27.0		8.4	1.2		0.8	0.3	2.0	**76.7**
2025	3.4		33.6	27.0		8.4	1.2		0.8	0.3	2.0	**76.7**
2026	3.4		33.6	27.0		8.4	1.2		0.8	0.3	2.0	**76.7**
2027	3.4		33.6	27.0		8.4	1.2		0.8	0.3	2.0	**76.7**
2028	3.4		33.6	27.0		8.4	1.2		0.8	0.3	2.0	**76.7**
2029			33.6				1.2		0.8		2.0	**37.6**
2030			33.6				1.2		0.8		2.0	**37.6**

Year	1	2	3	4	5	6	7	8	9	10	11	Total Savings
2031			33.6				1.2		0.8		2.0	**37.6**
2032			33.6				1.2		0.8		2.0	**37.6**
2033			33.6				1.2		0.8		2.0	**37.6**
2034			33.6				1.2		0.8			**35.6**
2035			33.6				1.2		0.8			**35.6**
2036			33.6				1.2		0.8			**35.6**
2037			33.6				1.2		0.8			**35.6**
2038			33.6				1.2		0.8			**35.6**
Total	34	39	672	270	9	84	24	9.5	16	3	30	**1,191**

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

There are no new facilities or policies required to obtain this benefit. The table below describes the actions required to obtain the physical benefits.

Project Component	Procurement	Installation
Low-flow devices (100 Clothes Washers and 1,000 Toilets), Rain Barrels, Small Cisterns, Graywater Reuse Retrofit Systems, and Hot Water On-Demand Systems	Rebates provided to customer applicants with proof of approved device/system purchased	Customer responsible for installing devices
200,000 ft^2 Turf Removal	Rebates provided to customer applicants with proof of turf removal and replacement with drought-tolerant landscape	Customer responsible for removal and replacement of turf
Drip Irrigation Systems and Showerheads	West Basin purchases devices and distributes to residents interested in the Project	Customer responsible for installing devices
Smart Meter Devices	District 29 purchases smart meters and reviews water use data to identify high water users for installation	District 29 installs and monitors meters. If potential leaks are identified, District 29 will notify customers to have leaks repaired
Large cisterns	The City purchases the equipment necessary for the installation of these cisterns	The City will construct and install cisterns

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This Project will not result in any adverse physical effects. Educating the public, distributing rebates, installing devices and repairing leaks presents no risk to the public or environment, therefore, this Project has been determined to be categorically exempt under CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This Project addresses long-term drought preparedness by offering drought relief and long-term water savings in the form of water conservation programs that improve water use efficiency. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(1) Promote water conservation
(2) Improve landscape irrigation efficiencies
(3) Achieve long-term reduction of water use

The Project will assist the local agencies and the Region in meeting water reduction goals and will maximize available water supplies. The installation of water conservation devices can provide immediate and long-term water use reductions through the useful life of the devices. It is expected that once the useful life of the devices is reached, customers will replace the devices with similar or higher efficient devices.

Secondary Physical Benefit: Energy Saved and Greenhouse Gas Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Generating the energy needed to produce, convey, and distribute water produces carbon dioxide emissions that contribute to global warming, which itself threatens California's water supply. The state has committed to reducing its emissions by 15% by 2020 under AB-32, the Global Warming Solutions Act of 2006. Decreasing the amount of energy required to produce water supply is an Objective of the California Water Action Plan, and decreasing the emission of greenhouse gases is a Planning Target of the GLAC IRWM Plan.

As the result of a recent climate change vulnerability analysis, the GLAC IRWM Region has identified the need to adapt to and mitigate against further climate change. The Region's objectives support projects that reduce energy consumption and greenhouse gas emissions. The Project will reduce energy consumption by 289,958 kWh per year and avoid greenhouse gas emissions of approximately 80,608 kg of CO_2e per year, thereby helping to mitigate against climate change as well as adapt to climate change through demand reduction.

2) Estimates of Without Project Conditions

Without the Project, an additional 289,958 kWh/year of energy and 80,608 kg/year of CO_2 equivalents would be consumed through the use of imported water to the Project area.

3) Descriptions of Methods Used to Estimate Physical Benefits

The Project will offset imported water (blend of 61% SWP and 39% Colorado River Aqueduct) through water use efficiency and the use non-potable stormwater. According to DWR, approximately 4,126 kilowatt-hours per acre-foot (kWh/AF) is required for conveyance and pumping of SWP water to the Oso Pumping Plant (*DWR Bulletin B-132-10, 2013*), which is the nearest SWP pumping plant to the GLAC Region. Similarly, approximately 1,976 kWh/AF is required to convey CRA water to the Region (*CPUC Study, page 64*). Based on the ratio of these supplies, an estimated 3,288 kWh/AF of energy is used to provide imported supplies to Southern California agencies. Since 88.2 AFY of imported water is expected to be offset by the Project, approximately 289,958 kWh/year will be saved.

Additionally, the Project would avoid greenhouse gas emissions generated by the energy needed to import water. This value was calculated by applying the annual total-output statewide emission rate of 0.278 kg of CO_2e per kWh from the U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region. By offsetting the use of 88.2 AFY of imported water, the Project will avoid greenhouse gas emissions of approximately 80,608 kg of CO_2e per year.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

There are no additional facilities required to obtain the water supply savings benefits described above. To achieve this benefit, an effective marketing campaign will need to be developed, rebates distributed, smart meters will need to be purchased, and each agency will need to ensure the devices have been installed.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This Project will not result in any adverse physical effects. Educating the public, distributing rebates, and installing devices presents no risk to the public or environment, therefore, this Project has been determined to be categorically exempt under CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While not directly addressing long-term drought preparedness, the secondary benefit will help in making significant contributions by reducing energy and greenhouse gases. This Project will make significant contributions to improving the sustainability of regional and local water supplies by offsetting imported water use which will allow supplies to be conserved for future use. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(1) Promote water conservation
(2) Improve landscape irrigation efficiencies
(3) Achieve long-term reduction of water use

The Project will assist the local agencies and the Region in meeting water reduction goals and will maximize available water supplies. The installation of water conservation devices can provide immediate and long-term water use reductions through the useful life of the devices. It is expected that once the useful life of the devices is reached, customers will replace the devices with similar or higher efficient devices.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Comprehensive Water Conservation Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Saved	88.2 AFY of water saved	Tools and Methods: Water use readings before and after leak repairs and installation of potable water conservation equipment will be used to determine water savings at each site. Water usage information for each participating site will be obtained every three months after installations and retrofits are completed to determine water savings. Locations: Water use data will be gathered from meters on each site including parks where cisterns are located. Data to be Collected: Actual water usage data from water meters on each site will be collected. **The monitoring tools and targets are appropriate for the benefits claimed because** it will provide an accurate amount of potable water saved. **The monitoring data will be used to measure performance by** analyzing each year's billing data to determine the actual water usage for each customer and comparing it to the historical use.
Secondary Benefit – Energy Saved and Greenhouse Gas Reduced	289,958 kWh of energy 80,608 kg of CO_{2e}	Tools and Methods: The water savings at each site will be used to estimate the associated energy usage for that volume of water and compared against the energy usage for that volume to be imported through the SWP using the kWh/AF factors. A greenhouse gas emission rate of 0.278 kg CO_2e for every kWh of energy saved will be applied to estimate greenhouse gas emissions avoided from the Project. Locations: Water use data will be gathered from meters on each site including parks where cisterns are located. Data to be Collected: Water savings estimations will be calculated for each site and aggregated for the entire Project. **The monitoring tools and targets are appropriate for the benefits claimed because** the calculations will show the amount of energy saved and greenhouse gas avoided. **The monitoring data will be used to measure performance by** showing the estimated energy savings and greenhouse gas reductions provided by the actual volume of imported water offset through the Project

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Comprehensive Water Conservation Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Saved • Secondary Benefit – Energy Saved and Greenhouse Gas Avoided
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. An alternative method considered that could achieve the same types of physical benefit as the proposed Project would be to allow the natural replacement of fixtures, without marketing and rebates incentives. The cost would be close to $0 since it would rely on the customers to cover the costs of buying and installing devices. The proposed Project is estimated to cost $2,172,485.
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 least cost alternative was not selected since the reliability that these benefits could be achieved was less given that there is no incentive or education for customers to increase conservation. If a similar level of conservation savings were to be achieved without the Project incentives, it is expected it would take much longer than 3 years and could not provide immediate drought relief. This Project provides a variety of water saving options. Some devices may be more cost effective in certain markets but this service area has been evaluated as to customer requests and for saturation of certain components in previous programs. Recent drought restrictions and customer awareness of the critical conditions in California have primed residents for a serious change of habits. Overall, this project is designed to meet the needs of the diverse service area.
Comments:	

Project 8: Urban Streams Restoration in the Malibu Creek Watershed (Project)
Implementing Agency: Mountains Restoration Trust
Project Description

(25 Word) The Project will protect seven native species along 1.5 stream miles of Medea Creek and restore one acre of habitat by revegetating with native plants.

(Expanded) The Project proposes to restore a section of Medea Creek as part of the Urban Streams Restoration in the Malibu Creek Watershed. Mountains Restoration Trust (MRT), in partnership with the Rancho Simi Recreational Park District (RSRPD), and the Resource Conservation District of the Santa Monica Mountains (RCDSMM) will lead the Project. The Project will restore 1.5 miles of Medea Creek through the trapping and removal of the non-native Red Swamp Crayfish (Crayfish). This voracious, non-native predator feeds on aquatic plants and macro-invertebrates, and amphibian and fish eggs, thus disrupting the entire aquatic and riparian ecosystem. This removal will provide an immediate positive response from native species populations. The Project will also restore habitat by planting native vegetation on one acre of floodplain along a 0.25 mile stretch of Medea Creek. Plantings will restore a nearly denuded area and provide the connecting segment that will complete a total of 2.2 miles of continuous vegetated stream banks. The reestablishment of native plants will provide food and habitat for native animal species, which are anticipated to gradually return to the area after restoration.

The major physical components of the Project include removing Crayfish from 1.5 miles of stream within Medea Creek and removing invasive plants from a one acre site along 0.25 miles of Medea Creek. The Medea Creek planting site will first be cleared of invasive plants, such as bull thistle, hoary mustard, and smilo grass. After the invasive species are removed, approximately 900 new native plants, including approximately 200 trees, 300 shrubs, 250 perennials, and 150 grasses, will be planted. Native plant species will include oak, willow, cottonwood, toyon, wild rose, sugar bush, milkweed, and giant wild rye.

The anticipated physical benefits of the Project include the primary benefit of protecting seven native species, including the Baja California Treefrog (*Pseudacris hypochondriaca*); California Newt[13] (*Taricha torosa*); Southern Steelhead trout[1] (*Oncorhynchus mykiss*); California Treefrog (*Pseudacris cadaverina*); Dragonfly larvae (*order Odonata*); Arroyo Chub[1] (*Gila orcuttii*); and the California Red-legged Frog[1] (*Rana darytonii*). The secondary benefit of the Project is the restoration of one acre of floodplain along a 0.25 mile stretch of Medea Creek by removing and replacing invasive plant species with native plant species. Additional benefits include improved water quality by reducing sedimentation in the Creek caused by burrowing Crayfish and enhanced open space and recreational opportunities provided by restoring native habitat.

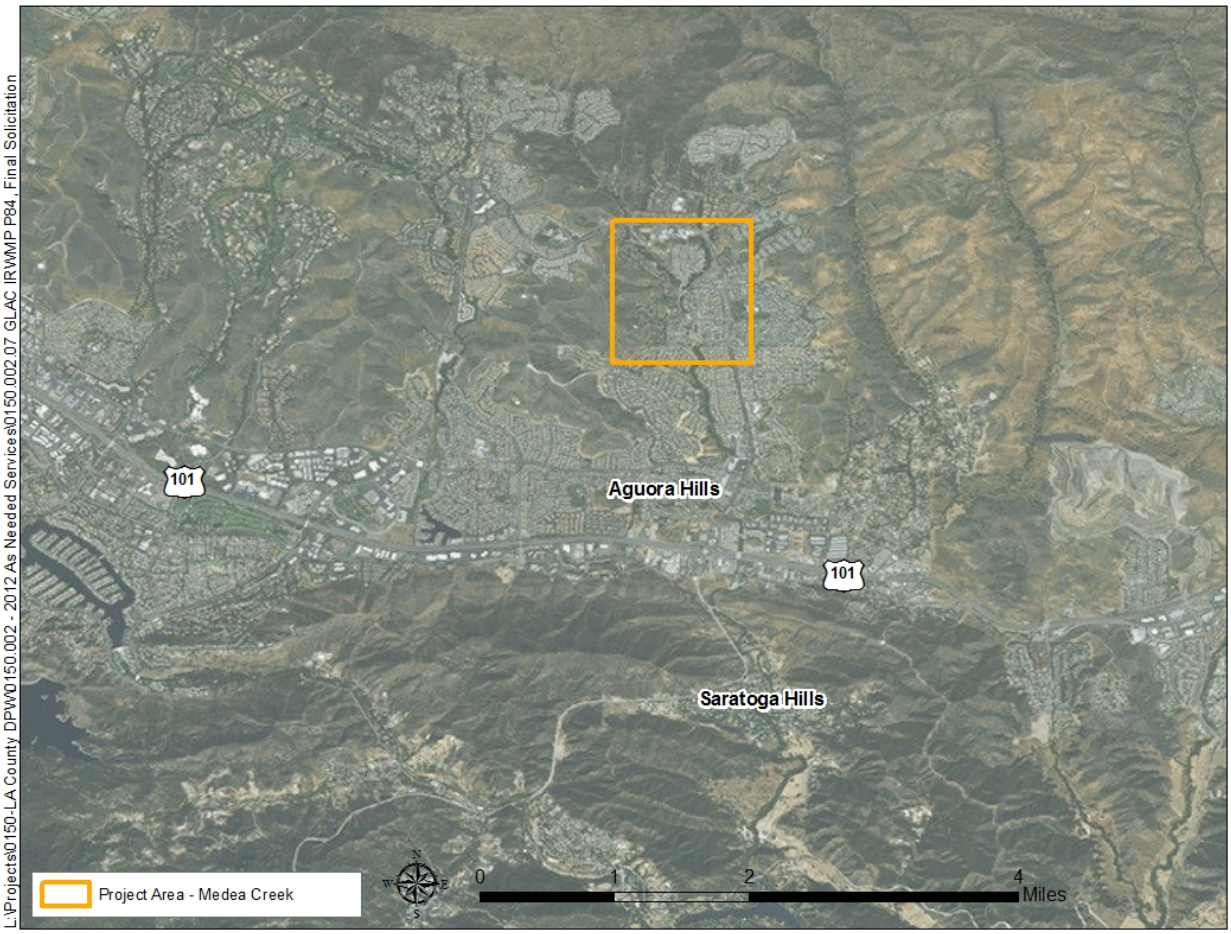
The Project addresses a current need of the region supporting the following objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP): protect, restore, and enhance natural processes and habitats (Enhance Habitat), increase watershed-friendly recreational space for all communities (Enhance Open Space and Recreation), reduce flood risk in flood prone areas by restoring floodplain (Reduce Flood Risk), and comply with water quality regulations by improving the quality of stormwater (Improve Surface Water Quality).

The intended outcomes of the Project are the protection of seven native species along 1.5 stream miles of Medea Creek and restoration of one acre of habitat by planting native vegetation.

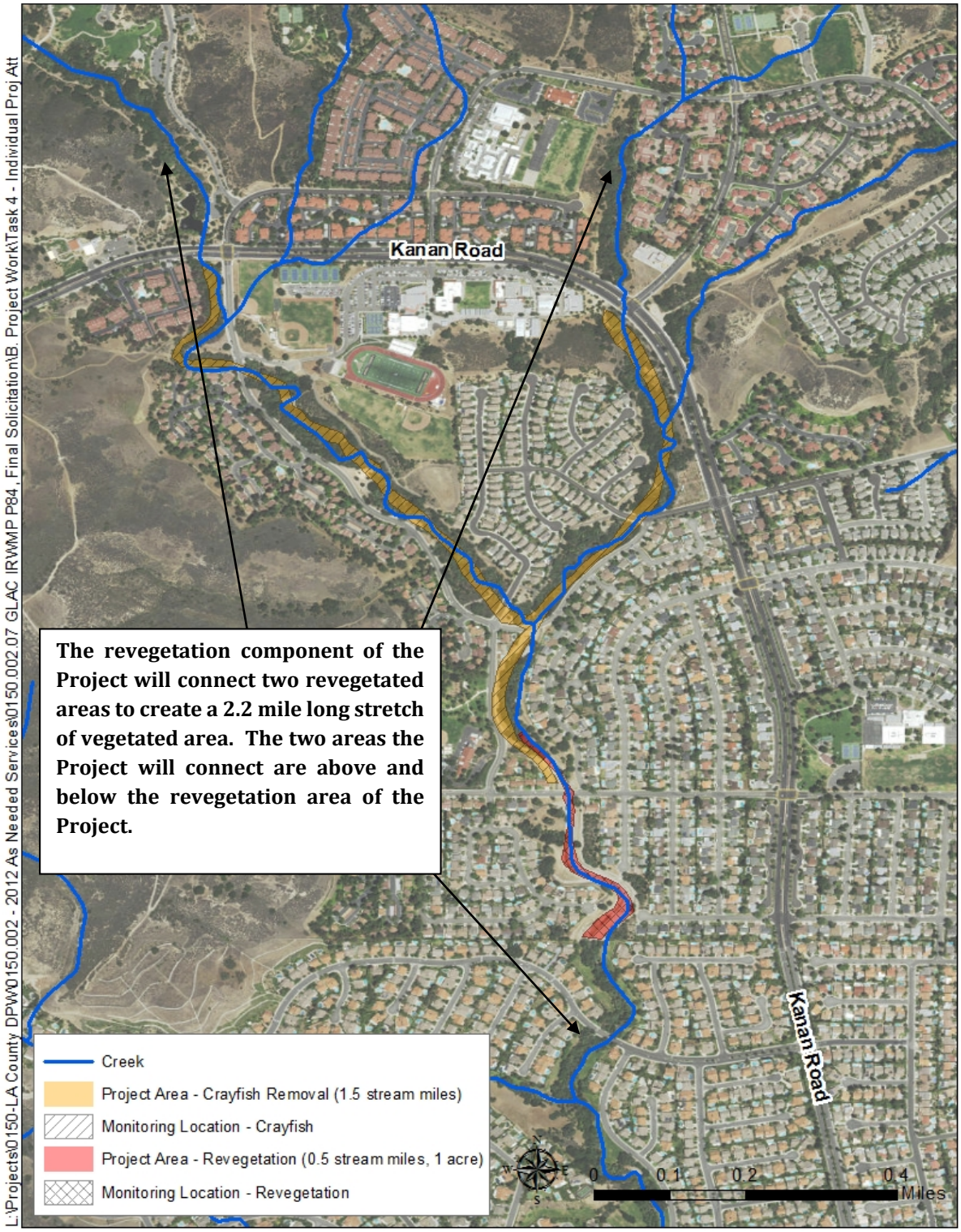
[13] Listed as either threatened, endangered, or species of special concern.

Project Map

Project Area Overview



Medea Creek Project Area



Project Physical Benefits

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

- Primary Benefit – Species Protected
- Secondary Benefit – Habitat Restored

The following tables list and quantify the primary and secondary benefits of the Urban Streams Restoration in the Malibu Creek Watershed Project.

Primary Benefit –Species Protection

The table below provides information about the benefit of protected species. The Project Schedule dictates that this benefit begins in 2019 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Urban Streams Restoration in the Malibu Creek Watershed
Type of Benefit Claimed: Species Protection
Units of the Benefit Claimed: Number of species
Anticipated Useful Life of Project (years): 100 (see comment box below)

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	0	0
2016-2023	0	6	6
2023-2116	0	7	7

Comments:

- Relationship between crayfish and California Newt eggs: Gamradt, Kats, and Anzalone. "Aggression by Non-Native Crayfish Deters Breeding in California Newts" June 1997. pg. 795.
- "Before" and "after" crayfish removal numbers showing the correlation between reduction of crayfish numbers and increase in native species numbers: Santa Monica Bay Restoration Project. "Trancas Creek Amphibian Restoration Final Report" pg. 4.
- Initial stream survey of protected species has not yet been completed for the Project site, but the base numbers in the table have been extrapolated from survey work done in nearby creek sections.
- It is reasonable that the species protection benefit of this Project would last, in effect, forever. However, for the purposes of this application, it was assumed benefits would last for 100 years.
- The Rindge Dam is located downstream of the Project location and Steelhead trout cannot pass above the Dam. Thus, it is important to note that the species protection benefit for Steelhead trout depends on the removal of Rindge Dam. Rindge Dam is currently being processed for removal by the California Department of Parks and Recreation and the U.S. Army Corps of Engineers. The Rindge Dam removal is in the Environmental Impact Report development stage. It is anticipated that the dam removal will take seven years to be completed. For this reason, species protection benefits for Steelhead trout are shown to begin in 2023.

Secondary Benefit – Habitat Restored

The table below provides information regarding habitat restored. The Project Schedule dictates that this benefit begins in 2016 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Urban Streams Restoration in the Malibu Creek Watershed
Type of Benefit Claimed: Habitat Restored
Units of the Benefit Claimed: Acres
Anticipated Useful Life of Project (years): 100 (see comment box below)

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0	0
2016	0	1	1
2017-2115	0	1	1

Comments:

- This one acre will provide the connecting segment that will complete 2.2 miles of continuous vegetated stream banks.
- It is reasonable that the restored habitat benefit of this Project would last, in effect, forever. However, for the purposes of this application, it was assumed benefits would last for 100 years.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Species Protection

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The Crayfish was likely first introduced to creeks in the area by fishermen who used them as fishing bait. This voracious, non-native predator feeds on aquatic plants and macro-invertebrates, and amphibian and fish eggs, thus disrupting the entire aquatic and riparian ecosystem. Because the Crayfish, as a non-native species, has no natural predator within the Malibu Creek Watershed, it has flourished and overtaken many of the region's native species. Removing the Crayfish from Medea Creek provides opportunity for native species to reestablish in these areas, including the Baja California Treefrog (*Pseudacris hypochondriaca*); California Newt (*Taricha torosa*); Southern Steelhead trout (*Oncorhynchus mykiss*); California Treefrog (*Pseudacris cadaverina*); Dragonfly larvae (*order Odonata*); Arroyo Chub (*Gila orcuttii*); and the California Red-legged Frog (*Rana darytonii*). Returning native species strengthens the riverine ecosystem by increasing its stability and resiliency.

Scientific study has shown that Crayfish removal will quickly and directly result in the increase of many other animal species, including six of the species listed above. The seventh species, the endangered Southern Steelhead trout, will benefit from the removal of the Crayfish once the Steelhead are re-introduced to the Malibu Creek watershed with the future removal of Rindge Dam. Many organizations and agencies, such as the California Department of Fish and Wildlife (CDFW), place a high priority on removing Crayfish from the watershed to assure a successful reintroduction of the Steelhead.

2) Estimates of Without Project Conditions

Currently, the National Park Service is working with MRT on invasive Crayfish removal from Medea Creek within Paramount Ranch; but no other agency besides MRT has attempted a watershed wide eradication Program that focuses on working from the headwaters down in all streams within the Malibu Creek Watershed. Without this Project, Crayfish will continue to be the dominant species within the 1.5 stream miles of Medea Creek and will continue to re-infest cleared streams. Given the predatory nature of the Crayfish, native species will continue to be preyed upon and will be unable to reestablish within the area. Crayfish will continue to proliferate without an intensive, systematic removal effort. Without support for this Project, the area will continue to suffer reduced numbers of native aquatic species and macro-invertebrates, which negatively impacts an area larger than the Project site.

3) Descriptions of Methods Used to Estimate Physical Benefits

Studies show a correlation between the decrease in Crayfish numbers and the increase in native macro-invertebrates, amphibians, and fish[14]. Since the seven species are native to the Malibu Creek Watershed and vulnerable to Crayfish, removing the Crayfish will protect these species.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

Physical benefits are realized after Crayfish traps are purchased, installed, and cleared of caught Crayfish. The systematic removal of Crayfish will be done starting upstream and moving downstream, using existing and temporary manmade in-stream barriers[15].Permits have already been obtained for crayfish removal within the creek,

[14] Global Invasive Species Database: Impact Information for *Procambarus clarkii*. Accessed 6 July 2015. http://issg.org/database/species/impact_info.asp?si=608&fr=1&sts=&lang=EN.

[15] Kerby, Riley, Kats, and Wilson. 1 August 2005. "Barriers and flow as limiting factors in the spread of an invasive crayfish (*Procambarus clarkii*) in southern California streams. Pgs. 403, 405-408.

including a Streambed Alteration Agreement from CDFW. A right of way (ROW) Permit from Rancho Simi Valley RSRPD is pending payment of the fee, but MRT has been granted the property owner's permission.

The species protection benefit for Steelhead trout depends on the removal of Rindge Dam downstream from the Project location. Rindge Dam is currently being processed for removal by the California Department of Parks and Recreation and the U.S. Army Corps of Engineers. The Rindge Dam removal is in the Environmental Impact Report development stage and removal of the dam is anticipated to take seven years to complete.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
A potentially adverse physical effect of the Project would be the foot traffic of the Crayfish trappers as they access the creek sections. However, due to the proximity of homes in the area, there are numerous social trails to the creek which will allow the Crayfish trappers to reach the creek without causing any added disturbance to the native vegetation. Crayfish trappers will be working in the creek and will be wearing waders.

An additional potential adverse impact resulting from the Project is that species other than Crayfish could be caught in the Crayfish traps. This would be mitigated by purchasing traps that are designed specifically for capturing Crayfish. If any other species are inadvertently caught in the traps, they would be removed and set free. All trapped Crayfish will be counted, measured, and sexed to add to scientific data. Crayfish that are removed are frozen, and then provided to California Wildlife Center, a wildlife rehabilitation center in Calabasas, to be fed to raccoons.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The species protection benefit of the Project does not address long-term drought preparedness.

Secondary Physical Benefit: Habitat Restored

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Habitat restoration in this reach is needed to help bridge the gap in an otherwise intact vegetated wildlife corridor. The Project site has been degraded due to the impacts of nearby residential development, but the Project can help recreate the most natural riparian habitat possible, within the limitations of fire department setbacks and Ventura County Watershed Protection District (VCWPD) access restrictions. The site currently provides little habitat value in the creek floodplain. Medea Creek at this location is largely exposed, but does have several stands of invasive plants. Of major concern is creating a consistently supportive habitat for the Steelhead trout. The lack of vegetation also creates an erosion and sedimentation problem that negatively impacts the stream banks and the ecology of the stream itself.

The Project will use the design and permitting obtained for a prior habitat restoration project initiated by MRT in December 2012. MRT worked on the initial phase of a mitigation (enhancement) project for CDFW that involved the Project site. MRT collaborated with the RCDSMM, VCWPD, and the Ventura County Fire Department to access areas for habitat restoration. The property owner, RSRPD, created an Encroachment Agreement and installed irrigation hook-ups for MRT's use during restoration. Because the project size was below the CDFW's threshold for project size eligibility, the project was not completed.

2) Estimates of Without Project Conditions
There are currently no other projects proposed for this area. Without the Project, the 0.25 mile strip of largely barren land would remain within a 2.2 mile strip along Medea Creek. This break in vegetative habitat creates a gap in the wildlife corridor that offers very little shelter or forage opportunities for area wildlife, thereby making it difficult for certain species such as frogs, newts, and fish to move from one protected area to another, limiting their range. Note

that this largely barren strip also contains several stands of invasive plants, which would remain without this Project.

3) Descriptions of Methods Used to Estimate Physical Benefits

The one acre of Project area chosen for habitat restoration has been delineated using on-ground surveys and based on various agency setback requirements. For instance, Fire Department regulations prohibit planting within 100 feet of any structure and the VCWPD restricts areas that they use for access and storm debris storage from the planting zones. On-ground surveys were used to determine where these agency setbacks were located and identify the area that would connect a 2.2 mile trip of native vegetation along Medea Creek.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The physical benefit of habitat restored will be realized once the native vegetation is planted and established. To establish the native vegetation, the Project requires installation of a temporary irrigation system consisting of above-ground pipes and hoses for hand-watering. Approximately 15% of the irrigation system has been installed to date and will be completed by early fall of 2016. The finished system will consist of above ground Ultra Violet Resistant PVC lines that run from a valve connection to the various planting areas. There will be a pipe end with a hose connector fitting within 100 feet of every plant. The system will have various gate valves and tees to allow hoses to be connected and use one or two at a time, to hand water all plants with hundred foot hoses. MRT staff will do all of the hand watering and the Rancho Simi Recreation and Park District will pay for the water. The irrigation facilities are expected to be removed early fall 2018. Permits and design drawings for the habitat restoration portion of the Project have already been secured.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

The re-vegetation will require a temporary irrigation system that will be removed after plant establishment is achieved. The irrigation system will be installed above-ground and will cause no soil disturbance. To avoid adverse effects, all watering will be done by hand to ensure that water is applied only to the specific restoration plants, preventing potential weed growth, water waste, and erosion.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The habitat restored benefit of the Project does not actively address long-term drought preparedness.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC, nor does it provide direct water-related benefits to a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Urban Streams Restoration in the Malibu Creek Watershed		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Species Protection	7 species protected	Tools and Methods: Biological field surveys will be conducted annually. Locations: Entire project site and surrounding locations (see project map). Data to be Collected: Numbers of Crayfish. Numbers of Baja California Treefrog; California Newt; Southern Steelhead trout; California Treefrog; Dragonfly larvae; Arroyo Chub; and California Red-legged Frog. **The monitoring tools and targets are appropriate for the benefit claimed because** the purpose of the biological field surveys will be to determine the overall density of Crayfish on the site. Studies show that by decreasing the number of Crayfish within a habitat, native species are protected and return to the area[16]. **The monitoring data will be used to measure performance by** determining the extent to which Crayfish have been removed from the Project area. A 100% reduction in Crayfish numbers will be considered successful.
Secondary Benefit – Habitat Restored	1 acre restored habitat	Tools and Methods: Transect surveys will be conducted annually. Locations: Site of re-vegetation effort. Data to be Collected: Percent of native plant cover. **The monitoring tools and targets are appropriate for the benefit claimed because** the purpose of the transect surveys will be to determine the percent of native plant cover on the site. **The monitoring data will be used to measure performance by** determining the percentage of absolute vegetative cover. Eighty-five percent absolute coverage will be considered success.

[16] Santa Monica Bay Restoration Project. "Trancas Creek Amphibian Restoration Final Report" pg. 4.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Urban Streams Restoration in the Malibu Creek Watershed	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Species Protection • Secondary Benefit – Habitat Restored
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? There are no other Project alternatives that simultaneously achieve a habitat restoration benefit and species protection benefit.
	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: Not Applicable	

Project 9: Inglewood New Well No. 7 Project (Project)
Implementing Agency: City of Inglewood (City)
Project Description

(25 Word) The Project will install one production well to produce an average of 1,178 AFY of local groundwater for the City of Inglewood's potable distribution network.

(Expanded) The Project will enhance the City's groundwater production capacity by an average of 1,178 acre-feet per year (AFY) over the Project's 50-year lifetime, allowing the City to fully utilize its groundwater allocation in the West Coast Basin and reduce its dependence on expensive and energy-intensive imported water supplies. This will also ensure that the City's customers in this Disadvantaged Community (DAC) area will have a more reliable supply of local water relative to imported water.

The City receives its potable water from two sources: approximately 7,200 AFY from the West Basin Municipal Water District (WBMWD) and approximately 2,700 AFY from City wells. The City owns 4,731 AFY of groundwater rights in the West Coast Basin. In recent years, production has decreased substantially due to the age of the wells. Thus, the City has not been able to pump their full allocated rights. The new well will allow increased production and reduce the City's dependence on imported water.

The City currently operates four wells. The Project proposes to drill a new well (Well No. 7) at a City-owned property located at 101 West Arbor Vitae Street in order to provide a new source of high-quality groundwater. This new well is intended to replace the lost production from three existing wells that were built in 1974 (Well No. 1 and Well No. 2) and 1990 (Well No. 4). Currently, the combined production of Inglewood's four active wells is 2,700 AFY, which constitutes only 60% of the City's groundwater production rights. If this project is not implemented, more imported water will have to be purchased from MWD. In addition, implementation of this project will ensure that the City's customers in this DAC area will have a more reliable supply of local water relative to imported water.

The major physical components of the project include the drilling and development of one well with an average production capacity of 1,178 AFY, installation of a pump, installation of electrical and supervisory control and data acquisition (SCADA) components, and site improvements.

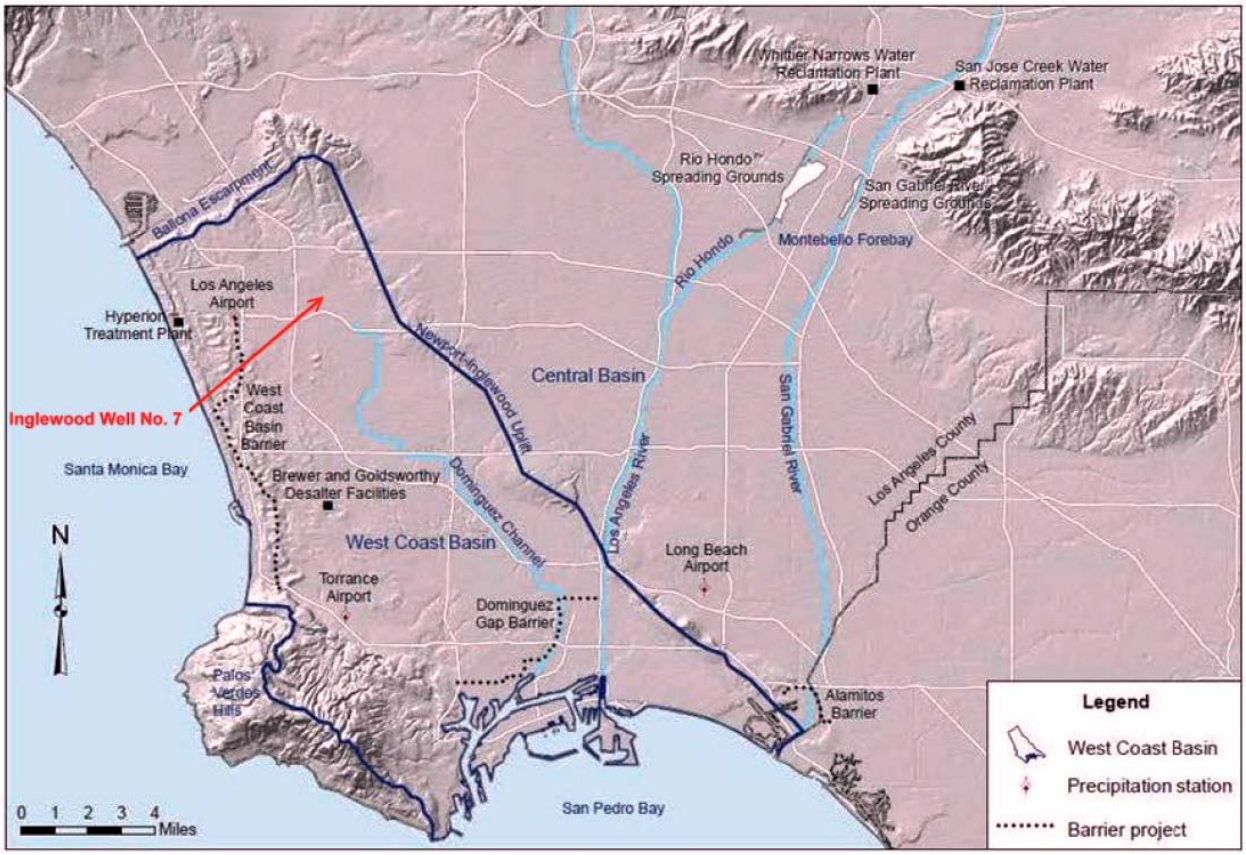
The anticipated physical benefits of the Project include the primary benefit of increasing local groundwater production from 2,700 AFY to 3,878 AFY, on average. The secondary benefit is reduced energy usage and greenhouse gas emissions from the offset of imported water with locally-produced groundwater supplies.

The Project addresses a current need of the region by addressing several of the Integrated Regional Water Management (IRWM) objectives listed in the Greater Los Angeles County 2014 IRWM Plan. The Project will increase local water supply reliability and better utilize the City's adjudicated water right in the West Coast Basin (Improve Water Supply). This will help the City provide a reliable water supply and reduce its purchases of imported water from WBMWD, which is itself under a shortage allocation that limits how much water it can purchase from the Metropolitan Water District of Southern California (MWD). The Project will also help to mitigate climate change vulnerabilities and the associated greenhouse gas emissions by offsetting 1,178 AFY of energy-intensive imported water with local groundwater supplies (Address Climate Change).

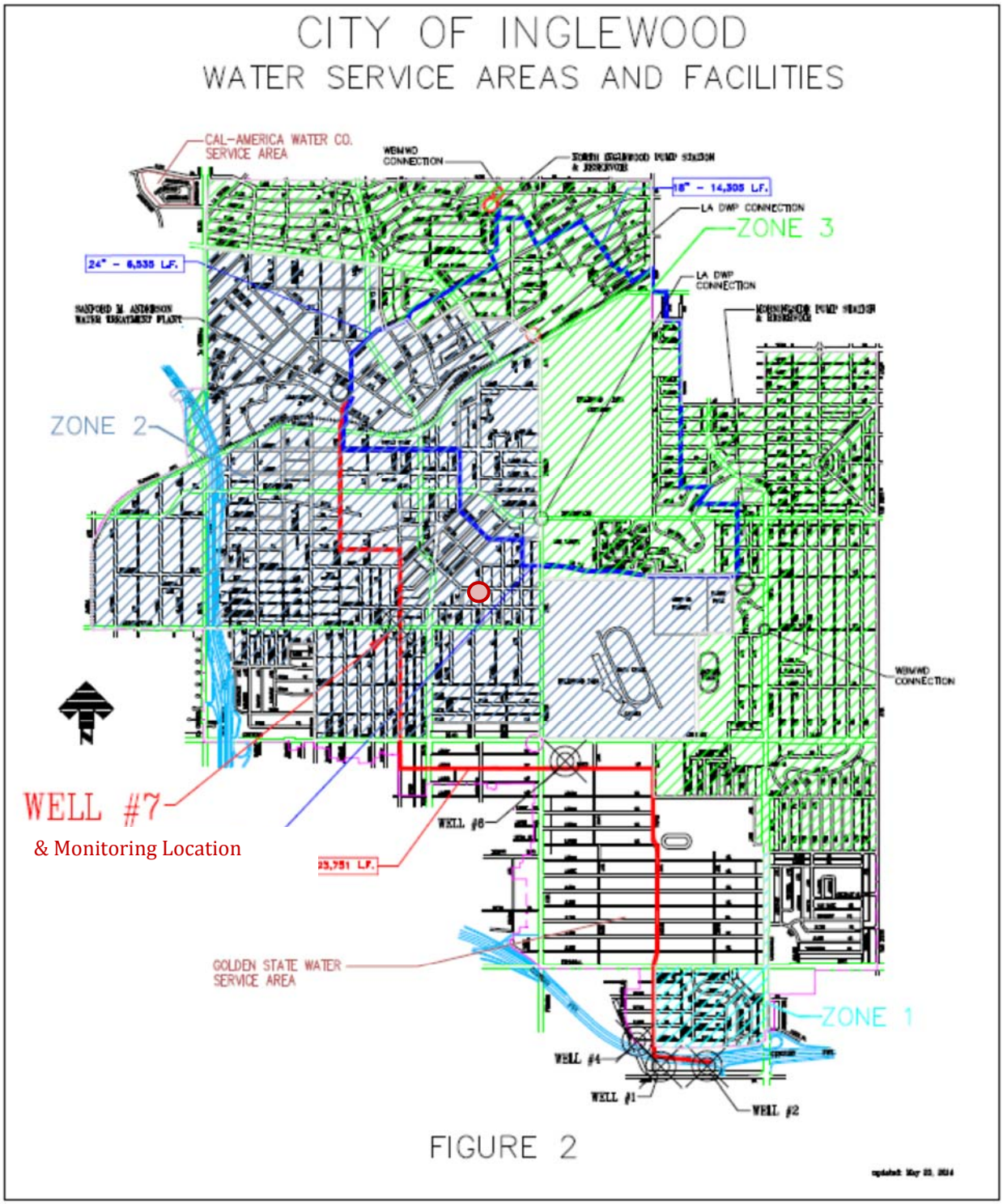
The intended outcome of the Project is to offset imported water by expanding a locally-produced supply. The project will offset 1,178 AFY of imported supplies from the drought-diminished State Water Project (SWP) and Colorado River with groundwater from the West Coast Basin.

Project Map

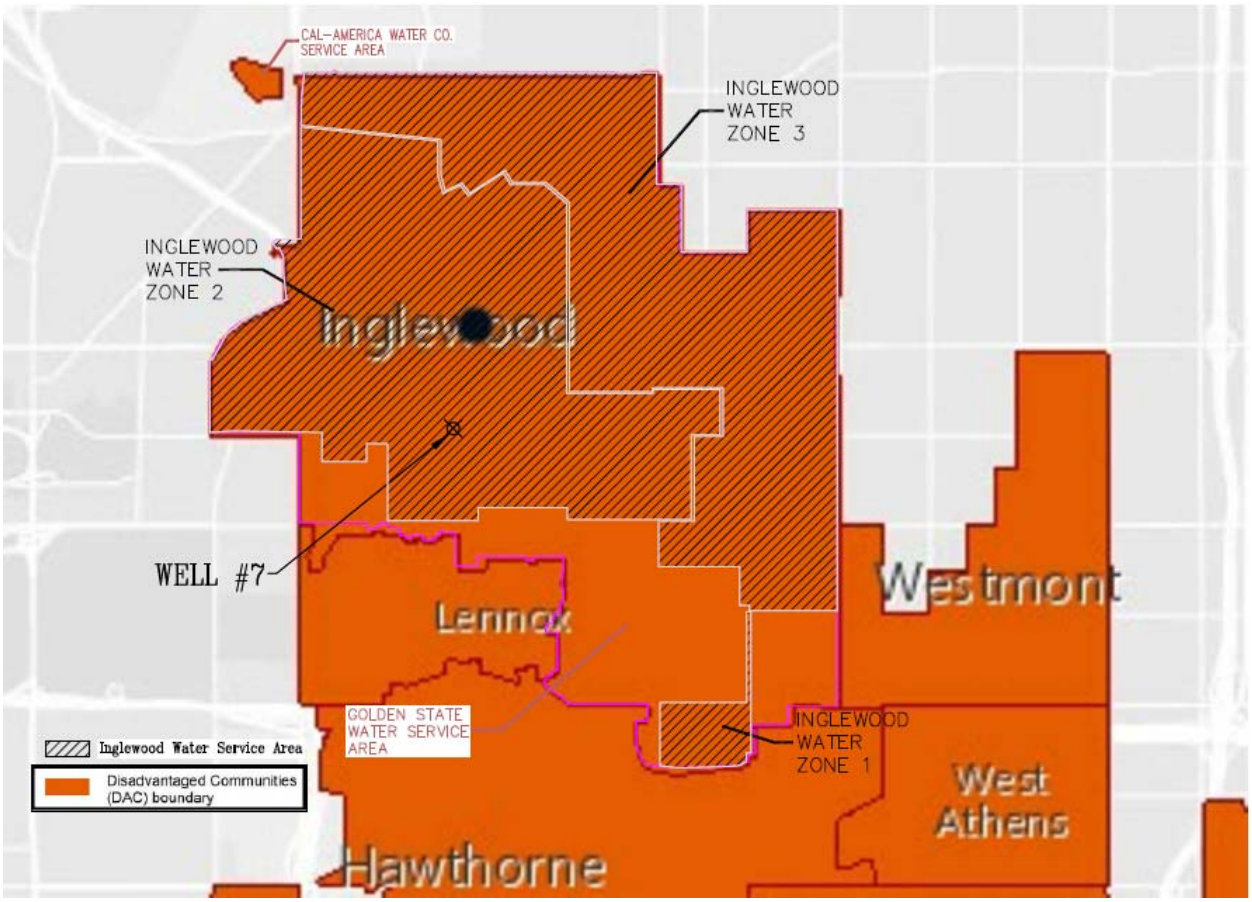
Location Map



City of Inglewood Service Area Map



Disadvantaged Communities (DACs) in Inglewood



Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

Primary Benefit – Water Supply Produced

The table below shows the benefits of increased local water supply and decreased dependence on imported water. Construction of the well will begin in August 2016, and the primary benefit is expected to start in April 2017. Over the useful life of 50 years, the cumulative benefit will be 58,914 AF. The benefits shown below reflect an assumed reduced pumping capacity over time, as reported by the City. So while the well pumping capacity is 1,936 AFY when constructed, the average production over the lifespan of the Project is expected to be approximately 1,178 AFY.

Table 5 – Annual Project Physical Benefits
Project Name: Inglewood Well No. 7
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project, (c) – (b)
2015	0	0 (Design)	0
2016	0	0 (Construction)	0
2017	0	1440 (starting in April)	1440
2018 – 2026	0	1936	1936
2027	0	1900	1900
2028	0	1900	1900
2029	0	1875	1875
2030	0	1875	1875
2031	0	1845	1845
2032	0	1845	1845
2033	0	1810	1810
2034	0	1800	1800
2035	0	1750	1750
2036	0	1700	1700
2037	0	1650	1650
2038	0	1600	1600
2039	0	1550	1550
2040	0	1500	1500
2041	0	1400	1400
2042	0	1300	1300
2043	0	1200	1200
2044	0	1100	1100
2045	0	1000	1000

Table 5 – Annual Project Physical Benefits

Project Name: Inglewood Well No. 7
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project, (c) – (b)**
2046	0	900	900
2047	0	800	800
2048	0	700	700
2049	0	600	600
2050	0	575	575
2051	0	550	550
2052	0	525	525
2053	0	500	500
2054	0	470	470
2055	0	430	430
2056	0	400	400
2057 – 2066 (last year of project life)	0	300	300

Comments:

- Feasibility study report for Inglewood Well No. 7 (March 2014).
- Design Capacity of Well No. 7 = 1,500 gallons per minute (gpm) = 2,420 AFY
- Assume operating target of 1,200 gpm (80% of design) = 1,936 AFY
- Production is expected to diminish after 10 years until end of useful life (est. 50 years) based on previous experience with well production (e.g. Well No. 6).
- Average production over 50-year Project lifespan is approximately 1,178 AFY

Secondary Benefit – Energy Saved and Greenhouse Gas Avoided

The table below shows how much energy will be saved and how much greenhouse gas emissions will be avoided by offsetting MWD imported water with West Coast Basin groundwater. Construction of the well will begin in August 2016, and the secondary benefit is expected to start in April 2017. Over the useful life of 50 years, the cumulative benefit will be 100,035,972 kilowatt-hours (kWh) of energy saved and 27,810,000 kilograms of carbon dioxide equivalent emissions (kg CO_2e) avoided. The benefits shown below reflect an assumed reduced pumping capacity over time, as reported by the City.

Table 5 – Annual Project Physical Benefits

Project Name: Inglewood Well No. 7
Type of Benefit Claimed: Secondary Benefit – Energy Saved and Greenhouse Gas Avoided
Units of the Benefit Claimed: kWh/year saved and kg of CO_2 equivalent emissions avoided
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
		Physical Benefits	
Year	**Without Project**	**With Project**	**Change Resulting from Project, (c) – (b)**
2015	0	0 (Design)	0
2016	0	0 (Construction)	0
2017	0	2,445,120 kWh 679,743 kg CO_2e	2,445,120 kWh 679,743 kg CO_2e
2018 – 2026	0	3,287,328 kWh 913,877 kg CO_2e	3,287,328 kWh 913,877 kg CO_2e
2027	0	3,226,200 kWh 896,884 kg CO_2e	3,226,200 kWh 896,884 kg CO_2e
2028	0	3,226,200 kWh 896,884 kg CO_2e	3,226,200 kWh 896,884 kg CO_2e
2029	0	3,183,750 kWh 885,083 kg CO_2e	3,183,750 kWh 885,083 kg CO_2e
2030	0	3,183,750 kWh 885,083 kg CO_2e	3,183,750 kWh 885,083 kg CO_2e
2031	0	3,132,810 kWh 870,921 kg CO_2e	3,132,810 kWh 870,921 kg CO_2e
2032	0	3,132,810 kWh 870,921 kg CO_2e	3,132,810 kWh 870,921 kg CO_2e
2033	0	3,073,380 kWh 854,400 kg CO_2e	3,073,380 kWh 854,400 kg CO_2e
2034	0	3,056,400 kWh 849,679 kg CO_2e	3,056,400 kWh 849,679 kg CO_2e
2035	0	2,971,500 kWh 826,077 kg CO_2e	2,971,500 kWh 826,077 kg CO_2e
2036	0	2,886,600 kWh 802,475 kg CO_2e	2,886,600 kWh 802,475 kg CO_2e

Table 5 – Annual Project Physical Benefits **Project Name:** Inglewood Well No. 7 **Type of Benefit Claimed:** Secondary Benefit – Energy Saved and Greenhouse Gas Avoided **Units of the Benefit Claimed:** kWh/year saved and kg of CO_2 equivalent emissions avoided **Anticipated Useful Life of Project (years):** 50			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project, (c) – (b)**
2037	0	2,801,700 kWh 778,873 kg CO_2e	2,801,700 kWh 778,873 kg CO_2e
2038	0	2,716,800 kWh 755,270 kg CO_2e	2,716,800 kWh 755,270 kg CO_2e
2039	0	2,631,900 kWh 731,668 kg CO_2e	2,631,900 kWh 731,668 kg CO_2e
2040	0	2,547,000 kWh 708,066 kg CO_2e	2,547,000 kWh 708,066 kg CO_2e
2041	0	2,377,200 kWh 660,862 kg CO_2e	2,377,200 kWh 660,862 kg CO_2e
2042	0	2,207,400 kWh 613,657 kg CO_2e	2,207,400 kWh 613,657 kg CO_2e
2043	0	2,037,600 kWh 566,453 kg CO_2e	2,037,600 kWh 566,453 kg CO_2e
2044	0	1,867,800 kWh 519,248 kg CO_2e	1,867,800 kWh 519,248 kg CO_2e
2045	0	1,698,000 kWh 472,044 kg CO_2e	1,698,000 kWh 472,044 kg CO_2e
2046	0	1,528,200 kWh 424,840 kg CO_2e	1,528,200 kWh 424,840 kg CO_2e
2047	0	1,358,400 kWh 377,635 kg CO_2e	1,358,400 kWh 377,635 kg CO_2e
2048	0	1,188,600 kWh 330,431 kg CO_2e	1,188,600 kWh 330,431 kg CO_2e
2049	0	1,018,800 kWh 283,226 kg CO_2e	1,018,800 kWh 283,226 kg CO_2e
2050	0	976,350 kWh 271,425 kg CO_2e	976,350 kWh 271,425 kg CO_2e
2051	0	933,900 kWh 259,624 kg CO_2e	933,900 kWh 259,624 kg CO_2e
2052	0	891,450 kWh 247,823 kg CO_2e	891,450 kWh 247,823 kg CO_2e
2053	0	849,000 kWh 236,022 kg CO_2e	849,000 kWh 236,022 kg CO_2e

Table 5 – Annual Project Physical Benefits

Project Name: Inglewood Well No. 7
Type of Benefit Claimed: Secondary Benefit – Energy Saved and Greenhouse Gas Avoided
Units of the Benefit Claimed: kWh/year saved and kg of CO_2 equivalent emissions avoided
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project, (c) – (b)**
2054	0	798,060 kWh 221,861 kg CO_2e	798,060 kWh 221,861 kg CO_2e
2055	0	730,140 kWh 202,979 kg CO_2e	730,140 kWh 202,979 kg CO_2e
2056	0	679,200 kWh 188,818 kg CO_2e	679,200 kWh 188,818 kg CO_2e
2057 – 2066 (last year of project life)	0	509,400 kWh 141,613 kg CO_2e	509,400 kWh 141,613 kg CO_2e

Comments:

Energy savings are based on the following sources:

- *DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7:* Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF), which is the nearest SWP pumping plant to the GLAC Region on the West Branch as listed in the table.
- *California Public Utilities Commission (CPUC) Study, page 23*: Energy associated with conveying Colorado River Aqueduct water, 1,976 kWh/AF
- *City of Inglewood*: MWD Full Service Treated water = 60% CRA/40% SWP blend (long-term average)
- *City of Inglewood SCE Power Usage spreadsheet*: Provides total energy consumed to pump local groundwater water from Inglewood's 4 active wells and convey to Inglewood's treatment facility, based on the City's Southern California Edison bills from July 2014 to May 2015. Provides aggregate pumping figures for the four active wells and energy consumption per acre-foot of water.

Greenhouse gas emissions savings are based on the following sources:

- *DWR 2014 Water-Energy Grant program Guidelines and Solicitation Package*: 0.278 kg CO_2e/kWh

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The City of Inglewood has 4,731 AFY of adjudicated water rights in the West Coast Basin. In 2014, the City received a total of 9,900 AF of potable water from all sources (8,000 AF from WBMWD and 1,900 AF from City wells). In recent years the production from existing wells has decreased substantially due to the age of the wells: from 4,880 AF in 2005 to 3,452 AF in 2008, 2,383 AF in 2011, and finally 1,854 AF in 2014. The City has purchased more imported water from WBMWD to make up for the loss of local supply, further straining scarce imported water supplies. A new well to boost groundwater production is needed for conjunctive use.

In 2011, the City began searching for a site to drill a new well. The most suitable site was located at 101 West Arbor Vitae Street in Inglewood, CA. The site is adjacent to the Raw Transmission Main pipeline, which connects to the Inglewood Water Treatment Plant.

A site feasibility study was conducted by Richard C. Slade & Associates, LLC (Consultant). In early 2014, the Consultant reviewed and interpreted hydrogeologic, geographic, and regional water level trends. The feasibility study concluded that it would be feasible for the City to drill and construct a new well at the site with an operational pumping rate in the range of 1,500 to 2,000 gpm. Based on the feasibility study, the well could be designed to allow the City to increase its groundwater production by an average of 1,178 AFY over the 50 year lifespan.

2) Estimates of Without Project Conditions

Without the proposed Well No. 7, the City groundwater production will be limited to existing wells: No. 1, No. 2, No. 4 and No. 6. In recent years the production from these wells has decreased substantially due to age. The City has just completed rehabilitation of Well No. 1, producing an additional 800 AFY. In 2016, the City will rehabilitate Well No. 2 which will produce an additional 400 AFY. The rehabilitation projects will boost production from 1,900 to approximately 3,100 AFY. These improvements will improve overall production to only 66% of the City's groundwater pumping rights, thus a new well with larger production capacity is needed.

3) Descriptions of Methods Used to Estimate Physical Benefits

Based on the Feasibility Study completed by the Consultant, the design capacity of the new well is 1,500 gpm. It is assumed that a target production rate of 1,200 gpm, which is 80% of the design capacity, is achievable. Therefore, the new well is capable of producing an additional 1,936 AFY of groundwater, but the benefits shown in Table 5 assume reduced pumping capacity over time, based on the City's experience with its other production wells. The average production over the 50 year lifespan of the Project will be 1,178 AFY. The new well, along with the rehabilitation of No. 2 will enhance the current groundwater production from 2,700 AFY to the targeted production of 3878 AFY.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The City has hired Tetra Tech Inc. to design the new well and help the City obtain a New Well Permit, a National Pollutant Discharge Elimination System (NPDES) Permit, and other permits from State agencies. The City has already completed the California Environmental Quality Act (CEQA) environmental review required for construction of a new well.

After completing the design and obtaining the required permits, the City will find a contractor through open bidding to drill a well and install well casing, submersible pump and motor assemblies, piping, valves, SCADA telemetry, and other electrical facilities at the site. Pump testing then determines the well production capability.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
The CEQA evaluation process was completed in 2014, and a Mitigated Negative Declaration (MND) was adopted at a public hearing on November 18, 2014. Based on the report, two removable trees on the current lot will be cut, and a permit to remove the trees will be obtained from the Inglewood Park Commission. The potential adverse effects of nuisance construction noise can be minimized by installing a temporary sound-proof wall. A submersible pump will be installed to mitigate noise from operation of the well.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The primary benefit of the project is to provide an additional local water resource to address long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this project will (1) help to efficiently manage the West Coast groundwater basin, and (2) yield a new water supply in terms of gaining access to groundwater that could not previously be pumped.

Secondary Physical Benefit: Energy Saved and Greenhouse Gas Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Energy costs make up a substantial part of the budget of water suppliers, who must raise their water rates when the price of electricity increases. Between 2006 and 2012, the price of energy in California rose 30%, and the Federal Energy Regulatory Commission predicts that it will rise another 47% by 2030 as renewable sources replace cheap coal power. The rising costs of both energy and water negatively impact residential customers, particularly in disadvantaged communities like Inglewood.

Generating the energy needed to produce, convey, and distribute water also produces carbon dioxide emissions that contribute to global warming, which itself threatens California's water supply. The State has committed to reducing its emissions by 15% by 2020 under AB-32, the Global Warming Solutions Act of 2006. Decreasing the amount of energy required to produce water supply is an Objective of the California Water Action Plan.

As the result of a recent climate change vulnerability analysis, the GLAC IRWM Region has identified the need to adapt to and mitigate against further climate change. The Region's objectives support projects like conservation that reduce energy consumption and greenhouse gas emissions. The Project will reduce energy consumption by an average of 2,000,244 kWh per year and avoid greenhouse gas emissions of approximately 556,068 kg CO_2e per year, thereby helping to mitigate against climate change as well as adapt to climate change through demand reduction.

2) Estimates of Without Project Conditions
Without the proposed Well No. 7, the City will continue to purchase approximately 7,200 AFY of imported water from MWD (via WBMWD), resulting in energy consumption of 20,419,360 kWh/year and related greenhouse gas emissions. However, constructing Well No. 7 in addition to completing the well rehabilitation activities will reduce imported water purchases to 5,264 AFY and energy consumption from imported water to 12,917,856 kWh/year, a 36% reduction below current levels.

3) Descriptions of Methods Used to Estimate Physical Benefits

Based on DWR data, approximately 4,126 kilowatt-hours per acre-foot (kWh/AF) are required for conveyance and pumping of State Water Project (SWP) water to the Oso Pumping Plant and 1,976 kWh/AF are required for Colorado River Aqueduct (CRA) water. From the City of Inglewood, WBMWD purchases imported MWD water that is a blend of 40% SWP water and 60% CRA water in a normal year. This results in an estimated 2,836 kWh/AF of energy to provide imported supply to the City. In recent years, considerably more water has come from the less energy-intensive CRA, so the energy savings estimates presented here are conservative.

Based on the City's energy bills for active wells No. 1, 2, 4, and 6, the average amount of energy required to pump local groundwater from July 2014 to May 2015 was 1,138 kWh/AF.

Based on the figures above, for every acre-foot of imported water conserved, 2,836 kWh – 1,138 kWh = 1,698 kWh of energy is conserved. Since this project will conserve an average of 1,178 AFY of imported water over the project lifetime, an average of 1,178 AFY × 1,698 kWh = 2,000,244 kWh/year of energy will be conserved.

Based on the default emissions intensity supplied by DWR's 2014 Water-Energy Grant program (0.278 kg CO_2e/kWh), an average of 556,068 kg CO_2e per year in greenhouse gas emissions will also be avoided.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The City has hired Tetra Tech Inc. to design the new well and help the City obtain a New Well Permit, NPDES Permit, and other permits from State agencies. The City has already completed the CEQA environmental review required for construction of a new well.

After completing the design and obtaining the required permits, the City will find a contractor through open bidding to drill a well and install well casing, submersible pump and motor assemblies, piping, valves, SCADA telemetry, and other electrical facilities at the site. Pump testing then determine the well production capability; and well production capability will determine the energy savings and greenhouse gas reduction

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

CEQA evaluation and process was completed in 2014, and was approved through public hearing on November 18, 2014. A CEQA Mitigated Negative Declaration of Environmental Impacts report was adopted. Based on the report, two removable trees on the current lot will be cut, and a permit to remove the tree will be obtained from the Inglewood Park commission. The potential adverse effects of nuisance construction noise can be minimized by installing a sound-proof wall. A submersible pump will be installed to mitigate the noise during operation of well.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This secondary project benefit (Energy Saved and Greenhouse Gases Avoided) does not address long-term drought preparedness.

Direct Water-Related Benefit to a DAC

The direct water-related needs of the Disadvantage Community (DAC) of the City of Inglewood (City) are increased local groundwater production and reduced dependence on energy-intensive and expensive imported water. Energy costs make up a substantial part of the budget of water suppliers, who must raise their water rates when the price of electricity increases. The rising costs of both energy and water negatively impact residential customers, particularly in disadvantaged communities like Inglewood.

The Project will provide a direct water-related benefit to DACs by adding to existing public water supply infrastructure for the City to assure continued reliability of the quantity of water. The Project will enhance the City's groundwater production capacity by approximately 1,936 acre-feet per year (AFY), allowing the City to fully utilize its groundwater allocation in the West Coast Basin and reduce its dependence on expensive and energy-intensive imported water supplies.

The City currently operates four wells. The Project proposes to drill a new well (Well No. 7) at a City-owned property located at 101 West Arbor Vitae Street in order to provide a new source of high-quality groundwater. This new well is intended to replace the lost production from the other three existing wells. Currently, the combined production of Inglewood's four active wells is 2,700 AFY, which constitutes only 60% of the City's groundwater production rights. The implementation of this project will ensure that the City's customers in this DAC area will have a more reliable supply of local water with less of a reliance on imported water. If this project is not implemented, more imported water will have to be purchased from West Basin Municipal Water District (via Metropolitan Water District). Because the entire Project will benefit a DAC, 100% of the project benefits will go to a DAC. See Attachment 7 for additional information.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Inglewood Well No. 7		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	1,178 AFY (average over Project lifetime) 1,936 AFY (targeted initial production)	Locations: Monthly flow meter readings at Well No. 7 Tools and Methods: Well No. 7 will be equipped with a meter that records flow and cumulative volume. The City will record cumulative volumetric readings for the well at least monthly and calculate the total volume of water extracted from the well on a quarterly and annual basis in order to track performance against the target average of 1,178 AFY production. Data to be Collected: production data for the well will be reported in the City's Water Monthly Production Reports. **The monitoring tools and targets are appropriate for the benefits claimed because** the flowmeters at the new well will record the amount of groundwater that is supplied. **The monitoring data will be used to measure performance by** showing the total groundwater produced on an annual basis and comparing it the 1,178 AFY target average.
Secondary Benefit – Energy Saved and Greenhouse Gases Avoided	3,287,328 kWh saved and 913,877 kg CO_2e avoided (average over Project lifetime)	Energy saved and greenhouse gases avoided are based on offsetting imported water supplies with local groundwater produced and monitored as described above. Tools and Methods: Groundwater production in AFY is converted to kWh of energy saved and kg of greenhouse gas avoided using the method described in the *Description of Methods Used to Estimate (Secondary) Benefit* section.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Inglewood Well No. 7	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Energy Saved and Greenhouse Gas Avoided
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project?** Yes. The City of Inglewood could purchase more imported water from MWD via WBMWD.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. Alternative 1: Purchase 1,178 AFY of imported water • MWD full-service treated Tier 1 water @ $923/AF × 1,178 AFY = **$1,087,294/year**. Alternative 2: Install New Well No. 7 to produce 1,178 AFY (Proposed Project) • Well construction costs: $2,000,000 construction costs amortized over 50 year lifespan = $40,000 year • Pumping costs: 1,138 kWh/AF × $0.21/ kWh × 1,178 AFY average = $281,518/year • Total costs: $40,000/year + $281,518/year = **$321,518/year**.
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** The proposed project is the least cost alternative.
Comments:	

Project 10: Recycled Water Supply for Palos Verdes Golf Course (Project)
Implementing Agency: City of Palos Verdes Estates

Project Description

(25 Word) This Project extends a recycled water system to serve a golf course, park, and school with 210 AFY and restores 0.85 acres of dune habitat.

(Expanded) The City of Palos Verdes Estates is partnering with the West Basin Municipal Water District (WBMWD) and Palos Verdes Golf Club to implement this project. The Project includes construction of a new recycled water line, pump station and onsite storage to serve 200 acre-feet per year (AFY) to the Palos Verdes Golf Course, owned by the City of Palos Verdes Estates and operated and maintained by the Palos Verdes Golf Club. The Project also includes the installation of connections to two (2) other sites along the alignment for an additional 10 AFY: Los Arboles Park and Riviera Elementary School. The habitat restoration involves removal of non-native acacia trees and understory grass; they will be replaced with a mix of native transitional riparian species and native scrub species at Malaga Dunes.

The major physical components of the Project include the construction of a four-pump lift station rated at approximately 1,250 gallons per minute, 12,000 feet of 4 to 8-inch diameter pipeline, valves, three connections, a 500,000 gallon storage tank or pond, and habitat restoration. Ten years ago, the Palos Verdes Golf Club invested in the construction of dual water lines ("purple pipe") to allow for use of recycled water for golf course irrigation to increase sustainability and provide a reliable, long-term water source. This Project extends the recycled water line from South High School in Torrance to the Palos Verdes Golf Course. The habitat restoration will take place along Valmonte Trail in the Malaga Dunes, located along the proposed recycled pipe alignment. Physical components include the native riparian and scrub species to be established.

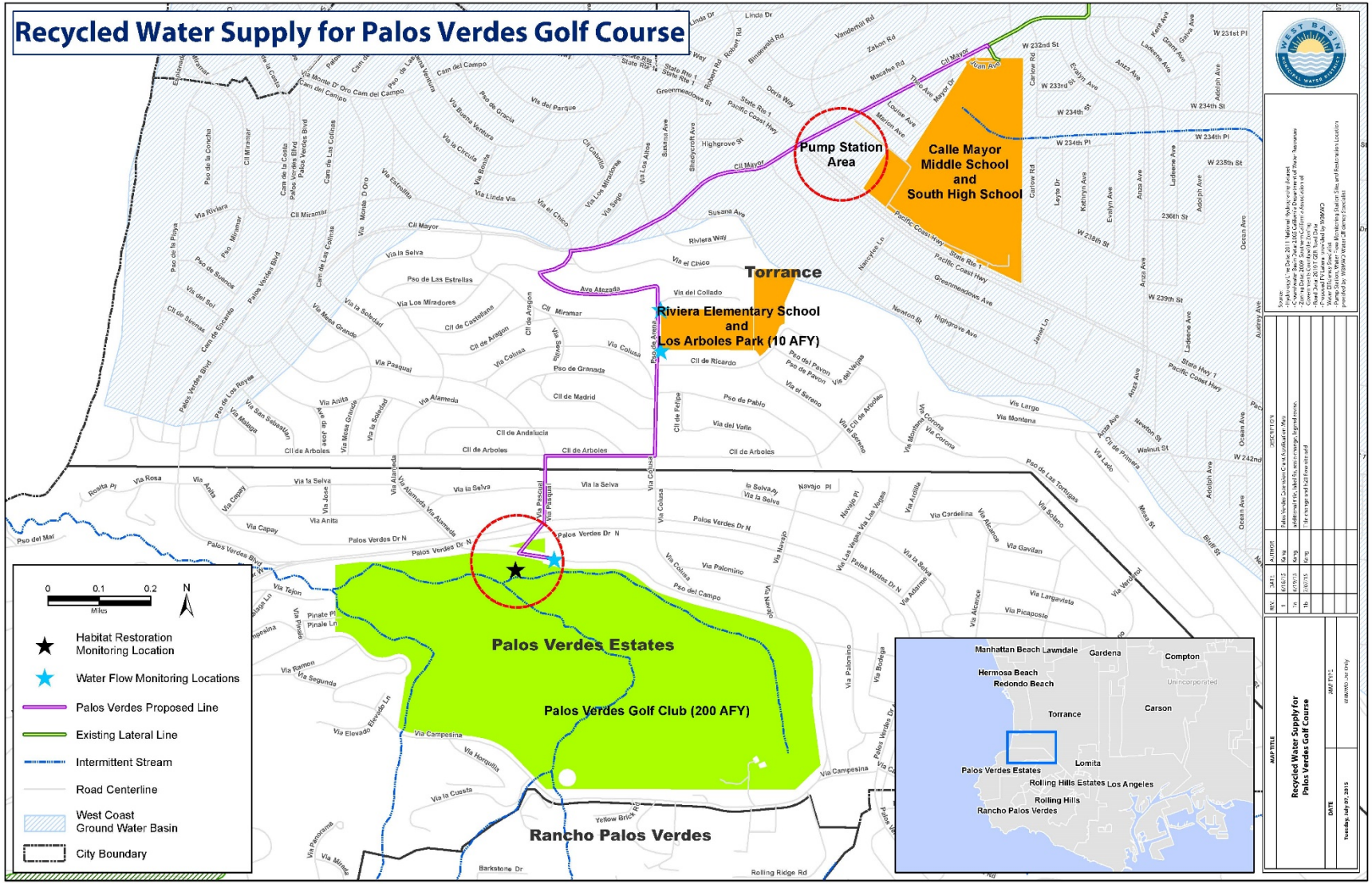
The anticipated physical benefits of the Project include the primary benefit of increasing local water supply by delivering 210 AFY of recycled water to three sites and secondary benefit of restoring 0.85 acres of native dune habitat along a publically accessible trail. The anticipated location of the pipeline is beneath a portion of the habitat restoration area that will be disturbed during construction.

The Project addresses a current need of the region by supporting the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). First, the Project will optimize local water resources to reduce the region's reliance on imported water (Improve Water Supply). This is accomplished by increasing use of recycled water in an area where there are currently no accessible groundwater supplies or recycled water sources. Second, the Project will protect, restore, and enhance natural processes and habitats in the native dune area (Enhance Habitat). Third, the Project will increase watershed-friendly recreational space for all communities (Enhance Open Space and Recreation). And finally, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to conserve imported potable water by developing a locally-produced supply. The Palos Verdes Peninsula currently relies solely on imported water supplies. There are no groundwater supplies, due to topography, and no access to recycled water because of distances to existing lines. This Project will construct a pipeline that connects recycled water supplies from an existing line in the southern part of Torrance to the golf course in the City of Palos Verdes Estates. In addition, the restoration of 0.85 acres of native dune habitat along a publically accessible trail will provide improvements to the ecosystem and public by enhancing a natural habitat, recreation, and open space area.

Project Maps

Primary Benefit



Secondary Benefit - Boundaries of habitat restoration along Valmonte Trail

Project Physical Benefits

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

- Primary Benefit – Water Supply Recycled
- Secondary Benefit – Habitat Restored

Primary Benefit – Water Supply Recycled

The table below provides information on the benefit of Water Supply Recycled. The Project Schedule dictates that this benefit begins in 2019 and continues for the 50-year lifespan of the Project.

Table 5 – Annual Project Physical Benefits
Project Name: Recycled Water Supply for Palos Verdes Golf Course
Type of Benefit Claimed: Water Supply Recycled
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 50

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0	0
2016 - 2018	0	0	0
2019 - 2068	0	210	210

Comments:

- *2009 West Basin Capital Implementation Master Plan*, Table 3.4 (page 3-24); Figure 9.1 (page 9-5); Tables 9.2 (page 9-4), 9.3 (page 9-12), 9.4 (page 9-13), and 9.37 (page 9-56).
- Palos Verdes Golf Club Water Use data from 2009 through 2014
- Estimated Project lifetime savings: 10,500 AF

Secondary Benefit – Habitat Restored

The table below provides information regarding Restored Habitat. The Project Schedule dictates that this benefit begins in 2019 and continues for the 50-year lifespan of the Project.

Table 5 – Annual Project Physical Benefits **Project Name:** Recycled Water Supply for Palos Verdes Golf Course **Type of Benefit Claimed:** Habitat Restored **Units of the Benefit Claimed:** Acres **Anticipated Useful Life of Project (years):** 50			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0	0
2016 - 2018	0	0	0
2019 - 2068	0	0.85	0.85
Comments: • *Results of Jurisdictional Delineation and Habitat Assessment of the Palos Verdes Golf Club Expansion Project, Palos Verdes Estates, Los Angeles County, California*, January 6, 2014.			

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Recycled

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The State of California is currently experiencing one of the most severe droughts on record, which has severely depleted statewide water supplies. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting SWP supplies from the Bay-Delta. The results of these still recent drought conditions can be seen throughout the Region as an increased implementation of local supply development projects and conservation measures and ordinances. With only one wet year in 2011, the Region is in the middle of yet another multiple year drought.

Historically, the Palos Verdes Golf Club invested in the construction of dual water lines ("purple pipe") to allow for future use of recycled water for golf course irrigation and to increase the sustainability of the facility with a reliable, long-term source of water to serve the recreational use. The local water purveyor, WBMWD, included service to this area under project T22-15 in the 2009 *Capital Implementation Master Plan for Recycled Water Systems (Master Plan)*. This Project brings that vision to fruition by extending a 4- to 8-inch diameter recycled water line approximately 12,000 linear feet from South High School in Torrance to the Palos Verdes Golf Course, Los Arboles Park, and Riviera Elementary School. The Project also includes construction of a pump station to boost the water to the higher elevation and a storage tank or pond at the golf course. The Palos Verdes Golf Club has already implemented water conservation measures throughout the course to mitigate the use of potable water supplies through the following actions:

- Reduced irrigated turf areas by 12% over the last 8 years.
- Approved plans to increase turf reduction an additional 9%.
- Replaced half of the sprinkler heads (900) on the property in 2014.
- Use of state-of-the-art computerized irrigation system with on-site weather stations that provide daily weather conditions and evapotranspiration (ET) readings.
- Use of remote sensors under each putting green that measures moisture to know precisely how much water is needed for each green.
- Use of a portable moisture sensor to provide exact readings for greens, tees, and fairways.
- Use of wetting agents that improve water uniformity and root development.
- Increased hand watering in order to be more precise in water management.

Recently with the State Water Resources Control Board's mandate to reduce potable water usage for irrigation of golf courses, the Palos Verdes Golf Club is seeking to expand its conservation efforts through the use of recycled water. In addition, since the Palos Verdes Peninsula area (Peninsula) only has access to imported water supplies, a broader supply portfolio is needed to improve the reliability of these supplies for residents and businesses. Imported water supply rationing began July 1, 2015, increasing the need for the development of locally-produced supplies.

The Project is needed to further efforts by the golf course, school, and park to conserve potable water supplies through the use of recycled water for irrigation. It has long been an objective of WBMWD to provide recycled water to the Peninsula, as documented in the Master Plan; but it has been cost prohibitive in the past. This pipeline extension will convey recycled water to the golf course, school, and park. This Project has the potential to supply recycled water to other sites on the Peninsula in the future.

2) Estimates of Without Project Conditions
If the Project is not implemented, the minimum estimated water savings of 210 AFY that could serve 420 households per year would not be realized and reliance on potable water supplies from imported sources would continue.

3) Descriptions of Methods Used to Estimate Physical Benefits
The method used to determine savings of the 210 AFY is based on Palos Verdes Golf Club Water Use data from 2009 through 2014. The delivery of water to consumers (end users) is tracked via a meter at the point of connection at the property. Records of meter readings will be used to estimate and verify the water supply benefit.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
The infrastructure to be constructed for this Project includes underground pipelines, valves, and a pump station to pump water uphill from the City of Torrance to the City of Palos Verdes Estates. The Project will include construction of approximately 12,000 feet of 4- to 8-inch diameter main, a 1,250 gallon per minute booster station, valves, and three recycled water service connections. The Project also includes the construction of a 500,000 gallon tank or storage pond at the golf course and the restoration of a portion of the Malaga Dunes by removing invasive species and replacing them with native drought tolerant plant species.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
There are no known long-term adverse physical effects of the Project. During construction, there will be emissions from the construction equipment. Mitigation measures and best management practices will be implemented during construction to minimize any adverse effects.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
This Project benefit (Water Supply Recycled) addresses long term drought preparedness by creating a locally-controlled, 100 percent reliable drought-proof supply of water for the golf course, school, and park. Over the 50 year lifetime of the Project, the estimated water savings is 10,500 AF. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote water recycling.

Secondary Physical Benefit: Habitat Restored

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
The City of Palos Verdes Estates and the Palos Verdes Golf Club propose to implement a transitional riparian restoration program within the Malaga Dunes that would address habitat degradation and enhance the ecological function in the restoration area. The restoration of the dunes area is directly associated with the recycled pipeline since the anticipated location of the pipeline is beneath a portion of the dunes area. The City seeks to restore the area by removing the non-native acacia within and near the construction footprint. The removal of acacia in this area creates an opportunity to restore all of the acacia-dominated dunes to a native transitional riparian community.

Currently within the ancient sand dune habitat, there is a diverse range of native species supporting an equally diverse range of wildlife. The 0.85-acre restoration area is invaded with a monotypic community of non-native acacia trees. These acacia stands are densely grouped and form a continuous canopy cover that precludes establishment of a healthy native understory. As part of the transitional riparian restoration program, the non-native acacia trees will be removed through stump cutting and offsite disposal. In consultation with the Palos Verdes Peninsula Land Conservancy and biologists, a mix of native transitional riparian species and native scrub species will be planted within the restoration area.

The typical monitoring and maintenance period associated with any transitional riparian habitat restoration

program is five years. This is the amount of time necessary for the vegetation to become established (first 3 years) and then for it to be sustainable without supplemental irrigation (additional 1-2 years). The species selected for this restoration program have routinely established successfully in the first three years of installation. Given that the dunes restoration area is also adjacent to the proposed recycled water pipeline, the plants will have access to a source of irrigation to help facilitate establishment. Annual monitoring in the form of observation surveys will be performed, along with monthly maintenance activities. Maintenance will include the removal of weeds to allow the newly-established native plants to succeed and thrive.

2) Estimates of Without Project Conditions

If the Project is not implemented, the habitat would continue to experience the growth of non-native plant species which impact the water usage and ecosystem habitat. Re-establishment of drought-tolerant native species would not be possible. The benefit of 0.85 acres of restored native dune habitat would not be realized.

3) Descriptions of Methods Used to Estimate Physical Benefits

The foundation for successful habitat restoration projects is early implementation of effective habitat maintenance. Monthly observation surveys will be taken by golf course personnel to monitor the growth of native plant species and any non-native plant growth. Under the supervision of a biologist, the golf course maintenance personnel will be trained on the removal of non-native plants on a continuous basis to preserve the restored habitat. A biologist will conduct quarterly observation surveys for the first two years and annually thereafter for a period of at least three years. The observation surveys will be utilized to determine recommendations related to weed control, pest control and resource protection, erosion control and additional native planting efforts.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

To obtain this physical benefit, invasive non-native species will be replaced with native drought tolerant species. The non-native acacia trees will be removed through stump cutting and offsite disposal. The non-native grass understory will be mowed and removed. The actions that will be taken once the native plant species are planted will be to continually monitor the growth of the native plant species, remove any non-native plant species immediately to prevent widespread growth, remediate any of the habitat as necessary, and to follow proper landscape maintenance protocol to ensure that invasive plant seeds are not spread.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no known adverse physical effects.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This Project benefit (Restored Habitat) does not address long-term drought preparedness.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Recycled Water Supply for Palos Verdes Golf Course		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Recycled	210 AFY of water recycled	Tools and Methods: Water Meter reads Data Collection Location: meters at customer properties Type of Analysis: meter totalizer **The monitoring tools and targets are appropriate for the benefits claimed because** meter readings will accurately account for AFY of recycled water served. **The monitoring data will be used to measure performance by** totalizing the acre-feet served by the Project year to year.
Secondary Benefit – Habitat Restored	0.85 acres of habitat restored	Tools and Methods: observational surveys of native species Data Collection Location: restoration area located at Malaga Dunes near the intersection of Paseo Del Campo with Palos Verdes Drive North. Type of Analysis: review of observational survey results **The monitoring tools and targets are appropriate for the benefits claimed because** surveys are the best way to verify the viability and sustainability of restored habitat. **The monitoring data will be used to measure performance by** identifying number and density of species compared to baseline.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Recycled Water Supply for Palos Verdes Golf Course_	
Question 1	**Types of benefits provided as shown in Table 5** • Water Supply Recycled • Habitat Restored
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** Yes. This is the only alternative that provides 100% of the golf course irrigation needs; the next best alternative can only supply about 50% of the irrigation needs.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. Alternatives are discussed in the October 2014 *Water Committee Report*, prepared by the Palos Verdes Golf Club. • Desalination – Did not pursue because of Environmental Issues/ Permitting. • Scalping Plant – Did not pursue due to lack of minimum flow requirements. • On-Site Reclamation Plant – Did not pursue due to lack of minimum flow requirements. • Reuse of Malaga Cove Nuisance Water – Continue to pursue but flows may diminish with extended drought. • On-Site Wells – Researched but adequate well water is unlikely due to geology of Palos Verdes.
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** The proposed Project is the preferred alternative because it provides the greatest water savings at the best cost. In the current drought, water supply is limited and the State-wide restrictions have placed mandates on golf courses who irrigate with potable water. The Palos Verdes Golf Club has been pursuing the connection to recycled water for at least 10 years and has already installed a dual-plumbed system to be able to supply Title 22 recycled water to the golf course while maintaining potable water for the greens, which are very sensitive to the constituents in Title 22 water.
Comments: *Water Committee Report, prepared by the Palos Verdes Golf Club, October 2014:* Discusses Alternatives	

Project 11: North Torrance Well Field Project, Phase III (Project)
Implementing Agency: City of Torrance
Project Description

(25 Word) The Project will increase water supply for the City of Torrance by producing 4,000 AFY of groundwater and improve water quality by reducing manganese concentrations.

(Expanded) The City of Torrance (City) will enhance its groundwater pumping capacity by 4,000 acre-feet per year (AFY) by constructing two new wells. The City currently has two sources of potable water: imported water supplied by the Metropolitan Water District of Southern California (MWD) and groundwater from the West Coast Basin. The City's total demand is currently around 20,000 AFY. Roughly 82 percent of this demand is supplied by imported water, with the remaining 18 percent supplied by groundwater. To provide groundwater, the City uses one well, Well No. 9, which has a capacity of 2,000 AFY.

This Project will enhance groundwater production and improve local water supply reliability and water quality. The first two phases include land acquisition and underground utility construction. Phase III (Project) will include construction of two new wells (Well No. 10 and Well No. 11) that will each provide 2,000 AFY. With the Project, the City's total groundwater pumping capacity would increase to 6,000 AFY. This additional 4,000 AFY of capacity resulting from the Project would increase the City's groundwater supply to 30 percent of its total supply portfolio[17].

The City has adjudicated groundwater rights to pump 5,640 AFY from the West Coast Basin. Since the wells, #9, #10 and #11, would have a total capacity of 6,000 AFY, the Project could provide 360 AFY of pumping capacity in excess of the City's adjudicated water right [6,000 AFY – 5,640 AFY]. This would benefit the City during times of drought or other emergencies due to a recent change in the basin adjudication. In December 2014, the Superior Court of California approved conjunctive use, allowing pumpers to bank unused pumping rights up to twice the amount of their adjudicated rights on a phased basis. Under these new rules, the City can bank up to 11,280 AFY in the Basin. Banked water can then be pumped back out and utilized by the City.

The major physical components of the Project include two new groundwater wells (No. 10 and No. 11), a 3 million gallon storage tank, a booster pump station, and a disinfection/treatment plant. The two wells will provide a combined pumping capacity of 4,000 AFY. A disinfection/treatment plant will be used to treat the pumped groundwater to reduce concentrations of manganese (Mn) and provide the appropriate disinfectant residual in the distribution system. The Project also includes a storage tank and booster pump station.

The anticipated physical benefits of the Project include the primary benefit of 4,000 AFY of groundwater produced, a local water supply source. The secondary benefit of the Project is improving water quality by reducing concentrations of Mn in the potable water distribution system. Offset of imported water with locally produced water will also provide energy savings and a reduction in greenhouse gas emissions (GHG).

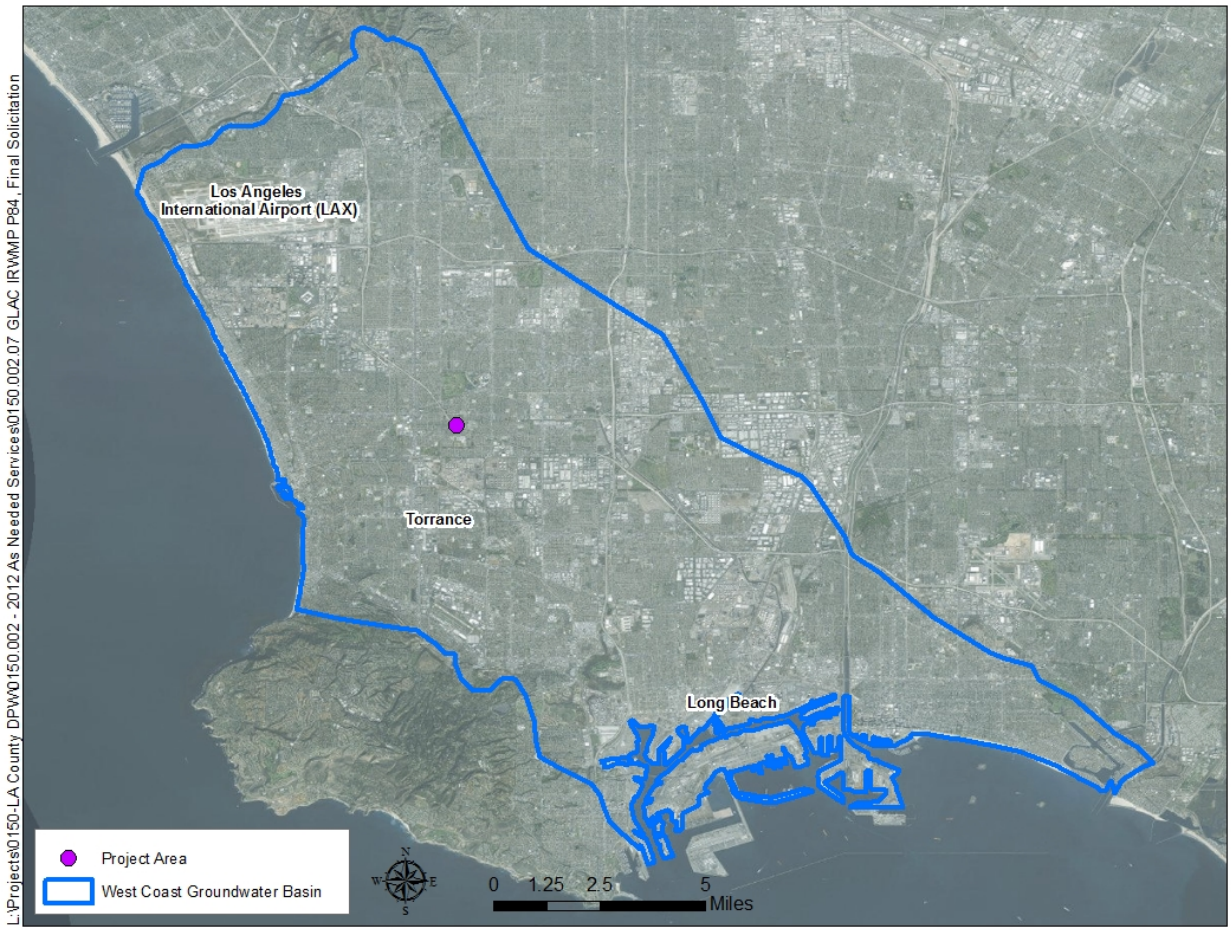
The Project addresses a current need of the region by supporting the following objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP): optimizes local water resources to reduce the Region's reliance on imported water (Improve Water Supply) and helps to mitigate against greenhouse gas emissions and address climate change vulnerabilities by reducing demand for energy-intensive imported water supplies (Address Climate Change).

The intended outcome of the Project is to reduce reliance on imported water by producing an additional 4,000 AFY of local groundwater supply and improve water quality by reducing concentrations of manganese.

[17] There are other plans (not included in this Project) to expand the desalter at Well No. 1.

Project Maps

Location Map of West Coast Basin and Project Area



Project Area Map – Wells, Storage Tank, Pump Station, Treatment, and Lab Facilities

Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Water Quality Improved through Manganese Reduction

Energy savings and greenhouse gas emission reduction are also benefits provided by the Project due to the offset of imported water supplies with locally produced water supplies.

Primary Benefit – Water Supply Produced

The table below provides information on the benefit of water supply produced.

Table 5 – Annual Project Physical Benefits

Project Name: North Torrance Well Field Project, Phase III
Type of Benefit Claimed: Secondary Benefit – Water Supply Produced
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 35 years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-2018	0	0	0
2019	0	4,000	4,000
2020-2053	0	4,000	4,000

Comments:

- Based on Well No. 9 production data for 2014 (Exhibit 2). Well No. 9 produces roughly 2,000 AFY. Wells No. 10 and No. 11 will both be sized the same as Well No. 9. So, combined, Wells No. 10 and No. 11 will each provide 2,000 AFY of supply, for a total of 4,000 AFY.

Secondary Benefit –
The table below provides information regarding the benefit of water quality improved.

Table 5 – Annual Project Physical Benefits
Project Name: North Torrance Well Field Project, Phase III
Type of Benefit Claimed: Primary Benefit – Water Quality Improved through Manganese Reduction
Units of the Benefit Claimed: milligrams per liter (mg/L) of manganese
Anticipated Useful Life of Project (years): 35 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-18	0.053	0.053	0
2019	0.053	0.04	0.013
2020-2053	0.053	0.04	0.013

Comments:

- The Without Project concentrations of manganese are calculated using the average manganese concentrations for 2013 (0.053 mg/L), 2014 (0.055 mg/L), and May 2015 (0.052 mg/L) (From laboratory analysis of Well No. 9, Water Operations Production Database, The City of Torrance).
- The treatment goal is 0.04 mg/L of manganese (Engineering Report for Manganese Treatment, 9 May 2015, page 18)
- The maximum contaminant level (MCL) for manganese is 0.050 mg/L. In order to be compliant with the Safe Drinking Water Act, the City must reduce concentrations to at least 0.049 mg/L.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Currently, the City's water demands are roughly 20,000 AFY. To supply this demand, the City imports 82 percent of its supply, on average, with the remaining 18 percent supplied by local groundwater from the West Coast Basin. Historically, groundwater has been pumped from Well Nos. 1 and 9, with Well No. 1 providing 1,500 AFY and Well No. 9 providing 2,000 AFY, but only the production from Well No. 9 counts against the City's adjudicated groundwater pumping rights of 5,640 AFY established in the West Coast Basin. Well No. 1 is part of a desalting program managed by the Water Replenishment District of Southern California (WRD). The desalter plant associated with Well No. 1 is operated by City personnel, but it is owned by WRD. Because the City only owns and operates Well No. 9, approximately 3,640 AFY of groundwater pumping rights go unused.

The groundwater pumped from Well No. 9 enters a one million gallon storage tank and three booster pumps located at McMaster Park, which are inadequate and in need of replacement. The Project will expand upon the previous two phases of the North Torrance Well Field Project. Phase I of the project included purchasing the well field site for $2.1 million and securing an easement from the Torrance Unified School District for vehicle access and underground utilities. This phase, completed in 2013, also included installing utility pipes and an asphalt road within the easement to convey water from proposed Well No. 11 and Well #9 to the proposed storage tank and pump station (see Project map). Phase II of the project will install utility pipes within the public right of way in Yukon Avenue and 182nd Street and to connect Well No. 9 to the project site (see Project map). Construction for Phase II is scheduled for June 2016.

Phase III (the Project included in this grant application) will construct two new groundwater production wells (Well Nos. 10 and 11), each with a capacity of 2,000 AFY that will help the City fully utilize its groundwater pumping right. The Project will provide the City with an additional 4,000 AFY of capacity for a total of 6,000 AFY of pumping capacity. Since the wells would have a total capacity of 6,000 AFY, the Project could provide 360 AFY of pumping capacity in excess of the City's adjudicated water right [6,000 AFY – 5,640 AFY]. This would benefit the City during times of drought or other emergencies due to a recent change in the basin adjudication. In December 2014, the Superior Court of California approved conjunctive use, allowing pumpers to bank unused pumping rights up to twice the amount of their adjudicated rights on a phased basis. Under these new rules, the City can bank up to 11,280 AFY in the Basin. Banked water can then be pumped back out and utilized by the City.

Phase III will also demolish the inadequate one million gallon storage tank and booster pump station at McMaster Park and replace them with a three million gallon storage tank and new booster pump station located at the Phase III Project site. These new facilities would be sized to handle the capacity from Well Nos. 9, 10, and 11.

The Project will produce additional local groundwater supply for the City, thereby providing the ability to fully utilize its groundwater right and reducing its reliance on imported water. Additionally, the Project will provide the City with a means to withdraw banked water during periods of drought or other emergencies.

2) Estimates of Without Project Conditions

Without the Project, the City would not increase its local water supply by 4,000 AFY and would continue to import roughly 82 percent of its potable water. The City would also continue to consume the energy and emit the GHGs associated with 4,000 AFY of imported water supplies.

3) Descriptions of Methods Used to Estimate Physical Benefits

The physical benefits of water supply produced were estimated using water production data from Well No. 9 between March 2011 and April 2015. These data indicate that Well No. 9 produces an average of 2,000 AFY of water. The proposed Well Nos. 10 and 11 will have the same design capacities as Well No. 9. Production rate data from a pilot well located in the same vicinity as the proposed wells were used to verify that the proposed Well Nos. 10 and 11 could produce 2,000 AFY. The pilot well data were used in the 30% Preliminary Design Report submittal.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The facilities required to obtain the physical benefit of water supply produced include two new groundwater wells (Nos. 10 and 11), a three million gallon storage tank, a booster pump station with three vertical turbine pumps for a total capacity of 4,500 gallons per minute, and other site appurtenances. The booster pump station would be used to distribute the groundwater into the City's supply system. Phase II of the North Torrance Well Field Project, which will install utility pipes within the public right of way in Yukon Avenue and 182nd Street and connect Well No. 9 to the project site, is also needed to obtain the physical benefits. Construction for Phase II is scheduled for June 2016.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

A June 2014 inundation study was conducted to determine the effects of a rupture in the three million gallon tank due to an earthquake. In an effort to mitigate potential impacts, 8-foot walls on all sides of the property will be constructed, flood gates will be installed, the site will be lowered in elevation by 1 foot, and the tank will be buried 20 feet below ground. The findings indicate that the water will be contained within the Project area and drained out through an existing 30-inch diameter storm drain, therefore the likelihood of catastrophic flooding should the tank rupture due to an earthquake or other natural disaster is reduced significantly. Any construction impacts, including noise and traffic, will be mitigated through identified mitigation measures as part of the Project's California Environmental Quality Act (CEQA) requirements.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The primary benefit of the project is to provide an additional local water resource to address long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this project will (1) help to efficiently manage the groundwater in the West Coast Basin, and (2) yield a new water supply in terms of gaining access to groundwater that could not previously be pumped.

Secondary Physical Benefit: Water Quality Improved through Manganese Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Manganese is a naturally-occurring metal within the West Coast Basin groundwater. Torrance has been monitoring manganese levels in the West Coast Basin since 1974, with the passage of the Safe Drinking Water Act. In an effort to better understand the water quality in the area surrounding the proposed Well Nos. 10 and 11, a pilot well was installed in the area of proposed Well No. 10 in June 2009 (see Project map). Based on water quality analyses conducted on the pilot well and Well No. 9, groundwater manganese concentrations in the area average 0.053 mg/L. The MCL for manganese, a standard set by the United State Environmental Protection Agency (EPA) for drinking water quality, is 0.050 mg/L. Based on the water quality analyses, the levels of manganese are 0.003 mg/L above the MCL. In October 2013, the Los Angeles Regional Water Quality Control Board mandated that the City reduce manganese, through treatment, to below the MCL.

The Project is needed to reduce the concentrations of manganese in the City's water system to levels that are below the MCL. To reduce the concentration, the Project will install a greensand treatment facility (see details below).

2) Estimates of Without Project Conditions

Without the Project, groundwater supplied by the City would continue to be above the MCL for manganese and would prevent its use for potable drinking water supply. There are no other projects that are planned to reduce manganese in the City's groundwater supply.

3) Descriptions of Methods Used to Estimate Physical Benefits

The method used to estimate the physical benefit of water quality improved for the Project is described in detail in the *City of Torrance Engineering Report for Manganese Treatment*. Water quality samples from Well No. 9 are analyzed quarterly for manganese, which provides an understanding of current levels. Based on water quality analyses, current groundwater manganese concentrations in the area average 0.053 mg/L. Manganese will be removed using a greensand treatment system. Greensand is glauconite sand that is coated with a thin layer of insoluble manganese dioxide (MnO_2). This coating removes manganese by creating a catalytic oxidation when the manganese in the water comes into contact with the sand. This type of system is used throughout the United States and is a proven, effective method to reduce manganese concentrations in water supplies. To reduce manganese concentrations below the MCL of 0.05 mg/L, it is assumed that an average of approximately 0.010 to 0.020 mg/L will be removed from groundwater through the greensand treatment system.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The facilities required to obtain the physical benefit of improved water quality include a greensand treatment system to lower manganese concentration. Additionally, regular water quality testing of the water produced by Well Nos. 10 and 11 will determine the degree to which concentrations of manganese have been reduced. This testing will occur at the water quality laboratory, located next to the proposed pump station, which will be built as part of this Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no adverse physical effects expected that would result from obtaining the water quality benefit of the Project. However, a 2014 inundation study was conducted to determine the effects of a rupture in the three million gallon tank due to an earthquake. In an effort to mitigate potential impacts, 8 foot walls on all sides of the property will be constructed, a flood gate will be installed, the site will be lowered in elevation by 1 foot, and the tank will be buried 20 feet below ground. The findings indicate that the water will be contained within the project area and drained out through an existing 30-inch diameter storm drain. These measures will reduce the likelihood of catastrophic flooding should the tank rupture due to an earthquake or other natural disaster to insignificant levels. Any construction impacts, including noise and traffic, will be mitigated through identified mitigation measures as part of the Project's CEQA requirements.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

Because this particular benefit relates to improved water quality, there is no direct long-term drought preparedness associated with the benefit. However, the Project as a whole addresses long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this project will (1) help to efficiently manage the West Coast Basin, and (2) yield a new water supply in terms of gaining access to groundwater that could not previously be pumped.

Direct Water-Related Benefit to a DAC

This Project does not provide direct water-related benefits to disadvantaged communities (DACs).

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** North Torrance Well Field Project, Phase III Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary benefit – Water Supply Produced	4,000 AFY	Location: At Well No. 10 and No. 11. Tools and Methods: A flowmeter will be installed at each well to record flow rate and amount of water produced. The data provided by the flowmeters will be used to measure the water production of the wells. Data to be collected: The flowmeter will measure flow (in gpm) on a continuous basis and the supervisory control and data acquisition (SCADA) system will record the data daily throughout the time that Wells No. 10 and 11 are in service. **The monitoring tools and targets are appropriate for the benefits claimed because** the flowmeters will record the amount of groundwater that is produced. **The monitoring data will be used to measure performance by** showing the total groundwater produced on an annual basis.
Secondary benefit – Water Quality Improved through Manganese Reduction	0.013 mg/L of manganese reduced	Location: At Well No. 10 and No. 11. Tools and Methods: Water from each of the wells will be piped to the water quality analysis lab that will be built as part of this Project. The lab is where analysis of manganese concentrations will occur. Data to be collected: Manganese concentrations in mg/L will be tested quarterly and recorded by technicians. **The monitoring tools and targets are appropriate for the benefits claimed because** water quality testing will determine the levels in mg/L of manganese coming from Well Nos. 10 and 11 to verify that the concentration of this constituent is below the MCL threshold. **The monitoring data will be used to measure performance by** comparing the manganese levels in the groundwater before treatment with the manganese levels after treatment to determine the reduction in concentration of the constituent.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** North Torrance Well Field Project, Phase III Project	
Question 1	**Types of benefits provided as shown in Table 5** • Water Supply Produced • Water Quality Improved through Manganese Reduction
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** There are no other project alternatives that would simultaneously obtain both of the benefits claimed by this Project. However, other treatment alternatives to reduce manganese concentrations were considered.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. • Ion exchange: considered but not selected because regeneration may increase Total Dissolved Solids levels and it is limited to removing a completely dissolved form of manganese. • Granular activated carbon: considered but not selected because it is not a fully-proven technology for manganese removal and it requires specific water quality characteristics (high pH) that are not observed in test water from Well No. 9 and the pilot well. • Biological filtration: considered but not selected because startup period may be significant (weeks to months) and it requires specific water quality characteristics (hydrogen sulfide, metals, organic materials) that are not seen in test water from Well No. 9 and the pilot well. • Membrane filtration: considered but not selected because there are high capital and operating costs, including high energy requirements and there is a need to dispose of filter backwash. • Oxidation and filtration on adsorptive media (Proposed Project): chosen as it is a proven and effective process, there are high filtration rates possible, and it is considered to be the most cost-effective method for removing manganese. Three quotes were received for oxidation and filtration/ adsorption systems. Costs for these different systems are provided below and are assumed for one well. • Filtronics, Electromedia ® I: System based on manganese oxidation using chlorine followed by removal of the manganese dioxide (MnO_2) precipitate by filtration on their proprietary Electromedia ® I. Total capital costs $3,900,000 • Pureflow, manganese dioxide ore: System based on manganese oxidation by chlorine followed by precipitate removal using MnO_2. Total capital costs $3,553,000. • Loprest, manganese greensand (Proposed Project): System based on catalytic oxidation using manganese greensand media. Total capital costs $2,713,000

Table 7 – Cost Effective Analysis **Project Name:** North Torrance Well Field Project, Phase III 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.** This Project is the least cost alternative.
Comments: *City of Torrance Engineering Report for Manganese Treatment*. May 9, 2015. Prepared by AQUAlity Engineering, Inc. Pages 19 and 27. Exhibit 4.	

Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project

Project 12: Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project (Project)
Implementing Agency: National Forest Foundation

Project Description

(25 Word) The Project will save 1,000 AFY of water by removing Arundo, an invasive plant and restoring 50 acres of riparian habitat along Big Tujunga Creek.

(Expanded) The headwaters of the Los Angeles River originate high in the Angeles National Forest and San Gabriel Mountains, where the Big Tujunga Watershed is one of its largest sources. More than 160 sensitive species call the San Gabriel Mountains home. The 2009 Station Fire, which was proclaimed a local emergency for Los Angeles County, caused extensive devastation to the surrounding landscape and provided an opportunity for the invasive and water-intensive *Arundo donax* (a giant reed which consumes five times more water than native vegetation to overwhelm habitats and establish larger stands than had existed prior to the fire.

The Los Angeles River Big Tujunga Restoration and Arundo Eradication Project proposes to save 1,000 AFY of water and restore 50 acres of land within the Big Tujunga and Little Tujunga Watersheds to pre-Station Fire conditions by removing *Arundo donax* (Arundo) from the area. This Project will tie in with other projects underway to remove Arundo within the downstream urban portions of the watershed. The National Forest Foundation, through a public-private partnership with the United States Forest Service, the Los Angeles Department of Water and Power, the Los Angeles County Flood Control District, the Coca-Cola Company, the Miller-Coors Company, Edison International, and the California Wildlife Conservation Board, is proposing the Project. The Project site is located along Hanson Dam, Little Tujunga Creek, and Big Tujunga Creek, primarily downstream of Big Tujunga Reservoir.

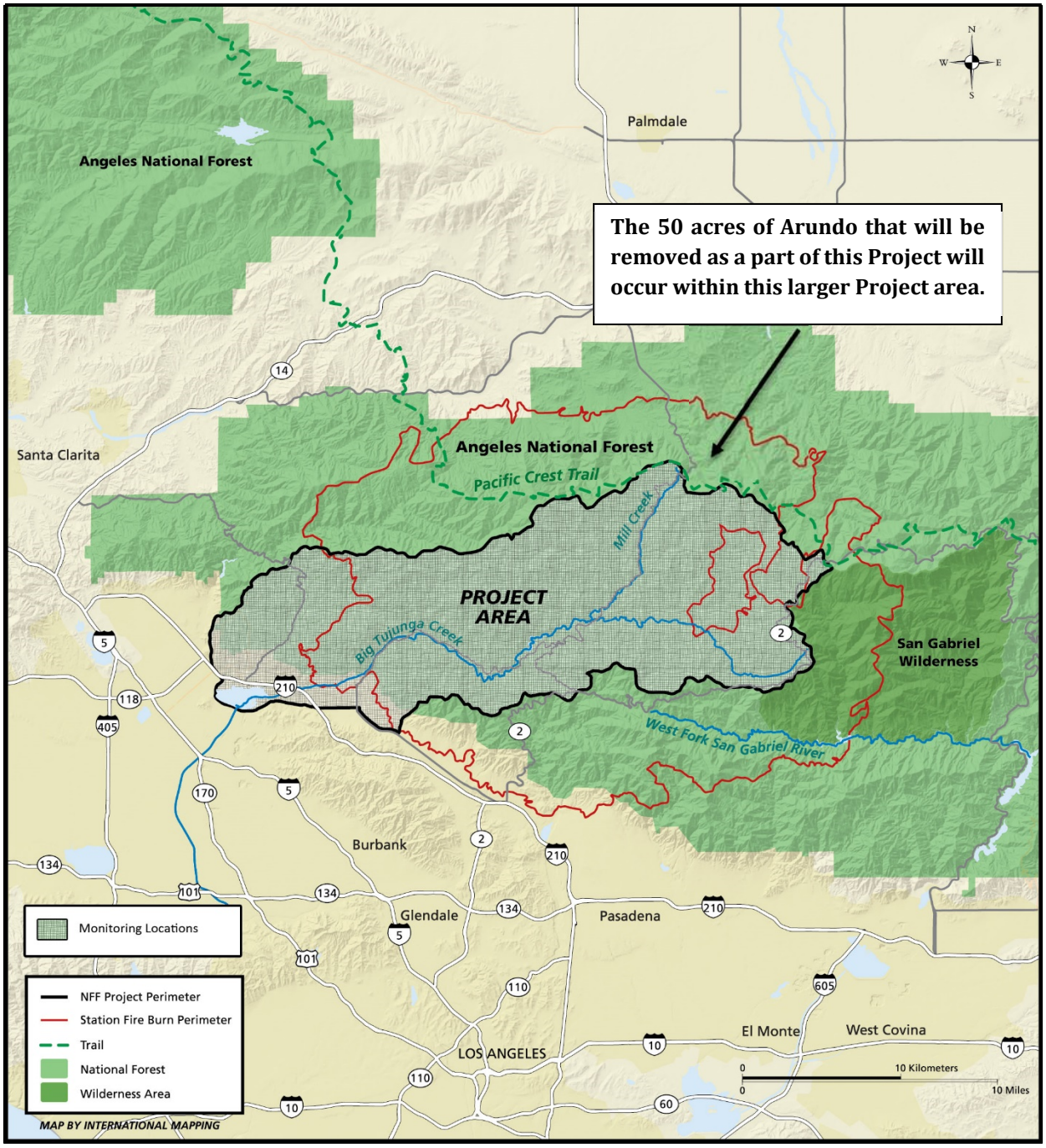
The major physical components of the Project include removal of approximately 50 acres of the invasive *Arundo donax* (Arundo) from along Big Tujunga Creek. Once the site is cleared of Arundo, the Project will include planting native species including willows and mulefat, propagated and cut from adjacent areas.

The anticipated physical benefits of the Project include the primary benefit of saving approximately 1,000 AFY of water supply, resulting from the removal of 50 acres of Arundo and the associated water demand. The secondary benefit is 50 acres of riparian habitat restoration along roughly 20 miles of Big Tujunga Creek. Additional benefits include invasive species removal, groundwater recharge into the San Fernando groundwater basin, and fishery benefits resulting from increased in-stream flow. Increased groundwater recharge and increased in-stream flow will occur in every section of the Creek downstream of the Project as a result of increased available water.

The Project addresses a current need of the region by supporting the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). First, the Project will improve water supply by reducing demand for 1,000 AFY of water (Improve Water Supply). Second, the Project will protect, restore, and enhance natural processes and habitats by restoring 50 acres of riparian habitat in the headwater areas of the Los Angeles River (Enhance Habitat). Third, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to save 1,000 AFY of local water supply and restore 50 acres of riparian habitat within the Project area.

Project Map


The 50 acres of Arundo that will be removed as a part of this Project will occur within this larger Project area.
Angeles National Forest
Palmdale
Santa Clarita
Angeles National Forest
Pacific Crest Trail
Mill Creek
PROJECT AREA
Big Tujunga Creek
San Gabriel Wilderness
West Fork San Gabriel River
Burbank
Glendale
Pasadena
LOS ANGELES
El Monte
West Covina
Monitoring Locations
NFF Project Perimeter
Station Fire Burn Perimeter
Trail
National Forest
Wilderness Area
10 Kilometers
10 Miles
MAP BY INTERNATIONAL MAPPING

Project Physical Benefits

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

- Primary Benefit –Water Supply Saved
- Secondary Benefit – Habitat Restored

Water supply saved and habitat restored are the primary and secondary benefits that will be achieved through Project implementation. When complete, the Project will increase water supply by 1,000 AFY and restore 50 acres of riparian habitat. Additional benefits of the Project include removing an invasive species (*Arundo donax*), and increasing in-stream flows to provide fishery benefit. By restoring native habitat and establishing plant species with lower water demands than Arundo, the Project will contribute to groundwater recharge into the San Fernando Aquifer.

The following tables list and quantify the primary and secondary benefits of the Project.

Primary Benefit – Water Supply Saved

The table below provides information on the water supply saved benefit. The Project schedule dictates that the full benefit begins in 2016 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project
Type of Benefit Claimed: Water Supply Saved
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 100 years (see comment box below)

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	600	600
2016	0	1,000	1,000
2017	0	1,000	1,000
2018 – 2038	0	1,000	1,000

Comments:

- Impacts of *Arundo: Arundo* Water Use & Stand Transpiration. California Invasive Plant Council, March 2011. Pg 48. Available at: http://www.cal-ipc.org/ip/research/arundo /4ImpactsWaterUse.pdf
- It is assumed that the water supply produced benefit of this Project would last, in effect, forever, particularly since this benefit is tied to the acreage of restored habitat (which is assumed to last indefinitely). However, for the purposes of this application, it was assumed benefits would last for 100 years.
- All Arundo biomass will be removed by 2016. However, re-sprouts will be treated until 2018 to ensure full eradication.

Secondary Benefit – Habitat Restored

The table below provides information regarding the habitat restoration benefit. The Project schedule dictates that the full benefit begins in 2016 and continues for the 100 year presumed lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project
Type of Benefit Claimed: Habitat Restored
Units of the Benefit Claimed: Acres
Anticipated Useful Life of Project (years): 100 (see comment box below)

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	30	30
2016	0	50	50
2017	0	50	50
2018 – 2028	0	50	50

Comments:

- The 50 acre area was chosen because it covers the headwaters of the watershed, which will help reduce further spread of Arundo to other parts of the watershed.
- It is assumed that the habitat restoration benefit of this Project would last, in effect, forever. However, for the purposes of this application, it was assumed benefits would last for 100 years.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Saved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
California is currently in a long term severe drought, with 2013 being the driest year and 2014 the third driest in recorded history in the state. The need to protect and preserve local supplies of water to avoid potential severe consequences of drought is more crucial than ever. Currently, the City of Los Angeles imports vast quantities of water; approximately 80% of the City's supply in fiscal year (FY) 2009/10 was imported to meet the demand of roughly 600,000 AFY, as outlined in the 2010 LADWP UWMP.

The Project will save 1,000 AFY of local water supplies for the Region, enough to serve 2,000 households per year. This local supply can offset the use of imported supply on which the Region so heavily relies.

2) Estimates of Without Project Conditions
Without the Project, the high water demand Arundo would continue to consume 1,000 AFY of water that could serve other beneficial uses. In addition, failing to complete the removal of Arundo from the riparian areas of Big Tujunga Creek would likely result in Arundo spreading downstream, increasing the amount of water consumed by this invasive plant and further exacerbating water resource conflicts between municipal uses and surrounding ecosystems.

3) Descriptions of Methods Used to Estimate Physical Benefits
The California Invasive Plant Council conducted a study of Arundo removal projects across California and found that removing the invasive reed saves, on average, approximately 20 AFY of water per acre of Arundo removed (CIPC 2011, p.48). This is the most recent, technically advanced, and complete scientific study of water savings from Arundo removal. Despite recorded Arundo water consumption rates as high as 48 AFY/acre, physiological water transpiration limits suggest that 24 AFY/acre is a more realistic estimate for Arundo. Given that the likely replacement vegetation combination of native shrubs and trees consume water at a rate of 4 AFY/acre, the net water savings is 20 AFY per acre of Arundo removed (CIPC 2011, p.48). With a total of 20 AFY/acre of water saved due to Arundo removal, this Project will save 1,000 AFY of water [(50 acres)*(20 AFY/acre)]).

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
The physical benefit of water supply saved will be realized once the invasive Arundo plants are removed and replaced with native vegetation. The actions required to realize this benefit include assembling a team, removing the Arundo through herbicide application and manual removal, disposing of the Arundo, and planting natives. Herbicide methods to be considered include: foliar spraying; spot spraying; frill or 'hack and squirt'; cut-stump; paint/daub; stem injection, basal bark treatment, and wick application.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
The Arundo will undergo herbicide application, which may have a potential adverse impact on water quality. This potential effect will be mitigated by using US Environmental Protection Agency (EPA) approved methods including certified applicators and approved herbicides at approved application rates, avoiding water contact, avoiding windy days for application, and flagging native habitat for avoidance. Three herbicides with formulations approved for use in wetlands by the EPA will be considered as treatment option - these are: glyphosate (Rodeo, Aquamaster, etc.), imazapyr (Habitat, Polaris, etc), and triclopyr (Garlon 3a). Any other potential impacts associated with the Project will be mitigated through measures as required by regulatory agencies.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The Project addresses long-term drought preparedness by contributing to sustainable water supply and reliability. Given that Arundo consumes five times more water than native vegetation (20 AF/acre versus 4 AF/acre), removing Arundo will provide an additional 1,000 AFY of water that can be used for other beneficial uses. The Project will provide a net gain in local water supply.

Secondary Physical Benefit: Habitat Restored

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The 2009 Station Fire caused extensive devastation to the habitat within the Big Tujunga and Little Tujunga Watersheds and provided an opportunity for Arundo to overwhelm native vegetation and establish larger stands than had existed prior to the fire. The Angeles National Forest provides habitat for 160 rare and sensitive species, which rely on native vegetation for food and shelter. In addition, Big Tujunga Creek provides habitat for three sensitive fish species, including one listed as Threatened under the Federal Endangered Species Act, the Santa Ana Sucker. By removing the Arundo, the Project will provide space for native vegetation to return to the area, thereby restoring native habitat for the numerous riparian species. In addition, because Arundo uses five times more water than native vegetation, removing Arundo will increase in-stream flow, restoring habitat for aquatic species, including the threatened Santa Ana Sucker.

2) Estimates of Without Project Conditions

Without the Project, the 50 acres of riparian habitat would not be restored. The invasive Arundo plants would continue to outcompete native vegetation for limited resources, including water, sunlight, and space. There are no other known projects within the Watershed that would restore this habitat by removing the Arundo on this scale.

3) Descriptions of Methods Used to Estimate Physical Benefits

The physical benefit of habitat restored was estimated through aerial mapping. The 50 acres were chosen for restoration because they represent the headwaters of the watershed. By clearing the headwaters of Arundo, the Project will help reduce the further spread of Arundo to other parts of the watershed by systematically eliminating upstream stands. If Arundo is first removed downstream, upstream stands of Arundo will continue to migrate downstream; by removing Arundo first from the headwaters, the Project can prevent its spread. This project will remove all of the Arundo from the Upper Big Tujunga and Little Tujunga Watersheds and will tie in with other projects underway to remove Arundo within the downstream urban portions of the watershed.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The physical benefit of habitat restored will be realized once the invasive Arundo plants are removed and replaced with native vegetation. The actions required to realize this benefit include assembling a team, removing the Arundo through herbicide application and manual removal, disposing of the Arundo, and planting natives. Herbicide methods to be considered include: foliar spraying; spot spraying; frill or 'hack and squirt'; cut-stump; paint/daub; stem injection, basal bark treatment, and wick application.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

The Arundo will undergo herbicide application, which may have a potential adverse impact on water quality. This potential effect will be mitigated by using US Environmental Protection Agency (EPA) approved methods including certified applicators and approved herbicides at approved application rates, avoiding water contact, avoiding windy days for application, and flagging native habitat for avoidance. Three herbicides with formulations approved for use

in wetlands by the EPA will be considered as treatment option - these are: glyphosate (Rodeo, Aquamaster, etc.), imazapyr (Habitat, Polaris, etc), and triclopyr (Garlon 3a). Any other potential impacts associated with the Project will be mitigated through measures as required by regulatory agencies.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The Project addresses long-term drought preparedness by contributing to sustainable water supply and reliability. Given that Arundo consumes five times more water than native vegetation, removing Arundo will provide an additional 1,000 AFY of water that can be used for both habitat uses and municipal uses. The Project will provide a net gain in local water supply.

Direct Water-Related Benefit to a DAC

The Project will provide direct water supply benefits to DACs that are served from the San Fernando Groundwater Basin (Basin). Removing the water-intensive Arundo plant will save 1,000 AFY of water. This water saved will infiltrate into the Basin, which can be utilized by retail pumpers who will provide direct water-related benefits to the DACs. This will provide more reliable water supply and may provide a lower cost to the customers of those pumpers. The service areas of three major pumpers of the Basin were used to calculate the DAC benefit. The three major pumpers of the Basin are the Los Angeles Department of Water and Power (LADWP), the City of Burbank, and the City of Glendale.

An additional benefit to DACs includes enhanced recreational opportunities in the popular picnic areas along Big Tujunga Creek. The Project will also employ at-risk youth from the adjacent DACs of Sunland, Tujunga, Pacoima, and Sun Valley through the Conservation Corps, which will provide them with jobs and skills training.

DAC benefits are further explained in Attachment 7 of this application.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Saved	1,000 AFY of water supply saved	Tools and Methods: Using the number of acres that have undergone Arundo removal, use 20:1 ratio (AFY : acre of Arundo removed) to determine the AFY of water supply benefit received. The number of acres of Arundo removed will be determined through annual aerial mapping and on-ground verification. Locations: Entire project site. Data to be Collected: The total acreage of Arundo removed will be recorded to calculate the amount of water supply produced. **The monitoring tools and targets are appropriate for the benefits claimed because** the number of acres of Arundo removed correlates to the amount of water supply produced. **The monitoring data will be used to measure performance by** multiplying the number of acres of Arundo removed by 20 AFY/acre to determine the water supply saved.
Secondary Benefit – Habitat Restored	50 acres of habitat restored	Tools and methods: Aerial mapping and on-ground surveys will be performed annually. Monitoring locations: Entire project site. Data to be Collected: The total acreage of Arundo removed will be recorded to determine the acreage of habitat restored. **The monitoring tools and targets are appropriate for the benefits claimed because** the purpose of aerial mapping and on-ground surveys will be to determine the acreage of restored habitat. **The monitoring data will be used to measure performance by** determining the extent to which the Project restored habitat.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Upper Los Angeles River Big Tujunga Restoration and Arundo Eradication Project	
Question 1	**Types of benefits provided as shown in Table 5** • Water Supply Saved • Habitat Restored
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** Water Supply Saved: Yes. Currently the Los Angeles Basin imports vast amounts of water from other outside watersheds. Imported water is another alternative that has been considered and previously implemented with high monetary and environmental costs from energy use, carbon emissions, and draw-down of remote reservoirs. Habitat Restored: No.
	If no, why? Habitat Restored: To achieve the benefit of habitat restoration, habitat must be actively restored. There is no other alternative to restore this habitat than to remove Arundo by implementing the Project.
	If yes, list the methods (including the proposed project) and estimated costs. Water Supply Saved: The cost of imported water from the Metropolitan Water District Tier 2 Supply Rate in 2015 was $290/acre foot[1]. Over 20 years, the cost to import 1,000 acre feet of water per year would be $5.8 million. The cost of this project to treat Arundo on 50 acres and provide 1,000 AFY for 20 years would be $2.24 million, with this cost incurred in the first 5 years. Therefore, this Project provides a cost savings of $3.56 million over 20 years. Therefore, this Project is the preferred alternative and the least cost alternative.
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]http://www.mwdh2o.com/mwdh2o/pages/finance/finance_03.html#Anchor-Tier-10903	

Nitrate Removal Treatment Facility at Well 2 Project

Project 13: Nitrate Removal Treatment Facility at Well 2 Project (Project)
Implementing Agency: Crescenta Valley Water District

Project Description

(25 Word) The Project will produce 240 AFY of additional local groundwater from the Verdugo Basin and improve water quality by reducing nitrates.

(Expanded) The Project will produce 240 acre-feet per year (AFY) of local, safe drinking water supply for Crescenta Valley Water District (CVWD) customers and improve water quality by reducing nitrates. This will be accomplished by reactivating Well 2 and installing a nitrate treatment system at CVWD's Ordunio Reservoir. Well 2 is an existing groundwater well that has been out of service since 1976 due to nitrate contamination.

The Project will allow CVWD to use a local water resource, increase CVWD's ability to use its adjudicated rights within the Verdugo Basin, and reduce CVWD's dependence on imported water from the Metropolitan Water District of Southern California (MWD) and Foothill Municipal Water District (FMWD), the regional and local wholesale suppliers. It will also provide additional emergency water supply to the Los Angeles Department of Water and Power (LADWP) and FMWD, and reduce nitrate contamination levels within the Verdugo Basin.

CVWD is partnering with Glendale Water and Power (GWP) for nitrate removal within the Verdugo Basin and with FMWD to achieve access to an emergency water supply and a reduction in imported water.

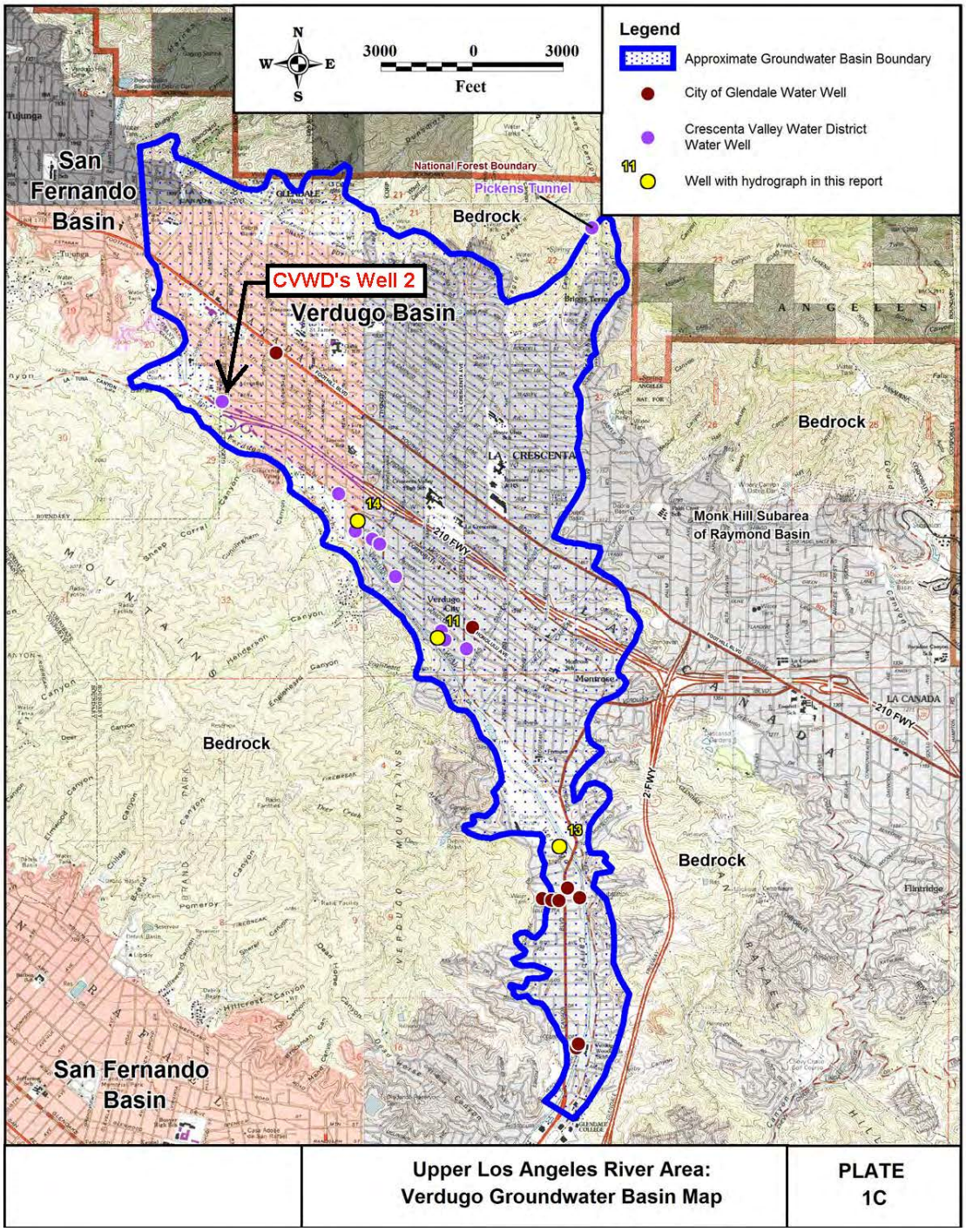
The major physical components of the Project are the installation of a new 225 gallon per minute (gpm) pump, a new nitrate treatment system that uses an ARoNite™ fixed-film biological process to reduce nitrate levels below the maximum contaminant level (MCL), onsite piping, a new building to house a new chlorination system, an electrical and telemetry system, and on-site improvements.

The anticipated physical benefits of the Project include the primary benefit of an additional 240 AFY of local water supply to CVWD. The secondary physical benefit of the Project is improved water quality from the installation of a nitrate treatment system that utilizes a bacterial reduction process. This bacterial reduction process will reduce nitrate levels below the MCL and allow CVWD to provide additional potable water to customers.

The Project addresses a current need of the region by supporting two of the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). The Project will reduce CVWD's dependence on imported water by making a local groundwater source more available (Improve Water Supply). In addition, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to allow CVWD to increase its water supply from a local source by 240 AFY and to reduce the nitrate levels within the Verdugo Basin. Another outcome will be that additional water supply will be available to FMWD and LADWP during emergency events or planned shutdowns of imported water.

Project Map


N
W
E
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3000
0
3000
Feet
Legend
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
CVWD's Well 2
Verdugo Basin
LA CRESCENTA
Monk Hill Subarea of Raymond Basin
14
11
13
210 FWY
2 FWY
LA CANADA
Bedrock
Bedrock
Bedrock
San Fernando Basin
Upper Los Angeles River Area:
Verdugo Groundwater Basin Map
PLATE
1C


NITRATE TREATMENT SYSTEM & MONITORING
CONNECTION TO RESERVOIR
OPERATION BUILDING WITH CHLORINATION AND ELECTRICAL EQUIPMENT
ORDUNIO RESERVOIR
WELL #2
Lowell Ave
Honolulu Ave
Foothill Fwy
N
CRESCENTA VALLEY WATER DISTRICT
ORDUNIO RESERVOIR
AERIAL PHOTO – 4029 LOWELL AVENUE

Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Water Quality Improved through Nitrate Reduction

Primary Benefit – Water Supply Produced

The table below provides information on the benefit of increasing local water supplies and reliability by replacing imported water with groundwater supply. The primary benefit is expected to start on May 1, 2017. Over the useful life of 35 years, the cumulative benefit will be 8,320 AF.

Table 5 – Annual Project Physical Benefits

Project Name: Nitrate Removal Treatment Facility at Well 2
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 35 Years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	0	0
2016	0	0	0
2017	0	160	160
2018 – 2051	0	240	240

Comments:

- *2007 - Preliminary Recommendations for Final Pumping Rate and Pump Depth Setting for Permanent Pump in Well No. 2 prepared by Richard C. Slade & Associates*: Recommended Pump Rate of 225 gpm as shown on Pages 4 & 5. While the capacity will be 225 gpm, the anticipated yield is only 150 gpm (~240 AFY) due to declining groundwater levels since 2007 and an assumed drop in the long-term pumping rate that has been observed in existing CVWD Wells.

Secondary Benefit – Water Quality Improved through Nitrate Reduction

The table below calculates the benefit of water quality improved through nitrate reduction when 240 AFY is pumped from the Verdugo Basin and treated. The values in the table are expressed in milligrams per liter (mg/L) of nitrate in the produced water if it were to be pumped with and without the Project. The secondary benefit is expected to start on May 1, 2017, with a useful life of 35 years.

Table 5 – Annual Project Physical Benefits

Project Name: Nitrate Removal Treatment Facility at Well 2
Type of Benefit Claimed: Water Quality Improved through Nitrate Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 35 Years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project, (c) – (b)**
2015	0	0 (avg) [Construction]	0
2016	0	0 (avg) [Construction]	0
2017	0	20 (avg)	20
2018 – 2051	0	20 (avg)	20

Table 5 – Annual Project Physical Benefits

Project Name: Nitrate Removal Treatment Facility at Well 2

Type of Benefit Claimed: Water Quality Improved through Nitrate Reduction

Units of the Benefit Claimed: mg/L

Anticipated Useful Life of Project (years): 35 Years

Comments:

- CVWD – Glenwood Nitrate Plant Operation Manual – May 2011
  CVWD's goal for nitrate concentration within the distribution system is 35 mg/L, which is below the nitrate MCL of 45 mg/L. For this project, CVWD is using 25 mg/L as the target concentration since additional blending water from other sources is not available. The proposed average nitrate target of 25 mg/L is assumed for the total flow conveyed from Well 2 to Ordunio Reservoir. The nitrate removal system will be designed to treat nitrate to less than 10 mg/L for a portion of the flow, and then that treated portion will be blended with the remaining flow from Well 2 to achieve a 25 mg/L concentration.
- CVWD's Well No. 2 Summary of Annual Water Quality Data Table
  CVWD tested water quality at Well 2 in 1993 and from 2001 to 2007 as shown in the data table. The average nitrate level (as NO_3) from 2001 to 2007 was 45 mg/L.
- 2006 –Draft Memorandum – Result of Recent Mini-Pumping Test, CVWD Well No. 2 prepared by Richard C. Slade & Associates.
  Pump test was performed between 1/17/06 to1/19/06 to determine well levels and nitrate levels. The Well 2 pump test results on page 5 shows the nitrate level (as NO_3) range from 45.2 mg/L to 48.1 mg/l and averaged 47.3 mg/L.
- 2010 – Biological and ion Exchange Nitrate Removal Evaluation – Water Research Foundation Project #4131, October 2010.
  A Water Research Foundation project to assess the effectiveness of biological treatment, as compared to the more commonly used ion exchange treatment, for removing nitrate from groundwater for drinking water use.
- 2012 – Cucamonga Valley Water District Well 23 ARoNite Demonstration Report, April 12, 2012 prepared by APT Water.
  APT Water and Cucamonga Valley Water District worked together on the installation and operation of the ARoNite System. As shown on the attached PowerPoint presentation, the nitrate levels were reduced from 71 mg/L to 4 mg/L.
- 2013 - Perchlorate Destruction and Potable Water Production Using Membrane Biofilm Reduction and Membrane Filtration prepared by CDM Smith, APT Water and Arizona State University
  CDM Smith and APT Water worked with West Valley Water District (WVWD) in Rialto, CA on a project to evaluate the feasibility of membrane biofilm reactor to destroy perchlorate and nitrate in groundwater and produce potable water at the pilot scale, evaluate process control parameters to optimize performance, and estimate full-scale technology costs. As shown on figure 5.21 on page 67, the nitrate levels were reduced from 38 mg/L to 4 mg/L.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Historically, 60 percent of CVWD's water supply is from groundwater within the Verdugo Basin and the remaining water supply is from FMWD, which is a member agency of MWD.

The Verdugo Basin is an adjudicated groundwater sub-basin of the San Fernando Valley Groundwater Basin which is defined in DWR Bulletin 118. The San Fernando Valley Groundwater Basin is part of the South Coast Hydrologic Region. CVWD and the City of Glendale (Glendale) are the only parties that have adjudicated rights within the Verdugo Basin. CVWD's annual pumping rights are 3,294 AFY and Glendale's annual pumping rights are 3,856 AFY, for a total of 7,150 AFY.

CVWD has 12 groundwater wells in the Verdugo Basin, most of which are located along the southerly part of the service area and along the Verdugo Wash. Of the 12 wells, ten are active and in use, one is out of service due to low water levels, and one (Well 2) is out of service due to nitrate levels above the MCL.

CVWD has experienced a significant decrease in water production from the Verdugo Basin since the start of the drought in 2012. CVWD produced 3,075 acre-feet of groundwater in 2012 and only 2,170 acre-feet in 2014, a reduction of 29% from 2011 (34% less than CVWD's pumping rights).

Well 2 was drilled in 1927 at CVWD's Ordunio Reservoir site, which is located at the intersection of Lowell Avenue and Honolulu Avenue. Well 2 was in service from 1949 to 1976 and provided an average of 95 AFY with a maximum of 194 acre-feet in 1963. Well 2 was taken out of service in 1976 when production diminished. When the MCL for nitrate was reduced from 90 mg/L to 45 mg/L in 1978, CVWD decided that Well 2 could not be reactivated because nitrate concentrations exceeded the new regulatory standard and there were no treatment or blending methods available at the site. By taking Well 2 out of service, CVWD lost 95–363 AFY of supply.

In 2006 and 2007, CVWD began to investigate ways to bring Well 2 back into service to increase access to groundwater. CVWD performed well rehabilitation and pump testing to get information on the well production and nitrate levels. However, the cost for treatment using an ion-exchange method and disposal of the brine waste made the project economically infeasible. The pumping test showed that Well 2 could maintain a pumping rate of 225 gpm. However, the pump test was performed before recent drought conditions began, and CVWD has recently seen decreased well production throughout the basin of about 30%. Therefore, the new well pump will have a capacity of 225 gpm (363 AFY), but the anticipated yield will be only 150 gpm (240 AFY).

Recently, the Verdugo Basin has seen a decline in water levels due to significantly less-than-average rainfall from 2011 to 2015. The long-term average rainfall for the Crescenta Valley area is 23.2 inches/year and the average from 2011 to 2015 has been 11.5 inches/yr. The water production from CVWD's existing wells decreased by 39% from 2011 to 2015.

In 2014, CVWD again investigated activating Well 2 and potential nitrate reduction treatment technologies that use a more economical bacterial reduction method. The driving force to re-investigate this Project was the continued increase in the cost of imported water from FMWD/MWD and the decline of the water levels in the Verdugo Basin.

The Project is needed to provide a clean reliable source of potable water to CVWD's customers and reduce reliance on imported water supplies. Well 2 is located one mile up-gradient of the closest existing well, so its water production will not be affected by drawdown. The majority of CVWD's wells are located in the southern part of the Verdugo Basin, where declining water levels due to reduced recharge from the recent drought have lowered water production. Although the well levels in CVWD's existing southerly wells are declining, the additional pumping from Well 2 will

not have any effect on those wells. In addition, the reduction of the nitrate contamination at Well 2 will assist in lowering the overall nitrate levels within the basin and provide clean potable water to CVWD's customers.

2) Estimates of Without Project Conditions

If the Well 2 project does not move forward, the loss of groundwater production from the existing wells will force CVWD to purchase additional imported water from FMWD under existing drought conditions. CVWD is planning to drill another groundwater well within the next five years; however, the location of the new well will be within the existing well field area.

CVWD has previously drilled production and monitoring wells in other locations within the Verdugo Basin but has not been successful recently with installing a new water production well. CVWD drilled Well 15 in 2001 and water production was 110 gpm. Well 15 is currently is out of service due to low water levels. CVWD drilled Well 17 in 2002, but water production was less than 20 gpm; the well was abandoned in 2003. In 2004, CVWD drilled three monitoring wells, each showing a potential water production of 10–50 gpm. As shown in the 2007 Pumping Rate and Pump Depth Setting for Permanent Pump in Well No. 2, Well 2 has demonstrated it can produce at least 150 gpm groundwater on a continuous basis if the nitrate issue is resolved.

3) Descriptions of Methods Used to Estimate Physical Benefits

The methods used to estimate the physical benefits involve water production data from Well 2 between 1949 and 1976. The methods also involve the *2007 Pumping Rate and Pump Depth Setting for Permanent Pump in Well No. 2*, which estimated a production rate of 225 gpm (363 AFY). However, the pump test was performed before the recent drought conditions. CVWD has seen a decreased well production throughout the basin of about 30%, and therefore the new pump will be designed for 225 gpm, but the anticipated yield is only 150 gpm (240 AFY).

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will include the installation of a new 225 gpm pump and motor assembly, a new ARoNite nitrate treatment system, a building that will house a new chlorination system, electrical equipment and telemetry equipment. The chlorination system is necessary to maintain the water in Ordunio Reservoir at 1 ppm chlorine. The supervisory control and data acquisition (SCADA) system will allow CVWD's operators to monitor and remotely control the system. Additional actions required will be to obtain an amended operating permit from the State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW).

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Potential adverse physical effects include noise from the new pump and motor assembly. This will be mitigated by using a submersible pump with the motor located at the bottom of the well.

In addition, the design of the new building exterior will be designed to match the existing buildings in the area and will not have a negative aesthetic impact.

Pumping operations at Well 2 will not have any adverse physical effects on CVWD's existing groundwater wells since the closest groundwater well is located approximately one mile away. The City of Glendale's wells are located 7 miles away and will also not be affected. Furthermore, the Verdugo Basin is adjudicated and administered by an appointed watermaster, so the potential adverse physical effects of pumping additional groundwater are assumed to be mitigated by the management actions by the watermaster.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The primary benefit of the project is to provide an additional local water resource to address long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this Project will (1) support system interties between CVWD, LADWP and FMWD, and (2) help to efficiently manage the Verdugo groundwater basin.

Secondary Physical Benefit: Water Quality Improved through Nitrate Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Historically, 60 percent of CVWD's water supply is from groundwater within the Verdugo Basin and the remaining water supply is from FMWD, which is a member agency of MWD. The Verdugo Basin is contaminated with nitrates from the old septic sewer systems that were used until the early 1980's and fertilizer use from past farming activities in the area.

Well 2 was drilled in 1927 at CVWD's Ordunio Reservoir site, which is located at the intersection of Lowell Avenue and Honolulu Avenue. The nitrate levels from 1958 to 1976 averaged 68 mg/L. In 1978, the MCL for nitrate was reduced from 90 mg/L to 45 mg/L. Well 2 could not be reactivated because nitrate concentrations exceeded the new regulatory standard and there were no treatment or blending methods available at the site.

CVWD monitored nitrate levels in Well 2 from 1977 to 2005 on an annual basis and the average nitrate level was 54 mg/L. CVWD stopped monitoring for nitrate levels after 2005 when the pump was removed. Well 2 was determined by the SWRCB to be inactive and no additional water quality data was required.

In 2006 and 2007, CVWD investigated the possibility of putting Well 2 back into service to increase access to groundwater supplies. CVWD performed pump testing on Well 2 to obtain information on nitrate levels. The nitrate levels from the 2006 and 2007 pump tests averaged 45 mg/L, which is equal to the MCL, with levels fluctuating between 50 mg/L and 41 mg/L. However, the cost for treatment using an ion-exchange method with disposal of brine waste made the project economically infeasible.

The Project is needed because Well 2 has the capacity to provide water production to meet the long-term needs of CVWD if a nitrate treatment system can be installed to reduce nitrate levels below the MCL.

2) Estimates of Without Project Conditions

If the Project does not move forward, Well 2 cannot be approved by the SWRCB to be put into service as a potable water production well. Therefore, CVWD will need to continue to purchase additional imported water from FMWD under existing (and potentially future) drought conditions.

3) Descriptions of Methods Used to Estimate Physical Benefits

The method used to estimate the physical benefits for the Project is described in a report prepared by APT Water for Cucamonga Valley Water District. This report describes the performance of the biological removal process with respect to nitrate reduction. In that demonstration, water with an influent concentration of 71 mg/L of nitrate was treated to approximately 4 mg/L nitrate. Since water from Well 2 has an average nitrate concentration of 45 mg/L, the ARoNite system will easily be able to reduce concentrations to below the MCL for nitrate. CVWD researched various biological nitrate removal treatment technologies; the ARoNite treatment system was selected because (1) it produces less waste to the sewer, (2) the installation and maintenance costs are lower than for other methods, and (3) the method was effective in reducing nitrate to acceptable levels.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will include the installation of a new nitrate treatment system, building pads, buildings, above ground piping, an electrical system, a chlorination system, a new pump & assembly, the connection to Ordunio reservoir, and other appurtenances. The Well 2 facility will be operated by CVWD and monitored by the SWRCB, DDW for compliance. Additional actions required will be to obtain an amended operating permit from the SWRCB, DDW, which will require additional water quality sampling and operations action plans to ensure that the water produced is below the MCL for nitrates.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Potential adverse physical effects involve migrating sounds from the nitrate treatment system. This will be mitigated by enclosing the nitrate treatment system within a storage bin.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The secondary benefit of the Project is to treat the water produced from Well 2 with a new nitrate treatment system, which will provide clean drinking water with nitrate concentrations below the MCL. The Project will provide an additional local water resource to address long-term drought preparedness and to efficiently manage the Verdugo Basin. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this Project will (1) yield a new water supply and (2) help to efficiently manage the Verdugo groundwater basin.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Nitrate Removal Treatment Facility at Well 2 Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	Produce Local Groundwater at 150 gpm (240 AFY)	Location: At Well 2. Tools and Methods: A flow meter will be installed to record flow rate and amount of water produced. The data provided by the flow meter will be used to measure whether the water production meets the goal of 240 AFY. Data to be collected: The flow meter will measure flow (in gpm) on a continuous basis and the SCADA system will record the data every 15 minutes throughout the time that Well 2 is in service. **The monitoring tools and targets are appropriate for the benefits claimed because** the flow meters will record the amount of groundwater that is supplied. **The monitoring data will be used to measure performance by** showing the total groundwater produced on an annual basis.
Secondary Benefit – Water Quality Improved through Nitrate Reduction	Nitrate reduction: treatment below the MCL	Location: At Well 2. Tools and Methods: An on-line nitrate analyzer will be installed to record nitrate levels on the treatment system's effluent piping. The data provided by the on-line nitrate analyzer will be used to measure whether the nitrate level is below the target of 25 mg/L. Data to be collected: The on-line nitrate analyzer will measure nitrate levels (as NO_3) on a continuous basis and will be recorded by the SCADA system every 15 minutes throughout the time that Well 2 is in service. **The monitoring tools and targets are appropriate for the benefits claimed because** the on-line nitrate analyzer will record the nitrate levels of the groundwater treated. **The monitoring data will be used to measure performance by** comparing the nitrate levels in the groundwater (before treatment) with the nitrate levels after treatment.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Nitrate Removal Treatment Facility at Well 2 Project	
Question 1	**Types of benefits provided as shown in Table 5** • Water Supply Produced • Water Quality Improved through Nitrate Reduction
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project?** Yes. In 2006 and 2007, CVWD investigated the possibility of putting Well 2 back into service to increase access to groundwater. However, the cost for treatment using an ion-exchange method and disposal of the brine waste made the project economically infeasible. In 2014, CVWD again investigated activating Well 2, employing potential nitrate removal technologies that use a more economical bacterial reduction process. The driving force to re-investigate this project was the continued increase in the cost of imported water from FMWD/MWD and the decline of the water levels in the Verdugo Basin.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. 1. Installation of an ion-exchange type of nitrate removal system and installation of a brine waste pipeline from Ordunio Reservoir to the Glenwood Plant. a. New ion-exchange type of nitrate removal system - $550,000 b. Pipeline – 2.4 miles or 12,670 LF x $220/LF = $2,787,400 c. Building & Chlorination & Electrical = $400,000 d. Total Cost - $3,737,400 2. Blending Well 2 with low nitrate water from FMWD/MWD, Glendale Water & Power, or LADWP. a. FMWD water line – 3.7 miles away, too costly and would have to purchase additional imported water b. Glendale water line – next to site, cost for water based on commercial rate. The rate will be $3.93/HCF, and over a year at 150 gpm, the cost would be about $400,000 per year. c. Los Angeles water line – next to site, but Los Angeles cannot sell water to other agencies 3. Reactivation of well and installation of ARoNite treatment system (this project). Total cost = $1,753,150
Question 3	**If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.** The proposed project is the least cost alternative.
Comments:	

Hoover, Toll, & Keppel School Recycled Water Project

Project 14: Hoover, Toll, & Keppel School Recycled Water Project (Project)
Implementing Agency: Glendale Water and Power (GWP)
Project Description

(25 Word) The Project will construct a recycled water main extension in the City of Glendale to serve the irrigation needs of three schools with 55 AFY.

(Expanded) The Project will provide 55 acre-feet per year (AFY) of recycled water supplies to Hoover High School, Toll Middle School, and Keppel Elementary School in the GWP service area. In addition, approximately 53 percent of the Project area encompasses Disadvantaged Communities (DACs). The City of Glendale is focusing on expanding the recycled water system as a result of Southern California's water supply shortage caused by extended drought conditions. These conditions directly affect the City's three sources of potable supply: the Colorado River Authority via the Metropolitan Water District of Southern California (MWD), the State Water Project (SWP) via MWD, and local groundwater. In order to conserve valuable potable water supply sources, the City seeks to expand the recycled water system to offset potable supplies for non-potable purposes.

The major physical components of the Project include the installation of approximately 7500 feet of 8-inch diameter C900 polyvinyl chloride (PVC) pipe, a connection to the existing GWP recycled water system, associated valves and appurtenances, and all other facilities necessary for a complete installation.

The anticipated physical benefits of the Project include the primary benefit of 55 AFY of water supply recycled that will offset imported water that currently supplies the irrigation needs of the three schools. The secondary benefit is improved water quality that is the result of reducing recycled water discharges in the Los Angeles River by 55 AFY, along with the associated chloride, total dissolved solids (TDS), and copper.

The Project addresses a current need of the region by supporting the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). First, the Project will increase recycled water use to optimize local water resources and reduce the region's reliance on imported water (Improve Water Supply). Second, the Project will improve surface water quality by removing a source of chloride, TDS, and copper from the Los Angeles River (Improve Surface Water Quality).

The intended outcome of the Project is to reduce potable water demand on GWP's system by 55 AFY by offsetting imported water supplies with locally-produced recycled water from the Los Angeles Glendale Water Reclamation Plant (LAGWRP). This recycled water is currently discharged to the Los Angeles River. Additionally, by shifting the recycled water to irrigation beneficial uses, the Project will reduce the amount of chloride, TDS, and copper entering the river, improving the overall water quality of that surface water body.

This Project will assist GWP and MWD in meeting potable water demands despite an 80 percent reduction in SWP imported water allocations, which has resulted in rapidly diminishing local and regional storage supplies. Since this project extends existing facilities, it can be rapidly implemented to alleviate existing drought impacts. The Project will also address future shortages if the drought continues and water storage declines to levels that require additional mandatory conservation. GWP is currently implementing Phase 3 of a Water Conservation Ordinance consisting of 17 measures to reduce consumption and prohibit water waste for existing and new customers within the City. Phase 3 of the Conservation Ordinance limits outdoor irrigation to two days per week which creates an opportunity to extend the recycled water system demand.

Project Map

Project Location - Recycled Water Customers

Project Location – Los Angeles–Glendale Water Reclamation Plant

Project Physical Benefits

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

- Primary Benefit – Water Supply Recycled
- Secondary Benefit – Water Quality Improved through Reduction of Chloride, TDS, and Copper

Primary Benefit – Water Supply Recycled

The primary benefit is water supply recycled. The Project Schedule dictates that this benefit will begin in 2018 as the Project will complete construction in 2017; the benefits will continue for the presumed 50-year lifespan of the Project.

Table 5 – Annual Project Physical Benefits
Project Name: Hoover, Toll, & Keppel School Recycled Water Project
Type of Benefit Claimed: : Primary Benefit - Water Supply Recycled
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 50 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2017	0	0 (construction)	0
2018 - 2067	0	55	55

Comments:
Methodology: The water supply benefit is expressed as AFY of recycled water produced at the LAGWRP that is used by the Project for irrigation end uses rather than discharging to the Los Angeles River. The AFY values are estimated in the *2007 Glendale Recycled Water System Improvements* document and have been updated using actual data from the potable irrigation meters that currently serve the three schools.

Sources: *Glendale Harris/North star billing system, actual data from water meters serving the irrigation systems for the* Hoover High School, Toll Middle School, and Keppel Elementary School in the GWP service area (pp. 1-2).

Secondary Benefit – Water Quality Improved through Reduction of Chloride, TDS, and Copper

The secondary benefit of the Project is water quality improved. This benefit consists of reduced loadings of chloride, TDS, and copper to the Los Angeles River by diverting 55 AFY of recycled water to irrigation uses. This benefit is expressed as milligrams per liter (mg/L) as requested by the 2015 Proposal Solicitation Package and represents the concentration of each constituent in the 55 AFY of recycled water that will not be discharged. The Project Schedule dictates that this benefit will begin in 2018 as the Project will complete construction in 2017; the benefits will continue for the presumed 50-year lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Hoover, Toll, & Keppel School Recycled Water Project

Type of Benefit Claimed: Secondary Benefit – Water Quality Improved through reduction of chloride, TDS, and copper

Units of the Benefit Claimed: mg/L

Anticipated Useful Life of Project (years): 50 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2017	Chloride: 0 TDS: 0 Copper: 0	0 0 0	0 0 0
2018 - 2067	Chloride: 0 TDS: 0 Copper: 0	152.3 728.7 0.10	152.3 728.7 0.10

Comments:

Methodology: Water quality benefits are estimated as mg/L of chloride, TDS, and copper that are present in the 55 AFY of recycled water that will not be discharged to the Los Angeles River. Since the recycled water is diverted from the River to irrigation end uses, the loadings of these three constituents goes from measurable values to effectively zero. Expressed as concentrations for the purposes of this grant application (as requested by the PSP), this is interpreted as going from measureable concentrations to effectively zero.

Sources: Concentrations of chloride, TDS, and copper were averaged over a 12-month period in 2014 using the *2014 Los Angeles Glendale Water Reclamation Plant WDR Annual Report* (pp. R-3, R-6).

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Recycled
The Project will offset 55 AFY of the City's imported water demand with locally-produced recycled water, increasing overall supply reliability and reducing strain on the SWP.

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
The State of California is currently experiencing one of the most severe droughts on record, which has severely depleted statewide water supplies. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting SWP supplies from the Bay-Delta. The results of these persistent drought conditions can be seen throughout the Region as an increased implementation of local supply development projects and conservation measures and ordinances. With only one wet year in 2011, the Region is in the middle of yet another multiple year drought. GWP is impacted by drought conditions that directly affect the three sources of potable supply: Colorado River Authority water via MWD, SWP water delivered via MWD, and local groundwater. In order to conserve the City's potable water supply, major efforts are in place to expand the recycled water system.

The GWP existing recycled water system consists of approximately 23 miles of pipeline, five tanks, and six pump stations. The system serves a majority of the City's schools, cemeteries, parks and golf courses, with recycled water being primarily for landscape irrigation. There are also some secondary uses for office building toilet flushing, construction water, industrial process water, and filling of decorative fountains. The State Water Resources Control Board (SWRCB) Recycled Water Policy has mandated an increase in the use of recycled water by 2030. GWP has been actively extending the recycled water system in recent years in order to maximize the beneficial uses of fifty (50) percent or 8,500 AFY of recycled water produced by the LAGWRP. This facility is co-owned by the City of Los Angeles and the City of Glendale. GWP currently uses 2,000 AFY which is approximately 24 percent of the 8,500 AFY produced. The remainder of recycled water is discharged into the Los Angeles River.

During the initial construction of the recycled water infrastructure, large recycled water users were connected first, including golf courses and large parks. The City is now focusing on the smaller users and continues to work closely with the Glendale Unified School District in particular; Hoover High School, Toll Middle School and Keppel Elementary School are some of the identified users. Due to the relatively short distances between the schools, it is possible to extend one lateral line to serve all three sites. The Project will consist of extending 7,500 feet of new 8-inch diameter PVC main line to serve recycled water to the three schools. It is estimated that these schools have a demand of approximately 55 AFY to irrigate the football field, track field, soccer field, baseball field, and other planted areas. Connecting these schools to the recycled water system will reduce demand on GWP's potable water system and decrease reliance on imported water. Recently the City completed a *Recycled Water System Improvement and Extension Plan* that recommended proceeding with the connection to the three school sites.

2) Estimates of Without Project Conditions
Without the Project, irrigation needs of the school play grounds will continue to be supplied by imported water and may be curtailed, due to the reduced supply (allocation) from MWD and the state drought regulations. Additionally, state-wide imported water supplies will continue to be strained by the City's irrigation usage since GWP is part of the regional MWD and statewide SWP water supply system. And finally, discharges of treated effluent, containing chloride, TDS, and copper, will continue to the Los Angeles River without the Project.

3) Descriptions of Methods Used to Estimate Physical Benefits

The water supply benefit is expressed as AFY of recycled water produced at the LAGWRP that would be used by the Project for irrigation end uses rather than discharging to the Los Angeles River. The AFY values are estimated in the *2007 Glendale Recycled Water System Improvements* document and have been updated using actual billing data for the existing potable irrigation meters that currently serve Hoover High School, Toll Middle School, and Keppel Elementary School. The potable irrigation meter data is currently recorded in the Itron Enterprise Edition (IEE) Advanced Metering Infrastructure (AMI) Database.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will require the installation of 7,500 feet of 8-inch diameter C900 PVC pipe and associated valves and appurtenances. It will also require that excavation, encroachment, and street use permits be obtained; and appropriate signage will be required at the use sites. No new policies or actions are required to obtain the physical benefit.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Adverse physical effects from the Project are possible during construction of the project, consisting of noise and traffic impacts. As with all GWP pipeline installation projects, there will be multiple outreach activities with affected residents before and during construction, including traffic management to mitigate the impacts of lane closures during construction. California Environmental Quality Act (CEQA) requirements have been addressed by filing a Notice of Exemption.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The supply benefit and the Project as a whole will address long-term drought preparedness by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

3) Promote water recycling.

Secondary Physical Benefit: Water Quality Improved through reduction of chloride, TDS, and copper

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Historically, the City has delivered recycled water from the LAGWRP since the late 1970's. The capacity of the LAGWRP is 20 MGD, and the City is entitled to 50 percent of recycled water produced at the plant, which translates to an average of approximately 8,500 AFY. The total delivery to the existing recycled water users was about 2,000 AFY in 2014. Recycled water that is not reused, approximately 6,500 AFY, is discharged to the Los Angeles River and flows to the Pacific Ocean. The recycled water that is discharged to the Los Angeles River contains certain constituents, including chloride, TDS, and copper. The concentration values for these constituents are composite sampled on a weekly, monthly, and annual basis. The results are documented in the *Los Angeles-Glendale Water Reclamation Plant Annual Waste Discharge Requirements for Title 22 Recycled Water Monitoring Report*. Values from the 2014 version of this document are used to estimate the water quality benefits for the Project.

2) Estimates of Without Project Conditions

Without the Project, 55 AFY of recycled water and the TDS, chloride, and copper it contains would continue to be discharged to the Los Angeles River.

3) Descriptions of Methods Used to Estimate Physical Benefits

Water quality benefits are estimated as mg/L of chloride, TDS, and copper that are present in the 55 AFY of recycled water that will not be discharged to the Los Angeles River. Since the recycled water is diverted from the River to irrigation end uses, the loadings of these three constituents move from measurable values to effectively zero. Expressed as concentrations for the purposes of this grant application (as requested by the PSP), this is interpreted as a reduction of measureable concentrations of chloride, TDS, and copper to effectively zero.

The information in the table below was obtained from the *2014 Los Angeles-Glendale Water Reclamation Plant Annual Waste Discharge Requirements for Title 22 Recycled Water Monitoring Report.* It represents monthly composite samples of the effluent from the LAGWRP analyzed for chloride, TDS, and copper. The values for each month are shown, as well as the average value for the entire year.

Date	chloride	TDS	copper
	(mg/L)	(mg/L)	(mg/L)
Jan-14	140	696	0.0131
Feb-14	153	676	0.00994
Mar-14	125	588	0.00741
Apr-14	156	742	0.0124
May-14	148	748	0.0091
Jun-14	169	792	0.012
Jul-14	159	750	0.00869
Aug-14	158	752	0.00647
Sep-14	162	734	0.0174
Oct-14	150	804	0.00942
Nov-14	149	692	0.0088
Dec-14	158	770	0.00855
Annual Average	152.3	728.7	0.010

It is assumed that these values represent the amount of chloride, TDS, and copper that would be diverted from the Los Angeles River by implementing the Project. Though a water quality benefit would typically be expressed as a reduced loading, for the purposes of this grant application it is assumed that the water quality benefit may be described as follows such that the definition is expressed in milligrams per liter (mg/L):

- Chloride concentration is reduced from 152.3 mg/L to zero
- TDS concentration is reduced from 728.7 mg/L to zero
- Copper concentration is reduced from 0.010 mg/L to zero

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will require the installation of 7,500 feet of 8-inch diameter C900 PVC pipe and associated valves and appurtenances. It will also require that excavation, encroachment, and street use permits be obtained; and appropriate signage will be required at the use sites. No new policies or actions are required to obtain the physical benefit.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

Adverse physical effects from the Project are possible during construction of the project, consisting of noise and

traffic impacts. As with all GWP pipeline installation projects, there will be multiple outreach activities with affected residents before and during construction, including traffic management to mitigate the impacts of lane closures during construction. CEQA requirements have been addressed by filing a Notice of Exemption.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The water quality benefit does not specifically address long-term drought preparedness; but the Project as a whole does by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

1) Promote water recycling.

Direct Water-Related Benefit to a DAC

Water-Related Need of the DACs: The DAC areas within the City of Glendale (City) benefit from the open space and recreational opportunities provided by parks and playing fields. The Recreation Element, which is a component of the City's General Plan, contains the following language: "Glendale has an extreme deficit of both community and neighborhood park facilities. At the city-wide level, community parks are often overcrowded. The neighborhood park shortage is extreme and has been exacerbated by the increase in residential density in many of its neighborhoods. In order to meet the minimum National Recreation and Park Association standards would require the city to develop approximately 800 additional acres of park land. This additional park land would require a large commitment of financial resources that are not presently available".

Compounding the issue of the park space deficit, irrigation of playing fields is limited to two days per week due to current drought conditions and the mandatory conservation measures that have been imposed. This rate of water application will result in the browning of grass, thereby further limiting access to recreation opportunities for students and community members. The affected areas include a soccer field, football field, baseball field and a small park. Physical activity has been demonstrated to be fundamentally important to health and well-being. Allowing the playing fields and park to brown would decrease access to opportunities for physical activity, negatively impacting the surrounding DAC communities in the City.

In addition, the playing fields, park, and landscaping served by this project enhance the aesthetic of the area. An appealing aesthetic also helps to enhance the well-being of communities. Allowing these areas to brown will decrease their aesthetic value and diminish any associated benefit to the surrounding DAC communities.

The Project will address the water related needs of the DAC by providing a sustainable and reliable source of water to irrigate these community open spaces.

DAC Coverage: DACs were identified using DWR's Disadvantaged Communities Mapping Tool. The DAC layer for the map was derived from the U.S. Census American Community Survey (ACS) 5-year data set (2009 – 2013), with a California median household income (MHI) of $61,094 and a calculated DAC threshold of $48,875 (80% of the State's MHI). The Project Area is considered to be the area enclosed within the Hoover High School boundary (school district) for the fields and parks served by the three schools. Approximately 57 percent of the Hoover High School boundary encompasses DACs.

Additional information on DAC needs and coverage may be found in Attachment 7.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Hoover, Toll, & Keppel School Recycled Water Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Recycled	55 AFY	Tools and Methods: water meter reads Location: meters at customer properties Type of Analysis: meter totalizer **The monitoring tools and targets are appropriate for the benefits claimed because** meter readings will accurately account for AFY of recycled water served. **The monitoring data will be used to measure performance by** totalizing the acre-feet served by the Project year to year.
Secondary Benefit – Water Quality Improved through Reduction of Chloride, TDS, and Copper	Chloride reduction: 152.3 mg/L TDS reduction: 728.7 mg/L Copper reduction: 0.010 mg/L	Tools and Methods: composite sampling for constituents, Methods: TDS: SM2450 C Chloride: EPA 300.0 Copper: EPA 200.8 Location: LAGWRP effluent at discharge point to L.A. River Type of Analysis: 24-hour composite **The monitoring tools and targets are appropriate for the benefits claimed because** composite sampling will accurately reflect the amount of chloride, TDS, and copper that is diverted from the Los Angeles River. **The monitoring data will be used to measure performance by** totalizing the pollutants removed by the Project year to year.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis Project Name: Hoover, Toll, & Keppel School Recycled Water Project	
Question 1	**Types of benefits provided as shown in Table 5:** • Primary Benefit – Water Supply Recycled • Secondary Benefit – Water Quality Improved Through Reduction of Chloride, TDS, and Copper
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? GWP water sources are limited to groundwater, imported water or recycled water. The ground water levels continue to drop and the Glendale groundwater production was therefore reduced. The only other alternative would be to import water from MWD at the unit cost for each additional AF, continuing reliance on imported water. No other alternate sources of water were evaluated that could be used to supply irrigation water to the area. The proposed project is the preferred alternative since it utilizes available recycled water which is currently going to the ocean via the Los Angeles River.
	I**f 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:	

Project 15: Lopez Spreading Grounds Improvement Project (Project)
Implementing Agency: Los Angeles County Flood Control District (LACFCD)
Project Description

(25 Word) The Project will produce 480 AFY of water supply by increasing capacity at the Lopez Spreading Grounds to increase stormwater infiltration and groundwater recharge.

(Expanded) This Project will produce 480 AFY of water supply by improving recharge to the San Fernando Groundwater Basin via Lopez Spreading Grounds. Improvements include enhancing the existing intake and storage capacity at the Lopez Spreading Grounds. LACFCD is the lead agency partnering with the Los Angeles Department of Water and Power (LADWP). As a result of this Project, LADWP will be able to pump this additional 480 AFY of water from the San Fernando Groundwater Basin in-lieu of using imported water that is less reliable and more costly. LADWP's service area is 31% Disadvantaged Communities (DACs) that will directly benefit from improving local water supply reliability.

The major physical components of the Project include reconfiguring and deepening Lopez Spreading Grounds' original five spreading basins into four larger basins as well as replacing portions of the intake canal adjacent to Pacoima Wash. These improvements will increase the total storage capacity of the spreading basins from approximately 24 AF to 73 AF. Approximately 240,000 cubic yards of sediment, including silt material, will be removed from the spreading grounds and the intake canal. The removal of sediment will increase the percolation rate from 10 cubic feet per second (CFS) to approximately 14.3 CFS, thus improving groundwater recharge efficiency. The intake canal will be restored to its original geometry and lined with gunite to prevent further erosion. Automated gate systems will be installed to replace the existing manually-operated flashboard systems at the Lopez Flood Control Basin diversion structure and between the basins. These improvements will enhance operational efficiencies by decreasing the response time to divert stormwater flows from the channel to the basins when stormwater is available. LADWP will use existing facilities to pump and treat the groundwater supplies.

The anticipated physical benefits of the Project include the primary benefit of increasing local water supply by 480 AFY thereby offsetting more energy intensive imported water, which provides a secondary benefit of reducing energy usage by 1,620,480 kWh per year and greenhouse gas (GHG) emissions by 450,493 kilograms (kg) of carbon dioxide equivalents (CO_2e) per year. Maximizing the ability of spreading grounds overlying the San Fernando Groundwater Basin to recharge stormwater reduces the amount of excess flows that are lost to the ocean. Retaining and recharging these flows provides LADWP the ability to increase groundwater pumping by 480 AFY and offset the need to import this water through the State Water Project (SWP) and Colorado River Aqueduct (CRA), which require more energy to convey and treat.

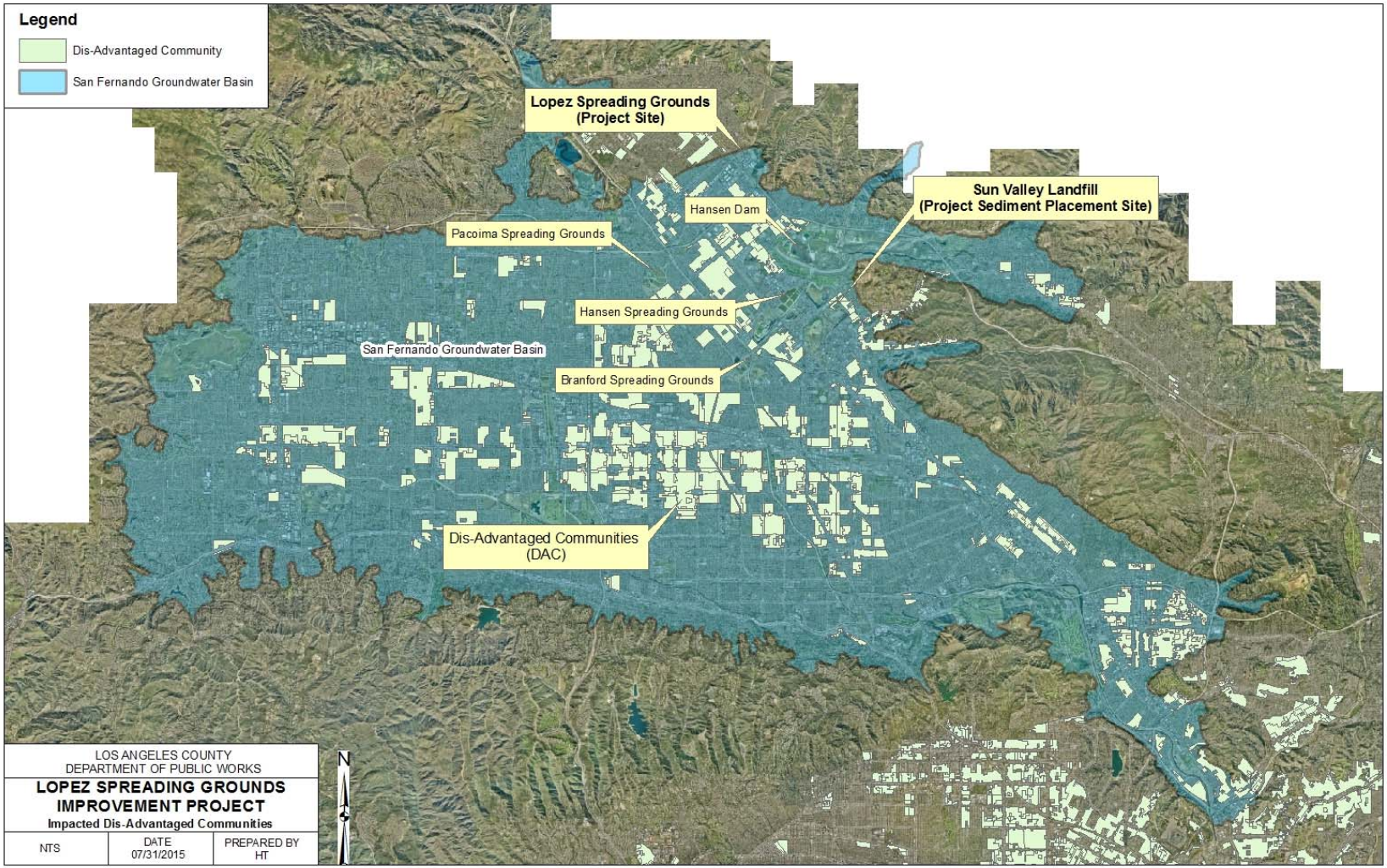
The Project addresses a current need of the region by increasing water supply by centralizing stormwater infiltration to offset regional dependence on imported water thereby improving overall regional water supply reliability. Since stormwater availability is variable, the ability to capture and store flows over a longer term is critical to fully leverage this supply source. The Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Plan has highlighted centralized stormwater recharge as a key strategy to increase local water supplies and mitigate the impacts from GHG emissions to address climate change vulnerabilities by reducing demand for energy-intensive imported water supplies.

The intended outcome of the Project is to capture and infiltrate an additional 480 AFY of stormwater to increase groundwater supply in the San Fernando Groundwater Basin. This additional supply will allow LADWP, to use more groundwater and less imported water, to help decrease dependence on imported water and also reduce energy usage and GHG emissions.

Project Map

Project Location, Work Boundaries, Facilities and Monitoring Location

Project Location, Water Resources Affected by the Project, and DACs in the Project Area



Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Energy Saved and GHG Avoided

Other benefits include water quality and integrated flood management benefits. Water quality benefits will be achieved by capturing runoff that could contain contaminants that would otherwise decrease water quality downstream. Soil-aquifer systems are very efficient at removing pathogenic bacteria, heavy metals, and toxic elements. The Project supports integrated flood management through capturing additional stormwater flows in the upper watershed for infiltration and diminishing downstream flows during storm events.

Primary Benefit – Water Supply Produced

The primary benefit of this Project is to produce 480 AFY of water supply by improving recharge to the San Fernando Groundwater Basin via Lopez Spreading Grounds. The table below provides information on the benefit of water supply produced through the additional capture and infiltration of stormwater. The benefits below reflect an average annual amount, assuming average hydrologic conditions. Over the 50-year useful life of the Project, this results in a total of approximately 24,060 AF of additional supply produced.

Table 5 – Annual Project Physical Benefits

Project Name: Lopez Spreading Grounds Improvement Project
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 50+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015 - 2016	583	583	0
2017	583	643	60
2018-2067	583	1,063	480

Comments:

- *Flow monitoring data from the Los Angeles County Department of Public Works, Water Resources Division (years 1956–2012)* (http://dpw.lacounty.gov/wrd/SpreadingGround/watercon/): The Lopez Spreading Grounds has an annual historical average stormwater infiltration rate of 583 AFY.
- *The Los Angeles County Department of Public Works, Water Conservation Model, 2013:* The model uses historical daily inflow and basin parameters such as storage capacity and percolation rate to project an average annual water infiltration of 1,063 AFY after modifying the spreading basins parameters to a storage capacity of approximately 73 AF and percolation rate of 14.3 CFS.
- Useful Project life of 50 years is based on LACFCD's standard for spreading grounds projects.
- The full annual benefit is expected to begin in 2018. A partial benefit was estimated for 2017 since the Project construction will be completed in September 2017. The partial benefit in 2017 was based on an analysis to determine the quantity of flows that could be expected during the months of 2017 after the Project has been constructed based on the LACFCD's observed flows from 1996 to 2006.

Secondary Benefit – Energy Saved and GHG Avoided
The table below provides information on the benefit of energy saved and GHG avoided through the offset of treated imported water (blend of 84% SWP and 16% CRA for LADWP) with stormwater recharged and pumped as San Fernando Groundwater Basin groundwater. Over the 50-year useful life of the Project, this results in a total of approximately 81,226,560 kWh energy saved and 22,580,962 kg of CO_2e avoided.

It should be noted that the previous "Water Supply Produced" table shows existing stormwater recharge/water supply values in the "Without Project (b)" column. It is recognized that these volumes reflect an ongoing supply production that will use the same amount of energy with or without the Project. Therefore, the current energy used to recharge stormwater at Lopez Spreading Grounds is not characterized as "Energy Saved and GHG Avoided" and does not appear in the benefits table's "Without Project (b)" column (although it is recognized that this supply is less energy intensive than other units of supply used in the area). The implementation of this Project does, however, directly change the amount of water currently imported to the area and thereby provides a previously non-existent energy savings and GHG avoidance as shown in the "With Project (b)" column.

Table 5 – Annual Project Physical Benefits
Project Name: Lopez Spreading Grounds Improvement Project
Type of Benefit Claimed: Secondary Benefit – Energy Saved and GHG Avoided
Units of the Benefit Claimed: Energy Saved: kWh saved per year and CO_2e Reduced: kg of CO_2 equivalents not emitted per year
Anticipated Useful Life of Project (years): 50+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-2016	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0
2017	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 202,560 CO_2e Reduced: 56,312	Energy Saved: 202,560 CO_2e Reduced: 56,312
2018-2067	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 1,620,480 CO_2e Reduced: 450,493	Energy Saved: 1,620,480 CO_2e Reduced: 450,493

Comments:
- *DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7:* Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF) (nearest West Branch SWP pumping plant to the GLAC Region).
- *California Public Utilities Commission (CPUC) Study, page 64*: Energy associated with conveying Colorado River Aqueduct Water (1,976 kWh/AF) (as listed in the DWR 2014 Water Energy Grant Guidelines and PSP).
- *LADWP Support Letter, July 28, 2015*: Proportions of imported water used by LADWP (84% SWP/16% CRA), on average
- Energy to import water to LADWP = 3,782 kWh/AF or (1,815,360 kWh per year for 480 AFY).
- *Metropolitan Water District of Southern California (MWD), 2007. Groundwater Assessment Study. Report Number 1308. – Chapter IV, Page IV-2-7 Table 2-3*: Groundwater pumping costs for the San Fernando Basin of $63/AF in 2004 and converted to 2015 dollars as $88/AF.

Table 5 – Annual Project Physical Benefits
Project Name: Lopez Spreading Grounds Improvement Project **Type of Benefit Claimed:** Secondary Benefit – Energy Saved and GHG Avoided **Units of the Benefit Claimed:** Energy Saved: kWh saved per year and CO_2e Reduced: kg of CO_2 equivalents not emitted per year **Anticipated Useful Life of Project (years):** 50+ years
• *Bureau of Labor Statistics, May 2015. Average Energy Prices, Los Angeles-Riverside-Orange County. – Page 1*: 21.7 cents per kWh used to convert the cost of pumping groundwater from San Fernando Groundwater Basin to the energy used (406 kWh/AF). • Project increased pumping of 480 AFY resulted in 194,880 kWh per year from 2017 to 2066. • Imported energy – groundwater energy = 1,620,480 kWh per year of savings from 2017 to 2066. • *U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*: The annual total-output statewide emission rate of 0.278 kg of CO2e/kWh was used to convert energy savings to a reduction in CO_2e. Offsetting imported water by 480 AFY, the Project will avoid GHG emissions of approximately 450,493 kg of CO_2e per year (504,670 kg of CO_2e per year to import water versus 54,177 kg of CO_2e per year to pump groundwater). • The full annual benefit is expected to begin in 2018. A partial benefit was estimated for 2017 according to the Project schedule as 60 AF as explained for the water supply produced benefit.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the SWP supplies from the Bay Delta. Additionally, the GLAC Region goes through frequent drought cycles that place considerable stress on the groundwater supply. As a result, the Region does not have adequate supply to meet demands in years when imported supply is limited. The current drought has resulted in severe SWP cutbacks requiring local groundwater purveyors to increase pumping of the San Fernando Groundwater Basin supplies even without the normal water replenishment necessary to maintain groundwater levels. For these reasons, exploring local water supply development has become more important than ever. Groundwater is a reliable local water supply in times of drought and recharging this supply is of great importance in order to keep groundwater levels at sustainable levels and to minimize pumping impacts on the structural integrity of the aquifer.

Over time, sediment deposits in the Lopez Spreading Grounds have accumulated, diminishing storage capacity and percolation rates. Sedimentation coupled with lag times from having to manually operate the diversion of flows into the spreading grounds and within the basins limit the infiltration and water supply production potential.

Maximizing the ability of spreading grounds overlying the San Fernando Groundwater Basin to recharge stormwater reduces the amount of excess flows that are lost to the ocean and increases supply production in the San Fernando Basin. The Project will increase recharge and supply production at the Lopez Spreading Grounds by 480 AFY. This increase in local supply will offset the need to import the same amount of water through the SWP and CRA.

2) Estimates of Without Project Conditions

Without the Project, the Lopez Spreading Grounds will continue to operate in a limited capacity. The amount of stormwater that can be captured and infiltrated will continue to be limited by the 24 AF storage capacity and 10 CFS percolation rate, restricting recharge volume to only 583 AFY (*Flow monitoring data from the Los Angeles County Department of Public Works, Water Resources Division, years 1956 – 2012*). Thus, without the Project, the additional 480 AFY of stormwater flows could otherwise be lost to the ocean.

3) Descriptions of Methods Used to Estimate Physical Benefits

Los Angeles County Department of Public Works' Water Conservation Model (Model) was used to calculate the amount of water that could be captured and infiltrated with the implementation of the Project. The Model applies the mass balance equation with inputs of historical daily inflow and spreading grounds properties to calculate daily total percolation, storage, and outflow as a function of time. The Model showed that by increasing the capacity of the Lopez Spreading Grounds from approximately 24 AF to 73 AF and increasing the percolation rate of the spreading grounds from approximately 10 CFS to 14.3 CFS, an additional capture and recharge amount of 480 AFY could be achieved. In addition, calculations were conducted to determine the best configuration of the basins to eliminate loss of water through seepage to the adjacent channel.

To run the Model scenario described above, the following inputs were used:

- Flow monitoring data from 1996 to 2007 at a local data logger near the intake of the spreading grounds
- Storm runoff data from 1996 to 2007
- Infiltration rates
- Intake capacity

- Storage capacity

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
The Lopez Spreading Grounds is an existing centralized stormwater capture and infiltration facility. While no new facilities are required to obtain the increased groundwater supply through stormwater capture and infiltration, adjustments to the current facilities are required. These include combining and deepening the basins, removing 240,000 cubic yards of sediment, replacing the existing 36-inch corrugated metal pipe portion of the intake canal with a 3 feet by 5 feet reinforced concrete box culvert, replacing the existing slide gate at the intake diversion structure and flashboard systems between the spreading grounds' basins with electronically operated gates, installing approximately 475 feet of electrical conduit along the side of the intake canal to power the automated features at the intake diversion structure, and constructing a discharge outlet connecting the spreading grounds to Pacoima Wash.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
This project will not have any adverse physical effects. Typical noise, air quality, and visual impacts associated with construction of the Project may occur, but will be mitigated through typical construction Best Management Practices (BMPs). If needed, a Stormwater Pollution Prevention Plan will be developed and implemented, during construction to mitigate potential stormwater pollution impacts. The Lopez Spreading Grounds and associated intake canal and diversion structure are existing facilities and most of the work will take place within their existing footprint. A portion of the intake canal and diversion structure is within U.S. Army Corps of Engineers' right-of-way. Construction at the intake canal and the diversion structure in and around Pacoima Wash will be approved by the US Army Corps of Engineers prior to construction.

The Lopez Spreading Grounds has a mostly undeveloped tributary area since it is located in the upstream portion of the Los Angeles River watershed. Thus, the water diverted to the spreading basins is of relatively good quality and not expected to have any adverse impacts on the soil or aquifer quality. The Project is expected to have positive impacts on the groundwater quality in the San Fernando Groundwater Basin.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
The Project addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. By increasing facility size and adjusting operations to allow more stormwater to be captured and recharged to the San Fernando Groundwater Basin, the Project increases a local water supply that can be used in times of drought. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(4) Conjunctive use of water
(5) Efficient groundwater basin management
(6) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater runoff and infiltrating it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin as dry year supply. Additionally, the Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers a new water supply source by capturing stormwater runoff that could otherwise be lost to the ocean.

Secondary Physical Benefit: Energy Saved and GHGs Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Generating the energy needed to produce, convey, and distribute water produces carbon dioxide emissions that contribute to global warming, which itself threatens California's water supply. The state has committed to reducing its emissions by 15% by 2020 under AB-32, the Global Warming Solutions Act of 2006. Decreasing the amount of energy required to produce water supply is also an objective of the California Water Action Plan, and decreasing the emission of greenhouse gases is a Planning Target of the GLAC IRWM Plan. This Project will contribute to both goals by reducing the amount of energy used to import water to the GLAC Region and avoid the associated emissions. The rising costs of both energy and water negatively impact residential customers, particularly in DACs.

The Project will increase local groundwater supply in the San Fernando Groundwater Basin by increasing the amount of local stormwater that can be captured and infiltrated at the Lopez Spreading Grounds. Increasing this local supply will allow LADWP to use more local groundwater from the basin and import less water from the SWP and CRA. As significantly more energy is required to convey imported water through the SWP and CRA than is required to pump groundwater from the basin, the Project will reduce energy use and GHG emissions associated with that energy use.

2) Estimates of Without Project Conditions

Without the Project, LADWP will have the same San Fernando Groundwater Basin allocations and need to maintain its current reliance on imported water supply. Without the reductions in imported water use, LADWP will continue to use 1,815,360 kWh per year to import the 480 AFY which has a GHG emission association of 504,670 kg CO_2e.

3) Descriptions of Methods Used to Estimate Physical Benefits

The Project provides energy conservation through the offset of treated imported water with groundwater that has been recharged through stormwater capture and infiltration at the Lopez Spreading Grounds. LADWP's imported water is a blend of 84% SWP and 16% CRA. Approximately 4,126 kWh/AF is required for conveyance and pumping of SWP water to the Oso Pumping Plant (DWR Bulletin B-132-14, 2014), which is the nearest SWP pumping plant to the GLAC Region. It is expected that additional energy would be required to further distribute the water to and through LADWP's system, so the assumed energy consumption for imported water is a conservative minimum. The energy required to transport CRA water to the GLAC Region is estimated to be 1,976 kWh/AF (CPUC Study, page 64). Based on LADWP's ratio of these supplies, an estimated 3,782 kWh/AF of energy is used to import water to the GLAC Region. This would result in an energy usage of 1,815,360 kWh per year to import 480 AFY of supply.

For the Project, it is assumed that the energy to pump the additional supply from the San Fernando Groundwater Basin is the only additional energy required for the Project. There is no energy required to divert capture or infiltrate the stormwater flows. Any energy used to treat and distribute the groundwater supply was assumed to be the same for imported water.

The energy associated with pumping groundwater from the San Fernando Groundwater Basin was estimated using the MWD 2007 Groundwater Assessment Study, Report Number 1308. – Chapter IV, Page IV-2-7 Table 2-3. The study indicates groundwater pumping costs for the San Fernando Basin of $63/AF in 2004. This value was projected out to 2015 dollars as $88/AF. According to the U.S. Bureau of Labor Statistics (USBLS), the average cost of electricity in the Los Angeles area in 2015 is $0.217/kWh (USBLS, May 2015). Using these values, it can be estimated that the energy required to pump groundwater in the San Fernando Groundwater Basin is approximately 406 kWh/AF. As 480 AFY of imported water is expected to be offset by the Project, it is expected that 194,880 kWh per year will be used to pump the groundwater from the basin.

When the energy consumption to import 480 AFY (1,815,360 kWh per year) is compared against the energy consumption to pump 480 AFY from the San Fernando Groundwater Basin (194,880 kWh per year), the Project will result in an energy savings of approximately 1,620,480 kWh per year.

To calculate the GHG emissions avoided through the Project, the annual total-output statewide emission rate of 0.278 kg of CO_2 equivalents (CO_2e) per kWh (*U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*) was applied to the 1,620,480 kWh per year of energy saved. As a result, it was estimated that the Project will avoid GHG emissions of approximately 450,493 kg of CO_2e per year.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

No new facilities are required to obtain the energy savings and greenhouse gas avoidance physical benefits beyond what is required to derive the water supply benefits described previously. LADWP plans to reduce imported water purchases by using more groundwater from the San Fernando Basin as provided by the implementation of this Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This project will not have any adverse physical effects. Typical noise, air quality, and visual impacts associated with the construction may occur, but will be mitigated through typical construction Best Management Practices (BMPs). If needed, a Stormwater Pollution Prevention Plan will be developed and implemented during construction to mitigate potential stormwater pollution impacts.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While the physical benefit of saving energy and avoiding GHG emissions does not specifically address long-term drought preparedness, the Project as a whole does. To achieve the secondary benefit of saving energy and avoiding GHG emissions through offsetting imported water use, the Project is capturing and infiltrating stormwater flows to the San Fernando Groundwater Basin which increases the local water supply that can be used in times of drought. Therefore, the Project as a whole addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(1) Conjunctive use of water
(2) Efficient groundwater basin management
(3) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater runoff and infiltrating it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin as potable water. Additionally, the Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers a new water supply source by capturing stormwater runoff that would otherwise be directed out of the watershed through flood control channels and lost to the ocean.

Direct Water-Related Benefit to a DAC

The Project will provide direct water supply benefits to LADWP customers of which 2,180,213 are listed as being in DACs. The Project will replenish the San Fernando Groundwater Basin through stormwater capture and infiltration which will contribute an additional 480 AFY of local, higher reliability, lower cost groundwater supply to the overall supply mix provided to LADWP customers.

The direct water-related need of the DACs is the need for a reliable cost-effective water supply that is available during SWP cutbacks at a lower cost to the customers. DACs within LADWP's service area total 31% of its total service area (94,648 acres of DAC area of the total service area of 303,933 acres) as shown in Attachment 7. Supply reductions during severe droughts can impact DACs more adversely than other communities since they traditionally have fewer resources to augment supplies or reduce demands. By increasing local supply reliability the potential for impacts from supply reductions is lessened for DACs.

The Project provides a direct water-related benefit to the DACs by increasing the supply reliability through increased groundwater storage and mitigating against the potential supply reductions during severe droughts. The Project will capture and infiltrate an additional 480 AFY of stormwater into the San Fernando Groundwater Basin as a source of supply for LADWP and their customers who are approximately 31% DACs by area. The Project replaces imported water which has a lower reliability and higher cost with local groundwater and mitigates against future supply reductions and higher costs for DACs.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Lopez Spreading Grounds Improvement Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	Additional 480 AFY captured and infiltrated into the San Fernando Groundwater Basin	Tools and Methods: Data loggers and staff gauges will be used to measure inflow to spreading grounds and water levels at the spreading grounds, respectively. The total inflow into the basins will be recorded and compared against the baseline average of 583 AFY to determine the increase in infiltration. Locations: Flow will be measured at the inlet to the desilting basin which is the first basin before the water enters the spreading basins (see Project map). Data to be Collected: Flow measurements will automatically be recorded on a regular basis in cubic feet per second (CFS) and converted to annual volumes in AF to compare against the historical average volume of 583 AFY. **The monitoring tools and targets are appropriate for the benefits claimed because** the data loggers will record the volume of stormwater diverted to the spreading basins from Pacoima Wash and the measurements taken with the staff gauges will confirm percolation rates. **The monitoring data will be used to measure performance by** recording the volume of water entering the spreading basins with data loggers as well as the water levels in the basin. This is an accurate depiction of the volume that is infiltrating to the groundwater basin because only the water that will be detained and infiltrated will be recorded at the inflow monitoring station. Basin level monitoring will confirm percolation rates.

Table 6 – Project Performance Monitoring Plan **Project:** Lopez Spreading Grounds Improvement Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Secondary Benefit – Energy Saved and GHGs Avoided	1,620,480 kWh per year energy saved and 450,493 kg of CO_2e per year avoided	Tools and Methods: LADWP is required to provide San Fernando Groundwater Basin pumping volumes to the Upper Los Angeles River Watermaster. At this time, it is anticipated that pumping data provided to the Watermaster could be compared against previous years to determine if LADWP has increased pumping of groundwater as a result of the Project. Any increases in groundwater pumping are assumed to have offset the need for future imported water purchases. The proportion of imported water used by LADWP that is SWP vs CRA may be estimated annually and used in combination with the record of imported water energy usage described in this attachment to calculate the energy required to have imported the measured water supply benefit for that year. An energy requirement for pumping groundwater from the San Fernando Basin could be used with the measured supply savings to compare against the energy required to import that same volume to estimate an energy savings. A greenhouse gas emission rate of 0.278 $kgCO_2e$ will be applied for every kWh of energy saved to estimate the GHG reduction with the Project Locations: LADWP San Fernando Groundwater Basin wells pumping and production data Data to be Collected: LADWP San Fernando Groundwater Basin wells pumping and production data **The monitoring tools and targets are appropriate for the benefits claimed because** the calculations would estimate the amount of energy saved and greenhouse gas avoided using the actual amount of groundwater produced in lieu of purchasing imported water. **The monitoring data will be used to measure performance by** showing the estimated energy savings and GHG reduction provided by the actual volume of local supply increased through stormwater capture and infiltration.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Lopez Spreading Grounds Improvement Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Energy Saved and GHGs Avoided
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? While improvements to other spreading grounds overlying the San Fernando Groundwater Basin could produce similar water supply and energy savings benefits, the Lopez Spreading grounds has specific improvements needed at the facility which prevented other alternatives from being considered. In addition to the Project at Lopez Spreading Grounds, LACFCD has plans to improve several other spreading grounds overlaying the San Fernando Groundwater Basin. Maximizing the capability of each of the spreading grounds that is connected to the San Fernando Groundwater Basin maximizes the potential of the groundwater recharge system as a whole, which reduces the amount of excess stormwater flows that are lost to the ocean.
	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: Not Applicable	

Project 16: Big Dalton Spreading Grounds Improvement Project (Project)
Implementing Agency: Los Angeles County Flood Control District (LACFCD)
Project Description

(25 Word) The Project will produce 1,025 AFY of water supply by increasing stormwater recharge at Big Dalton Spreading Grounds, reducing dependence on energy-intensive imported water.

(Expanded) The Project will produce 1,025 acre-feet per year (AFY) of water supply by improving stormwater recharge to the Glendora Groundwater Basin (Glendora Basin) via Big Dalton Spreading Grounds. Improvements include constructing a new diversion from Little Dalton Diversion Channel and increasing storage capacity at the Big Dalton Spreading Grounds. Los Angeles County Flood Control District (LACFCD) is the lead agency, partnering with Three Valleys Municipal Water District (TVMWD) and the City of Glendora. Of the 1,025 AFY produced, approximately 525 AFY would come from the capture and recharge of additional releases from Big Dalton Dam and approximately 500 AFY would be diverted from the Little Dalton Debris Basin Watershed. This new supply can then be pumped by the City of Glendora in-lieu of using less reliable and more energy-intensive imported water sources to meet local demands.

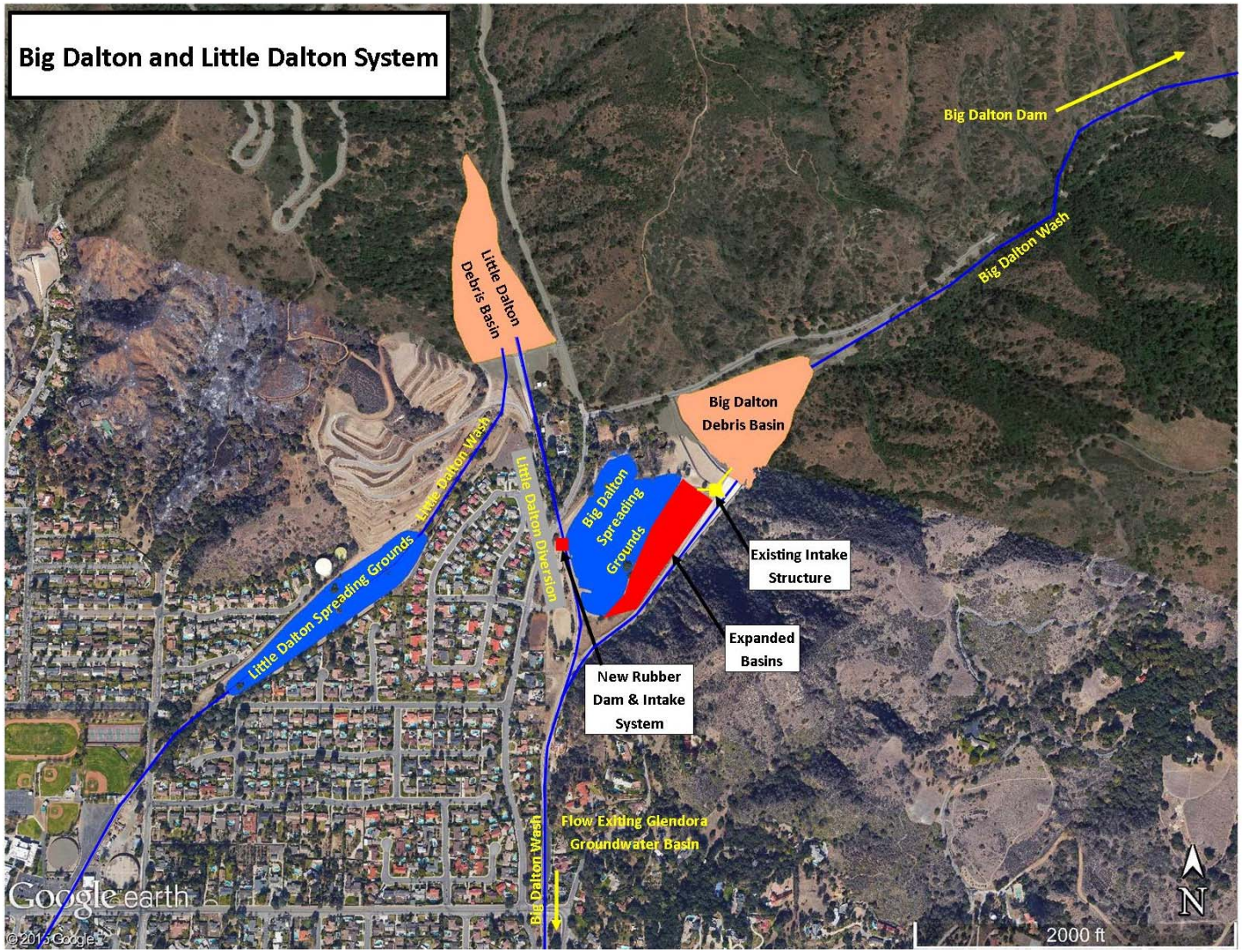
The major physical components of the Project include reconfiguring and deepening Big Dalton Spreading Grounds' original nine spreading basins into three larger basins as well as constructing a rubber dam and intake structure to divert flows from the Little Dalton Diversion Channel to the Big Dalton Spreading Grounds. These improvements will increase the total storage capacity of the spreading basins from approximately 12 acre-feet (AF) to 37 AF. To implement these improvements, approximately 83,000 cubic yards (CY) of sediment will be removed from the spreading basins. A slurry wall will be constructed on the east side of the spreading grounds to prevent seepage of stormwater to the Big Dalton Wash. New automated gate systems will be installed to replace the existing manual flashboard systems between the basins and at the existing intake from Big Dalton Wash. This will increase the response time to divert stormwater flows from Big Dalton Wash to the basins when stormwater flows are available, and will allow for flows to be controlled more efficiently.

The anticipated physical benefits of the Project include the primary benefit of producing 1,025 AFY of local water supply through improved stormwater recharge. The Project also provides a secondary benefit of saving 3,080,125 kWh per year of energy and avoiding 856,275 kilograms (kg) of carbon dioxide equivalents (CO_2e) of greenhouse gas (GHG) emissions per year by offsetting more energy-intensive imported water with locally produced water.

The Project addresses a current need of the region to increase stormwater capture and recharge and decrease dependence on imported water supplies. Since stormwater availability is variable, the ability to capture and store flows over a longer term is critical to optimize this supply source. The Greater Los Angeles County (GLAC) 2014 Integrated Regional Water Management (IRWM) Plan has highlighted centralized stormwater recharge as a key strategy to increase local water supplies and mitigate the impacts from GHG emissions to address climate change vulnerabilities by reducing demand for energy-intensive imported water supplies. As the GLAC Region is highly dependent on imported water, maximizing groundwater recharge where stormwater flows are available is of great importance.

The intended outcome of the Project is to recharge the Glendora Basin with an additional 1,025 AFY of stormwater. This additional supply will allow the City of Glendora to use more groundwater and less imported water, to help decrease dependence on imported water and also reduce energy usage and GHG emissions.

Project Map


Big Dalton and Little Dalton System
Big Dalton Dam
Big Dalton Wash
Little Dalton Debris Basin
Big Dalton Debris Basin
Little Dalton Wash
Little Dalton Diversion
Big Dalton Spreading Grounds
Little Dalton Spreading Grounds
Existing Intake Structure
Expanded Basins
New Rubber Dam & Intake System
Flow Exiting Glendora Groundwater Basin
Big Dalton Wash
Google earth
© 2015 Google
2000 ft
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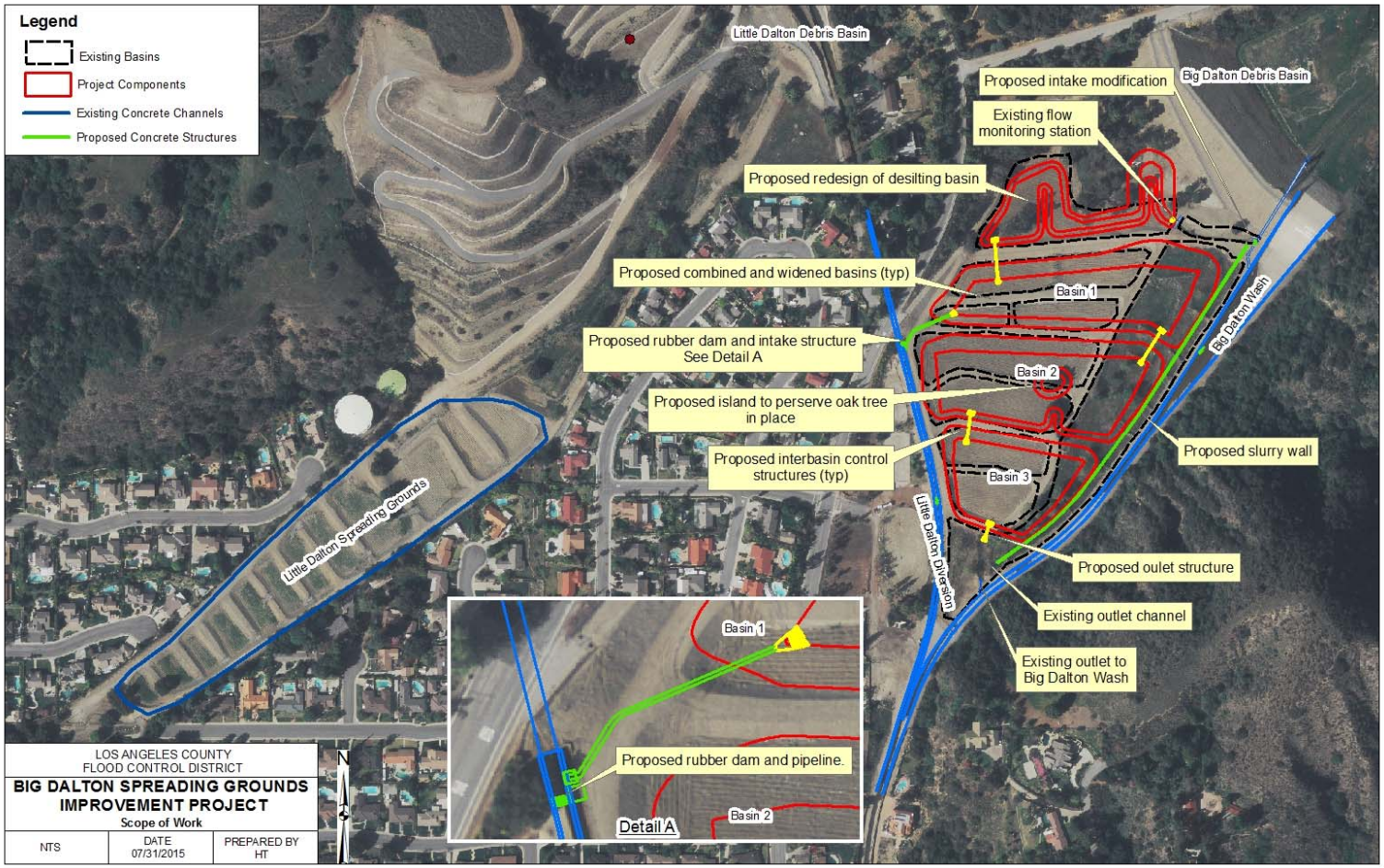

Legend
Existing Basins
Project Components
Existing Concrete Channels
Proposed Concrete Structures
Little Dalton Debris Basin
Proposed intake modification
Big Dalton Debris Basin
Existing flow monitoring station
Proposed redesign of desilting basin
Proposed combined and widened basins (typ)
Basin 1
Proposed rubber dam and intake structure See Detail A
Big Dalton Wash
Basin 2
Proposed island to perserve oak tree in place
Proposed slurry wall
Proposed interbasin control structures (typ)
Basin 3
Little Dalton Spreading Grounds
Little Dalton Diversion
Proposed oulet structure
Existing outlet channel
Existing outlet to Big Dalton Wash
Basin 1
Proposed rubber dam and pipeline.
Detail A
Basin 2
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
BIG DALTON SPREADING GROUNDS IMPROVEMENT PROJECT
Scope of Work
NTS
DATE 07/31/2015
PREPARED BY HT
N

Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Energy Saved and GHGs Avoided

Other benefits include water quality and integrated flood management benefits. Water quality benefits will be achieved by capturing runoff that could contain contaminants that would otherwise decrease water quality downstream. Soil-aquifer systems are very efficient at removing pathogenic bacteria, heavy metals, and toxic elements. The Project supports integrated flood management through capturing additional stormwater flows in the upper watershed for recharge and diminishing downstream flows during storm events.

The Project improvements will increase Big Dalton Spreading Grounds' recharge potential beyond the available stormwater supplies so that additional water can be recharged. In a related project, TVMWD is planning on constructing a new service connection and delivering an additional 5,000 AFY of imported water to Big Dalton Spreading Grounds when available, to further increase groundwater supply reliability. The stormwater recharge will be prioritized and so there is no concern that this project will limit the spreading capacity for stormwater recharge.

Primary Benefit – Water Supply Produced

The table below provides information on the benefit of water supply produced through the additional capture and infiltration of stormwater. The benefits in Table 5 reflect an average annual volume of stormwater recharge. Historical water conservation data shows the Big Dalton Spreading Grounds produce, on average, approximately 640 AFY. This average quantity was used as the baseline of the water supply produced. Full benefits are shown to begin in 2019 upon Project completion. Over the 50-year useful life of the Project, this results in a total of approximately 51,255 AF of additional supply produced.

Table 5 – Annual Project Physical Benefits

Project Name: Big Dalton Spreading Grounds Improvement Project
Type of Benefit Claimed: Primary Benefit - Water Supply Produced
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 50+ years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-2017	640	640	0
2018	640	645	5
2019 – 2068	640	1,665	1,025

Comments:

- *Flow monitoring data from the Los Angeles County Department of Public Works, Water Resources Division, years 1930 – 2013* (http://dpw.lacounty.gov/wrd/SpreadingGround/watercon/file\Water Conserved Data 2012-2013.pdf): The Big Dalton Spreading Grounds has a historical average stormwater recharge of 640 AFY.
- *Historical Big Dalton Dam stormwater releases recorded at Gaging Station F120B-R, years 1997-2013*: Dam releases were used to estimate the additional flows from Big Dalton Dam that Big Dalton Spreading Grounds could receive with the Project improvements (an additional 525 AFY).
- *HydroCalc Program, LACFCD*: The program was used to estimate the amount of stormwater runoff from the Little Dalton Debris Basin Watershed (730 AFY).
- *Flow monitoring data from the Los Angeles County Department of Public Works, Water Resources Division, years 1997 to 2013*: Records show an average of 230 AFY of stormwater was recharged at Little Dalton Spreading Grounds from the Little Dalton Debris Basin Watershed.
- The difference between the amount of stormwater runoff from the Little Dalton Debris Basin Watershed (730 AFY) and the amount that is diverted to the Little Dalton Spreading Basins for recharge (230 AFY) is 500 AFY. This 500 AFY will flow through Little Dalton Diversion and into Big Dalton Spreading Grounds for recharge with the implementation of this Project.
- Useful Project life of 50 years is based on the LACFCD's standard for spreading grounds projects.
- The full annual benefit is expected to begin in 2019 according to the Project schedule. The partial benefit in 2018 was based on an analysis to determine the quantity of flows that could be expected during December 2018 after the Project has been constructed based on the LACFCD's observed flows and average rainfall from 1997-2013.

Secondary Benefit – Energy Saved and GHGs Avoided

The table below provides information on the benefit of energy saved and GHGs avoided through the offset of imported water use (which is a blend of 71% State Water Project (SWP) and 29% Colorado River Aqueduct (CRA) provided by TVMWD) by new Glendora Basin supplies from stormwater recharge. See the Technical Analysis of Physical Benefits Claimed Section of this attachment for additional description of the methodology used to calculate the values. Over the 50-year useful life of the Project, the Project is expected to save approximately 154,021,275 kWh and reduce GHGs by 42,817,927 kg of CO_2e.

It should be noted that the previous "Water Supply Produced" table shows existing stormwater recharge/water supply values in the "Without Project (b)" column. It is recognized that these volumes reflect an ongoing supply production that will use the same amount of energy with or without the Project. Therefore, the current energy used to recharge stormwater at Big Dalton Spreading Grounds is not characterized as "Energy Saved and GHG Avoided" and does not appear in the benefits table's "Without Project (b)" column (although it is recognized that this supply is less energy intensive than other units of supply used in the area). The implementation of this Project does, however, directly change the amount of water currently imported to the area and thereby provides a previously non-existent energy savings and GHG avoidance as shown in the "With Project (b)" column.

Table 5 – Annual Project Physical Benefits

Project Name: Big Dalton Spreading Grounds Improvements Project
Type of Benefit Claimed: Secondary Benefit – Energy Saved and GHGs Avoided
Units of the Benefit Claimed: Energy Saved: kWh saved per year and CO_2e Reduced: kg of CO_2 equivalents not emitted per year
Anticipated Useful Life of Project (years): 50+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015-2017	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 0 CO_2e Reduced: 0
2018	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 15,025 CO_2e Reduced: 4,177	Energy Saved: 15,025 CO_2e Reduced: 4,177
2019 – 2068	Energy Saved: 0 CO_2e Reduced: 0	Energy Saved: 3,080,125 CO_2e Reduced: 856,275	Energy Saved: 3,080,125 CO_2e Reduced: 856,275

Comments:

- DWR Bulletin B-132-14, 2014, Appendix B, page B-20, Table 7: Energy required to pump SWP to the Oso pumping plant (4,126 kWh/AF), (nearest West Branch SWP pumping plant to the GLAC Region).
- *California Public Utilities Commission (CPUC) Study, page 64*: Energy associated with conveying Colorado River Aqueduct Water (1,976 kWh/AF) (as listed in the DWR 2014 Water Energy Grant Guidelines and PSP).
- *Personal Communication with Ken Zimmer, July 2015, LACFCD*: Proportions of imported water used by TVMWD who supplies imported water to City of Glendora, estimated as 71% SWP/29% CRA, on average.
- Energy to import water to City of Glendora = 3,503 kWh/AF or (3,590,575 kWh per year for 1,025 AFY) for 71% SWP/29% CRA blend.
-
-

Table 5 – Annual Project Physical Benefits

Project Name: Big Dalton Spreading Grounds Improvements Project
Type of Benefit Claimed: Secondary Benefit – Energy Saved and GHGs Avoided
Units of the Benefit Claimed: Energy Saved: kWh saved per year and CO_2e Reduced: kg of CO_2 equivalents not emitted per year
Anticipated Useful Life of Project (years): 50+ years

Comments continued:

- *Metropolitan Water District of Southern California (MWD), 2007. Groundwater Assessment Study. Report Number 1308. – Chapter IV, Table 7-3*: Groundwater pumping costs for the Main San Gabriel Basin (closest groundwater basin to the Glendora Basin) of $85/AF in 2006 and converted to 2015 dollars as $108/AF.
- *Bureau of Labor Statistics, May 2015. Average Energy Prices, Los Angeles-Riverside-Orange County. – Page 1*: 21.7 cents per kWh used to convert the cost of pumping groundwater from Glendora Basin to the energy used (498 kWh/AF).
- Energy required to pump 1,025 AFY of groundwater from Glendora Basin is estimated to be 510,138 kWh per year from 2019 to 2068.
- Imported energy – groundwater energy = 3,080,125 kWh per year of savings from 2019 to 2068.
- *U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*: The annual total-output statewide emission rate of 0.278 kg of CO2e/kWh from this source was used to convert the energy savings to a reduction in CO_2e. By offsetting the demand of 1,025 AFY of imported water, the Project will avoid GHG emissions of approximately 856,275 kg of CO_2e per year (998,180 kg of CO_2e per year to import water versus 141,905 kg of CO_2e per year to pump groundwater).
- Useful Project life of 50 years is based on LACFCD's standard for spreading grounds projects.
- The full annual benefit is expected to begin in 2019 according to the Project schedule with a partial benefit for 2018 based on the estimated 5 AFY supply benefit from that year.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the SWP supplies from the Bay Delta. The GLAC Region goes through frequent drought cycles that place considerable stress on the groundwater supply. As a result, the Region does not have adequate supply to meet demands in years when imported supply is limited. The current drought has resulted in severe SWP cutbacks requiring local groundwater purveyors to increase pumping of the Glendora Basin supplies even without normal water replenishment necessary to maintain groundwater levels. For these reasons, exploring local water supply development has become more important than ever. Groundwater is a reliable local water supply in times of drought and recharging this supply is of great importance in order to keep groundwater levels at sustainable levels and to minimize pumping impacts on the structural integrity of the aquifer.

The Big Dalton Spreading Grounds have been capturing and recharging stormwater to the Glendora Basin since 1930. The facility captures stormwater flows released from the Big Dalton Dam via the Big Dalton Debris Basin and the Big Dalton Wash that runs along the east side of the Big Dalton Spreading Grounds. Lag times from manually diverting flows using a flashboard system in addition to limited storage and intake capacity are reducing the production potential at the spreading grounds. Additionally, the basin on the east side of the Big Dalton Spreading Grounds has been abandoned due to seepage to the Big Dalton Wash. The Project will address these inefficiencies by replacing the existing manual flashboard systems with automatic gate systems, removing sediment, and deepening and reconfiguring the basins to increase storage and percolation rates. Furthermore, the Project will construct a slurry wall between the existing abandoned basin and Big Dalton Wash to prevent seepage in the future and allow the Spreading Grounds' entire footprint to be used.

Little Dalton and Big Dalton Spreading Grounds are the only centralized recharge facilities for the Glendora Basin and it is important to maximize their ability to capture and recharge stormwater to ensure healthy groundwater basin management. However, the Little Dalton Spreading Grounds is unable to accept all stormwater runoff from its upstream Watershed and facilities currently do not exist to divert these flows to Big Dalton Spreading Grounds. This results in valuable stormwater flows being lost for recharge in the Glendora Basin.

Additionally, the City of Glendora depends on water pumped from the Glendora Basin to meet 22%, or 2,400 AFY, of water demands (*City of Glendora Support Letter for the Big Dalton Spreading Grounds Project. July 2015*). The City purchases imported water from TVMWD to meet remaining demands. The Project will increase the capture of locally available stormwater, which will greatly reduce the City's reliance on imported water purchases from TVMWD.

2) Estimates of Without Project Conditions

Without the Project, the Big Dalton Spreading Grounds will continue to operate at a limited capacity. Approximately 500 AFY of stormwater from the Little Dalton system and 525 AFY from the Big Dalton system would be lost downstream. Without the Project, Big Dalton Spreading Grounds' recharge capacity will continue to be limited to only 640 AFY.

3) Descriptions of Methods Used to Estimate Physical Benefits

The Project's removal of sediment and refurbishment of the abandoned spreading basin is expected to increase the storage capacity from 12 AF to 37 AF which, in conjunction with the new intake structure and rubber dam, will allow Big Dalton Spreading Grounds to accept and recharge an additional 1,025 AFY of stormwater.

Of the 1,025 AFY, an estimated 525 AFY will come from releases from Big Dalton Dam. The 525 AFY estimate is based on historical releases from Big Dalton Dam (measured at Gaging Station F120B-R) and corresponding flows into Big Dalton Spreading Grounds (using flow monitoring data from 1997-2013). The data was used to estimate the additional flow that could be diverted to the Big Dalton Spreading Grounds after the capacity increase with the Project.

The remaining 500 AFY of the total 1,025 AFY of new supply will be diverted from the Little Dalton Debris Basin. Based on LACFCD's HydroCalc program, the Little Dalton Debris Basin Watershed produces approximately 730 AFY (*http://dpw.lacounty.gov/wmd/dsp_LowImpactDevelopment.cfm, HydroCalc Calculator link: data logger 14BSG from 1997-2013*). It was determined that approximately 230 AFY of the 730 AFY from the Little Dalton Debris Basin Watershed is conserved at Little Dalton Spreading Grounds and that the remaining volume (500 AFY) has been lost downstream and is available for recharge.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Big Dalton Spreading Grounds is an existing centralized stormwater capture and infiltration facility. The Project will improve the existing facility by combining and deepening the basins, constructing a slurry wall at the east basin, removing approximately 83,000 cubic yards of sediment, constructing a new diversion system and intake from the Little Dalton Diversion Channel to the Big Dalton Spreading Grounds, replacing the existing flashboard systems within the Spreading Grounds and the slide gate at the intake diversion structure with new automated slide gates with electric motor operators (EMOs), and installing electrical conduit to power the automated features. It is assumed that City of Glendora will use capacity in existing facilities to pump and treat the additional groundwater supplies produced. No new policies will be required.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This Project will not have any adverse physical effects. Typical noise, air quality, and visual impacts associated with construction of the Project may occur, but will be mitigated through typical construction Best Management Practices (BMPs). Additionally, a Stormwater Pollution Prevention Plan will be developed, if deemed necessary, and implemented during construction to mitigate potential stormwater pollution impacts. The Big Dalton Spreading Grounds and other facilities that will be worked on as part of the Project are existing facilities and most of the work will take place within their existing footprints. Construction at the diversion structure in and around Little Dalton Diversion will be approved by the US Army Corps of Engineers prior to construction. An oak tree is currently located between two of the basins at the spreading grounds. When these basins are reconfigured, an island around the oak tree will be constructed to preserve the tree.

The Big Dalton Spreading Grounds has a mostly undeveloped tributary area since it is located in the upstream portion of the San Gabriel River watershed. The water that will be diverted to the Big Dalton Spreading Grounds is of relatively good quality and not expected to have any adverse impacts on the soil or aquifer quality. The Project is expected to have positive impacts on the groundwater quality in the Glendora Basin.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The Project addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. By increasing facility size and adjusting operations to allow more stormwater to be captured and recharged to the Glendora Basin, the Project increases a local water supply that can be used in times of drought. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(7) Conjunctive use of water

(8) Efficient groundwater basin management
(9) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater runoff and recharging it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin as dry year supply. Additionally, the Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers an improved water supply source by capturing stormwater runoff that would otherwise be directed out of the Glendora Basin.

Secondary Physical Benefit: Energy Saved and GHGs Avoided

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Generating the energy needed to produce, convey, and distribute water produces carbon dioxide emissions that contribute to global warming, which itself threatens California's water supply. The state has committed to reducing its emissions by 15% by 2020 under AB-32, the Global Warming Solutions Act of 2006. Decreasing the amount of energy required to produce water supply is also an Objective of the California Water Action Plan, and decreasing the emission of greenhouse gases is a Planning Target of the GLAC IRWM Plan. This Project will contribute to both goals by reducing the amount of energy used to import water to the City of Glendora via TVMWD and avoid the associated emissions.

The Project will increase local groundwater supply in the Glendora Basin by increasing the amount of local stormwater that can be captured and infiltrated at the Big Dalton Spreading Grounds. Increasing this local supply will allow City of Glendora to use more local groundwater and import less water from the SWP and CRA. As significantly more energy is required to convey imported water through the SWP and CRA than is required to pump groundwater from the basin, the Project will reduce energy use and avoid the associated GHG emissions.

2) Estimates of Without Project Conditions
Without the Project, the City of Glendora will need to maintain its current level of reliance on imported water supply as opposed to being able to offset 1,025 AFY of imported water with local groundwater if the Project is implemented. Without the reductions in imported water use, the City of Glendora will continue to use 3,590,575 kWh per year to import the 1,025 AFY through TVMWD which has a GHG emission association of 998,180 kg CO_2e.

3) Descriptions of Methods Used to Estimate Physical Benefits
The Project provides energy conservation through the offset of treated imported water with groundwater that has been recharged through stormwater capture and infiltration at the Big Dalton Spreading Grounds. The City of Glendora purchases imported water through TVMWD. TVMWD's imported water is a blend of 71% SWP and 29% CRA. Approximately 4,126 kWh/AF is required for conveyance and pumping of SWP water to the Oso Pumping Plant (DWR Bulletin B-132-14, 2014), which is the nearest SWP pumping plant to the GLAC Region. While this is significant, it is expected that additional energy would be required to further distribute the water to and through TVMWD's system, so the assumed energy consumption for imported water is a conservative minimum. The energy required to transport CRA water to the GLAC Region is estimated to be about 1,976 kWh/AF (CPUC Study, page 64). Based on TVMWD's ratio of these supplies, an estimated 3,503 kWh/AF of energy is used to import water to the GLAC Region. This would result in an energy usage of 3,590,575 kWh per year to import 1,025 AFY of supply.

For the Project, it is assumed that the energy to pump the additional supply from the Glendora Basin is the only additional energy required for the Project. The energy required to divert, capture, and recharge stormwater flows is

minimal compared to the energy required to import water. Any energy used to treat and distribute the groundwater supply was assumed to be the same for imported water.

The energy associated with pumping groundwater from the Glendora Basin was estimated using the *MWD of Southern California, 2007. Groundwater Assessment Study. Report Number 1308. – Chapter IV, Table 7-3*. The study indicates groundwater pumping costs for the Main San Gabriel Basin which is assumed to have similar pumping costs to the Glendora Basin. Costs are noted in the report as $85/AF in 2006. This value was projected out to 2015 dollars as $108/AF. According to the U.S. Bureau of Labor Statistics (USBLS), the average cost of electricity in the Los Angeles area in 2015 is $0.217/kWh (USBLS, May 2015). Using these values, it can be estimated that the energy required to pump groundwater in the Glendora Basin is approximately 498 kWh/AF. As 1,025 AFY of imported water is expected to be offset by the Project, it is expected that 510,450 kWh per year will be used to pump the groundwater from the basin.

When the energy consumption to import 1,025 AFY (3,590,575 kWh per year) is compared against the energy consumption to pump 1,025 AFY from the Glendora Basin (510,450 kWh per year), the Project will result in an energy savings of approximately 3,080,125 kWh per year.

To calculate the GHG emissions avoided through the Project, the annual total-output statewide emission rate of 0.278 kg of CO_2 equivalents (CO_2e) per kWh (*U.S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region*) was applied to the 3,080,125 kWh per year of energy saved. As a result, it was estimated that the Project will avoid GHG emissions of approximately 856,275 kg of CO_2e per year.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
No new facilities are required to obtain the energy savings and greenhouse gas reduction physical benefits beyond what is required to derive the water supply benefits described previously. The City of Glendora expects to reduce imported water purchases by using more groundwater from the Glendora Basin as provided by the implementation of this Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
This project will not have any adverse physical effects. Typical noise, air quality, and visual impacts associated with the construction may occur, but will be mitigated through typical construction Best Management Practices (BMPs). Additionally, a Stormwater Pollution Prevention Plan will be developed and implemented during construction to mitigate potential stormwater pollution impacts. The Big Dalton Spreading Grounds and other facilities that will be worked on as part of the Project are existing facilities and most of the work will take place within their existing footprints. Construction at the intake canal and the diversion structure in and around Little Dalton Diversion will be approved by the US Army Corps of Engineers prior to construction.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
While the physical benefit of saving energy and avoiding GHG emissions does not specifically address long-term drought preparedness, the Project as a whole does. To achieve the secondary benefit of saving energy and avoiding GHG emissions through offsetting imported water use, the Project is capturing and recharging stormwater flows to the Glendora Basin which increases a local water supply that can be used in times of drought. Therefore, the Project as a whole addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will promote:

(4) Conjunctive use of water
(5) Efficient groundwater basin management

(6) Solutions that yield a new water supply

The Project promotes conjunctive use by capturing stormwater runoff and recharging it to the groundwater basin to increase groundwater supply that can later be pumped out of the basin as dry year supply. Additionally, the Project promotes efficient groundwater basin management by contributing to groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers an improved water supply source by capturing stormwater runoff that would otherwise be directed out of the Glendora Basin.

Direct Water-Related Benefit to a DAC

While the Project will provide supply benefits to some Disadvantaged Communities (DACs) in the area that pump groundwater from the Glendora Basin including customers of the City of Glendora, it is not expected that the benefit will go to more than 25% DACs.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Big Dalton Spreading Grounds Improvement Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	Additional 1,025 AFY captured and recharged into the Glendora Basin	Tools and Methods: Data loggers will be used to measure flows into the Big Dalton Spreading Grounds and staff gauges will measure water levels at the spreading grounds. The total inflow into the spreading grounds will be recorded and compared against the baseline average of 640 AFY to determine the increase in recharge. Locations: Flow will be monitored at the inlet to the desilting basin which is the first basin before the water enters the spreading basins (see Project map) as well as the intake from the Little Dalton Diversion. The staff gauges will be located in each basin of the Big Dalton Spreading Grounds. Data to be Collected: Flow measurements will automatically be recorded on a regular basis in cubic feet per second (CFS) and converted to annual volumes in AF to compare against the historical average volume of 640 AFY. **The monitoring tools and targets are appropriate for the benefits claimed because** the data loggers will record the volume of stormwater diverted to the Spreading Grounds and the staff gauges will help confirm recharge. **The monitoring data will be used to measure performance by** recording the volume of water entering the spreading grounds with data loggers as well as the water levels in the basins. This is an accurate depiction of the volume that is recharging to the groundwater basin because only the water that will be captured and recharged will be recorded at the inflow monitoring station.
Secondary Benefit – Energy Saved and GHGs Reduced	3,080,125 kWh per year energy saved and 856,275 kg of CO_2e per year avoided	Tools and Methods: City of Glendora Groundwater pumping data for the Glendora Groundwater Basins will be compared against previous years to determine if City of Glendora has increased pumping of groundwater as a result of the Project. Any increases in groundwater pumping can be assumed to have offset the need for future imported water purchases from TVMWD. The proportion of imported water used by TVMWD that is SWP vs CRA will be estimated annually and used in combination with the record of imported water energy usage described in this attachment to calculate the energy required to have imported

Table 6 – Project Performance Monitoring Plan **Project:** Big Dalton Spreading Grounds Improvement Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
		the measured water supply benefit for that year. An energy requirement for pumping groundwater from the Glendora Groundwater Basin will be used with the measured supply savings to compare against the energy required to import that same volume to estimate an energy savings. A greenhouse gas emission rate of 0.278 kgCO2e will be applied for every kWh or energy reduced to estimate the GHG reduction with the Project Locations: City of Glendora operated Glendora Basin wells pumping and production data Data to be Collected: City of Glendora operated Glendora Basin wells pumping and production data **The monitoring tools and targets are appropriate for the benefits claimed because** the calculations would estimate the amount of energy saved and greenhouse gas reduced using the actual amount of groundwater produced in lieu of purchasing imported water. **The monitoring data will be used to measure performance by** showing the estimated energy savings and GHG reduction provided by the actual volume of local supply increased through stormwater capture and recharge.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Big Dalton Spreading Grounds Improvement Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Energy Saved and GHGs Avoided
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. Three basin configuration alternatives were considered for implementation at the Big Dalton Spreading Grounds. Each required a different amount of excavation and had different cost per AFY produced, as shown below. While Options 2 and 3 would have provided higher storage capacities, it was determined that Option 1 (used for this Project) is the most cost effective and efficient based on the 1,025 AFY that is estimated in available stormwater. • Option 1: 37 AF storage capacity, $1,625/AFY produced • Option 2: 41 AF storage capacity, $2,800/AFY produced • Option 3: 42 AF storage capacity, $2,311/AFY produced
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: *LACFCD Preliminary Cost Estimate, June 2015*: Compares the costs of the three different sediment disposal locations.	

Project 17: Live Oak Well VOC Treatment Facility Project (Project)
Implementing Agency: City of Arcadia (City)

Project Description

(25 Word) The Project will construct a treatment facility in Arcadia which will restore 2,650 AFY of production to the Live Oak Well and reduce TCE concentrations.

(Expanded) The City of Arcadia (City) is proposing to restore 2,650 acre feet per year (AFY) of water supply production by constructing a 4,000 gallon per minute (gpm) capacity Liquid-phase Granular Activated Carbon (LGAC) treatment system at its Live Oak Well. The Live Oak Well has a 4,000 gpm capacity that previously supplied approximately 15 percent of the City's total annual water demand. The well, located adjacent to the southern end of the Santa Anita Wash at the inlet to the Peck Spreading Basin, extracts water from the Main San Gabriel Basin (Basin) which has recently recorded historic low groundwater elevations. This drop in water level may have made the well more susceptible to existing contamination in the basin. In February 2015, the well was shut down due to concentrations of trichloroethylene (TCE) recorded above the maximum contaminant level (MCL) of 5 micrograms per liter (µg/L).

The City has been working with Stetson Engineers, Inc. to mitigate the contamination at this supply source and has determined that adding LGAC treatment to the facility would most effectively remove the TCE from the produced water, and in the process remove TCE from the Basin which would otherwise continue down-gradient to groundwater producers that supply Disadvantaged Communities (DAC). TCE is currently treated by blending, but LGAC treatment will actually remove the contaminant from the water before it enters the distribution system and potentially re-enters the Basin via irrigation.

The major physical components of the Project are the installation of a new LGAC treatment system to reduce TCE levels at the Live Oak Well to levels below the MCL. As part of the facility improvements, a variable frequency drive (VFD) will be added to booster pumps that are integral to the facility distribution system.

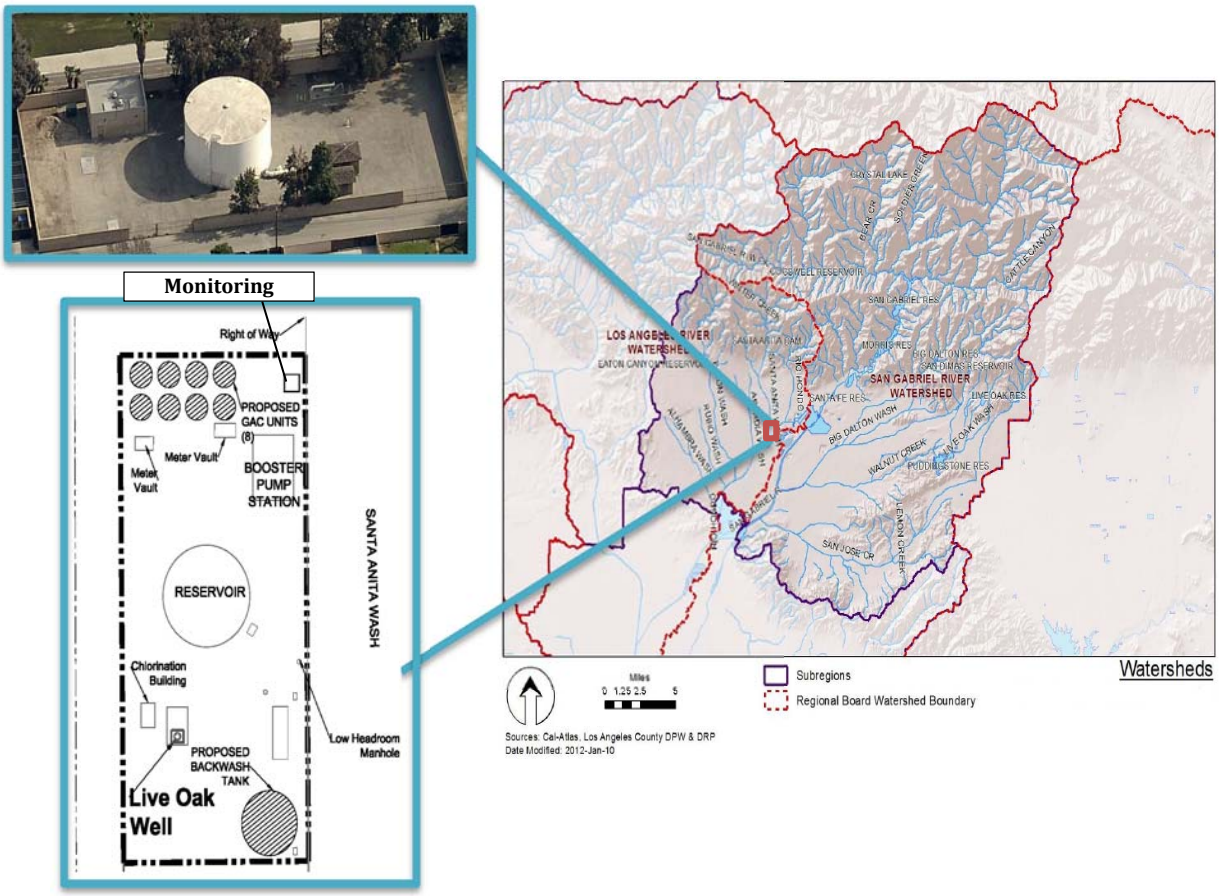
The anticipated physical benefits of the Project include the primary benefit of 2,650 AFY of water supply produced from local groundwater that is currently unusable due to TCE contamination. A secondary benefit is water quality improved through the removal of TCE from the water produced from the Live Oak Well. Another benefit is the reduction of TCE mass in the Main San Gabriel Basin aquifer. TCE concentrations in the Basin vary from 3 to 10 µg/L. Depending on the actual concentration of TCE in the water when it is extracted, the treatment facility would remove approximately 22–72 pounds of TCE per year and 440–1,440 pounds during the 20 year lifetime of the facility.

The Project addresses a current need of the region by supporting two of the objectives of the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP). The Project will reduce the City's dependence on imported water by making a local source more available (Improve Water Supply). In addition, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

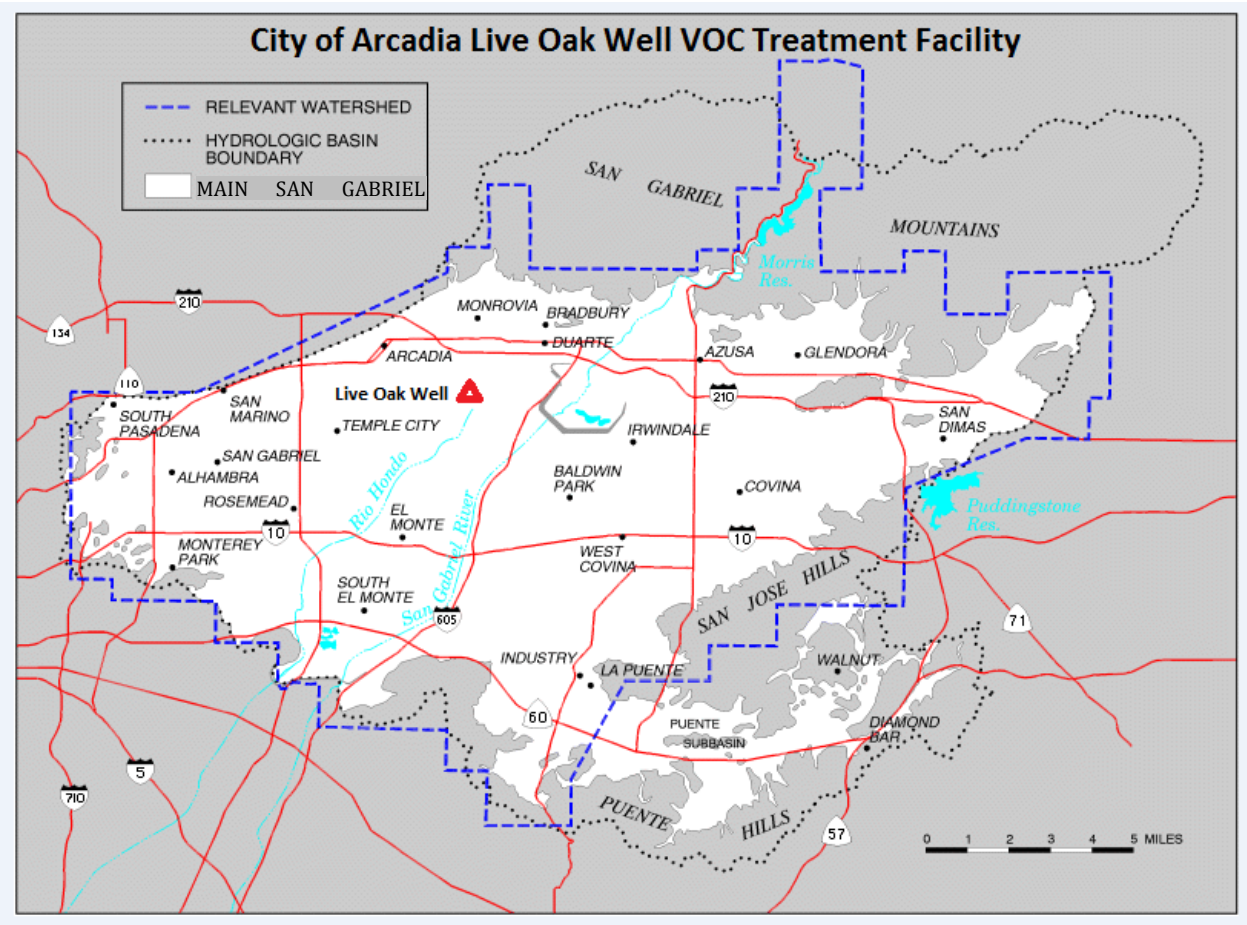
The intended outcome of the Project is to restore the City's access to a local water supply source and to reduce TCE concentrations within the Main San Gabriel groundwater basin.

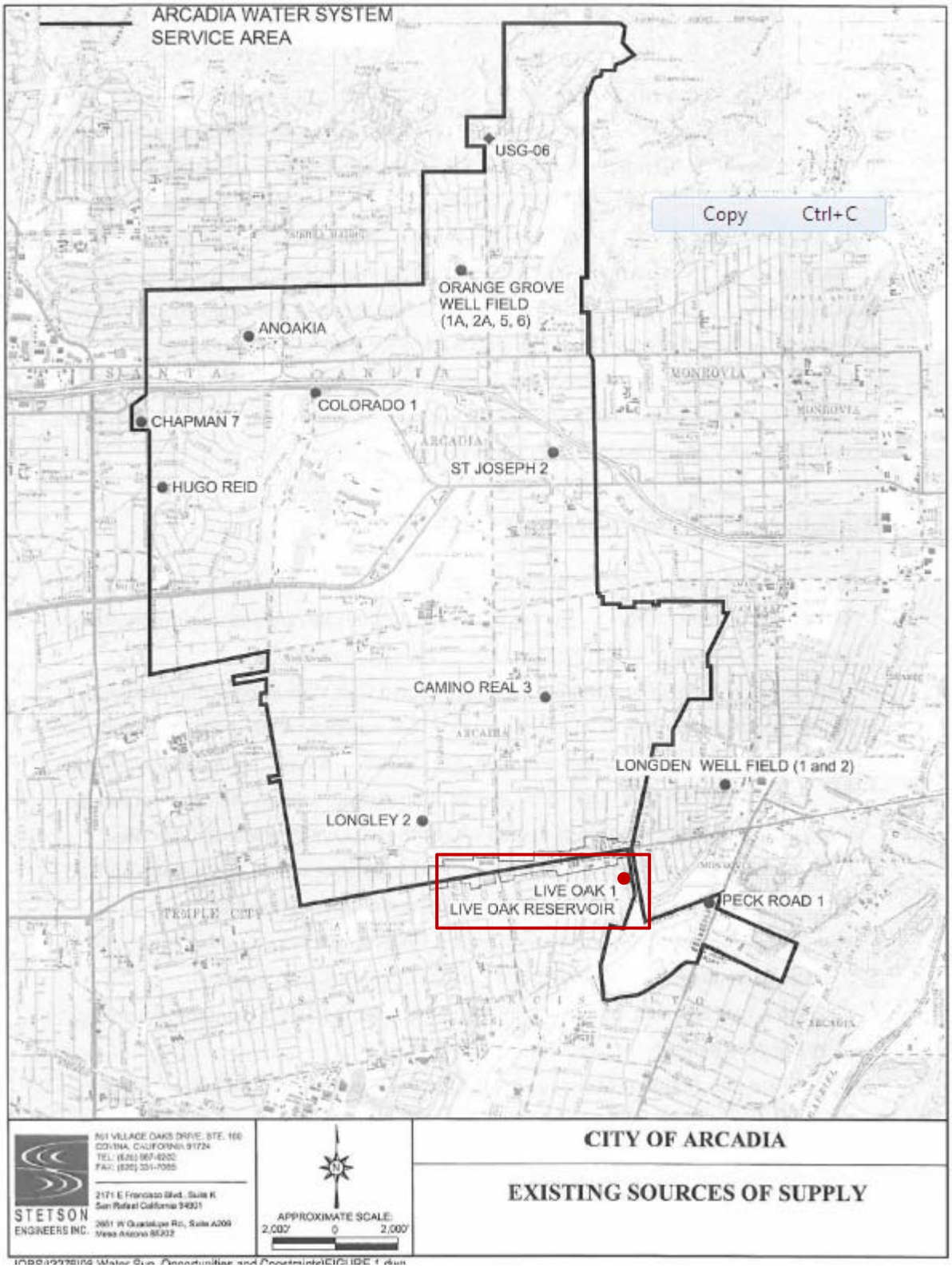
Project Map

Project Site Location, Site Plan View, and Aerial Photograph



Site Location within San Gabriel Basin and San Gabriel River Watershed




ARCADIA WATER SYSTEM
SERVICE AREA
USG-06
Copy Ctrl+C
ORANGE GROVE
WELL FIELD
(1A, 2A, 5, 6)
ANOAKIA
COLORADO 1
CHAPMAN 7
ST JOSEPH 2
HUGO REID
CAMINO REAL 3
LONGDEN WELL FIELD (1 and 2)
LONGLEY 2
LIVE OAK 1
LIVE OAK RESERVOIR
PECK ROAD 1
STETSON
ENGINEERS INC.
APPROXIMATE SCALE:
2,000' 0 2,000'
CITY OF ARCADIA
EXISTING SOURCES OF SUPPLY

Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Water Quality Improved through TCE Reduction

Primary Benefit – Water Supply Produced

The table below shows the benefit of increasing local water supplies and reliability by replacing imported water with groundwater supply. The primary benefit is expected to start on April 2018. Over the useful Project lifespan of 20 years, the cumulative benefit will be approximately 52,337 AF.

Table 5 – Annual Project Physical Benefits

Project Name: City of Arcadia Live Oak Well VOC Treatment Facility
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 20 Years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	1,000[a]	1,000	0
2016	0	0	0
2017	0	0	0
2018	0	1,987[b]	1,987
2019 – 2037 (last year of Project life)	0	2,650	2,650

Comments:

- *Water Supply Opportunities and Constraints Study* prepared by Stetson Engineers, Inc., page 12 (April 24, 2015)
- (a) AF of water produced by the Live Oak Well prior to being shut down in March 2015.
- (b) Pro-rated, assuming the well comes online in April 2018.

Secondary Benefit – Water Quality Improved through TCE Reduction

The table below calculates the water quality improvement from reducing TCE contamination from the Live Oak Well when 2,650 AFY is pumped from the Main San Gabriel Basin and treated. The values in the table are expressed as mg/L of TCE reduced in the produced water if it were to be pumped with and without the Project. The secondary benefit is expected to start on April 2018.

Table 5 – Annual Project Physical Benefits

Project Name: City of Arcadia Live Oak Well VOC Treatment Facility
Type of Benefit Claimed: Secondary Benefit – Water Quality Improved through TCE Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 20 years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0 [Feasibility]	0
2016	0	0 [Construction]	0
2017	0	0 [Construction]	0
2018	0	0.006	0.006
2019 – 2037 (last year of project life)	0	0.006	0.006

Comments:
Water Supply Opportunities and Constraints Study prepared by Stetson Engineers, Inc. (April 24, 2015)

- Page 11: LGAC treatment system will be designed for a maximum TCE concentration of 10 µg/L (0.01 mg/L); LGAC treatment system will be able to remove TCE to non-detect levels.
- Table 2: Comparison of Groundwater Levels at Live Oak Well and TCE Contamination shows most recent TCE concentrations in Live Oak Well are 5–6 µg/L (0.005 – 0.006 mg/L).

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
The City of Arcadia serves approximately 16,000 AFY of water from two main sources: the Main San Gabriel Basin and the Raymond Basin. The City occasionally purchases emergency supplemental water from the Metropolitan Water District of Southern California (MWD) via the Upper San Gabriel Municipal Water District (USGMWD). Since 2010, the City has been relying more heavily on the Main San Gabriel Basin because the watermaster for the Raymond Basin reduced all adjudicated pumping rights by 30 percent over the course of five years (*Raymond Basin Management Board Resolution No. 42-0109*). As a result, Arcadia's pumping rights in the Pasadena sub-area of the Raymond Basin were reduced over the last five years from 2,118 AFY to 1,482 AFY. The City risks a shortfall in local supply if production from the Main San Gabriel Basin is not restored.

To compensate for decreased production from the Raymond Basin, the City has increased production from its seven active groundwater wells in the Main San Gabriel Basin. The Live Oak Well is an existing 4,000 gpm well that serves as the City's highest capacity production well; it supplies approximately 15 percent of the annual demand. From 2012 through 2014, groundwater production from the Live Oak Well increased from about 2,260 AFY to about 3,260 AFY.

The Live Oak Well extracts water from the Main San Gabriel Basin, which has recently recorded historic low water elevations. This drop in the Basin's water level has been correlated with increasing TCE concentrations in the well. In February 2015, the well was shut down after a routine water sample and two confirmatory samples indicated a TCE concentration of 6 µg/L, which is above the MCL of 5 µg/L.

Loss of production from the Live Oak Well requires the City to supplement its supply from other sources, which are limited. Options include additional pumping from the Raymond Basin, which is also constrained (as explained above) by low water levels and pumping rights, untreated imported water, and treated imported water obtained through the City's connection with MWD.

The City has been working with Stetson Engineers, Inc. to develop potential solutions to mitigate the contamination at the Live Oak Well and has determined that adding LGAC treatment to the facility would most effectively remove the contaminant from the water produced and from the groundwater which would otherwise continue down-gradient to groundwater producers that supply DAC areas. Constructing the LGAC treatment system will allow the City to bring the Live Oak Well back online, restoring a critical source of locally-produced water.

2) Estimates of Without Project Conditions
If the treatment facility is not constructed, the City will have to increase pumping from the Raymond Basin; however, since it is already utilizing 89 percent of its adjudicated rights in that basin, it will have to supplement with emergency imported water purchases from MWD during high-demand months. Because Arcadia does not purchase imported water consistently, the City pays a premium of $11,000 per cubic foot per second for this water to cover MWD's capacity charge, in addition to MWD's Tier I rate of $923/AF (2015).

3) Descriptions of Methods Used to Estimate Physical Benefits
The increased water supply of 2,650 AFY was estimated by Stetson Engineers, Inc. in the *Water Supply Opportunities and Constraints Study* based on historical production from the Live Oak Well, which averaged

2,745 AFY between 2012 and 2014. The estimate of water supply produced was reduced to account for potential further reductions in production due to diminished aquifer replenishment.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits
The Project will involve designing and constructing a new 4,000 gpm capacity LGAC treatment system at the Live Oak Well. The LGAC treatment system will consist of eight 12-foot diameter LGAC vessels, each holding 20,000 pounds of carbon; an 80,000 gallon backwash tank; onsite piping; electrical controls; and telemetry. As part of the facility improvements, a variable frequency drive (VFD) will be added to booster pumps that are integral to the the facility distribution system. The City will submit a Water Supply Permit Amendment to the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW). The Project must be approved by the City Council, and all CEQA requirements will be completed. The City will also obtain permits to discharge backwash into the sewer from the Regional Water Quality Control Board (RWQCB), the Los Angeles County Department of Public Works (LACDPW), and the Los Angeles County Sanitation Districts (LACSD). Finally, the City will complete the design and construction of the Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them
The potential adverse effects of nuisance noise can be minimized by installing a sound-proof wall during the construction of the new well. Both the Raymond and Main San Gabriel Basins are adjudicated and are administered by appointed watermasters, so the potential adverse physical effects of pumping additional groundwater are assumed to be mitigated by the management actions therein.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness
This project would improve long-term drought preparedness for the City by allowing the well to operate and provide water from a local supply source by removing the contamination instead of blending it to lower concentrations. It will also address the drought preparedness of the greater Los Angeles region as a whole by reducing the City's demand on the neighboring Raymond Basin and reducing the City's demand for emergency imported water from MWD.

The supply benefit and the Project as a whole will address long-term drought preparedness by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

4) Efficient groundwater basin management.

Secondary Physical Benefit: Water Quality Improved through TCE Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Table 2 of the *Water Supply Opportunities and Constraints Study* prepared by Stetson Engineering, Inc. indicates groundwater level and TCE concentration data in the Live Oak Well since 2002. The data show a correlation between low water levels and high TCE concentrations. In 2013, as water levels began to fall in response to the drought, TCE levels began rising, and they increased even more steeply in 2014. In February 2015, the well was shut down when samples indicated TCE concentrations of 6 µg/L and 5.6 µg/L, which exceed the MCL of 5 µg/L.

In April 2015, the City contracted with Stetson Engineering, Inc. to investigate the City's options for restoring its local supply. Stetson studied six options for treating the TCE contamination at the wellhead: blending, air stripping by pressure aeration, air stripping by reservoir inflow aeration, air stripping by packed-tower aeration, LGAC treatment, and packing-off (sealing the well perforations) the high-TCE zones in the Live Oak

Well.

Guiding the selection of technologies is the requirement that the technology be a SWRCB, DDW–approved Best Available Technology. DDW requires an amended Water Supply Permit for any new treatment facility intended to treat a drinking water source. DDW further designates various treatment technologies as being "best available technology" (BAT) based on whether contaminant concentrations can be reduced to non-detect concentrations, regardless of the original concentration. As part of the process to obtain a DDW amended Water Supply Permit for TCE treatment, the following requirements must be met: 1) the treatment technology should be a BAT, 2) documentation may be requested by DDW to support treatment of the contaminant of concern to non-detect concentrations, and 3) the ability to treat a contaminant to non-detect concentrations must be verified using start-up testing.

Blending and packing off are not feasible for reasons summarized in Table 7 (below). Of the remaining treatment options, only LGAC and packed-tower aeration are BATs; and of these two, only LGAC would avoid the need to procure an Air Quality Management District (AQMD) permit, a lengthy process because the treatment facility would be located near residential areas and schools. Therefore, the City selected LGAC as its preferred remedy. The LGAC treatment system will be able to treat influent with a maximum TCE concentration of 10 µg/L to non-detect levels.

A further benefit is the removal of TCE from the groundwater, which will improve groundwater quality in supplies used for downgradient communities, including DACs such as El Monte and Rosemead.

2) Estimates of Without Project Conditions

If the treatment facility is not constructed, the City will have to increase pumping from the Raymond Basin; however, since it is already utilizing 89 percent of its adjudicated rights in that basin, it will have to supplement with expensive emergency imported water purchases from MWD during high-demand months. Under Chapter 15, Title 22 of the California Code of Regulations, the City could continue to operate the Live Oak Well provisionally for a period of six months while continuing to monitor TCE concentrations. If the average concentration over the six months exceeds the MCL, the well will have to be shut down until the water is treated to below MCL. However, the City has already elected to shut down the well to safeguard public health.

3) Descriptions of Methods Used to Estimate Physical Benefits

The physical benefit calculations assume an influent TCE concentration of 6 µg/L, based on the water samples taken in February 2015. The LGAC treatment system will be able to treat water from the Live Oak Well to non-detect levels for TCE. The benefit is therefore estimated to be a reduction of 6 µg/L, but this is conservative; if TCE concentrations continue to rise as the water levels in the basin fall, the reduction could be greater.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The Project will involve designing and constructing a new 4,000 gpm capacity LGAC treatment system at the Live Oak Well. The LGAC treatment system will consist of eight 12-foot diameter LGAC vessels, each holding 20,000 pounds of carbon; an 80,000 gallon backwash tank; onsite piping; electrical controls; and telemetry. As part of the facility improvements, a variable frequency drive (VFD) will be added to booster pumps that are integral to the facility distribution system. The City will submit a Water Supply Permit Amendment to the SWRCB DDW. The Project must be approved by the City Council, and all CEQA requirements will be completed. The City will also obtain permits to discharge backwash into the sewer from the RWQCB, the LACDPW, LACSD. Finally, the City will complete the design and construction of the Project.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

The potential adverse effects of nuisance noise can be minimized by installing a sound-proof wall during the construction of the new well. Both the Raymond and Main San Gabriel Basins are adjudicated and are administered by appointed watermasters, so the potential adverse physical effects of pumping additional groundwater are assumed to be mitigated by the management actions therein.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The water quality benefit does not directly address long-term drought preparedness, but the Project as a whole does by contributing to sustainable water supply and reliability during water shortages. Specifically, the Project will contribute to the following, as described in Table 1 - Statewide Priorities, for the IRWM Grant Program:

1) Efficient groundwater basin management.

Direct Water-Related Benefit to a DAC

The Project area does not encompass a DAC.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Live Oak Well VOC Treatment Facility Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	2,650 AFY	Location: At the Live Oak Well. Tools and Methods: The Live Oak well is already fitted with a flowmeter which records flow rate and totalizes the amount of water produced. The data provided by the flow meter will be used to measure whether the water production meets the goal of 2,650 AFY. Data to be collected: The flowmeter will measure flow (in gpm) on a continuous basis and the Supervisory Control and Data Acquisition (SCADA) system will record the data every 15 minutes throughout the time that the well is in service. **The monitoring tools and targets are appropriate for the benefits claimed because** the flowmeters will record the amount of groundwater that is produced. **The monitoring data will be used to measure performance by** showing the total groundwater produced on an annual basis.
Secondary Benefit – Water Quality Improved	Reduction of TCE concentration from ~6 µg/L to Nondetect.	Location: Existing groundwater wells; effluent sampling point from LGAC treatment system Tools and Methods: Routine sampling from existing production wells will be used to obtain an ambient concentration of TCE in the aquifer, against which TCE concentrations from the LGAC effluent can be compared to calculate the benefit. Samples will be obtained on a monthly basis and will be analyzed for TCE concentrations. Data to be collected: Samples analyzed for TCE concentrations from the Live Oak Well and at effluent sampling point for LGAC treatment system. **The monitoring tools and targets are appropriate for the benefits claimed because** concentrations of TCE can be compared before and after receiving LGAC treatment to assess the performance of the system and the overall water quality improved benefit.

		The monitoring data will be used to measure performance by comparing TCE concentrations before and after receiving LGAC treatment to non-detect levels

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Live Oak Well VOC Treatment Facility Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Water Quality Improved through TCE Reduction
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project?** Yes. The 2015 Stetson study examined six alternatives for addressing the TCE contamination from the Live Oak Well. Guiding the selection of technologies is the requirement that the technology be a Division of Drinking Water–approved Best Available Technology (BAT). DDW designates various treatment technologies as being BAT if contaminant concentrations can be reduced to non-detect concentrations, regardless of the original concentration. As part of the process to obtain a DDW amended Water Supply Permit for TCE treatment, 1) the treatment technology should be a BAT, 2) documentation may be requested by DDW to support treatment of the contaminant of concern to non-detect concentrations, and 3) the ability to treat a contaminant to non-detect concentrations must be verified through start-up testing. LGAC will avoid the emission of volatile organic compound (VOC) vapor that would be released if air-stripping were alternatively used as treatment.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. Alternative supply options: 1. *Increased production from other wells.* This option is not feasible because Arcadia's other wells in the Main San Gabriel Basin are producing close to capacity or are limited by their own water quality issues and blend plans. Arcadia's wells in the Raymond Basin are already producing at 89% of the City's adjudicated rights in the basin. 2. *Construction of a new well.* This option is not feasible because other parts of the basin are contaminated by nitrates, TCE, and perchloroethylene. A new well therefore would require the construction of a clean-up well as part of the Main San Gabriel Basin water management requirements, and it would therefore be considerably more expensive than the treatment options.

Table 7 – Cost Effective Analysis
Project Name: Live Oak Well VOC Treatment Facility Project

3. *Purchasing imported MWD water from USGMWD.* Total costs to purchase 2,650 AFY from USGMWD would be $2,486,212/year (assuming MWD rates do not rise), compared to $2,406,200/year to pump and treat the same quantity of water from the Live Oak Well (not including minimal operation and maintenance costs). Costs for imported water would likely be higher than this estimate because MWD rates rise every year and because MWD is currently operating under a Water Supply Allocation Plan, in which member agencies may be assessed steep penalty rates for exceeding their allocation. These costs could be passed on to the City if USGMWD exceeds its allocation.

   Cost of imported water

   a. USGMWD full-service treated Tier 1 rate = $1,014/AF (Stetson Report, page 21)
   b. MWD capacity charge for Arcadia = $11,000/cfs (Stetson Report, page 21)
   c. Cost to purchase 2,650 AFY from USGMWD = ($1,014 × 2,650 AFY) + (2,650 AFY ÷ 724 AFY/cfs × $11,000/cfs) = **$2,486,212** (assuming rates do not rise)

   Cost of Project water

   a. Marginal cost of energy to pump water from Live Oak Well to northern part of City's service area: $120/AF (Stetson Report, page 21)
   b. Replacement Water assessment and Basin administrative fees: $710/AF (Stetson Report, page 21)
   c. Unitized capital cost of LGAC treatment facility construction: $4,079,488 Project cost ÷ 52,337 AF production over Project lifetime = $78/AF
   d. Total marginal cost to pump water from Live Oak Well, including capital cost of treatment facility = $120 + $710 + $78 = $908/AF
   e. Total cost to pump 2,650 AFY from Live Oak Well = 2,650 AFY × $908/AF = **$2,406,200** (Note: this does not include operation and maintenance costs, but these are expected to be small because LGAC facilities require minimal maintenance).

Alternative treatment options for the Live Oak Well:

1. *Blending.* This option is not feasible because none of the City's other production wells can supply the requisite 7,000 gpm needed for blending to DDW standards (80% of the MCL). Moreover, the nearest well is already being operated as part of another blend plan.

2. *Air stripping by pressure aeration (proprietary GridBee technology).* This option is not feasible because it is not a BAT, as required by DDW's Water Supply Permit for a new treatment facility.

3. *Air stripping by reservoir inflow aeration.* This option is not feasible because it is not a BAT, as required by DDW's Water Supply Permit for a new treatment facility.

4. *Air stripping by packed-tower aeration.* This option is a BAT and would cost $1,285,632 in capital costs or $25 per acre-foot of treated water, making it the least-cost alternative (Stetson Report, page 30, Table 5; this estimate considers only capital costs of constructing the treatment facility and a 20% contingency, because administrative and

Table 7 – Cost Effective Analysis **Project Name:** Live Oak Well VOC Treatment Facility Project	
	pumping costs would be the same regardless of the type of treatment facility). However, the air stripping process generates vapor emissions that require an AQMD permit. The City anticipates difficulties in obtaining a permit because the treatment facility is located close to residential neighborhoods and schools. 5. *Liquid Granular Activated Carbon (the proposed project).* This option is a BAT and would cost $3,428,976 in capital costs or $65 per acre-foot of treated water (Row D of the Project budget; assuming 52,337 AF over the Project lifetime). Although this is more costly than air stripping, LGAC does not generate vapor emissions and would not require an AQMD permit. 6. *Packing-off (sealing the well perforations) the high-TCE zones in the Live Oak Well.* While packing off the well would address contamination in the Live Oak Well, it does not address contamination in the aquifer because contaminants could still migrate past the well to impact downgradient wells. Therefore it is not considered a long-term solution. Additionally, it is unclear whether the Basin Watermaster would approve the City's application to modify the Live Oak Well perforations because such applications are evaluated on the basis of preventing additional contamination and limiting the spread of existing contamination, which this option would not address.
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.** Only two of the above options meet all of the permitting and logistic requirements: LGAC and packed-tower aeration. The proposed LGAC treatment system is preferred because it is the best available technology to remove TCE to nondetect levels. It also generates no air emissions to the surrounding school and residential areas, has fewer permitting requirements, and can be completed more quickly than the other alternative. .
Comments:	

Project 18: Centralized Groundwater Treatment System Project (Project)
Implementing Agency: City of Monterey Park
Project Description

(25 Word) The Project will supply 2,740 AFY of additional local groundwater to Monterey Park and remove VOCs and 1,4-dioxane using a centralized groundwater treatment system.

(Extended) The City of Monterey Park (City) will build a centralized groundwater treatment system at its Delta Plant to replace its aging, inefficient individual wellhead treatment systems. This proposed centralized treatment system will provide an additional 2,740 acre-feet per year (AFY) of water supply and improve water quality for a Disadvantaged Community (DAC).

The major physical components of the Project include the installation of three triple Advanced Oxidation (AO) units operated in parallel with a fourth redundant triple AO unit. The proposed centralized treatment system will enable the City to maximize production from its three U.S. Environmental Protection Agency (EPA)-designated "remedy wells", which are currently limited by the flow-through capacities of the existing wellhead treatment systems. The proposed centralized treatment system will enable the City to increase the combined production from Wells 5, 12, and 15 from 5,700 gallons per minute (gpm) to 7,400 gpm, a net 2,740 AFY increase in local groundwater supply. The treatment system will remove volatile organic compounds (VOCs), 1,4–dioxane, and perchlorate, while maintaining the City's capacity to blend down arsenic and nitrate concentrations.

The existing wells and wellhead treatment systems are part of the South El Monte Operable Unit (SEMOU) "Interim Remedy" to contain VOCs and remove contaminant mass from the affected aquifer. The existing wellhead treatment systems employ various combinations of air stripping, liquid-phase granular activated carbon (LGAC), and ion exchange (IX) to remove VOCs and perchlorate. The City also operates two separate blending programs for arsenic and nitrate. Each of these systems has a separate Division of Drinking Water (DDW) permit and a separate monitoring and reporting program.

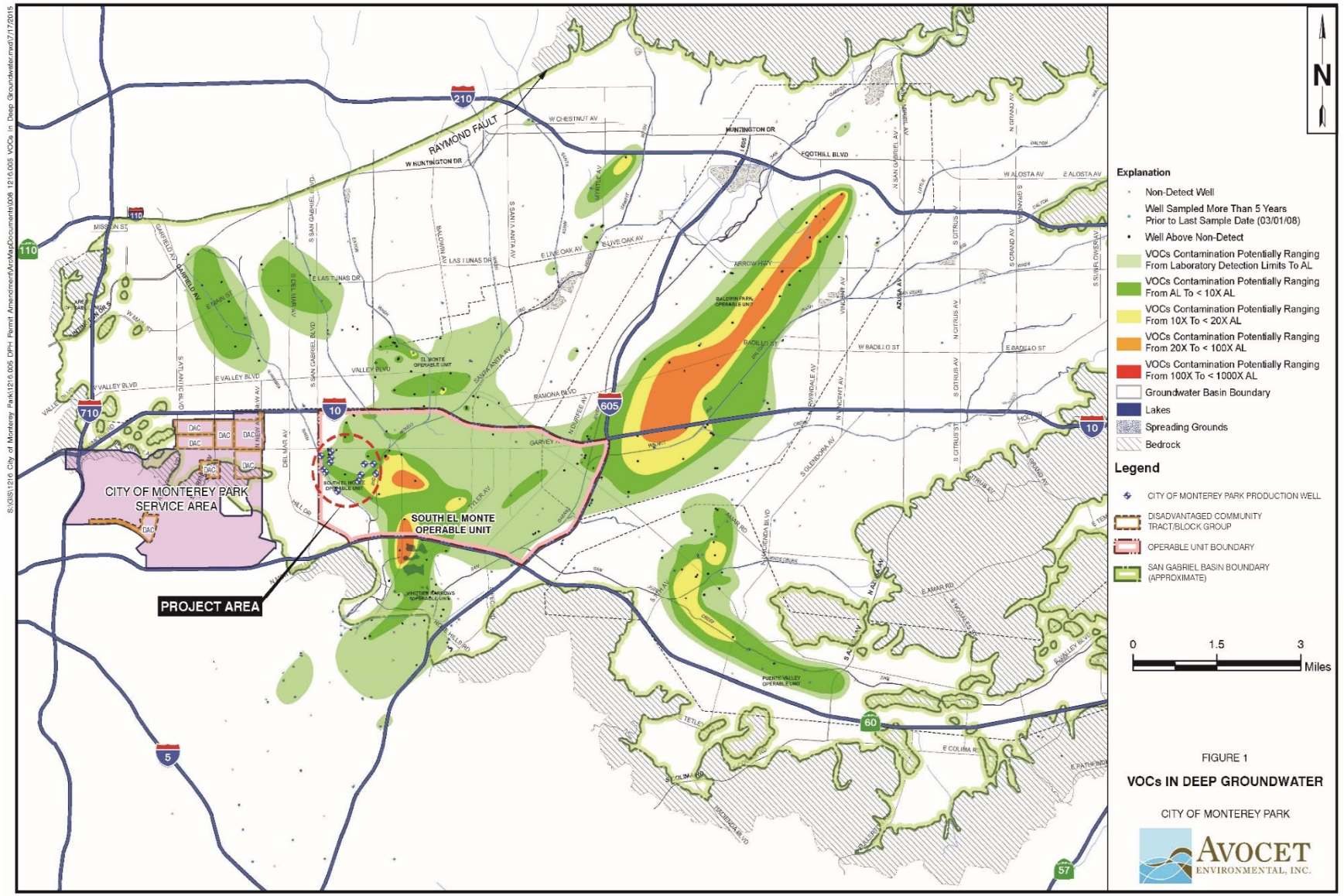
In recent years, two of the three wellhead treatment systems have been overwhelmed by higher-than-anticipated VOC concentrations and "recalcitrant" VOCs, and the air stripper for Wells 12 and 15 is beginning to fail mechanically. These supply wells are also impacted by 1,4-dioxane, which is not removed by any of the existing treatment systems. The Interim Remedy in the SEMOU involves the City, the San Gabriel Valley Water Company (SGVWC), and the Golden State Water Company (GSWC). The proposed centralized treatment system is supported by the EPA, the Department of Toxic Substances Control, the San Gabriel Basin Water Quality Authority (SGBWQA), and the San Gabriel Valley Municipal Water District (SGVMWD).

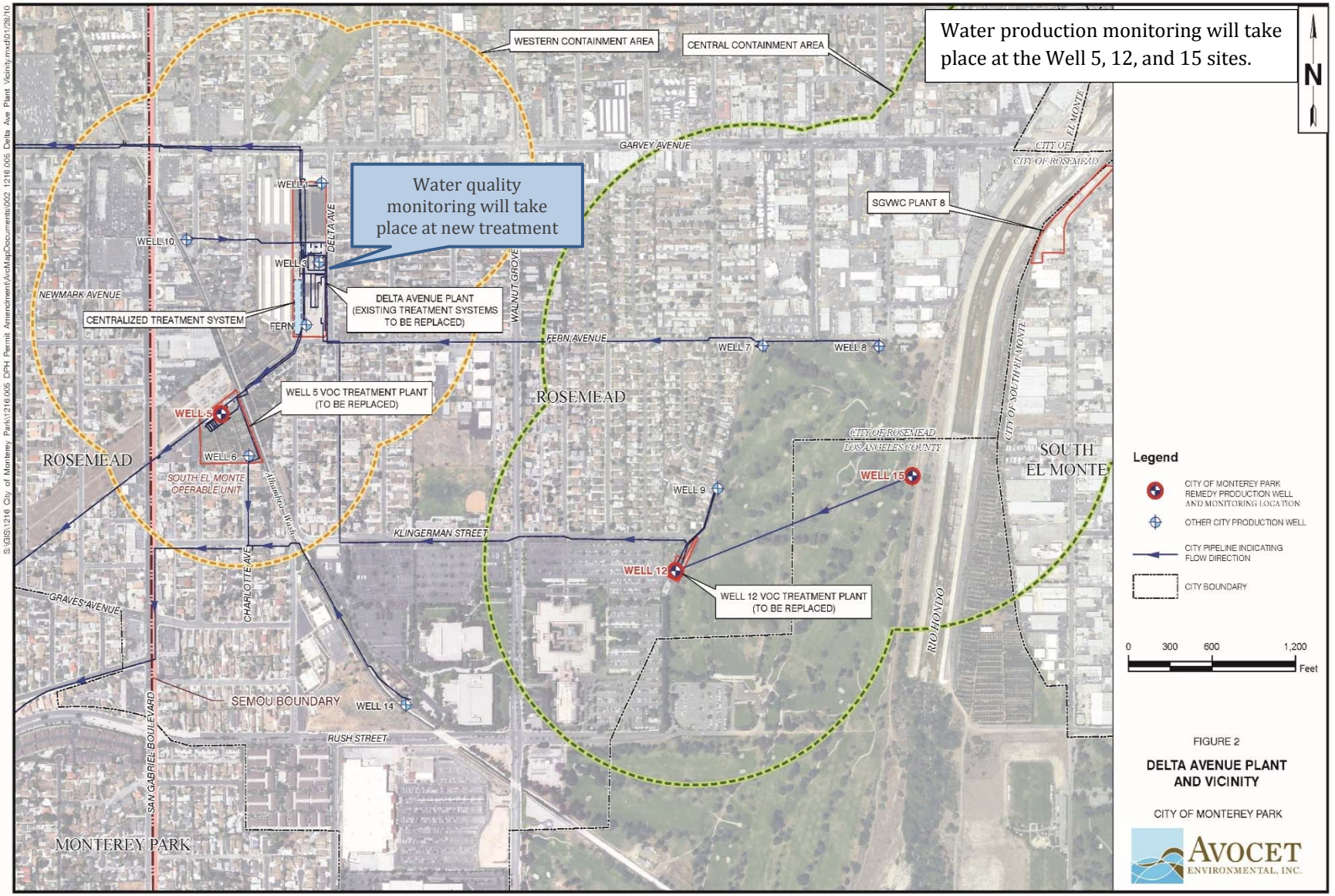
The anticipated physical benefits of the Project include the primary benefit of an additional 2,740 AFY of local groundwater supply produced from Wells 5, 12, and 15. The secondary physical benefit is water quality improved by removal of VOCs and 1,4-dioxane from groundwater. Other physical benefits include continued perchlorate removal, improved blending for arsenic and nitrate, and significant improvements to the SEMOU Interim Remedy including hydraulic containment and increased contaminant mass removal from the aquifer. Energy savings and greenhouse gas emission reduction are also benefits due to the offset of imported water.

The Project addresses a current need of the region by supporting two of the objectives of the Greater Los Angeles County (GLAC) Integrated Regional Water Management Plan (IRWMP). The Project will reduce the City's dependence on imported water by increasing a local source (Improve Water Supply). In addition, the Project will adapt to and mitigate against climate change vulnerabilities by offsetting energy-intensive imported water supplies and the associated greenhouse gas emissions (Address Climate Change).

The intended outcome of the Project is to increase local water supplies by 2,740 AFY and improve water quality. The Project will enable the City to reliably meet drinking water quality requirements while pumping its designated remedy wells, removing VOCs and 1,4-dioxane, and enhancing hydraulic control in the Central and Western Containment Areas of the SEMOU.

Project Map


S:\GIS\1216 City of Monterey Park\1216.005 DPH Permit Amendment\AvoMapDocuments\008 1216.005 VOCs in Deep Groundwater.mxd 7/17/2015
RAYMOND FAULT
CITY OF MONTEREY PARK SERVICE AREA
SOUTH EL MONTE OPERABLE UNIT
PROJECT AREA
Explanation
Non-Detect Well
Well Sampled More Than 5 Years Prior to Last Sample Date (03/01/08)
Well Above Non-Detect
VOCs Contamination Potentially Ranging From Laboratory Detection Limits To AL
VOCs Contamination Potentially Ranging From AL To < 10X AL
VOCs Contamination Potentially Ranging From 10X To < 20X AL
VOCs Contamination Potentially Ranging From 20X To < 100X AL
VOCs Contamination Potentially Ranging From 100X To < 1000X AL
Groundwater Basin Boundary
Lakes
Spreading Grounds
Bedrock
Legend
CITY OF MONTEREY PARK PRODUCTION WELL
DISADVANTAGED COMMUNITY TRACT/BLOCK GROUP
OPERABLE UNIT BOUNDARY
SAN GABRIEL BASIN BOUNDARY (APPROXIMATE)
0 1.5 3
Miles
FIGURE 1
VOCs IN DEEP GROUNDWATER
CITY OF MONTEREY PARK
AVOCET ENVIRONMENTAL, INC.


Water production monitoring will take place at the Well 5, 12, and 15 sites.
Water quality monitoring will take place at new treatment
WESTERN CONTAINMENT AREA
CENTRAL CONTAINMENT AREA
GARVEY AVENUE
SGVWC PLANT 8
WELL 1
WELL 10
WELL 3
DELTA AVE
NEWMARK AVENUE
CENTRALIZED TREATMENT SYSTEM
FERN
DELTA AVENUE PLANT (EXISTING TREATMENT SYSTEMS TO BE REPLACED)
WALNUT GROVE
FERN AVENUE
WELL 7
WELL 8
WELL 5 VOC TREATMENT PLANT (TO BE REPLACED)
WELL 5
ROSEMEAD
WELL 6
SOUTH EL MONTE OPERABLE UNIT
Alhambra Wash
CITY OF ROSEMEAD
LOS ANGELES COUNTY
CITY OF SOUTH EL MONTE
SOUTH EL MONTE
WELL 15
WELL 9
KLINGERMAN STREET
WELL 12
WELL 12 VOC TREATMENT PLANT (TO BE REPLACED)
RIO HONDO
GRAVES AVENUE
CHARLOTTE AVE
SEMOU BOUNDARY
WELL 14
RUSH STREET
SAN GABRIEL BOULEVARD
MONTEREY PARK
N
Legend
CITY OF MONTEREY PARK REMEDY PRODUCTION WELL AND MONITORING LOCATION
OTHER CITY PRODUCTION WELL
CITY PIPELINE INDICATING FLOW DIRECTION
CITY BOUNDARY
0 300 600 1,200
Feet
FIGURE 2
DELTA AVENUE PLANT AND VICINITY
CITY OF MONTEREY PARK
AVOCET ENVIRONMENTAL, INC.

Project Physical Benefits

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

- Primary Benefit – Water Supply Produced
- Secondary Benefit – Water Quality Improved through VOC and 1,4-Dioxane Reduction

Other physical benefits include improved blending for perchlorate, arsenic, and nitrate and significant improvements to the SEMOU Interim Remedy in terms of hydraulic containment and increased contaminant mass removal from the aquifer. Future groundwater quality data are expected to show decreased contaminant concentrations, thus protecting downgradient users in the San Gabriel Basin to the west and the Central Basin to the south. Energy savings and greenhouse gas emission reduction are also benefits provided by the Project due to the offset of imported water supplies.

Primary Benefit – Water Supply Produced

The table below provides information on the benefit of increasing local water supplies and reliability by replacing imported water with groundwater supply. The Project will increase the production of existing City wells from a current 9,190 AFY to 11,940 AFY once fully implemented. The primary benefit is expected to start on August 1, 2017. Over the useful life of 30+ years, the cumulative benefit will be 83,342 AF.

Table 5 – Annual Project Physical Benefits

Project Name: Centralized Groundwater Treatment System
Type of Benefit Claimed: Primary Benefit **-** Water Supply Produced
Units of the Benefit Claimed: Acre-feet per year (AFY)
Anticipated Useful Life of Project (years): 30 Years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	9,190	9,190	0
2016	9,190	9,190 (construction year)	0
2017	9,190	10,336 (partial construction year)	1,142
2018 – 2047	9,190	11,940	2,740

Comments:
Backup calculations for the above are in the *Increased Production Evaluation Table* (Avocet Environmental, Inc., June 2015) and are based on the current and projected pumping rates from Wells 5, 12, and 15. A detailed explanation of the calculations supporting this benefit are included in **Technical Analysis of Physical Benefits Claimed**.

Secondary Benefit – Water Quality Improved through VOC and 1,4-Dioxane Reduction

The table below calculates the water quality improvement benefit of reducing 1,4-dioxane and VOCs in the groundwater when 2,740 AFY is pumped from the San Gabriel Basin and treated with the centralized groundwater treatment system. The table shows the average concentration of 1,4-dioxane and VOCs from the three wells in mg/L when pumped, with and without the Project. The Project Schedule dictates that this benefit begins in August 2017 and continues for the 30-year lifespan of the Project.

Table 5 – Annual Project Physical Benefits

Project Name: Centralized Groundwater Treatment System

Type of Benefit Claimed: Secondary Benefit – Water Quality Improved through VOC and 1,4-Dioxane Reduction

Units of the Benefit Claimed: mg/L

Anticipated Useful Life of Project (years): 30 Years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	Total VOCs reduced: 0 1,4-dioxane reduced: 0	Total VOCs reduced: 0 1,4-dioxane reduced: 0	0
2016	Total VOCs reduced: 0 1,4-dioxane reduced: 0	Total VOCs: 0.0677 1,4-dioxane: 0.0012 (construction year)	0
2017	Total VOCs reduced: 0 1,4-dioxane reduced: 0	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012 (partial construction year)	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012
2018	Total VOCs reduced: 0 1,4-dioxane reduced: 0	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012
2019 – 2047	Total VOCs reduced: 0 1,4-dioxane reduced: 0	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012	Total VOCs reduced: 0.0677 1,4-dioxane reduced: 0.0012

Comments:

Backup calculations for the water quality improvements are provided in the *Increased Mass Removal Summary Table* (Avocet Environmental, Inc., October 2014) and are based on recent groundwater quality data, the current and projected pumping rates from Wells 5, 12, and 15. A detailed explanation of the calculations supporting this benefit are included in **Technical Analysis of Physical Benefits Claimed**.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The State of California is currently experiencing one of the most severe droughts on record, which has severely depleted statewide water supplies. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting SWP supplies from the Bay-Delta. The results of these still recent drought conditions can be seen throughout the Region as an increased implementation of local supply development projects and conservation measures and ordinances. With only one wet year in 2011, the Region is in the middle of yet another multiple year drought.

The City's response to reduced imported water supply and increased water conservation measures has been to explore alternative, local water supply options. This Project will produce a viable local water supply to meet future demand. The City has identified previously unused local groundwater as a source of supply; however, the aquifer is contaminated beyond the City's capacity to treat groundwater contamination with its current treatment systems, which are aging. Addressing these issues has been cost prohibitive.

The City is the main participant in the SEMOU "Interim Remedy," a regional hydraulic control program coordinated by the EPA to contain VOC contamination in the SEMOU and remove contaminant mass from the affected aquifer. The City's production Wells 12 and 15 in the Central Containment Area of the SEMOU and Well 5 in the Western Containment Area are EPA-designated "remedy wells". The existing wellhead treatment systems employ various combinations of air stripping, LGAC, and IX to remove VOCs and perchlorate.

Two of the three wellhead treatment systems have been overwhelmed by higher than anticipated VOC concentrations and "recalcitrant" VOCs, and the air stripper that treats groundwater from the wells is beginning to fail mechanically. In addition, the City's water supply wells are impacted by 1,4-dioxane, which none of the City's existing wellhead treatment systems can remove. The Interim Remedy has resulted in significant costs.

The three wellhead treatment systems are not interconnected, which physically restricts the amount of water that can be treated from the production wells. For example, increasingly frequent mechanical problems with the air stripping tower at the Delta Plan often result in Wells 12 and 15 being shut down. When this happens, the City is often forced to make up for the lost production by purchasing more imported water.

The centralized AO treatment system proposed is needed to provide the City a reliable way to consistently meet customer demand with clean, safe drinking water while consistently meeting EPA remediation obligations. Meeting these obligations will also protect downgradient users in the San Gabriel Basin to the west and the Central Basin to the south. Retiring the existing wellhead treatment systems that physically limit production will enable the City to produce an additional 2,740 AFY of water from its three remedy wells and exceed its EPA remediation obligation.

2) Estimates of Without Project Conditions

Without the Project, the City will continue to struggle to meet its EPA obligation to pump and treat groundwater from Wells 5, 12, and 15 at the required minimum rates and will not produce an additional 2,740 AFY of groundwater. This struggle will become more acute as the City's existing wellhead treatment systems continue to age and deteriorate. Wellhead treatment system downtime will become more frequent and of longer duration and, eventually, the City will have a reduced capacity to meet customer demand with safe, treated groundwater.

3) Descriptions of Methods Used to Estimate Physical Benefits

The primary benefit of the Project is that a centralized AO treatment system will enable the City to reliably produce and additional 2,740 AFY of water supply from Wells 5, 12, and 15 and consistently meet and exceed State Water Resources Control Board Division of Drinking Water (DDW) imposed drinking water standards as follows:

Well 5. The City had originally planned to treat groundwater pumped from Well 5 in a single-pass LGAC system consisting of five 20,000 pound LGAC vessels in parallel. At a flow-through capacity of up to 800 gpm per vessel, the originally planned LGAC treatment system would easily treat 2,100 gpm of groundwater that Well 5 is able to sustainably produce. When DDW (then DPH) introduced its "second barrier" treatment requirement for extremely impaired sources, the City had to reconfigure the Well 5 LGAC system to provide "lead-lag" treatment (i.e., two pairs of vessels operating in parallel and series) with the fifth vessel, which had already been purchased and installed, now redundant. At a flow-through capacity of 800 gpm per vessel pair, the installed LGAC treatment system should be able treat up to 1,600 gpm; however, system head losses attributable to the conversion from single-pass to lead-lag operation restrict treatment system capacity to 1,200 gpm. The difference between 1,200 gpm and 2,100 gpm is 900 gpm or **1,450 AFY**.

Wells 12 & 15. The City installed a packed tower air stripper to remove VOCs from groundwater pumped from Wells 12 and 15 (also Well 9 which is a "standby" well operated infrequently). The air stripping tower has a flow through capacity of 4,500 gpm, although Wells 12 and 15 combined can sustainably produce 5,300 gpm of groundwater. The air stripping tower was designed for a maximum influent VOC concentration of 67.4 micrograms per liter (µg/L), although actual VOC influent concentrations have consistently been higher. The City tries to address higher than anticipated influent VOC concentrations by reducing extraction from Well 15, the most contaminated well, or by reducing flow from both Wells 12 and 15 to achieve a higher air-to-water ratio. During periods of high demand, however, the City often has no option but to operate the air stripper at above the design influent VOC concentration. This results in VOC "breakthrough" in the air stripper effluent, necessitating frequent LGAC change-outs in the second barrier LGAC system. Building the centralized treatment system and removing the restrictions imposed by the existing air stripper would enable the City to increase production from Wells 12 and 15 from 4,500 gpm to 5,300 gpm. The difference between 4,500 gpm and 5,300 gpm is 800 gpm or **1,290 AFY**.

Adding the increases of 1,450 AFY from Well 5 and 1,290 AFY from Wells 12 and 15, the Project will enable the City to produce and treat an additional **2,740 AFY** from its three EPA-designated remedy wells. Increased production will significantly increase contaminant mass removal from the aquifer and significantly enhance hydraulic control in the Central and Western Containment Areas, thereby protecting downgradient users in the San Gabriel Basin to the west and the Central Basin to the south.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The principal centralized treatment system components required to increase production include: (1) A new subsurface pipeline between Well 5 and the City's Delta Avenue plant (2) New pumps with variable frequency drives (VFDs) in all three production wells (3) Four triple AO treatment units (4) Relocation/repurposing of the inactive IX vessels at the Delta Plant for single-pass LGAC operation (5) Interconnecting piping. Secondary components include piping modifications to bypass the existing air stripper that currently serves Wells 12 and 15, providing a utility bridge over Alhambra Wash for the new Well 5 pipeline, foundation pads for the equipment mentioned above, and instrumentation upgrades.

No new policies are required for the City to proceed with the centralized groundwater treatment system. The City Council has already approved a water rate increase and the allocation of funds for capital water projects.

Actions required for the City to proceed with the centralized groundwater treatment system are expected to include City Council approval of the contractor recommended by the City's Water Utility Department pursuant to a competitive bid process.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

The City does not anticipate any adverse physical effects related to increased production from Wells 5, 12, or 15. The centralized groundwater treatment system is essentially replacing older, less efficient wellhead treatment systems

on land already owned by the City so there are no anticipated adverse impacts. Potential adverse physical impacts during construction will be mitigated according to the City's CEQA Negative Declaration.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The primary benefit of the project is to provide an additional local water resource to address long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this Project will (1) help to efficiently manage the San Gabriel and Central groundwater basins, and (2) yield a new water supply in terms of gaining access to a certain volume of groundwater that could not previously be pumped and utilized.

Secondary Physical Benefit: Water Quality Improved through VOC and 1,4-dioxane Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The City is the main participant in the SEMOU "Interim Remedy," a regional hydraulic control program coordinated by the EPA to contain VOC contamination in the SEMOU and remove contaminant mass from the affected aquifer. The City's production Wells 12 and 15 in the Central Containment Area of the SEMOU and Well 5 in the Western Containment Area are EPA-designated "remedy wells".

Two of the three wellhead treatment systems have been overwhelmed by higher than anticipated VOC concentrations and "recalcitrant" VOCs, and the air stripper that treats groundwater from the wells is beginning to fail mechanically. In addition, the City's water supply wells are impacted by 1,4-dioxane, which none of the City's existing wellhead treatment systems can remove. The Interim Remedy has resulted in significant costs.

VOC groundwater contamination in the San Gabriel Basin was discovered in the 1970s and subsequent investigations showed that large areas were impacted. Numerous production wells were taken out of service and water purveyors scrambled to build wellhead treatment facilities, install new and deeper wells, or find alternate sources of water, including imported water from the Sacramento-San Joaquin Delta and the Colorado River. EPA designated large areas of the San Gabriel Basin as "superfund" sites and delineated several Operable Units (OUs), including the SEMOU. EPA and the Los Angeles Regional Water Quality Control Board (LARWQCB) also identifies "potentially responsible parties" (PRPs) that may have contributed to the contamination. PRPs were required to investigate their own properties while EPA conducted or oversaw a "Remedial Investigation/Feasibility Study" (RI/FS) in each OU. The Feasibility Studies prescribed the same remedy in each of the OUs in the San Gabriel Basin; specifically "pump & treat" for hydraulic control purposes to inhibit VOC migration. Since groundwater rights in the San Gabriel Basin are adjudicated, none of the PRPs had pumping rights and, water purveyors with existing rights became integral to the remedy. It was recognized that private water companies and public entities with water rights, such as the City, were best situated to operate the various "pump & treat" systems and distribute the treated groundwater to their customers. The Interim Remedy in the SEMOU involves the City, SGVWC, and GSWC. The City and SGVWC operate EPA-designated remedy wells in the Central Containment Area and the City and GSWC operate EPA-designated remedy wells in the Western Containment Area. The remedy wells were selected to achieve hydraulic control in the two containment areas and to remove contaminant mass from the aquifer.

Due to the limited flow-through capacity and/or poor physical condition of its wellhead treatment systems, the City is often unable to meet its minimum pumping obligations, compromising the Interim Remedy in terms of hydraulic control and contaminant mass removal.

The centralized AO treatment system proposed is needed to enable the City to reliably meet and exceed its EPA-mandated pumping obligations pertaining to hydraulic control and to remove more contaminant mass from the aquifer, thereby protecting downgradient users in the San Gabriel Basin to the west and the Central Basin to the south.

2) Estimates of Without Project Conditions

Without the Project, the removal of 0.0677 mg/L of VOCs and 0.0012 mg/L of 1,4-dioxane from the additional 2,740 AFY of produced groundwater will not be achieved. As the City's existing wellhead treatment systems continue to age, the City will be unable to meet its EPA obligation to pump Wells 5, 12, and 15 at the required minimum rates, compromising hydraulic control and reducing contaminant mass removed from the aquifer. The City would be forced to shut down the wells and purchase other water supplies. Over the life of the Project, this compromise will allow over 15,000 pounds of VOCs and 225 pounds of 1,4-dioxane that would otherwise have been removed to migrate to the west and south, potentially impacting other users. As there are no viable alternatives to AO for treating 1,4-dioxane, the City will eventually be required to implement the technology.

3) Descriptions of Methods Use to Estimate Physical Benefits

The secondary benefit of the Project is increased VOC removal from the 2,740 AFY of additional groundwater pumped and reduction in overall VOC concentrations in the underlying contaminated aquifer.

The Water Quality Improved benefit is reported in units of mg/L of VOC concentration reduction in produced groundwater as a result of the Project. The total VOC concentrations in Wells 5, 12 and 15 are 39, 53, and 99 µg/L, respectively and the flow-weighted average concentration is 67.7 µg/L. The AO units in the centralized treatment system will reduce influent VOC concentrations to zero. At the same time, by increasing production from the three remedy wells by 2,740 AFY, an additional 501 pounds of VOC mass will be removed from the aquifer every year. Over the 30-year operational life of the Project, this equates to removing an additional 15,030 pounds of VOC mass from the San Gabriel Basin that would otherwise have continued to migrate into currently "clean" areas of the basin.

The total 1,4-dioxane concentrations in Wells 5, 12 and 15 are 0.93, 1.7 and 1.1 µg/L, respectively and the flow-weighted average concentration is 1.2 µg/L. The AO units in the centralized treatment system will essentially reduce influent 1,4-dioxane concentrations to zero. At the same time, by increasing production from the three remedy wells by 2,740 AFY, an additional 7.5 pounds of 1,4-dioxane mass will be removed from the aquifer every year. Over the 30-year operational life of the Project, this equates to removing an additional 225 pounds of 1,4-dioxane mass from the San Gabriel Basin that would otherwise have continued to migrate into currently "clean" areas of the basin.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The principal centralized treatment system components required to improve hydraulic control and increase contaminant mass removal are the same as for the primary benefit and include: (1) A new subsurface pipeline between Well 5 and the City's Delta Avenue plant (2) New pumps with variable frequency drives (VFDs) in all three production wells (3) Four triple AO treatment units (4) Relocation/repurposing of the inactive IX vessels at the Delta Plant for single-pass LGAC operation (5) Interconnecting piping. Secondary components include piping modifications to bypass the existing air stripper that currently serves Wells 12 and 15, providing a utility bridge over Alhambra Wash for the new Well 5 pipeline, foundation pads for the equipment mentioned above, and instrumentation upgrades.

No new policies are required for the City to proceed with the centralized groundwater treatment system. The City Council has already approved a water rate increase and the allocation of funds for capital water projects.

Actions required for the City to proceed with the centralized groundwater treatment system are expected to include City Council approval of the contractor recommended by the City's Water Utility Department pursuant to a competitive bid process.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

The City does not anticipate any adverse physical effects related to increased production from Wells 5, 12, or 15. The centralized groundwater treatment system is essentially replacing older, less efficient wellhead treatment systems on land already owned by the City so there are no anticipated adverse impacts. Potential adverse physical impacts during construction will be mitigated according to the City's CEQA Initial Study.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The Project will provide an additional local water resource to address long-term drought preparedness. Specifically, from Table 1 – Statewide Priorities of the 2015 IRWM Grant Program Guidelines, this Project will (1) help to efficiently manage the San Gabriel and Central groundwater basins, and (2) yield a new water supply in terms of gaining access to groundwater that could not previously be pumped and utilized.

Direct Water-Related Benefit to a DAC

This Project provides direct water-related benefits to DACs. Over 25 percent of the Project area is considered a DAC: 32.1% based on the DAC Tract population and 27.9% based on the DAC Block Group population (See Attachment 7).

The water-related need of the DACs is that groundwater supply is a water quality issue in this area with potential cumulative human health risks due to the presence of 1,4-dioxane and residual VOC concentrations in treated groundwater from an "extremely impaired" source. The water served by the City, including service to its DAC population, meets all applicable drinking water quality standards; however, VOCs and 1,4-dioxane is present at concentrations below drinking water maximum concentration limits. Since the City's wells pump water from an extremely impaired source (i.e., the SEMOU), the DDW has expressed concern about the cumulative human health risk that may be posed by 1,4-dioxane and trace VOC concentrations and has required that the City remove 1,4-dioxane. **The Project provides a direct water-related benefit to DACs by** producing a clean and reliable local water supply through a new centralized treatment system that reduces VOCs and eliminates 1,4-dioxane from the groundwater supply. This will address the potential cumulative human health risk to DACs, other consumers within the City's service area, and neighboring communities.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Centralized Groundwater Treatment System Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	2,740 AFY of new supply produced	Locations: Monthly or quarterly flow meter readings at each of Wells 5, 12, and 15 will be used to calculate annual volume pumped. Tools and Methods: Each of the three wells will be equipped with a flow indicating and totalizing meter. The City will record cumulative flow readings for each well at least monthly and, as required by EPA, calculate the total volume of water extracted from each well on a quarterly and annual basis. These volumes will be compared to current pumping volumes and the differences will be recorded to track performance against the target 2,740 AFY increase. Data to be Collected: Monitoring data collected by the City will be used to measure Project performance. **The monitoring tools and targets are appropriate for the benefits claimed because** the flow meters at each well will record the amount of groundwater supply produced. **The monitoring data will be used to measure performance by** showing the total groundwater produced on an annual basis and subtracting from the 2015 production rate from these three wells.
Secondary Benefit – Water Quality Improved through VOC and 1,4-Dioxane Reduction	0.0677 mg/L of VOC; 0.0012 mg/L of 1,4-dioxane reduced	Locations: Quarterly samples from Wells 5, 12, & 15 and monthly samples of the treated groundwater, after the centralized treatment, will be taken for VOCs and 1,4-dioxane water quality comparison. Tools and Methods: Samples of treated groundwater, collected downstream of the centralized treatment system, will be analyzed to verify that VOCs and 1,4-dioxane are not present in the water served to the City's DAC and other communities. Samples of groundwater from Wells 5, 12, and 15 prior to treatment will enable the City to calculate the efficiency of the centralized treatment system and the increased mass of VOCs and 1,4-dioxane removed. **The monitoring tools and targets are appropriate for the benefits claimed because** the water quality test results will show the amount of mg/L of VOCs and 1,4-dioxane that will be reduced. **The monitoring data will be used to measure performance by** comparing the water quality before and after the new centralized treatment system.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Centralized Groundwater Treatment System Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Water Quality Improved Through VOC and 1,4-Dioxane Reduction
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** In 2009, the City designed a packed tower air stripper for Well 5 to replace the existing LGAC system. If implemented, the new air stripper would have removed the restriction on pumping from Well 5 imposed by the existing LGAC system. This would have allowed the City to pump Well 5 at 2,100 gpm versus the current 1,200 gpm, a 1,450 AFY increase. The City has also considered ways to increase production from Wells 12 & 15 by increasing the height of the existing air stripping tower and/or installing a larger blower to increase the air/water ratio. These alternatives were not pursued because they would not generate the same amount of additional supply as the proposed Project, and they do not remove 1,4-dioxane as required by DDW.
	If no, why? Not Applicable
	If yes, list the methods (including the proposed project) and estimated costs. The Well 5 air stripper estimate for construction was $1,360,000. The City did not pursue or estimate costs for possible modifications to the existing air stripper for Wells 12 and 15.
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.** Although the Project is not the least cost to produce additional supplies from the same area, it was selected for implementation because a centralized AO treatment system is the only proven and accepted treatment technology for removal of 1,4-dioxane from contaminated water supplies and therefore the only way to achieve the higher 2,740 AFY of new supply production.
Comments:	

Project 19: Southeast Water Efficiency Program Project (Project)
Implementing Agency: Central Basin Municipal Water District (Central Basin)
Project Description

(25 Word) The Project will provide 308 acre-feet per year (AFY) of water savings, as well as water quality improvements by conducting water conservation audits and retrofits.

(Expanded) The Project will audit 100 public facilities to determine sources of excess water use, and implement system and device retrofits based on audit results throughout the Central Basin service area. The Project will provide 308 AFY of local water supply and improve water quality by reducing Nitrate/Nitrite concentration in urban runoff by 0.5 milligrams per liter (mg/L). Central Basin has partnered with the Metropolitan Water District of Southern California (MWD) and the Central Basin Purveyors (a group of local supply retailers operating within Central Basin's service area) to fund and implement this Project. The Project expands on an existing incentive program Central Basin executed in partnership with the U.S. Department of Energy and DWR's Water Conservation Management and Education Program. The Project targets the largest water users in the Central Basin service area with priority given to public facilities in Disadvantaged Communities (DACs). The Project seeks to increase waster use efficiency and provides immediate drought relief and overall regional water supply reliability.

The major components of the Project include reviewing water use data to identify and audit up to 100 connections with disproportionately higher use including the irrigation system, indoor plumbing system, and existing water devices. Central Basin will then install one or more high efficiency devices to reduce indoor and outdoor water use, as appropriate. These devices include high-efficiency toilets (tanks and flushometers), zero water and ultra-low water urinals, laminar flow restrictors, large rotary nozzles, rotating nozzles for spray heads, weather-based irrigation controllers, central computer irrigation controllers, and flow regulators. Central Basin will also construct piping system upgrades and repairs that have been identified to improve water use efficiency and reduce water waste.

The anticipated physical benefits of the Project includes a primary benefit of 308 AFY of water savings through conservation. The secondary benefit is the improvement of water quality by reducing the concentration of Nitrate/Nitrite in urban runoff by 0.5 mg/L. Within the Project's four year implementation schedule, 100 sites will be retrofitted with an ultimate annual water savings of 308 AFY. During the lifetime of the Project (23 years), Central Basin expects to achieve 6,160 AF of total water saved; however it can be expected that the water savings generated would continue past the 23 years as customers replace the water efficient devices. Reduction in landscape irrigation is expected to be one of the primary sources of conserved water supply. As landscape irrigation is reduced, so is the amount of irrigation runoff that transports excess fertilizer (including Nitrate/Nitrite) in the watershed. It is expected that the reduction in irrigation-related urban runoff will reduce the transport of 0.5 mg/L per year of Nitrate/Nitrite to local waterways.

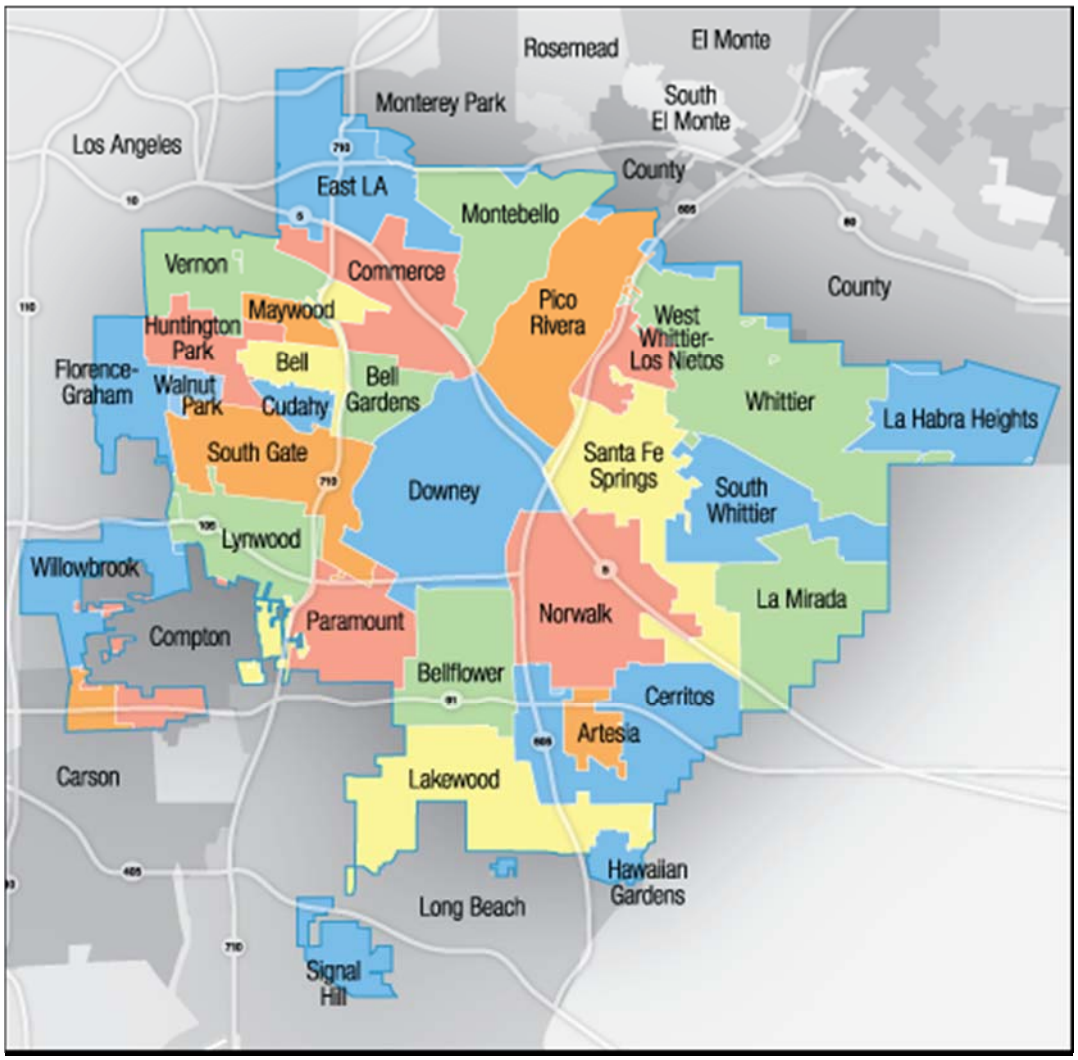
The Project addresses the current needs of the GLAC Region by decreasing the Region's reliance on imported water and optimizing local water supplies through conservation measures and improved surface water quality by reducing contaminants in urban runoff. As noted in the GLAC IRWM Plan, the Region's access to imported supply is limited due to both environmental concerns in the San Francisco Bay Delta as well as drought conditions. Water conservation is key to achieving an increase in water supply reliability and sustainability. It is also an effective method for reducing urban runoff and improving water quality for both Central Basin and the Region. Additionally, the Project will mitigate further climate change impacts to the Region by reducing the energy needed to meet demands in the service area and thereby reducing greenhouse gas emissions.

The intended outcome of the Project is to provide water supply savings to reduce long-term demand and facilitate increased regional and local water supply reliability and surface water quality.

Project Map

The Central Basin Service Area (Project area) map below, shows local communities within the Project area. Since the objective of the Project is to determine the 100 best sites for retrofits within Central Basin's service area, they can't currently be identified on the map. The Project Area DAC maps that follows, shows the location of DACs within the Project area which will be targeted for retrofit sites. Monitoring locations will be at the same site as the retrofit sites. The Project Area Water Bodies map provides information regarding local water bodies that will benefit from the Project's water quality improvements.

Central Basin Service Area



Project Area DACs

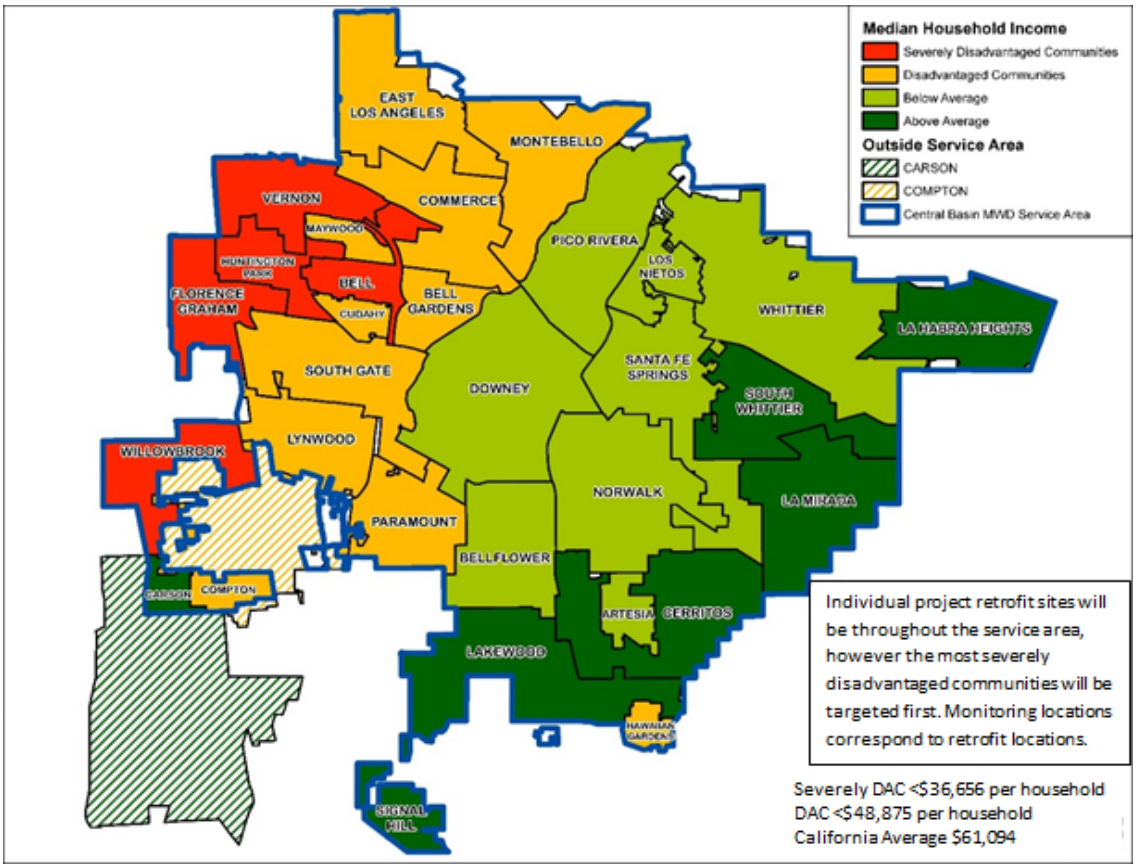
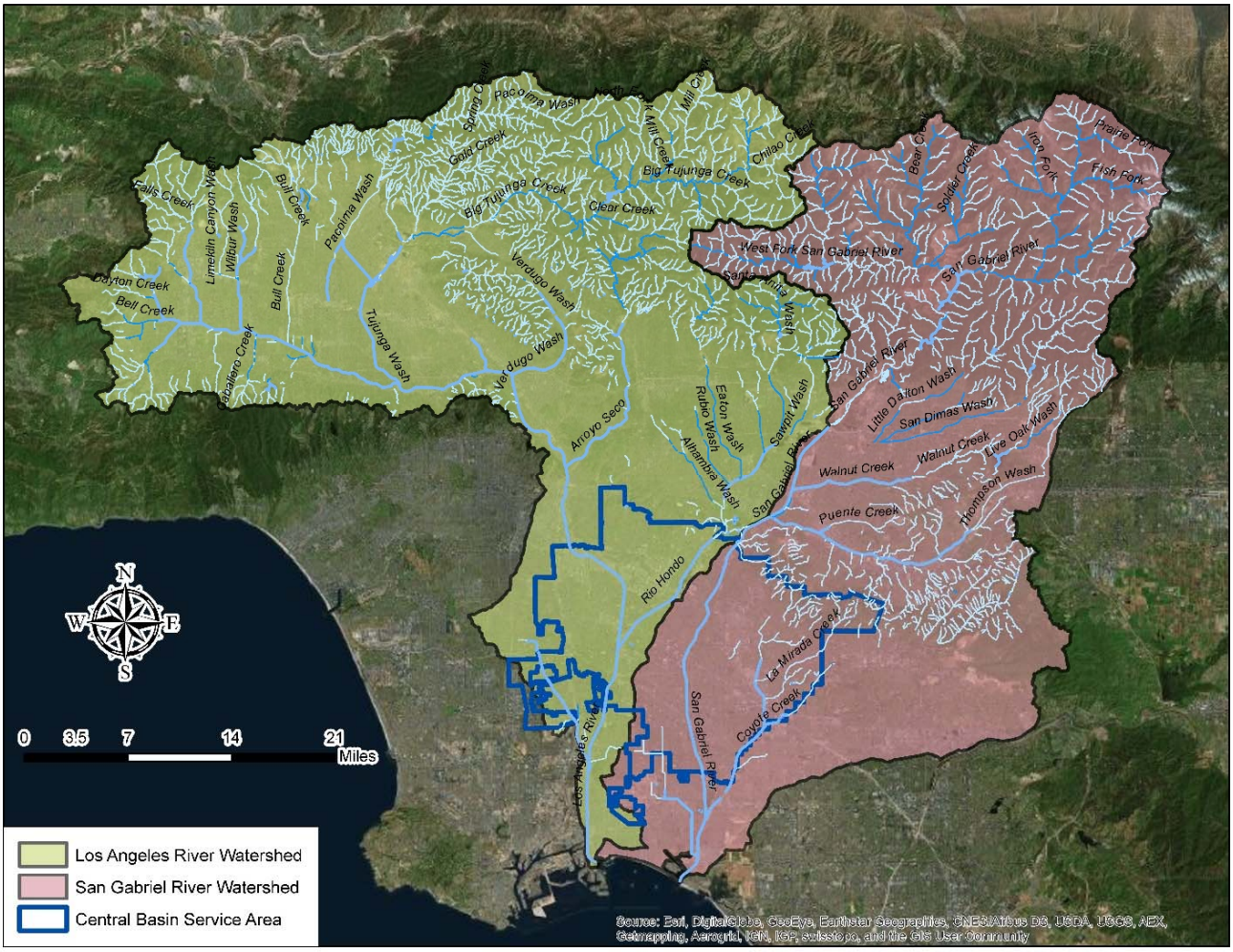


Figure 1: Project Area Water Bodies



Project Physical Benefits

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

- Primary Benefit – Water Supply Saved
- Secondary Benefit – Water Quality Improved Through Nitrate/Nitrite Reduction

Primary Benefit – Water Supply Saved

The table below provides information on the amount of water supply saved through the Project. Central Basin has a projected goal of retrofitting 25 sites per year (over a maximum of four years) until a total of 100 sites have been audited, retrofitted, and repaired. For every 25 sites retrofitted, the estimated potable water saved is approximately 77 AF each year. After 100 sites have been fully audited, retrofitted, and/or repaired, approximately 308 AFY will be saved. Each device has a useful life of 20 years, however, taking into consideration that the devices will be installed over a maximum four year period, the program will have a total useful life of approximately 23 years to allow each device to reach the end of its useful life. Over the lifespan of the Project, 6,160 AF of potable water will be saved.

Table 5a – Annual Project Physical Benefits

Project Name: Southeast Water Efficiency Program Project
Type of Benefit Claimed: Primary Benefit – Water Supply Saved
Units of the Benefit Claimed: Acre-feet per year
Anticipated Useful Life of Project (years): 20 years for each device and 23 years for the program

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2016	0	77	77
2017	0	154	154
2018	0	231	231
2019 – 2035	0	308	308
2036	0	231	231
2037	0	154	154
2038	0	77	77

Comments:

- *Water Conservation Management and Education Program* - The baseline to estimate the amount of annual water supply saved was developed from a sample site (a large High School) from Central Basin's Water Conservation Management and Education Program, which required several conservation and retrofit measures. This high school is representative of the public facilities that will be audited and retrofitted for this Project. The water savings of 77AFY (for every 25 sites) was derived from the sample site's conservation equipment ratings, number and type of equipment retrofitted, water system repairs, and related data.

Secondary Benefit – Water Quality Improved Through Nitrate/Nitrite Reduction

In Central Basin, Nitrate/Nitrite is considered to be one of the major water quality pollutants of concern since it is found in all fertilizers and is naturally occurring in soil. Nitrate/Nitrite was chosen as representative of many constituents that will also be reduced as a result of the Project. The table below provides information regarding the amount of water quality that will be improved based on outdoor retrofits and repairs at the sites. Since the sites have not been identified, it was assumed that all 100 sites will have comparable amounts of runoff and concentrations of Nitrate/Nitrite. Central Basin has a projected goal of retrofitting 25 sites per year for a total of 100 sites audited, retrofitted, and repaired. For every 25 sites retrofitted, it is estimated that approximately 0.125 mg/L of Nitrate/Nitrite will be reduced from the irrigated land runoff entering local water bodies. After 100 sites have been fully audited, retrofitted, and/or repaired, approximately 0.5 mg/L per year of Nitrate/Nitrate is expected to be reduced. Each device has a useful life of 20 years, however, taking into consideration that the devices will be installed over a maximum four year period, the program will have a total useful life of approximately 23 years to allow each device to reach the end of its useful life.

Table 5b – Annual Project Physical Benefits

Project Name: Southeast Water Efficiency Program Project
Type of Benefit Claimed: Water Quality Improved Through Nitrate/Nitrite Reduction
Units of the Benefit Claimed: milligrams per liter (mg/L)
Anticipated Useful Life of Project (years): 20 years for each device and 23 years for the program

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2016	0	0.125	0.125
2017	0	0.25	0.25
2018	0	0.375	0.375
2019 – 2035	0	0.5	0.5
2036	0	0.375	0.375
2037	0	0.25	0.25
2038	0	0.125	0.125

Comments:

- Since the sites have not been identified, it was assumed that concentrations of Nitrate/Nitrite and runoff will be the same for all 100 sites.
- *The Residential Runoff Reduction Study (MWDOC & IRWD; 2004) pg E2-24 to E2-28; Table 10* – This study compared the residential runoff and concentration of Nitrate/Nitrite in the runoff for sites with various BMPs implemented. Table 10 shows the mean and median Nitrate/Nitrite concentration (in mg/L) before and after implementation of the BMPs at a site selected to be representative of the potential site for this Project. The mean reduction was 1.09 mg/L, and the median reduction was 0.94 mg/L.
- Since *The Residential Runoff Reduction Study*'s project area and potential BMP's were considered similar to the Central Basin service area, it was assumed that this Project will achieve the same amount of reduction in Nitrate/Nitrite concentration with the same amount of runoff. However, to allow for the differences in the devices used and customer behavior, it was conservatively assumed that only 50 percent (or 0.5 mg/L) of the reduction in Nitrate/Nitrite will be achieved during full implementation.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Saved

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

Throughout the Western United States and especially within the State of California, drought is increasing in frequency, severity, and duration. Drought conditions and federal regulations have had a significant impact on the availability of imported surface water deliveries to Greater Los Angeles County (GLAC) Region. The GLAC Region has experienced significant cutbacks to imported supply since 2008 as a result of both the current drought and newly instated environmental restrictions limiting the State Water Project (SWP) supplies from the Bay Delta. The current drought has resulted in significant SWP cutbacks requiring Central Basin to increase pumping of groundwater from Central Groundwater Basin even without the normal imported or local surface water replenishment necessary to maintain groundwater levels. As a result groundwater levels have declined to historic low levels.

Currently, Central Basin's Water Conservation Management and Education Program has serviced 14% of the 293 school sites, and this Project will continue to assist the service area in achieving more water use efficiency. This Project will provide a necessary next step to continue progress made on reducing water supply demands through improved water use efficiency and thereby increasing supplies available for future needs and improving overall supply reliability. As the local imported water provider in the area, Central Basin also launched the Conservation Awareness Program and a web-based notification awareness tool that is being offered to purveyors and residents. This awareness tool will be continued through the life of this Project.

This Project will enable Central Basin to specifically address the need of the DACs in the service area. There are nine DACs that are required to cut usage between 8% and 16% as result of the recent mandate by the State Water Resources Control Board. These DACs may find it challenging to achieve additional reductions because of the upfront costs associated with investments in water efficient devices. Although this Project targets the most severe DACs first, it will also assist remaining DACs and non-DACs during and beyond the drought by providing the tools necessary to achieve water reductions.

2) Estimates of Without Project Conditions

If this Project is not implemented, the current high water use levels will be maintained and further deplete existing limited resources. Water conservation efforts are necessary to help combat the effects of the drought and to serve an increasing population. If the Project is not implemented, none of the anticipated water supply savings will occur (0 AFY instead of 308 AFY) in the time frame described by the Project. The grant funding requested is necessary to implement the Project since without it, customers will not likely purchase and install devices on their own which will result in the delay and reduction in water and energy savings.

3) Descriptions of Methods Used to Estimate Physical Benefits

Central Basin used the results from the successful Water Conservation Management and Education Program to estimate the physical benefit for this Project. To estimate potential savings for that Program, a 1,019,300 square feet sample site was selected to determine an estimate of overall baseline water use. The site selected had potential to benefit from a range of conservation and retrofit needs. Water saving volume assumptions were estimated from conservation equipment ratings, number and type of equipment retrofitted, water system repairs, and related data. Retrofits identified and implemented at the sample site resulted in an indoor per capita water savings of nearly 210,000 gallons per year and an outdoor irrigation water savings of nearly 1,963,000 gallons per year (totaling 2,173,000 gallons per year).

Since the number and type of water efficiency devices installed for each Project site will vary, Central Basin is using a conservative estimate that about 50% (or about 1,000,000 gallons) of the water savings achieved at the sample site can be achieved at any of this Project's sites. A conservative implementation rate for this Project is to implement retrofits at 25 sites a year which would equate to an additional 25,000,000 gallons (77 AF) every year. Within four years, it is anticipated that there all of the Project's 100 sites will be implemented resulting in a combined annual water savings of 100,000,000 gallons (308 AF). The Project's lifecycle has been estimated at 23 years, recognizing that each devise is assumed to have a 20 year useful life, and the number of devices in operation will ramp up over the first four years and start to decline over the last four years. The cumulative water savings from all 100 sites over that time period will be about 2 billion gallons (6,160 acre-feet) as shown in Table 5.

As an example, the Bellflower Unified School District participated in the ongoing Water Conservation Management and Education Program, and they were able to save over 37,000 gallons of water over 62 days of service.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

No new facilities or policies are required in order to obtain the physical benefit from the Project other than those included as part of the Project. To achieve this benefit, water audits will need to be performed on public facility sites and water use efficiency devices will be installed each of the chosen 100 sites. Devices such as high-efficiency toilets (tanks and flushometers), zero water and ultra-low water urinals, laminar flow restrictors, large rotary nozzles, rotating nozzles for spray heads, weather-based irrigation controllers, central computer irrigation controllers, and flow regulators could be used depending on the need of each individual site. Central Basin will also construct any piping system upgrades and repairs that have been identified to improve water use efficiency and reduce water waste.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This Project will not result in any adverse physical effects. Performing water audits, site retrofits, and repairs presents no risk to the public or environment, therefore, this Project is categorically exempt from the requirements of CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

This Project will make significant contributions to improve the sustainability of regional and local supplies. Water supply savings of 308 AFY through conservation efforts will offset the need for imported supplies and allow for future use. The ability to conserve existing water supplies for future use is a key strategy for addressing both current near-term drought conditions and long-term drought preparedness. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(6) Promote water conservation
(7) Improve landscape irrigation efficiencies
(8) Achieve long-term reduction of water use

The conservation benefit will be achieved by retrofitting inefficiencies in public facilities throughout Central Basin's service area. Performing water audits will allow Central Basin to achieve the 308 AFY water savings. The Project will target the largest water users with priority given to public facilities within DACs in order to allow more local water resources to be saved. Long-term reduction of water use is expected through the use of newly installed water efficient. The Project also promotes water conservation by educating the public on the water efficient measures.

Secondary Physical Benefit: Water Quality Improved Through Nitrate/Nitrite Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

The Los Angeles Regional Water Quality Control Board (RWQCB) has set a total maximum daily load for nutrients such as Nitrate/Nitrite in the impaired Los Angeles River Watershed (which is within the GLAC Region). The Project is needed because Los Angeles RWQCB Resolution No. R12-10 establishes goals for the Region to reduce the amount of nutrients being transported through the watershed as a result of both stormwater and incidental runoff. The release of these constituents in the watershed can cause oxygen depletion in aquatic ecosystems and can have serious health effects on aquatic wildlife. With the drought, less rain has been able to wash away constituents accumulating on the land, and as a result, incidental urban runoff is playing a bigger role in the transportation of Nitrate/Nitrite to local water bodies. Incidental runoff in urban areas, due to overwatering and inefficient turf irrigation release, is a key transport mechanism for excess fertilizer used on turf. For this Project, Nitrate/Nitrite was chosen as the indicator constituent since it is found in all fertilizers and is naturally occurring in soil.

The installation of irrigation reducing devices at multiple sites in the Project area, the amount of runoff picking up and transporting excess Nitrate/Nitrite to local water bodies in the GLAC Region will be reduced. This Project can play a key role in helping to meet the surface water quality needs and objectives for Central Basin and the Region.

2) Estimates of Without Project Conditions

Without the Project, the existing higher levels of irrigation, urban runoff and Nitrite/Nitrate and other contaminant concentrations will be maintained in local waterways. The runoff will continue to have pollutant concentrations at current levels. Specifically, Nitrate/Nitrite in the runoff will remain at approximately 2 – 2.5 mg/L.

3) Descriptions of Methods Used to Estimate Physical Benefits

The primary methods used to estimate the potential reduction in Nitrate/Nitrite through the installation of irrigation efficiency devices for this Project were based upon the *Residential Runoff Reduction Study* previously completed by the Municipal Water District of Orange County (MWDOC) and Irvine Ranch Water District (IRWD) in 2004 *(MWDOC & IRWD; 2004)*. The *Residential Runoff Reduction Study* was used by Central Basin since the sites studied are typical throughout Southern California and would be representative of Central Basin's area and potential site locations. The study showed examples of how installing landscape irrigation reduction devices will reduce the amount of total dry-weather runoff, and therefore reduce the amount of constituents, such as Nitrate/Nitrite, being transported in the watershed[18]. The study analyzed a site, which received a combination of public education and the installation of water efficiency devices and system repairs, and observed the subsequent reduction in total runoff as well as improvements in water quality. The analyzed site achieved approximately 1 mg/L of Nitrate/Nitrite concentration reduction. The outdoor irrigation retrofits and repairs that will occur as part of this Project is comparable to those implemented in the study. Therefore, it can be anticipated that this Project will achieve the same amount of reduction in concentration. However, to allow for the differences in the devices used and customer behavior, it was conservatively estimated that 50 percent (or 0.5 mg/L) of the reduction in Nitrate/Nitrite will be achieved during full implementation for this Project.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

No new facilities or policies are required in order to obtain the physical benefit from the Project other than those included as part of the Project. To achieve this benefit, water audits will need to be performed on public facility sites, efficient irrigation head sprinklers and/or smart irrigation system controls will be installed and overall public education will be provided.

[18] MWDOC and IRWD, The Residential Runoff Reduction Study, 2004, pg ES-5

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

This Project will not result in any adverse physical effects. Performing water audits, site retrofits, and repairs presents no risk to the public or environment, so the Project is categorically exempt from CEQA.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While not directly addressing long-term drought preparedness, the secondary benefit will help make significant contributions by improving the water quality in the runoff being transported in local waterways from over-irrigation and over-fertilization. This Project will make significant contributions to improving the sustainability of regional and local supplies by offsetting imported water use which will allow supplies to be conserved for future use. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this Project will:

(3) Promote water conservation
(4) Improve landscape irrigation efficiencies
(5) Achieve long-term reduction of water use

The Project also promotes water conservation by educating the public on the water efficient measures as well as water quality benefits.

Direct Water-Related Benefit to a DAC

Approximately 49% of Central Basin's service area is considered DAC as determined by geographic coverage of the area. This Project will enable Central Basin to specifically address the water related needs of specific DACs including Bell Gardens, Montebello, Bell, Commerce, Cudahy, Huntington Park, Maywood, Walnut Park, Vernon, East Los Angeles, Lynwood, South Gate, Florence-Graham, Willowbrook, Hawaiian Gardens, and Paramount. By helping these communities reduce overall water use, the ability to minimize water bills is increased. Without this Project, these DACs may find it challenging to achieve these water savings because of the upfront costs associated with purchasing and installing water efficient devices. This Project will be able to assist DACs during and beyond the drought by providing the tools necessary to achieve water reductions. Through the installation of outdoor landscape efficient devices, public facilities will be able to identify and remediate potential leaks which will allow for further reduction in water bills, resulting in a significant benefit for DACs.

The improved water quality in local water bodies will also directly benefit local DACs. Reduced Nitrate/Nitrite concentrations in urban runoff will help reduce impairment of the designated beneficial uses of these local resources. The Los Angeles RWQCB establishes goals for the region to reduce the amount of nutrients being transported through the watershed as a result of both stormwater and incidental runoff. The release of these constituents in the watershed can cause oxygen depletion in aquatic ecosystems and can have serious health effects on aquatic wildlife. These common pollutants have been found to directly impact human and ecosystem health.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Southeast Water Efficiency Program Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Saved	Save 308 AFY of potable water supply	Tools and Methods: Water consumption data from billing records from each site will be compared against previous year's data quarterly after retrofits are completed to determine water savings. Locations: Data will be collected at each of the retrofitted sites. Data to be Collected: Customer billing data. **The monitoring tools and targets are appropriate for the benefits claimed because** it will provide an accurate estimate of the amount of potable water saved. **The monitoring data will be used to measure performance by** analyzing each year's billing data to determine the actual water usage for each customer and comparing it to the historical use.
Secondary Benefit – Water Quality Improved	Reduce Nitrate/Nitrite concentrations by 0.5 mg/L	Tools and Methods: Central Basin will acquire the services of a site sampler who will: a) observe the occurrence of runoff from over-irrigation of both before and after the outdoor retrofit; b) collect samples for sites to determine the before and after concentration of Nitrate/Nitrite in the runoff. Locations: Physical observations will be made at 10% of the newly implemented sites over the first four years. Since it is estimated that 25 sites a year will be implemented, approximately 2-3 sites will be monitored per year for the first 4 years. Data to be Collected: Concentration of Nitrate/Nitrite (mg/L) before and after retrofit will be sampled. Pictures at sites to document runoff, if any, will be taken. Water use billing data from all retrofitted sites with designated meters for their outdoor irrigation consumption will be analyzed. **The monitoring tools and targets are appropriate for the benefits claimed because** they provide a conservative and realistic estimate of the reduction of Nitrate/Nitrite provided by the Project. The tools will allow Central Basin to observe the level of reduction in the amount of Nitrate/Nitrite concentration in the runoff. **The monitoring data will be used to measure Nitrate/Nitrite reduction from the water samples collected by** analyzing potable water usage at each site where efficient irrigation will be installed and applying all of the tools necessary to obtain information about how much Nitrate/Nitrite was reduced. Validating the benefits will require a pre-intervention and post-intervention analysis that will allow Central Basin to observe the occurrence of runoff and the reduction in Nitrate/Nitrite concentration.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis	
Project Name: Southeast Water Efficiency Program	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Saved • Secondary Benefit – Water Quality Improved through Nitrate/Nitrite Reduction
Question 2	**Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?** Alternatives were examined for that could provide the water saving benefit, but no others were identified that could achieve both water supply and water quality benefits of this Project.
	If no, why? Not applicable.
	If yes, list the methods (including the proposed project) and estimated costs. An alternative method that could achieve the same types of physical benefit would be to allow the natural replacement of fixtures throughout the facilities. Central Basin would not incur any costs for this since it will rely on the customers to cover the costs of buying and installing devices; therefore, the cost for this alternative would be close to $0. In addition, according to Central Basin's Water Use Efficiency Master Plan, alternative water resource solutions could be secured through water recycling in order to serve the increasing demand. These solutions were not carried forward to a cost analysis since it was found that water use efficiency programs will provide more immediate benefits. The proposed Project cost is $2,034,295.
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 least cost alternative to rely on the natural replacement of conservation fixtures by the public facilities was not chosen since it isn't guaranteed that these benefits can be achieved within the same timeframe. It is expected that a similar level of conservation savings would be achieved, but it would take much longer and will not provide immediate drought relief.
Comments: • *Water Use Efficiency Master Plan, 2011, Central Basin Municipal Water District*	

Project 20: Water LA Neighborhood Retrofits Project (Project)
Implementing Agency: The River Project
Project Description: ***(25 Word)*** The Project will install stormwater parkway basins and retrofit homes with Low Impact Development features to increase infiltration and improve water quality in DACs.

(Expanded) The River Project, as lead organization, is partnering with the Los Angeles Department of Water and Power (LADWP), the City of Los Angeles Bureau of Sanitation (LASAN), the County of Los Angeles Department of Public Works (LACDPW), and CalFire. The Project will produce 132 AFY of water and improve water quality through stormwater recharge to the San Fernando Groundwater Basin. These benefits will be realized by implementing 1,000 parkway basins and 100 home retrofits designed to capture and infiltrate stormwater, reduce urban runoff, and reduce water use in eastern San Fernando Valley. The Project includes home retrofits in eight Disadvantaged Community (DAC) neighborhoods; with many of the parkway basins installed in and around the home retrofit sites. Additional parkway retrofits will be installed in DACs where they can address multiple needs or concerns (e.g. groundwater recharge, water quality, local flooding, tree canopy, habitat), add value to planned or existing green infrastructure projects, and increase public awareness. Once sites have been identified, the Project team will reach out to community-based organizations and engage participants through: community meetings; flyers; door-to-door visits; the Water LA website and Site Assessment application; and various social media tools. Participants will take part in the design and implementation of their site retrofits by signing participation agreements and stewardship pledges.

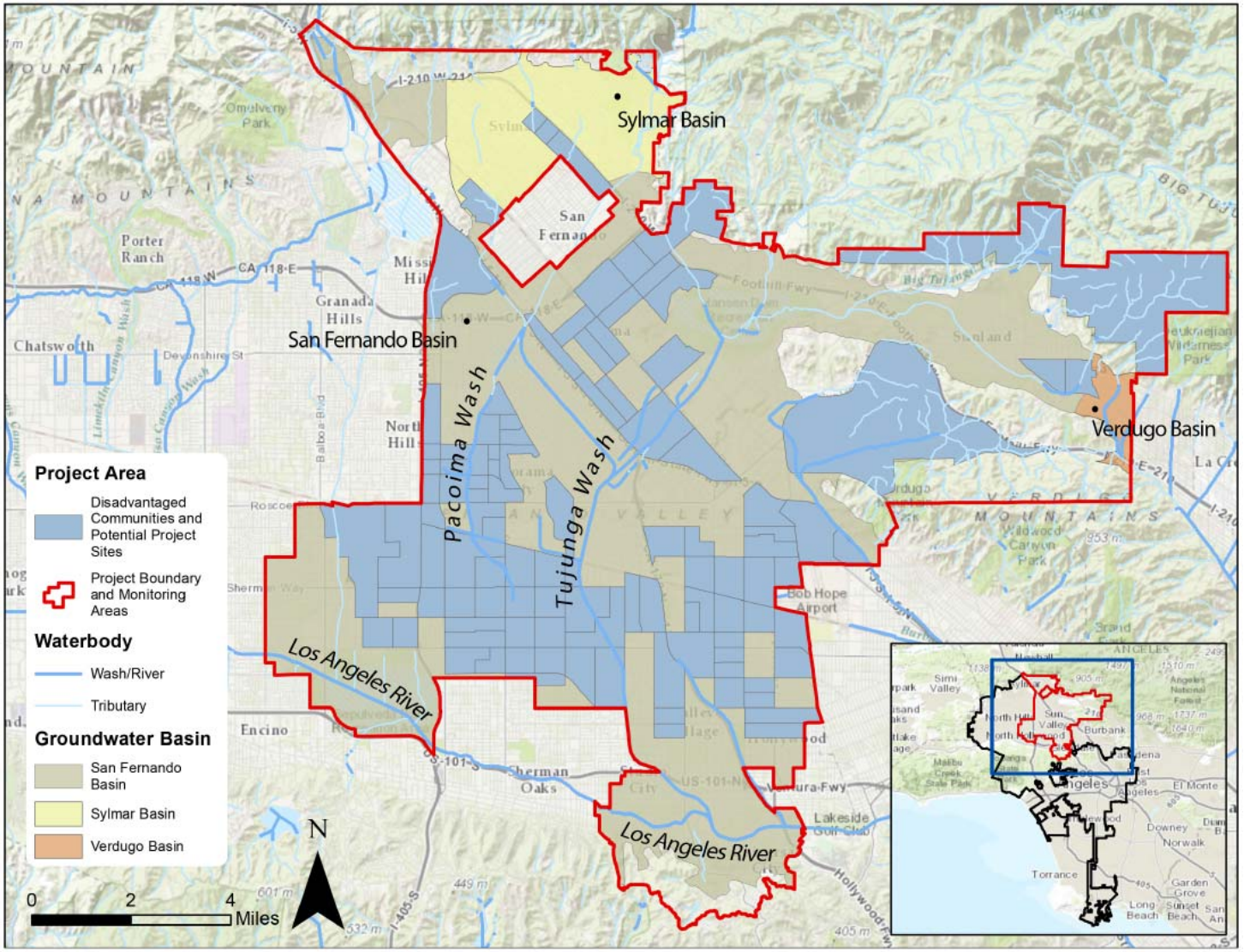
The major physical components of the Project include installing 1,000 parkway basins and 100 home retrofits. The parkway basins will have curb cuts allowing street runoff to enter the basin, rock reinforced slopes and erosion control, mulch, native trees and vegetation designed to detain, remediate, and infiltrate the runoff during storms and dry weather flow events. Home retrofits can include turf removal, rain tanks, rain grading, permeable surfaces, infiltration trenches, cool trees, greywater systems, and native and/or edible landscapes.

The anticipated physical benefits of the Project include the primary benefit of adding 132 AFY potable water supply to the San Fernando Groundwater Basin through stormwater recharge to increase the City of Los Angeles' local water supply. The Project provides a secondary benefit of improving water quality by preventing 0.125 mg/L of zinc contained in urban runoff from reaching the Los Angeles River. These flows are instead retained and infiltrated in the parkway basins and will help to reduce flooding in these neighborhoods. Home retrofits will provide potable water conservation through turf reduction, greywater installations, and rain tanks, which can reduce the overall cost of water for DACs. The Project will also improve habitat for wildlife through the installation of parkway basins, native plants, and tree cover.

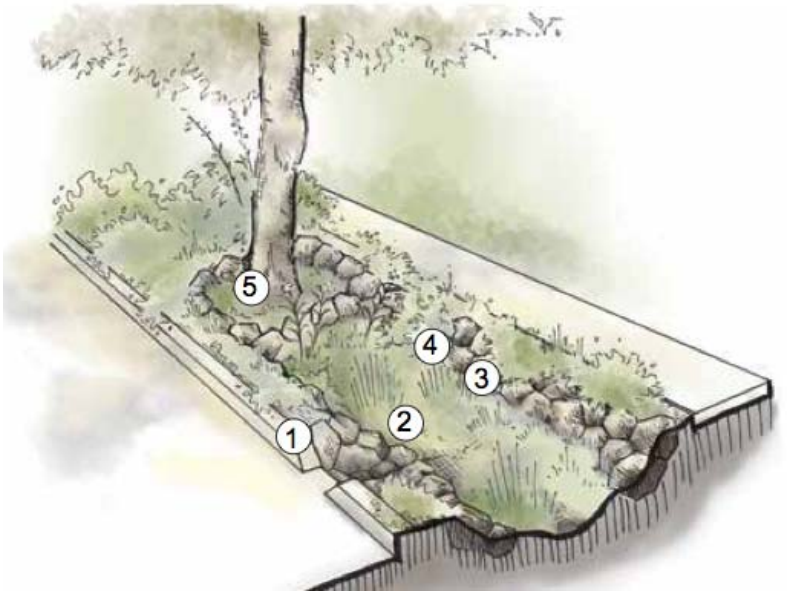
The Project addresses a current need of the region by increasing local water supply and improving water quality in the Los Angeles River Watershed through urban runoff management. The Greater Los Angeles County (GLAC) 2014 Integrated Regional Water Management (IRWM) Plan has highlighted distributed stormwater infiltration as a key strategy to meeting the objective of increasing use of local supplies, improving surface water quality and mitigating the impacts from greenhouse gas emissions on climate change. The Los Angeles River is listed as impaired for trash, metals, nutrients and bacteria and flows through many DACs and other communities identified by CalEnviroScreen as climate vulnerable.

The intended outcome of the Project is to offset imported water use through water conservation and stormwater recharge, reduce polluted surface water runoff, expand habitat and biodiversity, mitigate local flooding, increase tree canopy, and reduce greenhouse gas emissions.

Project Map


Sylmar Basin
San Fernando Basin
Verdugo Basin
Pacoima Wash
Tujunga Wash
Los Angeles River
Los Angeles River
Project Area
Disadvantaged Communities and Potential Project Sites
Project Boundary and Monitoring Areas
Waterbody
Wash/River
Tributary
Groundwater Basin
San Fernando Basin
Sylmar Basin
Verdugo Basin
N
0 2 4 Miles
Porter Ranch
Granada Hills
Chatsworth
Encino
Sherman Oaks
Bob Hope Airport
Lakeside Golf Club
Torrance
Burbank
Downey
Norwalk
Long Beach

Parkway Basin Diagram



1 Curb cut
2. Erosion control/sediment trap
3. Stormwater capture basin
4. Rock slopes
5. Optional tree shelf

Project Physical Benefits

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

- Primary Benefit – Water supply produced
- Secondary Benefit – Water quality improved through zinc reduction

The primary benefit of water supply produced through the capture and infiltration of stormwater and urban runoff through the implementation of the parkway basins and home retrofits is quantified in the table below. Although not quantified, the home retrofit components of turf removal, greywater systems, and rain tanks will increase potable water savings, which provides immediate drought relief and long-term water supply sustainability.

Other qualified Project benefits include decreased flooding in DACs through increased infiltration; increased habitat for wildlife, increased water efficient and edible landscape for home owners; increased supply reliability both locally with onsite rainwater capture and regionally with increasing groundwater recharge and decreased energy consumption and greenhouse gas emissions by decreasing dependence on imported water.

Primary Benefit – Water Supply Produced

The table below provides information on the primary benefit of water supply produced using parkway basins and home retrofits that will capture and infiltrate stormwater and urban runoff. The Project's phased implementation is reflected in the table below with benefits achieved as early as 2016 and full annual benefits achieved by 2020. Over the 30 year useful life of the Project it is estimated that approximately 4,242 AF of urban runoff will be infiltrated into the San Fernando Basin Groundwater Basin.

Table 5 – Annual Project Physical Benefits
Project Name: Water LA Neighborhood Retrofits
Type of Benefit Claimed: Primary Benefit – Water Supply Produced
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 30+ years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2015	0	0	0
2016	0	17.1	17.1
2017	0	53.1	53.1
2018	0	91.0	91.0
2019	0	120.9	120.9
2020 – 2049	0	132	132

Table 5 – Annual Project Physical Benefits
Project Name: Water LA Neighborhood Retrofits **Type of Benefit Claimed:** Primary Benefit – Water Supply Produced **Units of the Benefit Claimed:** AFY **Anticipated Useful Life of Project (years):** 30+ years

Comments:

- *LADWP hydrologic model, 2015*: Used to determine the volume of stormwater runoff that each parkway basin (0.125 AFY/parkway basin) and average home retrofit (0.07 AFY/home retrofit) could capture and infiltrate to the groundwater basin. Assumptions were made on the average size of each parkway basin and home retrofit, runoff tributary area, runoff coefficient, and infiltration capacity for the sites. Additionally, precipitation data from the La Tuna Debris Basin rain gage (near the northeastern San Fernando Valley Project area) was used as input to the model.
- To account for the phased installation of the 1,000 parkway basins from early 2016 through mid-2019, it was assumed that 23-24 parkway basins would be installed each month (262 in 2016, 286 in 2017, 286 in 2018, and 166 in 2019). A prorated annual benefit (based on the number of months the basins were operational in that year) was applied to the year that retrofit was installed with full annual benefit for each subsequent year through 2049.
- To account for the phased installation of the 100 home retrofits from early 2016 through early mid-2019, it was assumed that 1-3 home retrofits would be completed each month (20 in 2016, 30 in 2017, 30 in 2019, and 20 in 2019). A prorated annual benefit (based on the number of months the retrofits were operational in that year) was applied to the year that retrofit was installed with full annual benefit for each subsequent year through 2049.
- The useful life of the Project is estimated at 30 years based on LADWP's standard planning horizon though the Project benefits are expected to continue beyond 30 years assuming the Best Management Practices (BMPs) are properly maintained.

Secondary Benefit – Water Quality Improved through Zinc Reduction

To quantify the secondary benefit of water quality improved through the Project, a single representative constituent of zinc was selected. The reduction of zinc as a result of Project implementation is intended to reflect the expectation that many other contaminates will also be reduced, including copper, lead, nutrients, bacteria, and trash. The Project will reduce zinc concentrations to the Los Angeles River by capturing and infiltrating urban runoff. This benefit represents the removal of the zinc concentrations present in the urban runoff that will be captured through the parkway basins and home retrofits instead of flowing to the Los Angeles River. The Project will begin implementing the parkway basin and home retrofits in early 2016. The annual benefits described below correlate to a complete zinc concentration removal for each AFY of flow that does not runoff into the River. So while the concentration level reduction remains the same for each year of implementation, the total loading of zinc that reaches the River will decrease as more basins are implemented during the four year implementation schedule.

Table 5 – Annual Project Physical Benefits

Project Name: Water LA Neighborhood Retrofits
Type of Benefit Claimed: Secondary Benefit – Water Quality Improved through Zinc Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 30+ years

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2015	0	0	
2016	0	0.125	0.125
2017	0	0.125	0.125
2018	0	0.125	0.125
2019	0	0.125	0.125
2020 – 2049	0	0.125	0.125

Comments:

- *User Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.0), Technical Appendices, Page C-22, December 2008:* Event Mean Concentration (EMC) of the zinc for high-density single family residential land use based on Los Angeles County 1994-2000 flow-weighted composite sampled land use monitoring data. The EMC is assumed to be representative of the zinc concentration in the urban runoff that will be captured by the Project in parkway basins, rain gardens and infiltration trenches. The entire volume that is infiltrated will be removed from the runoff, thus 100% of this concentration is removed.
- The useful life of the Project is estimated at 30 years based on LADWP's standard planning horizon though the Project benefits are expected to continue beyond 30 years assuming the BMPs are properly maintained.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit: Water Supply Produced

1) Explanation of the Need for the Project, Including Recent and Historical Conditions

LADWP provides water to the City of Los Angeles. Historically, LADWP imported water from the Los Angeles Aqueduct (LAA), the SWP, and the CRA to make up the majority of its supply. Of the 11% of groundwater supplies used, 85% comes from the San Fernando and Sylmar Groundwater Basins. The Los Angeles County Flood Control District (LACFCD) and LADWP actively recharge these groundwater basins with stormwater originating in the upstream San Gabriel Mountains. However, because of the high level of urbanization, the majority of precipitation that falls in the San Fernando Valley flows into storm drains and out to the ocean to prevent flooding. Recently, drought conditions, increasing population, and the threat of future climate change have highlighted the need for LADWP to increase its focus on developing reliable local water supplies, such as stormwater to offset imported and potable supplies. Capturing and re-using stormwater on-site reduces potable water demand, while capturing and infiltrating stormwater into subsurface groundwater aquifers increases local potable water supply. This Project increases local groundwater reserves and enhances the reliability of the City of Los Angeles' local water supply.

The Project is needed because it provides a viable means of recharging the San Fernando Groundwater Basin at the neighborhood level. The majority of groundwater recharged into the San Fernando Groundwater Basin is a result of large centralized recharge facilities (i.e. Lopez, Tujunga, Pacoima, Branford, and Hansen Spreading Grounds). Although these facilities have the capacity to recharge high volumes of stormwater, the prospect of building new similar spreading facilities is unlikely given land use constraints and costs. Projects to enhance recharge through smaller scale, distributed recharge projects at the sub-regional and neighborhood levels need to be implemented. These types of distributed recharge projects have been highlighted in regional planning documents such as the Upper Los Angeles River Watershed EWMP and LADWP's Stormwater Capture Master Plan. This Project provides the opportunity to implement standardized smaller scale stormwater capture in the northeastern San Fernando Valley, an area situated above the San Fernando and Sylmar Groundwater Basins with soils that are very conducive to infiltration.

2) Estimates of Without Project Conditions

Once the Project has been fully implemented, an average of 132 AFY of water will be recharged into the San Fernando and Sylmar Groundwater Basins through the parkway basin and home retrofits. Without the Project, this stormwater would continue to run off hardscape into storm drains and out to the ocean. There are currently no other planned retrofit projects within the Project area. While it is possible that individual homeowners may be planning to retrofit their homes without the Project, it can be assumed that these individual efforts would not amount to the benefits that can be achieved through a full-scale incentivized Project. Additionally, the neighborhoods that will be selected for this project will be in DACs where low income levels hinder the homeowners' ability to make these retrofits on their own. Thus, it is expected that the homes selected would not be retrofitted without the Project.

3) Descriptions of Methods Used to Estimate Physical Benefits

The water supply benefit for the Project was calculated by estimating the volume of stormwater that could potentially be captured and infiltrated by a standard size parkway basin and the sum of typical low-impact development (LID) features for a home retrofit. Because each home retrofit will involve different LID features depending on what each homeowner chooses for their property, the actual capture and infiltration volume will vary from site to site. To estimate the supply benefit contribution from the 100 home retrofits, an average capture and infiltration volume per home retrofit was used.

The supply benefit for all retrofits was quantified using LADWP's hydrologic model for 2015 that simulates the amount of stormwater that would be captured by a BMP of a particular size over a 10 year period using actual precipitation data observed at 10 minute intervals. The precipitation data used for this simulation came from the La Tuna Debris Basin rain gage, which receives an annual average of 16.44 inches of rainfall and is located in close proximity to the northeastern San Fernando Valley. The ten year period chosen for the simulation was between Water Year 1997-98 and 2006-07, which received an annual average of 15.24 inches per year. Simulations were performed for a range of hypothetical scenarios. The scenario chosen as the estimated physical benefit represents the mean value of the worst-case and best-case modeled scenarios.

The table below shows the modeled stormwater capture benefit consistent with a typical parkway basin retrofit size of 5'x18'x1.5', a standard single-family residential landuse runoff coefficient of 42% derived using the weighted average residential runoff from parcels and roadways (*Los Angeles County Hydrology Manual, 2006*), tributary areas ranging from 0.25 acres to 1 acre (based on the average size that can be managed by the basins), and infiltration rates ranging from 1 inch per hour to 4 inches per hour (this range of infiltration rates is consistent with observed LADWP data for the northeastern San Fernando Valley). Using these inputs, the LADWP hydrologic model estimates a mean value of 0.125 AFY of stormwater infiltrated, with the best case infiltrating 0.18 AFY and the worst case infiltrating 0.07 AFY. With 1,000 parkway retrofits proposed in the Project scope, the estimated capture value equates 125 AFY once all retrofits have been installed. The actual groundwater recharge benefits could be less than or greater than the estimated amount depending on actual precipitation and tributary area characteristics.

Parkway Retrofit Annual Stormwater Capture Benefit (AFY)					
42% Runoff Coeff		Infiltration Rate (in/hr)			
		1	2	3	4
Tributary Area (AC)	**0.25**	0.07	0.09	0.10	0.11
	0.5	0.09	0.11	0.13	0.15
	0.75	0.10	0.13	0.15	0.17
	1	0.10	0.13	0.16	0.18

For the 100 proposed home retrofits, an average residential lot size of 64' x 104' was used based on a typical lot size from the Water LA Project Pilot project. If each residential retrofit is treated as an individual tributary area, this would equate to a maximum 0.15 acre tributary area per home retrofit. Each home retrofit would have a different combination of BMPs, so assumptions must be made in order to approximate an annual average groundwater recharge benefit. A standard single-family residential land use runoff coefficient of 42% is assumed for each site, the installed home retrofits would be designed to capture runoff from the entire tributary area (for a 1" storm at minimum), and the soil infiltration rates of the home retrofits would be equivalent to a typical parkway retrofit, on average. Using these inputs and the LADWP hydrologic model, each home retrofit could capture an estimated average of 0.07 AFY. Since the actual groundwater recharge benefits could be less than or greater than the estimated amount depending on actual precipitation, tributary area characteristics, and BMPs chosen at each home, the average of 0.07 AFY per retrofit was used resulting in a total 7 AFY of stormwater captured and infiltrated from 100 home retrofits.

Combining the two types of retrofits yields an estimated total of 132 AFY (125 AFY + 7 AFY = 132 AFY) once all parkway and residential retrofits have been completed.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

Parkway basin retrofits will be installed in existing residential parkways. Existing parkways will be retrofitted with curb cuts to divert stormwater from the street gutter into parkways basins. Each parkway will be designed to capture, treat and infiltrate stormwater into the ground by removing existing turf, excavating a basin up to 2' deep with side slopes of less than 3%, making two 45 degree cuts in the curb to leave an inlet 18-24" wide, installing dry stack rock

to armor slopes and create an erosion control feature at the inlet, installing mulch, and planting vegetation. A mid-level tree shelf and street tree are optional. Standard engineering plans for construction of parkways swales on existing public right-of-way areas to capture and treat storm runoff have been approved by the City of Los Angeles in 2010. These Standard Plans are being modified to match the parkway basins that will be installed by the Project and are expected to be approved by the end of 2015.

Home retrofits will include the installation of stormwater infiltration BMPs such as rain gardens, infiltration trenches, bioswales, and permeable pavers to capture, treat and infiltrate runoff. Identification of and coordination with participating residents from design to implementation will help to ensure long-term maintenance and effectiveness of the retrofits. Each participant will sign an agreement to maintain the LID features in such a way to ensure the benefits are ongoing.

While greywater systems, turf removal and rain tanks will not be contributing to stormwater infiltration they will be a component of some retrofits as a means of further reducing water use (which increases supply available for other uses). Though greywater systems that will divert washing machine water to landscape uses ("Laundry-to-Landscape" greywater systems) do not require permits, they will be required for those residences that choose to implement branched drain greywater systems.

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no known potential adverse physical effects as a result of capturing and infiltrating stormwater to reduce pollutant loading downstream. Because the soils will filter the runoff through soil aquifer treatment, and plant material utilized in parkway basins uptake pollutants, the Project is not expected to negatively impact groundwater quality. Salts, which can bypass the soil to the aquifer, will be minimal since the water will be stormwater runoff, which is typically low in salts. It is possible that the pollutants can accumulate in the soils, but these impacts should be minimal and will be mitigated with proper plant and soil maintenance.

The parkway retrofits intercept trash and other debris before they reach the storm drain. As such, these retrofits may become inundated with trash and other debris if not properly maintained. To mitigate these impacts, the parkway retrofits will be installed in front of residences where homeowners have agreed to perform basic maintenance (including trash removal, weeding, sediment removal, etc).

The parkway retrofits could also potentially pose tripping hazards for pedestrians. To mitigate these impacts and prevent injury, each parkway retrofit will be excavated no greater than 24" deep with side slopes not to exceed 3%. Additionally, project signage will inform pedestrians of the Project.

Infiltration near homes can pose a threat to the integrity of the foundation of the home. As part of the Project design, Strategy Plans were developed, in coordination with the City and County of Los Angeles, that lay out the setback requirements for infiltration as well as other important design elements for the rain tanks, greywater systems, parkway basins, permeable pavement, infiltration trenches, and grading for rain capture to ensure the integrity of the home and the proper function of the retrofit.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

The Project addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. The Project increases a local water supply that can be used in times of drought by increasing the capture and infiltration of stormwater and urban runoff to the San Fernando Groundwater Basin and reducing outdoor water demands at single-family residences. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will:

(10) Promote water conservation and reuse
(11) Achieve long-term reduction of water use
(12) Promote efficient groundwater basin management
(13) Promote solutions that yield a new water supply

The Project promotes water conservation by implementing turf removal at single-family residences and planting native landscapes that will require less water. The Project also promotes water conservation and reuse by implementing greywater systems and rain tanks to capture stormwater for reuse onsite. The Project will achieve long-term reduction of water demand at single-family residences by implementing these water saving features as part of the home retrofits to reduce outdoor water use and offset potable water demand. The Project promotes efficient groundwater basin management by contributing to distributed groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers a new water supply source by capturing stormwater and urban runoff that would otherwise be directed out of the watershed through storm drains and flood control channels and lost to the ocean.

Secondary Physical Benefit: Water Quality Improvement through Zinc Reduction

1) Explanation of the Need for the Project, Including Recent and Historical Conditions
Recently, Total Maximum Daily Loads (TMDLs) were developed by the Los Angeles Regional Water Quality Control Board (LARWQCB) to address the water quality degradation in the Los Angeles River and its tributaries, including TMDLs for metals (including zinc). The Municipal Separate Storm Sewer System (MS4) Permit requires that local agencies develop plans to reduce the level of pollutants in the water bodies and provide groundwater recharge by capturing runoff during the wet season. One such plan for the watershed, the Upper Los Angeles River Enhanced Watershed Management Program (EWMP) Plan, documents the need for distributed BMP projects such as the Water LA Pilot Project that was completed in 2014 (*Draft EWMP Plan for the Upper Los Angeles River Watershed Management Group, June 2015, pages 5-3 and 5-9*), and the City of LA's intention to implement more programs that increase stormwater capture and infiltration at the neighborhood scale.

The Project's distributed stormwater capture and treatment installations are the type of measures called out in these planning documents as necessary to meet the local and regional water quality needs. By implementing parkway basins throughout eight DAC neighborhoods in the eastern San Fernando Valley, as well as home retrofits that include onsite stormwater capture and infiltration, the Project will reduce pollutant loading to the Los Angeles River. Constituents that are currently impairing the River include zinc, other metals, nutrients, bacteria, and trash. Through implementation of this Project in high-density DACs, the Project will target and benefit communities that would otherwise not be able to afford these retrofits.

2) Estimates of Without Project Conditions
Without the Project, there may be other LID/BMP projects that are implemented in the Los Angeles River Watershed, though it is unlikely that these projects would prioritize DACs and be able to implement as many of these measures without the funding. Additionally, the scale of this Project allows a real benefit to be readily quantified as opposed to a retrofit project that may occur in any one location (so it is assumed it would be 0 AFY without the Project). The Project aims to implement 1,000 parkway basins and 100 home retrofits in eight target DAC neighborhoods that will be selected based on need and site suitability. Without a distributed LID project of this scale, it is unlikely that urban runoff in these neighborhoods will be reduced, thus there would be no water quality improvement (particularly no zinc reduction) in the runoff from these areas.

3) Descriptions of Methods Used to Estimate Physical Benefits

The parkway basins and home retrofits are expected to improve water quality in the Los Angeles River and its tributaries by capturing, treating, and infiltrating stormwater and urban runoff. The Project uses zinc as the representative contaminant for calculating the concentration reduction benefits associated with improved water quality of the Los Angeles River, since this metal constituent is identified in the TMDL for the Los Angeles River. The zinc concentration in pre-retrofit site urban runoff was estimated to be 0.125 mg/L. The Los Angeles County User Guide for the Structural BMP Prioritization and Analysis Tool (SBPAT v1.0) developed in December 2008 was used to estimate the event mean concentration in runoff for zinc for the high-density single-family residential land uses typical in this area (Technical Appendices, page C-22). The land use-based pollutant concentration is based on monitoring data collected for the Los Angeles area. This zinc concentration of 0.125 mg/L is assumed to be the average zinc concentration in the runoff that will be captured and infiltrated by the Project and not allowed to enter the Los Angeles River and its tributaries.

The Project assumes a 100% reduction of zinc concentrations (or 0.125 mg/L) for each unit of urban runoff not reaching the Los Angeles River as a result of the Project. The Project will begin implementing the parkway basin and home retrofits in early 2016. The annual benefits described in the benefits table correlate to a complete zinc concentration removal for each AFY of flow that does not runoff into the River. So while the concentration level reduction remains the same for each year of implementation, the total loading of zinc that reaches the Los Angeles River will decrease as more basins are implemented during the four year implementation schedule.

4) Identification of All New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

Parkway basin retrofits will be installed in existing residential parkways. Existing parkways will be retrofitted with curb cuts to divert stormwater from the street gutter into parkway basins. The parkways will be designed to capture, treat and infiltrate stormwater into the ground by removing existing turf, excavating a basin up to 2' deep with side slopes of less than 3%, making two 45 degree cuts in the curb to leave an inlet 18-24" wide, installing dry stack rock to armor slopes and create an erosion control feature at the inlet, installing mulch, and planting vegetation. A mid-level tree shelf and street tree are optional. Standard engineering plans for construction of parkways swales on existing public right-of-way areas to capture and treat storm runoff were approved by the City of Los Angeles in 2010. These Standard Plans are being modified to match the parkway basins that will be installed by the Project and are expected to be approved by the end of 2015.

Home retrofits will include the installation of stormwater infiltration BMPs such as rain gardens, infiltration trenches, swales, and permeable pavers to capture, treat and infiltrate runoff. Identification of and coordination with participating residents from design to implementation will help to ensure long term maintenance and effectiveness of the retrofits. Each participant will sign an agreement to maintain the LID features in such a way to ensure the benefits are ongoing.

While greywater systems, turf removal and rain tanks will not be contributing to stormwater infiltration they will be a component of some retrofits as a means of further reducing water use (which increases supply available for other uses). While greywater systems that divert washing machine water to landscape do not require permits, they will be required for those residences that choose to implement branched drain greywater systems

5) Description of Any Potential Adverse Physical Effects and What is Being Done to Mitigate Them

There are no known potential adverse physical effects as a result of capturing and infiltrating stormwater to reduce pollutant loading downstream. Because the soils will filter the runoff through soil aquifer treatment, and plant material utilized in parkway basins uptake pollutants, the Project is not expected to negatively impact groundwater quality. Salts, which can bypass the soil to the aquifer, will be minimal since the water will be stormwater runoff,

which is typically low in salts. It is possible that the pollutants can accumulate in the soils, but these impacts should be minimal and will be mitigated with proper plant and soil maintenance.

The parkway retrofits intercept trash and other debris before they reach the storm drain. As such, these retrofits may become inundated with trash and other debris if not properly maintained. To mitigate these impacts, the parkway retrofits will be installed in front of residences where homeowners have agreed to perform basic maintenance (including trash removal, weeding, sediment removal, etc).

The parkway retrofits could also potentially pose tripping hazards for pedestrians. To mitigate these impacts and prevent injury, each parkway retrofit will be excavated no greater than 24" deep with side slopes not to exceed 3%. Additionally, project signage will inform pedestrians of the Project.

Infiltration near homes can pose a threat to the integrity of the foundation of the home. As part of the Project design, Strategy Plans were developed, in coordination with the City and County of Los Angeles, that lay out the setback requirements for infiltration as well as other important design elements for the rain tanks, greywater systems, parkway basins, permeable pavement, infiltration trenches, and grading for rain capture to ensure the integrity of the home and the proper function of the retrofit.

6) Description of Whether the Project Addresses Long-Term Drought Preparedness

While the secondary physical benefit of improving water quality does not specifically address long-term drought preparedness, the Project as a whole does. As mentioned for the primary benefit, the Project addresses long-term drought preparedness by contributing to a sustainable water supply and reliability during water shortages. The Project increases a local water supply that can be used in times of drought by increasing the capture and infiltration of stormwater and urban runoff to the San Fernando Groundwater Basin and reducing outdoor water demands at single-family residences. Specifically from Table 1 – Statewide Priorities, of the 2015 IRWM Grant Program Guidelines, this project will:

(1) Promote water conservation and reuse
(2) Achieve long-term reduction of water use
(3) Promote efficient groundwater basin management
(4) Promote solutions that yield a new water supply

The Project promotes water conservation by implementing turf removal at single-family residences and planting native landscapes that will require less water. The Project also promotes water conservation and reuse by implementing greywater systems and rain tanks to capture stormwater for reuse onsite. The Project will achieve long-term reduction of water demand at single-family residences by implementing these water saving features as part of the home retrofits to reduce outdoor water use and offset potable water demand. The Project promotes efficient groundwater basin management by contributing to distributed groundwater recharge that helps sustain healthy groundwater levels. Lastly, the Project offers a new water supply source by capturing stormwater and urban runoff that would otherwise be directed out of the watershed through storm drains and flood control channels and lost to the ocean.

Direct Water-Related Benefit to a DAC

The Project will select eight DAC neighborhoods in the eastern San Fernando Valley to implement the 1,000 parkway basins and 100 home retrofits. The DACs were identified using the American Community Survey (2009-2013) GIS shapefiles for DAC tracts as having a median household income (MHI) of less than 80% the statewide MHI (XXX). The Office of Environmental Health Hazard Assessment's CalEnviroScreen was used to further refine these potential project sites by identifying the top 10% and 25% of climate-vulnerable communities in the eastern San Fernando Valley.

These communities are considered to be disproportionately burdened by multiple sources of pollution. The Project will further refine these potential sites by incorporating soil suitability data and known water quality issues to determine the most effective neighborhoods to select for the Project. While the specific homes selected for the Project will be determined at a later stage, 100% of the homes and parkway basins that will be retrofitted will be located within DACs, with priority given to homes within the top 10%-25% climate vulnerable communities.

The direct water-related need of the DACs is for clean, affordable water supplies to meet basic needs and climate resilience. Many DAC homeowners maintain vegetable gardens and fruit trees to meet basic food needs. As calls for conservation increase and water prices rise, rainwater harvesting can help DAC homeowners continue to meet their drinking water and food needs without increasing costs for water. The DACs in this Project area also have polluted urban runoff that can limit their ability to benefit from local water bodies like the Los Angeles River and its local tributaries. In addition these areas have experienced localized flooding during storm events. The eastern San Fernando Valley is covered with high-density single-family residential land use that has resulted in minimal permeable area for infiltrating stormwater flows. Some communities in the Project area that were established in the early 20th century have fewer drainage facilities, and some lack drainage infrastructure altogether. These areas are more prone to flooding during storms. As the Project Map shows, the general Project area is in a relatively flat, developed valley near steep mountain ranges that make the area prone to flooding issues. DAC communities often have lower tree canopy and higher ambient temperatures. Increasing tree canopy lowers temperatures and can decrease residents cooling and heating costs, but generally requires a reliable water source.

The Project provides a direct water-related benefit by assisting 100 DAC homeowners in retrofitting their properties for climate resilience that will provide a self-sustaining water supply while also reducing water demands associated with outdoor landscaping, tree canopy, and edible gardens. The reduction in water demands may translate into lower water use and water supply costs for each participant in the program. The Project will retrofit 100 homes by installing rain tanks, replacing turf with native landscape, shade trees and edible vegetation, and installing greywater systems at no cost to the owner. All these elements help reduce water demands outdoors, while also providing a new water supply for the homeowners through rainwater capture and reuse onsite. Homeowners will be able to conserve water and support thriving native and edible landscapes without increasing their costs and their neighborhoods will improve aesthetically, will be more bio-diverse, cooler, and flood-safe.

These Project BMPs will also reduce stormwater flows from the sites and the parkway basin retrofits will divert and capture roadway runoff helping to reduce flooding throughout the neighborhoods. These BMPs will capture and infiltrate approximately 132 AFY of stormwater to the groundwater basin which will no longer contribute to stormwater flows that flood these neighborhoods and create safety hazards.

Project Performance Monitoring Plan

Table 6 – Project Performance Monitoring Plan **Project:** Water LA Neighborhood Retrofits		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary Benefit – Water Supply Produced	132 AFY of stormwater infiltrated	Tools and Methods: A subbasin will be selected that currently drains to an existing catch basin and does not have any other current or future planned stormwater capture projects in place. A flow monitoring station will be installed to establish a baseline flow from one rainy season before any retrofits are implemented and compared to actual precipitation data in order to estimate a runoff coefficient for the subbasin. Once a baseline runoff coefficient has been estimated, approximately five parkway retrofits will be installed within the upstream tributary watershed. During future rainy seasons, the difference in flows monitored for similar storms would be compared between baseline and post-project conditions in order to estimate the volume of water retained by the retrofits within the tributary area. This method provides an accounting for potential variances between each individual retrofit's hydrologic characteristics without incurring capital and resource costs at each individual basin. The results observed under this study would then be applied to all of the improvements to estimate the total benefit provided by the project. Locations: Flow will be measured at a downstream storm drain from a designated drainage area. Data to be Collected: Flow measurements will be automatically recorded in cubic feet per second (CFS) and will be converted to total AFY after one year. **The monitoring tools and targets are appropriate for the benefits claimed because** the flow meters will record storm flows downstream of a known number of retrofits. These flows will be compared to baseline data. A hydrologic model using actual precipitation data will be used to estimate the change in flow due to the retrofits. **The monitoring data will be used to measure performance by** determining the average change in flow due to the installation of a number of retrofits. This change in flow will show the potential infiltration volumes as a result of the installations. The volume infiltrated by these retrofits will be extrapolated to estimate a total infiltration in AFY for the Project.

Table 6 – Project Performance Monitoring Plan **Project:** Water LA Neighborhood Retrofits		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Secondary Benefit –Water Quality Improved through Zinc Reduction	0.125 mg/L zinc reduction in the volume infiltrated by the Project	Tools and Methods: Water quality monitoring at parkway basin sites will be conducted to determine the concentrations of zinc per unit of flow that will not reach the Los Angeles River due to the parkway basin. The Project will monitor at least one wet weather event each year at least five parkway basins and two nearby storm drains in one of the eight Project neighborhoods. An average concentration can be used to estimate the concentration of zinc in the runoff in the Project area. The volume of water infiltrated by the project will be monitored as describe for the water supply benefit above to confirm the measured concentration of zinc in that volume is not flowing to the storm drains and out to the Los Angeles River. Locations: Water quality samples will be taken from parkway basins and nearby storm drains during wet weather events. Data to be Collected: Water quality data will at a minimum be collected for zinc, but most likely other metals, nutrients, and bacteria as well. **The monitoring tools and targets are appropriate for the benefits claimed because** the concentration of zinc in the runoff in these neighborhood will show the concentration that is reduced by infiltration through the Project and no longer contributing to zinc loading to the downstream water bodies. This is expected to be 0.125 mg/L, on average. **The monitoring data will be used to measure performance by** documenting the actual concentration of zinc in the runoff that is infiltrated by the project and prevented from flowing into the river. This concentration in combination with the volume infiltrated shows the total zinc reduction.

Cost Effectiveness Analysis

Table 7 – Cost Effective Analysis **Project Name:** Water LA Neighborhood Retrofits Project	
Question 1	**Types of benefits provided as shown in Table 5** • Primary Benefit – Water Supply Produced • Secondary Benefit – Water Quality Improved Through Zinc Reduction
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. Larger scale, centralized downstream recharge facilities are an alternative option for the proposed Project. These larger scale projects typically cost between $10 million and $100 million depending on the size of the facility (*Los Angeles Department of Water and Power Stormwater Capture Master Plan Interim Report, Appendix G*). These projects provide economies of scale for capturing large volumes of stormwater. However, these projects typically require significant planning effort, real estate purchases, and significant operation and maintenance needs. Dry wells are a geographically distributed alternative for the parkway retrofits. Each dry well typically costs around $50,000 to install (*Bid Results for the Sun Valley Economic Development Administration (EDA) Public Improvements Project, page 3*). Dry wells involve much higher capital cost, but have been shown to have useful lives of more than 40 years. Maintenance for these dry wells would be a taxpayer cost, but can be performed relatively inexpensively on an annual basis by the Los Angeles Bureau of Sanitation. Dry wells do not provide the same water quality benefits in addition to water supply benefits that the Project will provide. The parkway retrofits for this Project would cost an estimated $3,000 each. The useful life of these projects can vary depending on how frequently the retrofits are maintained. Maintenance for these projects can be performed without the use of heavy equipment, making them ideal for individual homeowners to maintain. The homeowner maintenance agreements for this Project will provide essential maintenance cost savings that increase the value of these retrofits in the long run.
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.** Although the Project is not the least cost alternative in terms of cost per AF captured, this Project provides much greater flexibility in terms of location when compared to centralized stormwater capture projects and provide a wider array of benefits. Installing dry wells requires heavy equipment to maintain and are better suited to public agency ownership.

Table 7 – Cost Effective Analysis **Project Name:** Water LA Neighborhood Retrofits Project	
	The residential and parkway retrofits provide an opportunity for the public to participate in stormwater capture and allows homeowners to perform maintenance without the use of heavy equipment. The homeowner maintenance agreements have the potential to provide a public benefit without requiring public funding. Furthermore, the parkway retrofits are vegetated with native plants and are designed to support street trees without potable water supplies. The plants uptake pollutant loads, expand habitat and biodiversity, and their root systems will increase the basins' infiltrative capacity over time. The increase in tree canopy creates lower ambient temperatures and reduces residential cooling costs in climate-vulnerable communities.
Comments: • *Los Angeles Department of Water and Power Stormwater Capture Master Plan Interim Report, Appendix G*: Cost of centralized stormwater capture facilitates. • *Bid Results for the Sun Valley EDA Public Improvements Project (Page 3)*: Alternative BMP (dry well) costs	