Attachment 7

Greater Los Angeles County Region

IRWM Implementation Grant Proposal

Technical Justification of Projects

Attachment 7 consists of the following items:

Technical Justification of Projects. The body of this attachment provides an overview of the physical benefits associated with each individual project in this proposal, as well as technical justification for these benefits.

Table of Contents

Introduction

For each project in this Greater Los Angeles County (GLAC) IRWM Implementation Grant Proposal, technical justification supporting claimed physical benefits has been provided. The purpose of this attachment is to provide a discussion of the benefits claimed, and reference the appropriate documents, studies or knowledge used as support.

A technical justification section has been written for each individual project, and includes:

- Summary listed of the types of physical benefits being claimed
- Narrative description of the without-project baseline
- Narrative description of the physical benefits (with project)
- Annual physical benefits summarized using Table 9 from the Implementation Grant PSP, for those benefits quantified in the narrative

The following sections include the technical justification for each project included in the Proposal.

Table 7-1: Summary Table

Project	Water Supply		Water Quality		Flood Protection	Habitat	Energy Conservation	Greenhouse Gas Reduction
	AFY	Reduce Delta Demands (AFY)	Improve Water Quality	Reduce imported salts (MT/yr)	Increase Flood Protection	acres	kWh/yr	MT/yr
Citywide Storm Drain Catch Basin Curb Screens	--	--	Project Specific	--	Project Specific	--	--	--
Dominguez Channel Trash Reduction	--	--	Project Specific	--	Project Specific	140	--	--
Dominguez Gap SG Improvement	1,000	1,000	Project Specific	--	Increase capacity: 1,000 AFY Reduce flows: 20 cfs	--	2,646,000	958
Foothill MWD Recycled Water Project	318	318	Project Specific	--	--	--	594,335	195
Marsh Park Phase II	1	1	Project Specific	--	Reduce flows: 0.77 cfs	3	8,266	2
Oxford Retention Basin	--	--	Project Specific	--	Increase capacity: 20 AFY	10	--	--
Pacoima SG Improvement	10,500	10,500	Project Specific	3,234	Increase capacity: 667 AFY Reduce flows: 77 cfs	6.7	27,600,000	9,047
Peck Water Conservation Improvement	1,800	1,800	Project Specific	555	Reduce flows: 50 cfs	--	4,545,000	1,492
San Jose Creek WRP Optimization	8,400	8,400	Project Specific	--	--	--	2,850,000	8,276
South Gardena RW Pipeline	120	120	Project Specific	--	--	--	301,200	99
Upper Malibu Creek Watershed Restoration	--	--	Project Specific	--	Project Specific	4	--	--
Vermont SW Capture	--	--	Project Specific	--	Increase capacity: 13.77 AFY	--	--	--
Walnut Creek SB Improvements	500	500	Project Specific	154	Increase capacity: 500 AFY Reduce flows: 6 cfs	--	1,262,500	414
Total	**22,639**	**22,639**		**3,943**	**Increase capacity: 2,201 AFY Reduce flows: 154 cfs**	**164**	**39,807,301**	**20,483**

Citywide Storm Drain Catch Basin Curb Screens

The Citywide Storm Drain Catch Basin Curb Screens Project (Project) proposes to install curb screens onto all of the City of Calabasas's storm drain catch basins to capture trash, sediment and vegetation before it can be discharged to local waterways, including the Los Angeles River and Malibu Creek.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-2**.

A. Water Quality
   - Avoidance of 48,224 pounds of trash, sediment and vegetation per year that would otherwise be discharged to local waterways and the Santa Monica Bay.
   - Avoidance of bacterial loading associated with trash, sediment, and vegetation that would otherwise be discharged to local waterways and the Santa Monica Bay.

B. Flood Protection
   - Reduce frequency of storm drain blockages from 4-5 times per year to 2-3 times per year

C. Habitat Protection
   - Improve habitat in and around receiving waters

D. Recreation
   - Improve recreation in and around receiving waters

Table 7-2: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Quality – Reduced trash, sediment, and vegetation loading to receiving waters	Pounds	*Curb Screen Effectiveness Project*, 2010 *Los Angeles River Trash TMDL Compliance Report,* 2011 *Technical Report: Assessment of Catch Basin Opening Screen Covers*, 2006
Water Quality – Reduced bacterial	qualitative	*Tracking Bacterial Pollution Sources in Stormwater Pipes*, University of New Hampshire, April 2003[1]

[1] Jones, Stephen H, et al., 2003. *Tracking Bacterial Pollution Sources in Stormwater Pipes.*

Physical Benefit	Unit	Technical Justification
loading to receiving waters		*Microbial Source Tracking & Identification A Fact Sheet from the Southern California Coastal Water Research Project*, March 2012[2]
Flood Protection – Reduced frequency of storm drain blockages	Cleanouts per year	Expert opinion: Alex Farassati, City of Calabasas Environmental Services Manager *Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin*, A report prepared by the Center for Watershed Protection in coordination with the U.S. EPA, September 2008. *Santa Barbara Catch Basin Inlet Storm Drain Screens Project,* City of Santa Barbara, December 2011. Page 16.
Habitat – Improve habitat in and around receiving waters	qualitative	*Keeping Trash Out of Waterways: LA Water Board Leads the Way,* EPA Pacific Southwest, Region 9, July 2011. *The Problem with Marine Debris,* California Coastal Commission, 2012. *Trash Pollution in San Francisco Bay,* Save the Bay, 2007
Recreation – Improve recreation in receiving waters	qualitative	*Keeping Trash Out of Waterways: LA Water Board Leads the Way,* EPA Pacific Southwest, Region 9, July 2011.

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

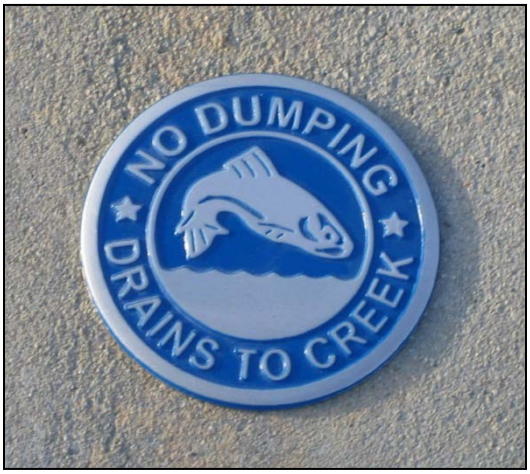
Without implementation of this Project, it is estimated that 48,224 pounds of trash, sediment and vegetation (trash) will continue to be discharged into local creeks, and continue to cause the watershed to be 303(d) listed for trash and sediment. Because of this, the City of Calabasas would be unable to meet its NPDES permit requirements which require zero trash discharged into water bodies by March 20, 2020 for the Santa Monica Bay Watershed Management Area (WMA), and September 30, 2016 for the Los Angeles River WMA.

The City would also continue to have issues with trash clogging storm drains. In the past, the City has had to send a contractor out four to five times during the rainy season to clean out

[2] Southern California Coastal Water Research Project, 2012. *Microbial Source Tracking and Identification.*

storm drains clogged with trash and debris. Localized flooding caused by storm drain blockages causes damage to streets and curbs either through water damage or through the operations needed to clear the blockage. There are several areas, in particular, that are prone to flooding during rain events including the intersections of:

- Parkway Calabasas at Calabasas Road
- Old Town Calabasas across the street from Sagebrush Cantina
- Calabasas Road at Civic Center Way
- Parkway Calabasas at Park Entrada
- Park Entrada at Tedregal Court
- Park Entrada at Alta Tupelo Drive
- Parkway Calabasas at Paseo Primario
- Park Sorrento at Park Adelfa



Without the Project, this same level of localized flooding will continue to occur. Finally, habitat and recreation would continue to be affected by trash, sediment and debris which create hazards in receiving water bodies.

Narrative Description of Physical Benefits (with Project)

A. Water Quality

Reduced trash, sediment, and vegetation loading to receiving waters

The City of Calabasas (City) is located in western Los Angeles County, and overlaps the Malibu Creek watershed and the Los Angeles River watershed, both of which are 303(d) designated water quality impaired for trash, bacteria and sediment. These watersheds drain to the ocean and can affect the quality of recreational beaches. The City's storm water collection system drains into these waterways and contributes to these impairments.

The City of Calabasas has been assigned baseline waste load allocations for both the Los Angeles River WMA and Santa Monica Bay WMA. According to the Los Angeles River Trash TMDL Staff Report, the City of Calabasas has been assigned a baseline waste load allocation of 22,505 gallons/year or 52,230 pounds of trash/year for the Los Angeles River WMA. According to the *Santa Monica Bay Nearshore and Offshore Debris TMDL Staff Report*, the City was assigned a baseline waste load allocation of 1,656.4 gallons/year of trash for the Santa Monica Bay WMA. Based on the Los Angeles River baseline waste load allocations of gallons/year

versus pounds/year, it is assumed that the 1,656.4 gallons/year is equivalent to 3,844 pounds of trash/year for the Santa Monica Bay. In total, the City of Calabasas baseline waste loads total 56,074 pounds of trash per year for both WMAs.

To prevent trash from entering catch basins, the City has already adopted a number of measures, including:

- Installed 3 CDS units and 41 Abtech Filters within the Los Angeles River watershed
- Utilized weekly street sweeping
- Banned single-use plastic bags and styrofoam containers
- Installed trash cans at all bus stops
- Installed markers and painted information near catch basins to notify the public that storm drain catch basins drain to the ocean
- Conducted volunteer creek clean-ups to collect trash in waterways
- Tested the use of a basket system on catch basins

Unfortunately, these methods have not been found to be completely effective in preventing trash, sediment and vegetation from entering storm drains. According to the City's *Trash TMDL Compliance Report* reporting 2011 compliance status, the CDS units and Abtech filters collected 14,450 pounds of trash over the course of a year. In the same report, street sweeping is said to have collected 5,400 pounds over three months, which can be extrapolated to 21,600 pounds per year. Together these total 36,050 pounds of trash per year.

Curb screen installation projects have taken place within the Region in the past and have proven to be effective in reducing the amount of trash, sediment and vegetation being discharged to watersheds from storm drains. In June 2006, the City of Los Angeles Bureau of Sanitation, Watershed Protection Division completed a pilot study that examined the effectiveness of curb screens titled *Technical Report: Assessment of Catch Basin Opening Screen Covers*[3].This study is included in the **Appendix CD**.As stated on page 4-1 of this study, it was determined that for dry days, the screen covers have an 86% effectiveness rate in preventing trash from entering storm drains over the course of a year. This effectiveness rate is based on the amount of trash that was captured versus the amount of trash un-captured, and is a weighted average of wet days and dry days (wet days have a lower trash capture rate than dry days). The study found that curb screens maximize the amount of trash kept on the streets for collection by street sweepers, minimize flooding potential, prevent large pieces of trash from

[3] City of Los Angeles Bureau of Sanitation, 2006. *Technical Report: Assessment of Catch Basin Opening Screen Covers.*

entering the catch basin, and provide ease of maintenance (page 4-2). The City of Calabasas is planning to use similar curb screens to those used in the City of Los Angeles Pilot Project which collect trash, sediment and vegetation at street level for collection by street sweepers.

Given that the City of Calabasas has a baseline trash loading of 56,074 pounds of trash per year, and the screen covers have an 86% effectiveness rate, 48,224 pounds per year of trash could be captured through the Project. This amounts to 482 tons over the 20-year lifespan of the Project.

Reduced bacterial loading to receiving waters

With the Project, it is predicted that bacteria levels in receiving waters will be reduced. Some scientists contend that accumulation of trash, debris, vegetation, pet waste and water inside storm drain system generate bacteria that discharge into surface waters and beaches. Studies that support this include:

- *Tracking Bacterial Pollution Sources in Stormwater Pipes*, University of New Hampshire, April 2003[4]
- *Microbial Source Tracking & Identification - A Fact Sheet from the Southern California Coastal Water Research Project*, March 2012[5]

These studies have found that one of the pathways for bacteria to reach source waters is through stormwater and dry weather runoff. At this time, studies have not estimated the reduction in bacterial loading from catch basin curb screens; but based on these studies, it is predicted that bacterial levels will decrease as the trash, debris and sediment entering storm drains is reduced.

B. Flood Protection

Reduced Frequency of Storm Drain Blockages

It is estimated that the frequency of storm drain blockages that require cleanout currently occur 4-5 times per year, according to Alex Farassati, the Environmental Services Manager with the City of Calabasas. With the Project, the cleanout frequency will be reduced to 2-3 times per year[6], which is supported by the discussion below. The screens to be installed will stop trash, sediment and vegetation that currently enter the storm drain system and cause blockages.

[4] Jones, Stephen H, et al., 2003. *Tracking Bacterial Pollution Sources in Stormwater Pipes.*
[5] Southern California Coastal Water Research Project, 2012. *Microbial Source Tracking and Identification.*
[6] Farassati, Alex, 2013. Personal communication, March 14, 2013. City of Calabasas Environmental Services Manager.

According to a publication produced by the Urban Drainage and Flood Control District[7], located in Colorado, storm sewer system cleaning is necessary to remove common pollutants, which include: trash and debris, sediments, oil and grease, antifreeze, paints, cleaners and solvents, pesticides, fertilizers, animal waste and detergents. The publication also states that "clogged drains and storm drain inlets can cause the drains to overflow". By installing curb screens on catch basins, the trash and debris will be reduced, and thus reduce the frequency of storm drain clogs and the flood damage associated with them. The City of Santa Barbara recently completed a report on curb screens installed throughout the city, and found that the amount of trash found in catch basins had decreased with the installation of screens.[8]

The study *Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin*[9] examined the effectiveness of street sweeping on the amount of material collected during storm drain cleanouts. The study found that with regular street sweeping, storm drain cleanouts removed approximately 40% less material than without street sweeping. Given that the Project will involve increased collection of trash, vegetation and debris by street sweepers, it is assumed that cleanouts will be reduced slightly more than this 40%, decreasing from 4-5 cleanouts per year to 2-3 cleanouts per year.

C. Habitat

Improve habitat in and around receiving waters

Habitat in and around the Los Angeles River, Malibu Creek, and the beaches at the end of these waterways is expected to be improved by a reduction in trash, sediment and vegetation. Birds, fish and mammals may mistake trash for food, causing a false feeling of being full and causing the animal to die of starvation. Marine debris, particularly plastic bags, strapping bands and six-pack rings may also cause animals to become entangled. Once entangled, animals have trouble,

[7] Urban Drainage and Flood Control District, 2010. *Storm Sewer System Cleaning*. Excerpt from Urban Storm Drainage Criteria Manual Volume 3. http://www.udfcd.org/downloads/pdf/critmanual/Volume%203%20PDFs/chapter%205%20fact%20sheets/S-12%20Storm%20Sewer%20System%20Cleaning.pdf

[8] City of Santa Barbara, 2011. *Santa Barbara Catch Basin Inlet Storm Drain Screens Project*. Page 16. http://www.santabarbaraca.gov/NR/rdonlyres/33184A2C-C142-4674-816B-2349B02A9FC9/0/111223CatchBasinInletStormDrainScreensFinalReport.pdf

[9] Center for Watershed Protection, 2008. *Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin.* A report prepared by the Center for Watershed Protection in coordination with the U.S. EPA, September.

eating, breathing or swimming.[10,11] By reducing the amount of trash reaching storm drains and receiving waters, trash will not be available to cause harm to wildlife.

D. Recreation

Improve recreation in and around receiving waters

Recreation in and around the Los Angeles River, Malibu Creek, and the beaches at the end of these waterways is expected to be improved by a reduction in trash, sediment and vegetation. Hazards to recreation can be caused directly by trash, or indirectly by water quality impairments such as bacteria. The report *Keeping Trash out of Waterways* states that the waste reaching waterways through storm drains contains pathogens that sicken swimmers and surfers. Surfrider Beach, located at the mouth of Malibu Creek, and Cabrillo Beach, located at the mouth of the Los Angeles River, frequently exceed bacterial TMDL levels, particularly during wet weather, according to Heal the Bay's *Beach Report Card* (pg. 26).[12] It is assumed that a reduction in trash, sediment and vegetation entering water bodies via storm drains will directly benefit recreation by reducing trash hazards and bacteria levels.

Limitations

The analysis presented here is an approximate analysis using simplifying assumptions that could have implications regarding the accuracy of the results. It will be necessary for the City to continue to contract with a street sweeping company to collect the trash gathered at street level. The amount of trash captured per year will be dependent on the number and intensity of storms as the curb screens are designed to open at high flows to prevent flooding caused by blockage of trash and vegetation. On average, however, it is estimated that 48,224 pounds per year will be captured. This Project is not expected to cause adverse physical effects.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

[10] EPA Southwest, Region 9, 2011. *Keeping Trash Out of Waterways: LA Water Board Leads the Way.* http://www.epa.gov/SoCal/water/la-trash.html
[11] California Coastal Commission, 2012. *The Problem with Marine Debris. http://www.coastal.ca.gov/publiced/marinedebris.html*
[12] Heal the Bay, 2012. *2011-2012 Annual Beach Report Card.* http://brc.healthebay.org/assets/pdfdocs/brc/annual/2012/HtB_BRC_Annual_2012_Report.pdf

Benefit #1 - Water Quality

The table below provides information regarding pounds of trash, sediment and plant matter captured, and prevented from discharging to local creeks on an annual basis:

Project Name: Citywide Storm Drain Catch Basin Curb Screens
Type of Benefit Claimed: Reduced trash, sediment and vegetation loading to receiving waters
Measure of Benefit Claimed (Name of Units): Pounds per year
Additional Information About this Measure: Not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	--	--	--
2015	48,224	0	-48,224
2016-2034	48,224	0	-48,224

References: *Technical Report: Assessment of Catch Basin Opening Screen Covers*, 2006

Benefit #2 – Flood Protection

The table below provides information regarding the change in frequency of storm drain blockages that require cleanout.

Project Name: Citywide Storm Drain Catch Basin Curb Screens
Type of Benefit Claimed: Reduction in storm drain blockage cleanout
Measure of Benefit Claimed (Name of Units): Storm drain cleanouts per year
Additional Information About this Measure: Not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	--	--	--
2015	4-5	2-3	-2
2016-2034	4-5	2-3	-2

References:

Farassati, Alex, 2013. Personal communication, March 14, 2013. City of Calabasas Environmental Services Manager.

Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin, A report prepared by the Center for Watershed Protection in coordination with the U.S. EPA, September 2008.

Santa Barbara Catch Basin Inlet Storm Drain Screens Project, City of Santa Barbara, December 2011. Page 16. http://www.santabarbaraca.gov/NR/rdonlyres/33184A2C-C142-4674-816B-2349B02A9FC9/0/111223CatchBasinInletStormDrainScreensFinalReport.pdf

Dominguez Channel Trash Reduction

The Dominguez Channel Trash Reduction Project (Project) will provide for the installation of unique "Keep Carson Beautiful" automatic retractable screens at the curb face opening of all of the approximately 1,800 catch basins within the City of Carson that drain to the Dominguez Channel. The trash excluders proposed in this Project will prevent trash, leaves, and other debris from entering the Dominguez Channel at 1,800 locations throughout the City of Carson. Trash, leaves and debris, and the chemicals released during decomposition are documented sources of water quality degradation, as noted in the Without-Project Baseline discussion below. Trash can also clog storm drains and cause localized street flooding. For these reasons, the removal of trash and the elimination of continued discharge of trash is a top priority in the *Dominguez Channel Watershed Management Master Plan* to improve water quality.[13]

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-3**.

A. Water Quality
   - Reduced discharge of 37.5 tons per year of trash, leaves, and other pollutants from the City of Carson to the Dominguez Channel Estuary for the Project life
   - Reduced discharge of bacteria to the Dominguez Channel Estuary for the Project life
   - Reduced discharge of toxic pollutants to the Dominguez Channel Estuary for the Project life

B. Habitat Protection
   - Protection of 140 acres of habitat for California Species of Special Concern such as the double-crested cormorant, and Federal Species of Concern such as the snowy egret and white-tailed kite (Table 2.4-2 of the Dominguez Watershed Management Master Plan).

C. Flood Protection
   - Reduced risk of street flooding by preventing debris accumulation in the storm conduits downstream from catch basins and conducting regular street sweeping

[13] Los Angeles County Department of Public Works, 2004. *Dominguez Watershed Management Master Plan.* See Page 3-10, Table 3.2-2: Summary of stakeholder-prioritization of issues, problems and concerns, and Page 3-16: Water Quality Concerns.

D. Education
   - Develop materials to promote, preserve and protect existing beneficial uses of the watershed and encourage future recreational use

E. Recreational Use
   - Increase number of visitors and provide support for added beneficial uses

Table 7-3: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Quality - Reduced discharge of trash, leaves, and other pollutants from City of Carson to the Dominguez Channel Estuary	tons/year	*Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL* *Los Angeles County NPDES Permit* *Dominguez Channel Watershed Management Master Plan* *Installation of Automatic Retractable Screen Excluder and Connector Pipe Screen Full Capture Trash System in the Catch Basin for Seventeen Cities in the Los Angeles Gateway Region*, Integrated Regional Water Management Joint Powers Authority, State Water Board Project No. C-06-6439-110 Expert opinion: Patricia Elkins, City of Carson Storm Water Quality Programs Manager
Water Quality - Reduced discharge of bacteria to the Dominguez Channel Estuary	Qualitative	*Tracking Bacterial Pollution Sources in Stormwater Pipes*, University of New Hampshire, April 2003[14] *Microbial Source Tracking & Identification A Fact Sheet from the Southern California Coastal Water Research Project*, March 2012[15]
Water Quality - Reduced discharge of toxic pollutants to the Dominguez Channel Estuary	Qualitative	California Regional Water Quality Control Board, Los Angeles Region, Resolution No. R11-008, May 5, 2011 - *Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL.* Staff Report.
Habitat Protection – Protection of Habitat for Species of Special Concern	Acres of habitat	*Dominguez Channel Watershed Management Plan,* 2004.

[14] Jones, Stephen H, et al., 2003. *Tracking Bacterial Pollution Sources in Stormwater Pipes.*
[15] Southern California Coastal Water Research Project, 2012. *Microbial Source Tracking and Identification.*

Physical Benefit	Unit	Technical Justification
in the Dominguez Channel Estuary		
Flood Protection – Reduced occurrence of street flooding	Qualitative	Expert opinion: Patricia Elkins, City of Carson Storm Water Quality Programs Manager
Education - Develop materials to promote, preserve and protect existing beneficial uses of the watershed and encourage future recreational use	Qualitative	Photo of trash excluder with "Keep Carson Beautiful" logo Fliers for watershed clean-up events
Recreational Use – Increase number of visitors and provide support for added beneficial uses	Qualitative	Expert opinion: Patricia Elkins, City of Carson Storm Water Quality Programs Manager

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

Currently, trash and other pollutants are discharged into the tidal and harbor areas of the Dominguez Channel, harming wildlife and reducing habitat value along the tidally influenced channel areas and in the Harbor. Water quality problems in the channel (including the estuary) are well documented; for example, the Dominguez Channel is 303(d) listed for nutrients, metals, pesticides, pathogens and toxicity.[16] The without-project conditions will result in a continuation of water quality degradation. In addition, beneficial uses of the Dominguez Channel will be impacted, and in particular ecological systems will continue to be harmed by discharged trash and other pollutants that are associated with accumulated trash (e.g., bacteria).[17,18]

Storm drain conveyance capacity will continue to be reduced by the accumulation of trash within storm drains and will increase the risk of localized flooding. Trash will continue to block lift pumps used by the Los Angeles County Flood Control District to lift stormwater from low-lying collection areas to discharge points.

[16] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.
[17] Jones, Stephen H, et al., 2003. *Tracking Bacterial Pollution Sources in Stormwater Pipes.*
18 Southern California Coastal Water Research Project, 2012. Microbial Source Tracking and Identification.

Without the Project the City would be required to implement a much smaller-scale version of the Project on only 40 Priority A catch basins,[19] as opposed to all 1,800 catch basins currently in the Project proposal. This limited implementation would help address the trash problem, but would not provide a comprehensive effort as needed to enable the City to meet National Pollutant Discharge Elimination System (NPDES) Permit requirements.

Moreover, if the quality of water in the Dominguez Channel is not improved by implementation measures such as the Project, it will not be possible to perform subsequent habitat restoration in the Dominguez Channel Estuary and Albertoni Farms (see location maps included in Attachment 3 - Work Plan).

Alternative trash collection devices are not feasible for the City. Installation of debris excluders at outfall locations is not a viable alternative to the installation of trash excluders on or in catch basins. The elevation of tidal prisms and the overall flow volume entering the Dominguez Channel Estuary precludes installation of any trash capture device on storm drain outfalls tributary to the Estuary.

Narrative Description of Physical Benefits (with Project)

A. Water Quality

Reduced discharge of trash, leaves, and other pollutants from City of Carson to the Dominguez Channel Estuary

The 1,800 trash excluders to be installed on storm drain catch basins for the Project are retractable screens that will capture trash and other debris at the street level where it can then be removed through weekly street sweeping.[20, 21] Should the installation of automatic retractable screens at the curb face be physically infeasible, as determined by LACFCD on a case-by-case basis, connector pipe screens may be installed inside catch basins instead. Connector pipe screens are fixed screens with 5 mm-sized openings that cover the pipe inside the catch basin that connects the catch basin to the main line storm drain. These connector pipe screens provide the same level of trash protection as the trash excluders, but are connected to the inside of the catch basin, which does not allow for trash collection at the

[19] Priority areas are determined by LACFCD as follows: Priority A – Catch basins that are designated as consistently generating the highest volumes of trash/debris, Priority B – Catch basins that are designated as consistently generating moderate volumes of trash/debris, and Priority C – Catch basins that are designated as generating low volumes of trash/debris.

20 Green Vision Partners, 2012. *Next Generation Inlet Protection.*

[21] G2 Construction. *Stormwater Solutions.*

street level by street sweepers. Debris is trapped inside the catch basin and removed on a regular basis. The connector pipe screens are approved by the Regional Water Quality Control Board as trash "full-capture" devices and have been installed in catch basins throughout the Los Angeles River Watershed.[22]

The trash excluders are expected to prevent the discharge of as much as 37.5 tons of trash per year. LACFCD has indicated that 15 to 25 tons of floating trash are detained and removed at in-channel floating booms annually, while it is assumed that the same weight of non-floating trash continues to the ocean for a total of approximately 50 tons.[23] According to the City of Carson's Water Quality Programs Manager, once the Project is complete, the debris excluders will provide for capture of trash at the street level and that volume is conservatively estimated at 37.5 tons annually, or 75% of 50 tons.[23] This equals approximately 750 tons over the 20-year anticipated life of the Project.

Reduced discharge of bacteria to the Dominguez Channel Estuary

The trash excluders to be installed on storm drain catch basins for the Project are predicted to reduce the amount of bacteria discharged to the Dominguez Channel. Some scientists contend that accumulation of trash, debris, vegetation, pet waste and water inside storm drain system generate bacteria that discharge into surface waters. Studies that support this claim include:

- *Tracking Bacterial Pollution Sources in Stormwater Pipes*, University of New Hampshire, April 2003[24]
- *Microbial Source Tracking & Identification A Fact Sheet from the Southern California Coastal Water Research Project*, March 2012[25]

These studies have found that one of the pathways for bacteria to reach source waters is through stormwater and dry weather runoff. At this time, studies have not estimated the reduction in bacterial loading from catch basin curb screens; but based on these studies, it is predicted that bacterial levels will decrease overall as trash, debris and sediment are prevented from entering storm drains.

[22] California Regional Water Quality Control Board, Los Angeles Region. *Attachment A to Resolution No. 2007-012*. Page 3.
[23] Elkins, Patricia, 2013. Personal communication on March 13, 2013.
[24] Jones, Stephen H, et al., 2003. *Tracking Bacterial Pollution Sources in Stormwater Pipes.*
[25] Southern California Coastal Water Research Project, 2012. *Microbial Source Tracking and Identification.*

Reduced toxic pollutant concentrations in the Dominguez Channel Estuary

The Dominguez Channel is currently 303(d) listed as impaired for toxic pollutants, including lead, zinc, copper, Diazinon, Benzo[a]anthracene, Pyrene, Polychlorinated biphenyls (PCBs), Dieldrin, DDT, Benzo[a]pyrene, phenanthrene and chrysene. A consent decree between U.S. EPA, Heal the Bay, Inc. and Santa Monica BayKeeper, Inc. was approved on March 22, 1999, and was amended in September 2010. The consent decree resolved litigation between those parties relating to the pace of TMDL development in the Los Angeles Region. The court order directs the U.S. EPA to ensure that TMDLs for all 1998-listed impaired waters in the Los Angeles Region be established within 13 years of the consent decree.[26] In accordance with the consent decree, the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL addresses the listings for cadmium, chromium, copper, mercury, lead, zinc, chlordane, dieldrin, toxaphene, DDT, PCBs certain PAH compounds, benthic community effects and toxicity. Based on the consent decree schedule, TMDLs must be approved or established by U.S. EPA by March 24, 2012.

Some toxic pollutants, including pesticides and heavy metals, can bind to sediment that is discharged to the Dominguez Channel through the storm drain system. In the staff report written for the Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL, it is noted that a number of constituents have been found bound to sediment in the Dominguez Channel Estuary, including PAHs, DDT, Benzo[a]anthracene, Benzo[a]pyrene, Chrysene, Phenanthrene, Pyrene, Diazinon, chromium, copper, lead and zinc.[26] It is expected that the trash excluders will help to reduce the amount of contaminated sediment reaching the storm drain system as sediment will be captured and collected with the trash, decreasing the amount of accumulated toxics that would otherwise have been discharged to the Dominguez Channel.

B. Habitat Protection

The Dominguez Channel Estuary is home to many types of common and sensitive plants and wildlife including amphibians, small mammals, insects and many varieties of birds. The habitats within the Domiguez Channel Watershed are extremely valuable for locally-occurring wildlife and native plants. Several of the species that live or migrate through the watershed are considered sensitive. Seventeen sensitive plant species, including five that are endangered

[26] California Regional Water Quality Control Board, Los Angeles Region, 2011. *Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL*. Staff Report. pp. 2, 13-15. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents

(California orcutt grass, coastal dunes milk-vetch, Lyon's pentachaeta, Mexican flannelbush, salt march bird's beak) have the potential to occur. Thirty-eight sensitive wildlife species, including seven endangered or threatened animals (Palos Verdes blue butterfly, California brown pelican, California least tern, coastal California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, Pacific pocket mouse) have the potential to occur (Dominguez Watershed Management Master Plan Table 2.4-1, Table 2.4-2 and 2.4.4 Summary of Biological Resources, 2004).[27]

Trash can present hazards to local plants and wildlife. This Project will reduce these types of threats. Marine debris impacts the environment, economy, and human health and safety. The extent of the impacts is determined by the type of marine debris and where it settles in the ocean (i.e.., submerged, floating, or within a sensitive habitat). Fishing nets, plastic bags, and tires can sink to the ocean floor and break and smother coral reefs. Fishing line can float along the ocean surface and catch vessel propellers causing costly damage.

By improving water quality in the receiving waters of the City of Carson's storm drain system, it will be possible for habitat in the 140-acre Dominguez Channel Estuary and Albertoni Farms area to be restored or enhanced through other programs. This habitat area contains California Species of Special Concern (e.g., double-crested cormorant) and Federal Species of Concern (e.g., snowy egret and white-tailed kite).[27] Additional information is provided in Attachment 8.

C. Flood Protection

Reduced potential for street flooding

The Project will provide some incidental flood damage avoidance. The debris excluders will prevent most trash and debris from entering the storm drain system. This action decreases the risk of trash, leaves, and debris accumulating in underground storm drain systems and potentially causing flooding in upstream streets. The trash excluders would also help to prevent trash and debris from collecting in and around lift station pumps used by the Los Angeles County Flood Control District to pump stormwater from low-lying collection areas to discharge points.[23]

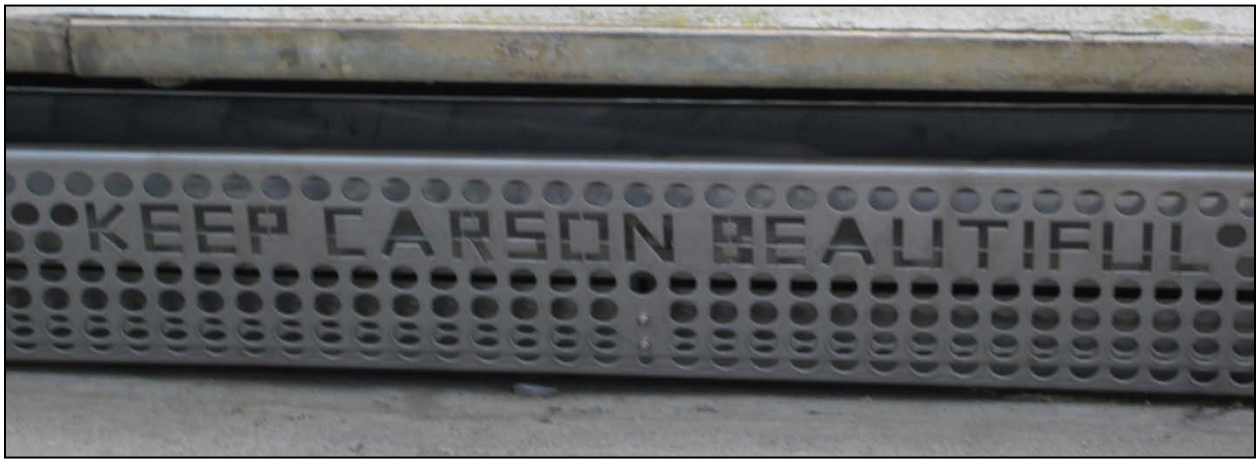
It is important to note that street flooding caused by accumulated debris in the storm conduits is different from street flooding caused by accumulated debris at the catch basin screens. The Project will reduce accumulation of debris in conduits downstream from the catch basin screens and will therefore reduce the risk of street flooding that would be caused by this type

[27] County of Los Angeles Department of Public Works, 2004. *Dominguez Watershed Management Master Plan.*

of obstruction. The Project will actually cause accumulation of trash at the catch basin screens, but this will be mitigated by regular street sweeping and automatic retraction of the screens during storm events. [23]

D. Education

This project will increase public awareness of Dominguez Watershed water quality issues, and encourage participation in its management and protection. To accomplish this, the trash excluders will have the "Keep Carson Beautiful" logo (see below), and a website will be created to educate the public about the unique trash excluders and water quality issues. Each year, the City uses the Keep America Beautiful Great American Cleanup activity and the Coastal Cleanup Day (both held at the Dominguez Channel) to increase public awareness about water quality issues (see sample fliers for these events in the **Appendix CD**).



E. Recreational Use

Promote, preserve and protect existing beneficial uses of the watershed and encourage future recreational use

According to the Los Angeles County RWQCB Basin Plan (Page 2-10), existing beneficial uses for the Dominguez Channel and Dominguez Channel Estuary include: non-contact water recreation, commercial and sport fishing (estuary only), estuarine habitat (estuary only), marine habitat (estuary only), wildlife habitat (estuary only), rare/threatened/endangered species habitat, migration of aquatic organisms (estuary only), spawning/reproduction/early development

habitat (estuary only). Contact recreation is listed as a beneficial use, but is prohibited by the Los Angeles County Department of Public Works.[28]

Currently, only non-contact water recreation use is permitted, and is typically limited to walking or biking along the levee access roads. When the Project is completed, trash (especially floating trash) will be significantly reduced and the estuary will be a more attractive site. With the Project, water quality will improve and with time the estuary could reach a status where water contact recreation is allowed.[23]

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Reduced discharge of trash, leaves, and other pollutants from City of Carson to the Dominguez Channel Estuary

The table below provides information regarding the tons of trash, leaves, and other debris that will be reduced in the Dominguez Channel by the Project.

Project Name: Dominguez Channel Trash Reduction
Type of Benefit Claimed: Reduced discharge of trash, leaves, and other pollutants from City of Carson to the Dominguez Channel Estuary
Measure of Benefit Claimed (Name of Units): tons
Additional Information About this Measure: Not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	0	0	0
2016	0	37.5	-37.5
2017-2035	0	37.5	-37.5

References:

- *Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL*
- *Los Angeles County NPDES Permit*

[28] Los Angeles Regional Water Quality Control Board, 1994. *Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.* http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/basin_plan/basin_plan_documentation.shtml

- *Dominguez Channel Watershed Management Master Plan*
- *Installation of Automatic Retractable Screen Excluder and Connector Pipe Screen Full Capture Trash System in the Catch Basin for Seventeen Cities in the Los Angeles Gateway Region*, Integrated Regional Water Management Joint Powers Authority, State Water Board Project No. C-06-6439-110.
- Expert opinion: Patricia Elkins, City of Carson Storm Water Quality Programs Manager

Benefit #2 – Protection of Habitat for Species of Special Concern in the Dominguez Channel Estuary

The table below provides information regarding the acres of habitat for California Species of Special Concern that will be protected by the Project.

Project Name: Dominguez Channel Trash Reduction
Type of Benefit Claimed: Protected habitat for California Species of Special Concern in the Dominguez Channel Estuary
Measure of Benefit Claimed (Name of Units): acres
Additional Information About this Measure: Not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	0	0	0
2016	0	140	140
2017-2035	0	140	140

References: *Dominguez Channel Watershed Management Plan,* 2004.

Dominguez Gap Spreading Grounds West Basin Percolation Enhancements

The Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project (Project) will remove five to ten feet of clay sediment in the west basin to increase percolation and allow for increased recharge capacity. This clay sediment has impeded the percolation rates of these spreading grounds since they were originally constructed. In addition, the connection between the east and west basins will be realigned as a result of the new configuration of the west basin.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-3**.

A. Water Supply
   - Increased local water supply of 1,000 acre-feet per year (AFY) of local captured stormwater recharged to the Central Groundwater Basin (Central Basin)

B. Reduced Delta demands to help address CALFED Bay-Delta Program objectives

C. Water Quality
   - Reduction of contaminants (ammonia, coliform bacteria, copper, etc.) that would otherwise be discharged to the downstream Los Angeles Harbor over the 50-year lifespan of the Project

D. Flood Protection
   - Increased detention volume of 1,000 AF from sediment removal, plus improved percolation, enables LACFCD to capture an additional 1,000 AF of stormwater each year and increase flood protection capacity
   - Reduction in peak flows during flood events by 20 cfs

E. Energy Conservation
   - Reduction of 2,646,000 kWh per year or 132 million kWh over the 50-year lifespan of the Project

F. Greenhouse Gas Reduction
   - Avoidance of 958 metric tons of CO_2 equivalents per year or 47,900 metric tons of CO_2 equivalents emitted over the 50-year life of the Project

Table 7-4: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Increased percolation to the West Basin	acre-feet per year	*Water Conservation Model,* 2011
Delta Demands - decreased	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Water Quality – reduced constituent loading to receiving waters (ammonia, coliform, copper, etc.)	Qualitative	*Water Conservation Model*, 2011 2011-2012 Los Angeles County *Annual Stormwater Monitoring Report*, Table 4-4.3 Los Angeles River @ Wardlow Dry & Wet Weather Exceedance Summary (S10 monitoring Station)
Flood – Reduced peak flows during flood events	cfs	*Water Conservation Model*, 2011
Energy Conservation - reduced energy from offset of imported water	kWh	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf
Greenhouse Gas Reduction - reduced emissions	Tons of CO_2 equivalents	Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

The Greater Los Angeles County (GLAC) Region relies heavily on new sources of water to bridge the gap between water supplies and water demand. Without the Project, 1,000 AFY of stormwater will be wasted to the Pacific Ocean via the Los Angeles River and won't be utilized to reduce the Region's reliance on imported water. The low percolation rate of the Dominguez Gap Spreading Grounds limits the amount of water that can be captured for recharge, and this rate will continue to be diminished as more sediment enters the spreading grounds. During large storms, the grounds fill up quickly and force stormwater flows to continue flowing past the spreading grounds in the Los Angeles River and to the Pacific Ocean. In addition, without the Project, there will be no additional flood protection provided for downstream communities.

The 1,000 AFY of untreated stormwater will continue to flow to the Pacific Ocean. Without the increased percolation rate no additional stormwater will be diverted from peak flows in the Los Angeles River, and therefore there will be no increase in flood protection.

Without the Project, pollutants which are carried in stormwater will continue on to the Los Angeles River and the Pacific Ocean rather than being captured in the spreading grounds for subsequent removal by soil aquifer treatment. The pollutants that would continue to be discharged to receiving water bodies include ammonia, coliform bacteria, copper, and lead, among others.

Narrative Description of Physical Benefits (with Project)

The GLAC Region relies heavily on new sources of water to bridge the gap between water supplies and water demand. A long-term drought has caused recent water shortages and an increase in imported water use. It is imperative that groundwater recharge is maximized to take advantage of wet year water flows from stormwater. The raised groundwater elevation from additional recharge would allow an increase in pumping in dry years to supplement reduced flows from imported water supplies.

A. Water Supply

Increased Percolation to the Central Basin

This Project will increase the groundwater recharge capacity of the Dominguez Gap Spreading Grounds by 1,000 AFY, from an existing recharge rate of 487 AFY to an estimated 1,487 AFY. The specific components of the Project that will accomplish this are the removal of sediment and clay lenses. This benefit is supported by the Los Angeles County Flood Control District (LACFCD) Conservation Model.

The shallow clay layer in the upper 5 to 10 feet of the subsurface underlying the spreading grounds will be removed in the facility's west basin to improve percolation and increase storage capacity. Estimated removal depths are based on recommendations in the January 2009 *Geological Investigation Report*. Approximately 100,000 cubic yards of excavated material will be removed from the site. This improvement will increase the storage capacity of the spreading grounds from 234 to 296 acre-feet by deepening the west basin. Increased percolation rates cannot be precisely quantified at this time because the impacts of the sediment removal cannot be accurately measured.

The Water Conservation Model was used to estimate the amount of stormwater that could be recharged given this increase in percolation and storage capacity. It is estimated that an additional 1,000 AFY of stormwater from the Los Angeles River can be diverted and recharged to the Central Basin. The model uses historical flow data (daily mean flow rate) from stream gaging stations over the last 16 years and determines how much water could have been conserved if various spreading basin parameters were adjusted. In this case, the storage and intake capacity are increased and it is assumed that the percolation rate increases from 1 cfs to 5 cfs so that the annual water conservation increases by 1,000 AFY. The model used is similar to a simplified reservoir routing model that takes the historical daily inflow and calculates the daily outflow, percolation and storage. In order to calculate the improved water supply benefit, the current groundwater recharge rate was calculated using historical data from the spreading grounds, including as inflow and water surface elevation. This benefit will be measured through monitoring of the inflow data to the spreading grounds after project completion.

There are 31 entities, including numerous municipalities, with rights to extract groundwater from the Central Basin. These entities pumped a combined average of 185,914 AFY between 2011 and 2012[29], while relying on a portfolio of imported water, groundwater and recycled water to meet the needs of their customers. By increasing the amount of water available to pump, these entities will benefit directly through the reduction in imported water they would need to purchase.

B. Reduced Delta Demands to Help Address CALFED Bay-Delta Program Objectives

The Greater Los Angeles County IRWM Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2006 IRWMP Plan. Diversion of water from the Delta to southern California has caused damage to the Bay Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps), damages habitats, and reverses river flows. By reducing the Region's reliance on the Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet CALFED Bay-Delta Program objectives to restore tidal marshes and floodplains, and restore fish and wildlife species.

[29] Watermaster Service in the Central Basin, Los Angeles County Jul 1, 2011 – June 30, 2012

C. Improved Surface Water Quality

The increased diversion of surface water to the Dominguez Gap Spreading Grounds will reduce the contaminant loadings downstream of the spreading grounds, and thus improve surface water quality in the Los Angeles River and Los Angeles Harbor. As discussed above under "Increased Percolation to the Central Basin," the amount of surface water diverted will, on average, equal an additional 1,000 AFY. According to the Los Angeles Water Quality Control Board, the Los Angeles River is water quality impaired by ammonia, cadmium, copper, lead, nutrients, and trash.[30]

Using the 2011-2012 Los Angeles County *Annual Stormwater Monitoring Report*, it may be verified that detected pollutants directly downstream from the Dominguez Gap Spreading Grounds included fecal coliform, fecal enterococcus, fecal streptococcus, total coliform, cyanide, ammonia, lead, selenium, copper, and cadmium.[31] It is assumed for this analysis that by implementing the Project, these constituent loadings would be prevented from discharge to downstream receiving bodies in proportion to the 1,000 AFY increase in groundwater recharge.

D. Flood Protection

Reduced Localized Flood Damage

The Project will provide flood damage avoidance benefits, particularly along Compton Creek upstream from the Project location. Some of the downstream area past the Dominguez Gap Spreading Grounds is a part of the 100-year Flood Zone, requiring mandatory flood insurance. This Project will help mitigate flood risk in the area, helping meet the federal mandatory flood insurance requirements.

The Project will reduce the peak flood flow rate by approximately 20 cfs downstream of the Project.[32] This will result in reduced flood depths and reduced width of flooding. There are no models that can presently demonstrate the precise impacts.

[30] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 29: Dominguez Channel.
[31] 2011-2012 Los Angeles County *Annual Stormwater Monitoring Report*, Table 4-4.3 Los Angeles River @ Wardlow Dry & Wet Weather Exceedance Summary (S10 monitoring Station).
[32] Los Angeles County Flood Control District, 2011. *Water Conservation Model.*

E. Energy Conservation

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total greenhouse gas (GHG) emissions.

It has been estimated that the average cost to pump groundwater in the Central Basin was $65/AF in 2007[33], which can be updated to 2012 dollars as $71.5/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2012 was $0.202/kWh.[34] Using these values, it can be estimated that the energy required to pump groundwater in the Central Basin is estimated to be 354 kWh/AF. For imported supplies, it has been estimated that approximately 3,000 kilowatt-hours (kWh) per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[35] Assuming 2,646 kWh/AF (3,000 - 354) and an average annual imported water offset of 1,000 AF, approximately 2,646,000 kWh per year of energy will be saved by implementing the Project. Over the 50-year lifespan of the Project, this totals 132 million kWh of conserved energy.

F. Greenhouse Gas Reduction

The proposed Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport imported SWP water for the Region. This value may be calculated by applying a factor of 0.724 pounds (lbs) of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[36] By offsetting the demand of 1,000 AF of imported SWP water, the proposed Project will avoid GHG emissions of 958 metric tons per year of CO_2 equivalents per year. Over the 50-year life of the Project, this totals 47,900 metric tons of avoided carbon emissions.

Relationship to other Projects in the Proposal

Though this project is not directly related to other projects in the Proposal, it is a part of a network of spreading grounds which LACFCD operates to replenish groundwater in the Los Angeles area. Improvements made to any of these spreading grounds will improve the ability of

[33] Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Central Basin. Report Number 1308.
[34] Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
[35] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.
[36] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

the LACFCD to capture stormwater for replenishment of groundwater, and provide better flood management.

Common elements with other Projects in this Proposal are:

- Use of local water resources
- Offset Imported water
- Reduce Energy
- Reduce Greenhouse gas emissions

Facilities, Policies, and Action Needed

The following facilities are needed to implement the Project:

- No new facilities needed, only re-configuration of east and west basin connection

The following policies and other actions are needed to implement the Project:

- None anticipated

Agreements are needed with the following stakeholders to implement the Project:

- MOU for cost-share between the Water Replenishment District of Southern California (WRD) and LACFCD

Uncertainties

The amount of water supply and quality benefit are both uncertain due to natural variability and the uncertainty of groundwater modeling. Stormwater supplies rely heavily on the number of storms, amount of precipitation, and consequentially the amount of runoff, which varies every year. The water conservation model is also based on historical data that only estimates the amount of water that has been and could be conserved in the future. Therefore, any benefits that utilize the estimation of runoff, such as water quality benefits and energy savings, are also uncertain due to the natural variability and uncertainty of groundwater modeling.

Potential Adverse Effects

No adverse effects of the Project are foreseen.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Increased Groundwater Supply

The table below provides information regarding the water supply benefit of increased percolation of stormwater to the Central Groundwater Basin.

Project Name: Dominguez Gap Spreading Grounds Improvements **Type of Benefit Claimed:** Increased percolation to the Central Groundwater Basin **Measure of Benefit Claimed (Name of Units):** acre-feet **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	487	n/a	n/a
2016	487	1,487	1,000
2017-2065	487	1,487	1,000
References: *Water Conservation Model,* 2011			

Benefit #2 – Reduced peak flows during flood events

The table below provides information regarding reduced peak flows that will be experienced downstream after the Project is implemented.

Project Name: Dominguez Gap Spreading Grounds Improvements **Type of Benefit Claimed:** Reduction in peak flow rate during flood events **Measure of Benefit Claimed (Name of Units):** cubic feet per second (cfs) **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**

2012-2015	Baseline	n/a	n/a
2016	Baseline	Baseline - 20	-20
2017-2065	Baseline	Baseline - 20	-20
References: *Water Conservation Model,* 2011			

Benefit #3 – Reduced energy from offset of SWP water

The table below provides information regarding energy conservation provided through the offset of SWP water with groundwater.

Project Name: Dominguez Gap Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced energy usage **Measure of Benefit Claimed (Name of Units):** kWh **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	Baseline	n/a	n/a
2016	Baseline	Baseline - 2,646,000	-2,646,000
2017-2065	Baseline	Baseline - 2,646,000	-2,646,000
References: *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf			

Benefit #4 – Reduced GHG emissions

The table below provides information regarding the reduction in CO_2 emissions made possible through the offset of SWP water with groundwater.

Project Name: Dominguez Gap Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced GHG emissions

Dominguez Gap Spreading Grounds West Basin Percolation Enhancements

Measure of Benefit Claimed (Name of Units): Metric tons of CO_2 equivalents **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	Baseline	n/a	n/a
2016	Baseline	Baseline - 958	-958
2017-2065	Baseline	Baseline - 958	-958
References: Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html			

Foothill Municipal Water District Recycled Water Project

The Foothill Municipal Water District (FMWD) Recycled Water Project (Project) seeks to develop recycled water, increase stormwater and urban runoff capture for recharge, and increase water conservation throughout the FMWD service area. The Project includes the construction of a 0.25 million gallon per day (MGD) membrane bioreactor (MBR) plant that in addition to receiving stormwater and urban runoff flows, will also scalp municipal wastewater flows from a separate influent connection stemming from a Sanitation Districts of Los Angeles County (LASCD) trunk sewer line. Treated effluent from the plant, which will consist of a combination of captured municipal wastewater, stormwater, and urban runoff, will be discharged into infiltration galleries to be installed underneath athletic fields located on the campus of nearby La Cañada High School. The recycled water will help replenish the Raymond Groundwater Basin and will allow FMWD to obtain pumping credits to distribute to five of its eight member agencies. This Project will yield an estimated average of 318 AFY in total, consisting of recycled wastewater (280 AFY) and reuse water generated through stormwater and urban runoff capture (38 AFY).

In addition to providing a local source of water supply for FMWD, the Project also includes several educational components designed to encourage water conservation and promote sustainable watershed management. The educational components of the Project are being developed by three Cal Poly Pomona departments. The Civil Engineering Department is preparing a 3D model of the infiltration galleries, the Department of Landscape Architecture is developing drought tolerant landscaping for both the MBR and school sites, and the Department of Urban and Regional Planning is developing a curriculum that will provide instruction on water supplies, recycled water, and watershed management. This curriculum will involve tours of the MBR plant and Hahamongna Watershed Park, which is located directly across the street from the proposed MBR site. The Cal Poly Pomona contribution may be applied to other projects both within and outside FMWD's service area, thus benefitting the broader region.

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-5**.

- Water Supply
    - Replenishment of the Raymond Basin with an estimated 318 AFY of recycled water, stormwater and runoff utilizing infiltration galleries will allow FMWD to obtain pumping credits for that Basin to distribute to five of its eight member

agencies. This additional groundwater production from the Basin will help offset imported demand.
    - Greater supply reliability through use of recycled water, particularly considering FMWD's infrastructure and single connection to the available imported water supply.
- Reduced Delta demands to help address CALFED Bay-Delta Program objectives
- Water Quality
    - Capture and treatment of approximately 38 AFY of urban runoff and stormwater, preventing its discharge to the downstream Los Angeles River
- Public Outreach
    - Increase public engagement and knowledge of the area's water supplies, ongoing conservation efforts, and local water-related infrastructure projects; increase conservation practices in the community
- Education
    - Development of online educational curriculum by Cal Poly Pomona interdisciplinary team for students of La Cañada Unified School District and other area schools
- Energy Conservation
    - Reduce energy consumption by 29.7 million kWh over the Project lifespan
- Greenhouse Gas Reduction
    - Reduce GHG emissions by a total of 9,750 metric tons of CO_2 equivalents over the Project lifespan

Table 7-5: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Reduce dependence on imported water	acre-feet/year	Proposed agreement with LACSD. *Foothill Municipal Water District Recycled Water Project, Update to Incorporate a Watershed Approach* *FMWD Infiltration Calculations – Att 3 – FINAL*
Water Supply – Increase water supply reliability	acre-feet/year	Proposed agreement with LACSD. *Foothill Municipal Water District Recycled Water Project, Update to Incorporate a Watershed Approach* *FMWD Infiltration Calculations – Att 3 – FINAL*

Physical Benefit	Unit	Technical Justification
Delta Demands - decreased	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Water Quality - reduce urban runoff and stormwater flows to LA River	Qualitative	Los Angeles Regional Water Quality Control Board (LARWQCB) Basin Plan – Los Angeles River Total Maximum Daily Loads (TMDLs) http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/
Public Outreach – Increase public awareness	Qualitative	CUWCC Public Information BMP Guidebook http://www.cuwcc.org/Portals/0/BMPResources/PublicInformation/PublicInformationGuidebook.pdf Water Conservation: *Customer Behavior and Effective Communications*, by Water Research Foundation in 2010 Effectiveness of Residential Water Conservation Price & Non-Price Programs, by AWWA Research Foundation in 1998
Education – Increase education awareness	Qualitative	CUWCC Education Outreach BMP Implementation Guidebook http://www.cuwcc.org/Portals/0/BMPResources/SchoolEducation/SchoolEducationGuidebook.pdf Fifth Grade Common Core Standards (California) http://www.cde.ca.gov/ci/cr/cf/documents/glc5thgradecurriculum.pdf
Energy Conservation – Reduce energy consumption	kWh	Based on FMWD Recycled Water Project – Energy Savings Calculations, January 2013 http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf
GHG Reduction – Reduce GHG emissions	Metric tons of CO_2 equivalents	*FMWD Greenhouse Gas Calculations* Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

FMWD is a wholesale distributor of imported water to seven retail agencies located in the foothills of the San Gabriel Mountains. An eighth agency receives no imported water. FMWD is a member agency of Metropolitan Water District of Southern California (MWD) and has only one connection with that entity. FMWD is 100% reliant on imported MWD supplies and currently has no other projects planned that would alleviate imported water reliance. Without the Project, 318 AFY of potable water will continue to be imported via MWD. Reliance on imported water will continue, and therefore water supply reliability will not improve within the FMWD service area.

By providing a more reliable local source of supply, this Project will also help to offset the need for construction of an additional connection to MWD. As part of FMWD's strategic planning process, which began in 2005, the agency began to explore options for improving water supply reliability. In 2007, a Master Plan was developed that reviewed constructing another connection to MWD as one alternative for improving water supply reliability. This portion of the Master Plan was not adopted, but deferred until a Water Resource Plan – Alternatives Screening Report could be prepared to investigate other alternatives to the exorbitantly expensive second connection (e.g., developing additional local supply sources). In 2008, a Water Resource Plan – Alternatives Screening Report was prepared that found the total cost for the facilities associated with a proposed second connection would cost an estimated $19.8 million ($21.1 million in 2012 USD). Because of the pumping required, this connection would only be used during a MWD shutdown or emergency situation. Without the project, FMWD would be one step closer to having to construct a second connection to MWD.

The Project will also provide much needed underground storage for FMWD. Currently, FMWD system storage facilities consist of 6 storage tanks at 3 pressure zone locations with a total storage capacity of 6.8 million gallons. During a peak summer day, water in this reservoir system can turn over almost seven times. Because of the Angeles Forest abutting the FMWD service area on one side, the Arroyo Seco cutting through and full development of the property in the remaining area, property has not been identified for construction of another tank to relieve this peaking. Using the groundwater basin in place of constructing a steel or concrete tank is a more practical and feasible option. Without the project, FMWD may need to construct additional above ground storage or expand/retrofit an existing storage tank at a much higher cost.

In addition, increased use of imported water under the "without project" scenario will result in increased energy usage [and associated greenhouse gas (GHG) emissions] involved with pumping and distributing imported water over long distances. The energy requirements would be much lower if locally generated recycled water and captured stormwater and urban runoff were used instead of imported water.

The MBR facility will also capture and treat 38 AFY of stormwater and urban runoff. Currently stormwater and urban runoff are diverted from La Cañada High School into storm drains designed to carry the water to flood control channels, which in turn conveys this water to the ocean without any treatment. With the Project, FMWD will capture this potential supply, treat the flows at the MBR facility, and discharge the effluent into the infiltration galleries. This will reduce pollutant loading to the down-gradient Los Angeles River (urban runoff has a different drainage point than sewer flows) and the Pacific Ocean of constituents typical of surface runoff, including: nitrate, phosphates, ammonia, sulfate, chloride, heavy metals, total dissolved solids (TDS), and coliform (total and fecal). With the Project, the recycled water and captured stormwater and urban runoff that replenishes groundwater within the Raymond Basin (i.e., through the infiltration galleries) will receive soil aquifer treatment and help to improve the overall health of the aquifer. Because of the contaminants currently existing in the Raymond Basin (i.e., VOCs, nitrate and perchlorate) recharging the Raymond Basin with recycled water that meets Title 22 standards will help to dilute and eventually flush out the polluted water. By increasing pumping rights, member agencies required to treat for perchlorate and VOCs can pump more water annually from the Raymond Basin and remove the pollutants via existing wellhead treatment within a shorter timeframe. Additionally, nutrients and bacteria will be removed from the local storm drain that discharges into the Arroyo Seco (and eventually the Los Angeles River) via capture of stormwater and urban runoff. If the Project is not implemented these water quality benefits would not be realized.

Without the Project, a number of social and education benefits that have implications for the broader region would be foregone. As described in Attachments 3 and 8, the Project includes several educational components being developed by Cal Poly Pomona designed to encourage water conservation and promote sustainable watershed management. The Cal Poly Pomona contribution may be applied to other projects both within and outside FMWD's service area, thus benefitting the broader region. If this Project is not funded, Cal Poly Pomona will not be able to complete the educational activities associated with the Project.

Additionally, the LACSD is currently developing an MBR policy that uses the FMWD Project as the model to further develop similar scalping projects within the County of Los Angeles.

Without the project, the LACSD MBR policy may be further delayed and lack significant data and input from this Project. The Project will also be an incentive for other agencies interested in developing recycled water with infiltration galleries since it will be an example of how an agency without access to a central recycled water system or groundwater recharge basins, due to cost and geographic restrictions, will now able to make such a project feasible. These broader regional benefits will not be realized if the Project is not implemented.

Narrative Description of Physical Benefits (With Project)

A. Water Supply

Reduce Dependence on Imported Water/Increase Water Supplies

FMWD is a wholesale distributor of imported water to seven retail agencies located in the foothills of the San Gabriel Mountains. An eighth retail agency takes no imported water. FMWD is a member agency of MWD and currently has only one connection with that entity. FMWD's retail agencies supplement imported water with local supplies. On average within the service area, about 60% of demands are met through imported water while 40% are met with local water.

Overall, the FMWD system reservoir facilities consist of 6 storage tanks at 3 pressure zone locations with a total storage capacity of 6.8 million gallons. During a peak summer day, water in this reservoir system can turn over almost seven times. Because of the Angeles Forest abutting the FMWD service area on one side, the Arroyo Seco cutting through and full development of the property in the remaining area, property has not been identified for construction of another tank to relieve this peaking. Using the groundwater basin to alleviate storage needs in lieu of a steel or concrete tank is a more practical and feasible option.

The total estimated flow of wastewater, stormwater and urban runoff capture is 318 AFY. About 280 AF consists of wastewater flow capture from the LACSD District No. 28, Joint Outfall B – Unit 6 trunk sewer. The flow was measured by LACSD from September 22, 2009 through September 28, 2010 and the data consists of sewer flows in two minute intervals during that entire length of time. The estimated volume of water to be captured by the Project is based on low sewer flows during early morning periods based on the data provided. The flows of intercepted municipal wastewater that were used to calculate an appropriate size for the MBR plant were established based on running the project 24 hours a day to reduce the overall unit cost of the Project.

About 15 AF of stormwater runoff was calculated using the average precipitation data between Los Angeles Civic Center and Mount Wilson. The total area of the football, soccer, softball, and baseball fields is 318,000 square feet. Assuming one-inch rainfall for the total area, 198,239 gallons would be captured. Based on the California Department of Water Resources website[37], the Los Angeles Civic Center average annual precipitation (from 1890 to 2002) is 14.41 inches and Mount Wilson average precipitation is 34.58 inches. The average rainfall between the two stations is 24.50 inches which was used to determine the 15 AF the fields will capture.

About 23 AF of urban runoff capture was calculated based on the size of the athletic fields and the annual irrigation amount for turf. The total area of the football, soccer, softball, and baseball fields is 318,000 square feet. Based on FMLink[38], 10,000 gallons of runoff is generated per 1,000 square feet per summer for an average lawn. A football field converted to synthetic turf saves 2,000,000 gallons per year. Based on these two numbers it was assumed that the athletic fields on average use 30,000 gallons per 1,000 square feet per year. This generates approximately 7,546,000 gallons, or 23 AF, of dry weather runoff per year.

B. Reduced Delta Demands to Help Address CALFED Bay-Delta Program Objectives

The Greater Los Angeles County IRWM Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2007 IRWMP Plan. Diversion of water from the Delta to southern California has caused damage to the Bay Delta's ecosystem due to State Water Project (SWP) and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps), damages habitats, and reverses river flows. By reducing the Region's reliance on the Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet CALFED Bay Delta Program objectives to restore tidal marshes and floodplains, and restore fish and wildlife species.

C. Water Quality

Capture and Treatment of Urban Runoff and Stormwater

The MBR facility will capture and treat 38 AFY of stormwater and urban runoff, preventing untreated runoff from ultimately reaching the Los Angeles River. This flow is estimated as

[37] http://cdec.water.ca.gov/cgi-progs/precip/PRECIPOUT

[38] http://www.fmlink.com/article.cgi?type=Sustainability&title=Natural%20Landscaping%20and%20Artificial%20Turf%3A%20Achieving%20Water%20Use%20and%20Pesticide%20Reduction&pub=BuildingGreen&id=40602&mode=source

explained above in the Water Supply section. Currently stormwater and urban runoff are diverted from La Cañada High School into storm drains designed to carry the water to flood control channels, which in turn conveys this water to the ocean without any treatment. With the Project, FMWD will capture this potential supply, treat the flows at the MBR facility, and discharge the effluent into the infiltration galleries. This will reduce pollutant loading to the down-gradient Los Angeles River (urban runoff has a different drainage point than sewer flows) and the Pacific Ocean of constituents typical of surface runoff, including: nitrate, phosphates, ammonia, sulfate, chloride, heavy metals, total dissolved solids (TDS), and coliform (total and fecal). Additionally, nutrients and bacteria will be removed from the local storm drain that discharges into the Arroyo Seco (and eventually the Los Angeles River) via capture of stormwater and urban runoff. See additional information in Attachment 8.

D. Public Outreach

A website will be created for the public to book tours of the facility. A 3D model of the infiltration galleries will be developed to demonstrate to the public how the overall recharge system works. In addition, the LACSD is developing an MBR policy that will use the Project as the model to further develop MBR facilities within their service area.

The Project will make use of drought tolerant landscaping for demonstration gardens (around the MBR and school site) which provide an example to immediately engage the public on ways to plant water wise plants and conserve water. The Project will also make use of outreach during tours of the MBR facility to encourage conservation. Tours will include the use of Hahamongna Watershed Park (located directly across the street from the MBR plant) where the watershed, stewardship of the Arroyo Seco, and history of the area will be described, with an emphasis on ecosystem and natural habitat features. Other topics covered as part of the tour include imported water and local water sources, conservation inside the home, and drought tolerant landscaping. All of these measures are intended to foster public engagement and to increase the use of conservation practices in the community. See additional information in Attachment 8.

E. Education

The proposed Project includes several educational components designed to promote water conservation and sustainable watershed management throughout the FMWD service area. The educational components of the Project will be designed by three Cal Poly Pomona departments: Civil Engineering, Landscape Architecture, and Urban and Regional Planning. Specific educational activities include:

- Establishment of research collaborations with Cal Poly Pomona, allowing students to gain real world experience in project design and implementation
- Demonstration of the benefits of low impact development (LID) through development of drought tolerant landscaping at the Project site.
- Development of new water-related education curriculum for 5th graders within the La Cañada Unified School District
- Development and implementation of public and school group tours of the MBR facility and neighboring Hahamongna Watershed Park

These measures are intended to promote education and to increase the use of conservation practices in the community. See additional information in Attachment 8.

F. Energy Conservation

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total GHG emissions.

An energy analysis was performed by FMWD to calculate the net savings for the Project. [39] These savings are estimated based on the power requirements to operate the MBR facility and the power required to pump the percolated water from the aquifer at FMWD's connection at the Rose Bowl. The power requirements for imported State Project Water from the east branch of the California Aqueduct are then subtracted since this water will be offset by the Project. The energy calculations are shown in more detail in the **Appendix CD**.

According to the analysis, the net energy savings for 318 AFY of water (i.e., MBR production energy + extraction energy - imported energy) is approximately 594,335 kWh for one year of Project operation, or 29.7 million kWh over the 50-year Project lifespan. The estimated total savings of the Project for one year of operation is enough power to serve 85 single-family homes for one year.

G. Greenhouse Gas Reduction

The proposed Project would avoid GHG emissions generated by the additional energy needed to transport imported SWP water for the GLAC Region. This value may be calculated by applying

[39] Based on FMWD Recycled Water Project – Energy Savings Calculations, January 2013

a factor of 0.724 lbs of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[40] By offsetting the demand of 318 AF of imported SWP water, the proposed Project will avoid 195 metric tons of CO_2 equivalents per year, or 9,750 metric tons over the 50-year Project lifespan.

Relationship to other Projects in the Proposal

The designed scope of the Project, in reference to planned construction and operation of the 0.25 MGD MBR plant and infiltration galleries, dictates a comprehensive and full-install approach. All parts of the Project will be jointly implemented and constructed as all planned elements need to be utilized concurrently.

Common elements with other Projects in this Proposal are:

- Conservation
- Use of local water resources
- Offset Imported water
- Reduce energy usage
- Reduce greenhouse gas emissions

Facilities, Policies, and Action Needed

The following facilities are needed to implement the Project:

- Construction of a new MBR facility,
- Construction of infiltration galleries underneath athletic fields, and
- Development of 0.5 acres of vacant land with drought-tolerant landscaping/open space.

The following policies and other actions are needed to implement the Project:

- Title 22 Draft Groundwater Recharge Regulations, and
- Sale of groundwater pumping credits to member agencies

Agreements are needed with the following stakeholders to implement the Project:

- LACSD,
- Raymond Basin Watermaster,
- La Cañada United Methodist Church,

[40] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

- La Cañada Unified School District and
- City of La Cañada Flintridge.

Uncertainties

The variability of precipitation could have an impact on the amount of stormwater runoff captured and recharged from year-to-year. Should there be a dry hydrologic year, stormwater capture may be slightly less. However, that may result in more irrigation thus increasing the possibility of capturing more urban runoff.

The Raymond Basin Management Board (RBMB) currently lacks groundwater monitoring data regarding how recharging of recycled water into the Monk Hill subbasin will affect the overall Raymond Basin. FMWD is currently conducting a hydrological analysis using a consultant. FMWD will provide results of the hydrological analysis in order to help shape and create added depth to the Salt and Nutrient Management Plan that RBMB is obligated to compose and monitor per Regional Water Quality Control Board requirements.

Potential Adverse Physical Effects

There are no adverse physical impacts from this Project. Rather, the Project contributes positively to local and regional environmental stewardship, adds to the well-being of the community through development of 0.5 acre vacant land and provides FMWD's participating retail agencies with a local and reliable supply.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit. These benefits are assumed to begin in mid-to-late 2016 and end in mid-to-late 2066 (in accordance with the Schedule presented in Attachment 5).

Benefit #1 - Water Supply, Reduction in Imported Water

The table below provides information regarding reduction in imported supply, with and without the Project.

Physical Benefit: Reduction of 318 AFY of imported water
Measure of Benefit Claimed (Name of Units): AF

Year	Physical Benefits		
	Without Project	With Project	Change Resulting from Project
2012-2015	0	0	0
2016	0	80	80
2017-65	0	318	318
2066	0	239	239
References: Supporting references include flow data from LACSD which reflects the low flows in the LACSD District No. 28, Joint Outfall B – Unit 6 trunk sewer and estimates of the amount of stormwater and urban runoff captured as described in an FMWD staff paper: Foothill Municipal Water District Recycled Water Project, Update to Incorporate a Watershed **Note**: Amount of recharge may change with future expansions of project and/or agreement with RBMB			

Benefit #2 - Water Supply, Increase in Water Supplies

The table below provides information regarding increase in local water supply, with and without the Project.

Physical Benefit: Recharge of 318 AFY (Raymond Groundwater Basin)			
Measure of Benefit Claimed (Name of Units): AF			
Year	**Physical Benefits**		
	Without Project	**With Project**	**Change Resulting from Project**
2012-2015	0	0	0
2016	0	80	80
2017-2065	0	318	318
2066	0	239	239
References: Supporting references include flow data from LACSD which reflects the low flows in the LACSD District No. 28, Joint Outfall B – Unit 6 trunk sewer and estimates of the amount of stormwater and urban runoff captured as described in an FMWD staff paper: Foothill Municipal Water District Recycled Water Project, Update to Incorporate a Watershed **Note**: Amount of recharge may change with future expansions of project and/or agreement with RBMB			

Benefit #3 - Energy Conservation

The table below provides information regarding energy conservation, with and without the Project.

Physical Benefit: Energy savings (MBR + pumping - imported water)			
Measure of Benefit Claimed (Name of Units): kWh			
Year	**Physical Benefits**		
	Without Project	**With Project**	**Change Resulting from Project**
2012-2015	1,128,900	0	0
2016	1,128,900	148,583	148,583
2017-2065	1,128,900	594,335	594,335
2066	1,128,900	495,752	495,752
References: Energy savings are articulated in a calculation that uses metered information from the State Water Project and FMWD. Calculations also include use of recycled water energy information from a study with manufacturers and groundwater production based on efficiency testing by FMWD's member agencies. Attached to this Attachment #7 is the *Cost Effective & Energy Efficient MBR Systems* analysis that elaborates more on these numbers. **Note**: Amount of energy savings may change with future expansions of project.			

Benefit #4 - Greenhouse Gas Reduction

The table below provides information regarding reduction of greenhouse gas emissions.

Physical Benefit: Greenhouse gas production			
Measure of Benefit Claimed (Name of Units): metric tons (MT)			
Year	**Physical Benefits**		
	Without Project	**With Project**	**Change Resulting from Project**
2012-2015	0	0	0
2016	93	44	49
2017-2065	371	175	195
2066	278	132	146
References: Greenhouse gas emissions are articulated in a calculation that uses metered information from the State Water Project and FMWD. Calculations also include use of recycled water energy information from a study with manufacturers and groundwater production based on efficiency testing by FMWD's member agencies. Attached to this Attachment #7 is the *Cost Effective & Energy Efficient MBR Systems* analysis that elaborates more on these numbers. **Note**: Amount of greenhouse gas emission reduction may change with future expansions of project.			

Marsh Park, Phase II

The Marsh Park Phase II Project (Project) will expand the existing park to create an additional three acres of park land in a park-poor neighborhood on the banks of the soft-bottom portion of the Los Angeles River. The Project will convert over three acres of impervious surface into pervious surface which can detain, infiltrate, and recharge stormwater. On-site and off-site runoff will be detained and bio-filtered through the park's system of bio-swales and filter inserts before being slowly released into the Los Angeles River. While native Californian plants will dominate the entire 3.0 acres of parkland to promote outdoor education and water conservation, riparian habitat restoration will occur on 1.25 of the three acres.

The park, which will ultimately convert 5.4 acres of industrial land into a multi-benefit natural park, is being constructed in three phases. Phase I has been completed; it comprises a pocket park and a skate park, which equal one acre in size. Phase II (the project described in this proposal) will add three acres of park land. Phase III, which has not yet been planned or designed, will add another 1.4 acres, and will be located in an area that connects Phase I and Phase II.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-6**.

A. Water Supply
   - Reduction of imported water demand by 1.01 acre-feet/year (AFY) from permanently reducing the potential irrigation demands at the Project site
   - Reduction of imported water demand by 2.14 AFY from increasing the capture and recharge of stormwater, bringing the total imported offset to 3.15 AFY
   - Increased water supply reliability for pumpers in the San Fernando Groundwater Basin during times of drought experienced by the State Water Project (SWP) by offsetting less reliable imported water with more reliable groundwater

B. Reduced Sacramento-San Joaquin Delta (Delta) demands to help address Delta environmental goals

C. Water Quality
   - Avoidance of pollutant loadings that would otherwise be discharged to the Los Angeles River over the 100-year life of the Project

D. Flood Protection

- Increased detention of 1.5 AF during 50-year storm events which will decrease flood risk downstream along the Los Angeles River
- Improved stormwater drainage for 5.8 acres of combined residential tributary area and park land that will decrease flood risk upstream

E. Open Space
- Increased open space for parks by three acres
- Increased open space for riparian habitat by 1.25 acres

F. Energy Conservation
- Reduction of 826,600 kWh over the 100-year lifespan of the Project

G. Greenhouse Gas (GHG) Reduction
- Avoidance of 200 metric tons of CO_2 equivalents emitted over the 100-year life of the Project

Table 7-6: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Offset of imported water demand from reduced irrigation demand	AFY	Sheet L2.03 of Marsh Park Phase II Construction Documents
Water Supply – Offset of imported water from Increased capture and recharge of stormwater	AFY	Average Annual Rainfall calculations; KPFF correspondence (email) on November 1, 2012
Water Supply - increased reliability	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012. Los Angeles Department of Water and Power (LADWP) 2010 Urban Water Management Plan
Delta Demands - decreased	Qualitative	DWR. *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Water Quality – Reduced pollutant loading to receiving waters	Qualitative	http://ofmpub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=CAR4052100019990202090157&p_cycle=2004&p_state=CA&p_report_type=T#causes
Flood Protection – Increased detention during a 50-year storm	Qualitative	Hydrology and Hydraulics Report; KPFF correspondence (email) on November 1, 2012
Flood Protection – Increased stormwater	Qualitative	Hydrology and Hydraulics Report; KPFF correspondence (email) on November 1, 2012

Physical Benefit	Unit	Technical Justification
drainage of tributary area		
Open Space - Creation of riparian habitat	acres	Sheet L3.00 and L3.01 of Construction Documents
Open Space – Creation of park	acres	Sheets L3.00 and L3.01 of Construction Documents and Photographs
Energy Conservation - Reduction of energy from offsetting SWP water	kWh	http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308. Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
GHG Reduction - Reduction of emissions	Tons of CO_2 equivalents	Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

Marsh Park Phase II will be developed on a parcel of land that has been used historically for industrial purposes. The entire parcel is currently a large, paved, mostly vacant lot with several unoccupied buildings. One building does have a tenant – a dancewear manufacturing company. In the past, there was also a truck company and a moving and storage company warehouse.

If Marsh Park Phase II is not constructed, the status quo would continue. There are no other plans or funding for alternative projects. Thus, the area would continue to be a vacant industrial lot, and it is likely that the remaining tenant would move. It is not clear whether other companies would move to this area, but this scenario would likely create additional environmental concerns.

If the status quo is maintained, this area would not receive any of the social, environmental, and sustainability benefits that are described in Attachments 7 and 8. This would mean that the Elysian Valley neighborhood, which is a disadvantaged and "park-poor" community, would continue to lack access to the nearby Los Angeles River, the adjacent Los Angeles River Bike

Path, and nearby parkland. Thus, neighborhood adults and children would not have easy, walk-able access to a place where they can picnic, run, bicycle, use the health and fitness equipment, and engage in other healthy and social activities. Regional users of the river and bike path will also lose benefits if the park is not built, since it would be the only park for miles along the river where bikers and boaters can find water fountains, a restroom, and picnic tables. The Los Angeles River would continue to be impaired annually by untreated stormwater and the same amount of windswept trash. Trash loads currently exceed Total Maximum Daily Load (TMDL) standards. Without the park, other pollutants will also continue to reach the river. During a 50-year storm event, 5.8 acres[41] of industrial and residential parcels will drain approximately 2.14 acre-feet of unfiltered water into the river. If the status quo is maintained, many other benefits will not be accrued. For example, if the park is not built, there will be no riparian habitat that nurtures California native plants, no wildlife corridor, and no outdoor education programs for the neighborhood's youth. Overall, the residents of the Elysian Valley neighborhood, regional users of the river and bike path, and the environment will benefit in many ways from Marsh Park Phase II. Finally, without the Project the site could potentially be developed to the Maximum Applied Water Allowance (a higher level of irrigation demand) rather than being permanently restricted to a lower level of irrigation demand.

Narrative Description of Physical Benefits (with Project)

A. Water Supply

Offset of Imported Water Demands - Reduced Irrigation Demands

The Project will help reduce imported water demand by 1.01 AFY. Assembly Bill (AB) 1881 (2006) required all local agencies to adopt a water efficient landscape ordinance by January 1, 2010. DWR's "Model Water Efficient Landscape Ordinance" reflects the State policy of promoting the conservation and efficient use of water in landscapes. The objectives of AB 1881 include promoting water use efficiency by setting a Maximum Applied Water Allowance (MAWA) as an upper limit for water use that can be compared with the Estimated Applied Water Use (EAWU) to encourage overall water use efficiency.[42]

The MAWA for the site has been estimated at 1,539,889.3 gallons per year, while the EAWU has been estimated at 1,210,707.8 gallons per year for the Project, a difference of 329,181.5 gallons per year.[43] This value is equivalent to 1.01 AFY. Under the assumption that the site could

[41] Includes 2.8 acres of offsite tributary area (neighborhoods and streets) and 3.0 acres of onsite area for Phase II.
[42] http://www.water.ca.gov/wateruseefficiency/landscape/
[43] Marsh Park, Phase II construction drawings, Sheet L2.03 (see the Appendix CD)

support a maximum irrigation demand equal to the MAWA, and that permanent development of the park with reduced-demand native landscaping will limit irrigation demands to the EAWU, the Project will permanently offset the need for imported water to meet this irrigation demand difference of 1.01 AFY. A deed restriction on the land now limits development of the site to park and open space.

Offset of Imported Water Demands - Increased Stormwater Capture and Groundwater Recharge

The Project will increase the capture of stormwater and groundwater recharge by 2.14 AFY. This increases the supply of local groundwater that can subsequently be used by pumpers and constitutes another offset of imported water supplies from the SWP.

Hydrology calculations estimate that the Project will allow an average of 698,429 gallons per year of stormwater for infiltration from the onsite area. This collected run-off currently flows across impervious surfaces and into storm drains that discharge to the Los Angeles River. The hardscape and landscape areas are 1.17 and 1.91 acres, respectively. The runoff volume was calculated by using hardscape and landscape runoff coefficients of 0.95 and 0.40, respectively. Using 2002 to 2012 rainfall data for downtown Los Angeles, the average wet season was calculated to be 13.69 inches per year. Using the average rainfall per month, total area and runoff coefficient weighted, the total runoff for the 3.08 acres is 698,429 gallons. [44] This volume is equivalent to 2.14 AFY. Infiltration calculations are based on the document attached in the Appendix CD.

The Project site is located in the San Fernando Groundwater Basin and in the LADWP service area. This analysis assumes that additional stormwater recharged to the groundwater basin will provide additional potable supplies to local pumpers. The analysis also assumes that this additional supply of groundwater will offset demands for imported water that would otherwise be provided to the local area wholesale by the MWD through LADWP, the retail water supplier.

Total Imported Water Offset

Combined with the imported water offset achieved from reduced irrigation demands, the total imported offset from the Project is 3.15 AFY.

B. Reduced Delta Demands to Help Address Delta Environmental Goals

[44] Average Annual Rainfall Calculations – Marsh Park (See the Appendix CD)

The Greater Los Angeles County (GLAC) IRWM Region has made it a priority to reduce dependence on imported water supplies received from the Delta, a priority that is reflected in the GLAC Region's 2006 IRWMP Plan. Diversion of water from the Delta to Southern California has caused damage to the Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to Southern California directly impacts species (such as the entrainment of aquatic species in pumps) and damages habitats, while operations that reverse river flows impact ecosystems activity. By reducing the Region's reliance on the Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet Bay Delta environmental goals to restore tidal marshes and floodplains, and restore fish and wildlife species.

C. Water Quality

The Los Angeles River is listed on the Clean Water Act 303(d) list for nutrients and bacteria within numerous disadvantaged communities. The Project is on the banks of the Glendale Narrows reach of the Los Angeles River currently impaired by trash and bacteria TMDLs, and has been impacted by metals, ammonia, nutrients, odors and unnatural scum in the past 10 years. The Project site itself is within a groundwater plume of the San Fernando groundwater basin that is considered to be a superfund site contaminated by trichloroethylene, perchloroethylene and nitrate. The Glendale Narrows is a vital habitat patch that must be protected from water pollution because of its connections to nearby significant ecological areas in the Verdugo Mountains, Santa Monica Mountains, and San Gabriel Mountains. Water quality in this reach of the Los Angeles River is also tied to human health concerns since many people are known to eat the fish they catch from the river.

The Project's natural filtration system will help decrease pollutants flowing into the Los Angeles River, thereby helping the City meet TMDL requirements for trash and other constituents. The Project is on the banks of the Glendale Narrows reach of the Los Angeles River. The Glendale Narrows is a vital habitat that must be protected from water pollution because of its connections to nearby Significant Ecological Areas in the Verdugo Mountains, Santa Monica Mountains, and San Gabriel Mountains. Through its system of bioswales, stormwater filters, topography, and restored habitat, the Project is designed to detain, filter, and slow stormwater runoff and trash moving through the park. Alternative methods of trash removal (e.g., a trash boom or intensive maintenance) would be more expensive.

The Project will also help improve water quality in the Los Angeles River in terms of bacteria, toxic chemicals, and other pollutants that would otherwise be swept into the river along with

stormwater runoff. There are no current TMDLs for other pollutants, and no monitoring has been conducted to estimate the likely reductions in loading. [45]

D. Flood Protection

Increase Stormwater Detention and Reduce Flood Risk Downstream

The Project will increase detention of 1.5 AF of stormwater during a 50-year storm which will increase downstream flood protection. In the *Hydrology and Hydraulics Report*, the proposed stormwater discharge from the park site was demonstrated to be 13.67 cubic feet per second (cfs) during a 50-year storm, a reduction from the existing condition of 14.44 cfs during a similar storm event. This reduction of 0.77 cfs is caused by an "increase in vegetative/pervious cover and the addition of vegetated swales". [46] This 0.77 cfs is equivalent to approximately 1.5 AF of captured stormwater during the 24-hour, 50-year storm. The report also demonstrates that the drain pipe network proposed for the Project is adequate to convey the stormwater flows generated. The report used the "time of concentration calculator" (TC Calculator) developed by the Los Angeles County of Department Public Works to compute run-off and run-on flow rates.

Improve Stormwater Drainage and Reduce Flood Risk Upstream

The Project will increase stormwater drainage for 5.8 acres of residential and park land that is tributary to the Project site. Wet and dry-weather runoff from a 5.8 acre area currently flows untreated directly into the Los Angeles River, polluting its waters with contaminants. After rain events there is surface ponding at the intersection of Gleneden Street and the Project property, illustrating the need for rehabilitated storm infrastructure which the park will provide at this intersection.

E. Open Space

The Project will increase open space for parks and riparian habitat by 3 and 1.25 acres, respectively. Existing impervious industrial land will be converted into park land.

The acreages for these benefits are based on the survey and landscape architectural plans for the Project. The inclusion of riparian habitat, recreation, and open space area are central to the project concept and remain an integral part of the design development. The acreage of the habitat area, in particular, is discernible in the planting sheets of the construction document,

[45] http://ofmpub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=CAR4052100019990202090157&p_cycle=2004&p_state=CA&p_report_type=T#causes

[46] KPFF Consulting Engineers for Mountains Recreation & Conservation Authority. *Hydrology and Hydraulics Report*, Marsh Park, January 2013.

which includes a plant list of native riparian species, as well as symbols showing where the species are located in the Project.

F. Energy Conservation

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total GHG emissions.

It has been estimated that the average cost to pump groundwater in the San Fernando Basin was $63/AF[47] in 2004[48], which is the equivalent $76/AF in 2012. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2012 was $0.202/kWh.[49] Using these values, the energy required to pump groundwater in the San Fernando Basin is estimated to be 376 kWh/AF. For imported supplies, West Basin Municipal Water District (WBMWD) has estimated that 3,000 kilowatt-hours (kWh) per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[50] Assuming 2,624 kWh/AF (3,000 - 376) and an average annual imported water offset of 3.15 AF, approximately 8,266 kWh per year of energy will be saved by implementing the Project. Over the 100-year life of the Project, this totals 826,600 kWh of conserved energy.

G. GHG Reduction

The proposed Project would avoid GHG emissions generated by the additional energy needed to transport imported SWP water for the Region. This value may be calculated by applying a factor of 0.724 lbs. of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[51] By offsetting the demand of 3.15 AF of imported SWP water, the proposed Project will avoid GHG emissions of approximately 2 metric tons per year of CO_2 equivalents per year. Over the 100-year life of the Project, this totals 200 metric tons of avoided carbon emissions.

[47] Assumed that pumping cost does not include operations and maintenance. Only energy costs.
[48] Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308.
[49] Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
[50] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.
[51] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

Relationship to other projects in the Proposal

Marsh Park is part of the regional project to revitalize the Los Angeles River which is being implemented by local non-profits and all levels of government including federal, state, county, and municipal. Since the City of Los Angeles adopted the Los Angeles River Revitalization Master Plan in 2007, there has been a surge of momentum to implement the plan that is projected to take 50 to 100 years. Marsh Park is one of many projects guided by that plan to completely redefine the environmental and social quality of inner-city Los Angeles neighborhoods.

Facilities, Policies and Actions Needed

In order to obtain the physical benefits, the entire design and construction of the park as an integral Best Management Practice (BMP) will be required. The new bioswales, stormwater filters, topography and planted areas all work together to manage stormwater on-site. The other physical benefits, such as recreation, open space and habitat, are made possible through the conversion of the existing industrial parcels into the proposed park. Two buildings and acres of impervious surface will need to be demolished. As much of the demolished waste will be recycled, some of which will be re-used on-site to build the proposed Project.

Uncertainties

The water quality and flood benefits were based on standard water management equations for the Los Angeles area. The Project has been designed for a 50 year – 24 hour storm event. If the area were to incur larger storms, the benefits are more uncertain. The water supply benefits could be affected by undetected leaks in the irrigation piping. The habitat, recreation and open space benefits will take effect as long as the Project is built according to the prepared construction documents. Funding freezes or other unforeseen market forces would be the only uncertainties that could prevent the habitat, recreation and open space benefits from being built.

Potential Adverse Physical Effects

Potential adverse physical effects of the project were evaluated and mitigated in the Mitigated Negative Declaration CEQA document.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Reduction of Imported Water

The table below provides information regarding the reduction in imported water gained from two aspects of the Project: (1) avoided irrigation demands, (2) increased recharge of urban runoff and stormwater.

Project Name: Marsh Park Phase II
Type of Benefit Claimed: Reduction of Imported Water
Measure of Benefit Claimed (Name of Units): acre-feet
Additional Information About this Measure: Includes avoided irrigation demands and increased recharge of urban runoff and stormwater

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0.5 (1)	--	--
2015	Irrig. demand = 4.73 (2) Recharge = 0	Irrig. demand = 3.72 (3) Recharge = 2.14	Irrig. demand = 1.01 Recharge = 2.14 Total offset = 3.15
2016-2114	Irrig. demand = 4.73 (2) Recharge = 0	Irrig. demand = 3.72 (3) Recharge = 2.14	Irrig. demand = 1.01 Recharge = 2.14 Total offset = 3.15

References: Sheet L2.03 of Marsh Park Phase II Construction Documents; Average Annual Rainfall calculations; KPFF correspondence (email) on November 1, 2012

Notes: (1) Water Footprint Network used to calculated approximate annual water use for existing industrial use; (2) AB 1881 was used to calculate irrigation demands, assuming that the property would be developed to use MAWA if the Project is not implemented; (3) Project construction documents indicate that the property will be developed to use EAWU (less than MAWA) if the Project is implemented

Benefit #2 – Increased Groundwater Recharge and Water Quality

The table below provides information regarding increase of groundwater recharge with urban runoff and stormwater that is also filtered by the recharge process.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Increase Groundwater Supply **Measure of Benefit Claimed (Name of Units):** acre feet **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	--	--
2015	0	2.14	2.14
2016-2114	0	2.14	2.14
References: Hydrology and Hydraulics Report; Average Annual Rainfall calculations; KPFF correspondence (email) on November 1, 2012			

Benefit #3 – Increase Flood Protection

The table below provides information regarding decrease in peak flows during flood events during a 50-year storm.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Decrease in Stormwater Runoff **Measure of Benefit Claimed (Name of Units):** cubic feet per second **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	14.44	--	--
2015	14.44	13.67	-0.77
2016-2114	14.44	13.67	-0.77
References: Hydrology and Hydraulics Report; KPFF correspondence (email) on November 1, 2012			

Benefit #4 – Increase Stormwater Detention Capacity

The table below provides information regarding increase in stormwater detention capacity.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Increase Stormwater Detention **Measure of Benefit Claimed (Name of Units):** acre-feet **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	--	--
2015	0	1.5	1.5
2016-2114	0	1.5	1.5
References: Hydrology and Hydraulics Report; KPFF correspondence (email) on November 1, 2012			

Benefit #5 – Increase in Park and Open Space

The table below provides information regarding increase in open space and creation of open space, free-play meadows.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Increase in park and open space **Measure of Benefit Claimed (Name of Units):** acres **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	--	--
2015	0	3	3
2016-2114	0	3	3
References: Project construction documents			

Benefit #6 – Increase in Riparian Habitat

The table below provides information regarding increase in riparian habitat.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Increase in Riparian Habitat **Measure of Benefit Claimed (Name of Units):** acres **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	--	--
2015	0	1.25	1.25
2016-2114	0	1.25	1.25
References: Project construction documents			

Benefit #7 – Energy Conservation

The table below provides information regarding energy consumption for conveyance of SWP imported water and groundwater pumping, with and without the Project.

Project Name: Marsh Park Phase II **Type of Benefit Claimed:** Energy Consumed **Measure of Benefit Claimed (Name of Units):** kilowatt-hours (kWh) **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	--	--
2015	Baseline	Baseline - 8,266	-8,266
2016-2114	Baseline	Baseline - 8,266	-8,266

References: http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf; Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308; Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm.

Benefit #8 –GHG Emissions

The table below provides information regarding GHG emissions for conveyance of SWP imported water and groundwater pumping, with and without the Project.

Project Name: Marsh Park Phase II
Type of Benefit Claimed: CO_2 equivalents emitted
Measure of Benefit Claimed (Name of Units): metric tons
Additional Information About this Measure:

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	--	--
2015	Baseline	Baseline - 2	-2
2016-2114	Baseline	Baseline - 2	-2

References: Climate Action Registry, General Reporting Protocol
http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

Oxford Retention Basin Multi-Use Enhancement Project

The Oxford Retention Basin Multi-Use Enhancement Project (Project) proposes to implement a number of improvements that will reduce flooding in the area surround the Oxford Retention Basin, improve the quality of runoff, and increase native habitat and recreational features surrounding the Retention Basin. These improvements will include:

- Installation of a 2-foot high parapet wall to increase the capacity of the retention basin
- Installation of a vegetated circulation berm
- Installation of trash best management practices (BMPs) at the outlets of storm drains that discharge to the basin
- Construction of bio-swales
- Establishment of native plants
- Removal of contaminated soils
- Installation of trail and observation areas
- Replacement of tide-gates for flood control purposes

These improvements are expected to yield the flood, water quality, habitat, and recreation benefits described below.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-6**.

A. Flood Protection
    - Increase retention capacity of retention basin by 20 acre-feet (AF)
    - Reduce number of annual nuisance flooding events by two
B. Water Quality
    - Decrease in bacteria concentrations in the Marina del Rey Back Basins
    - Decrease in toxics concentrations, specifically copper, lead, zinc, and polychlorinated biphenyls (PCBs), in the Marina del Rey Back Basins
C. Habitat
    - Increased native habitat area of 10 acres
D. Recreation
    - Addition of passive recreation features, including 3,500 linear feet of new trails and six new observation areas

Table 7-7: Project Physical Benefits, Units and Technical Justification

Oxford Retention Basin Multi-Use Enhancement Project

Physical Benefit	Unit	Technical Justification
Flood Protection – Increase basin retention volume	acre-feet of retention capacity	*Oxford Project Design Concept, 2012*
Flood Protection – Reduce localized flooding	reports of nuisance flooding	Josh Svensson, Los Angeles County Department of Public Works Watershed Management Division, 2013.
Water Quality – Decrease bacteria concentrations	Qualitative	*Oxford Retention Basin Sediment and Water Quality Characterization Study* *Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL Staff Report* *Oxford Project Design Concept,* 2012
Water Quality – Decrease toxic pollutant concentrations	Qualitative	*Oxford Retention Basin Sediment and Water Quality Characterization Study* *Marina del Rey Harbor Mothers' Beach and Back basins Bacteria TMDL Staff Report* *Oxford Project Design Concept,* 2012
Habitat – Increase native habitat area	acres	*Oxford Project Design Concept,* 2012 *Existing Biological Conditions at Oxford Basin,* 2010 *Review of Existing Biological Conditions at Oxford Basins*, 2012
Recreation – Increase passive recreation features	linear feet of trail number of observation areas	Project Concept Report and Design Concept Document

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

The Oxford Retention Basin is a large retention pond that is inundated year round with urban and stormwater runoff, high groundwater, and tidal inflows from Basin E of the Marina del Rey Harbor. There is the potential for flooding along the southerly and northwesterly perimeters of Oxford Basin caused by limited retention capacity and potential errors in operation of the Basin tide gates. Without the Project, there will be continued potential for nuisance flooding around the Basin in the 50-year storm event, and the County of Los Angeles Department of Public Works (DPW) would continue to respond to each incident of nuisance flooding with emergency pumping to remove the water.

In addition, without this Project, the existing manually-operated tide gates and contaminated soil in the basin will continue to cause water quality issues in Oxford Basin and contribute to Total Maximum Daily Load (TMDL) violations that occur in the Marina del Rey Back Basins (Basins D, E, and F). Other alternatives (such as a Treatment Wetland and a Treatment Train) were evaluated as part of the Project Concept Report. However, a properly constructed treatment wetland mimics conditions of a natural wetland and uses biological processes to remove targeted pollutants. An effective treatment wetland is typically maintained at shallow water depths of 1 to 2 feet maximum. The depth of water in Oxford Basin can vary from about 4 feet during the dry season to 10 feet during the storm seasons, and it is subject to a high groundwater table and tidal influences that prohibit the Basin from being maintained at depths of 1 to 2 feet.

Another major factor is the need for substantial detention time of 3 to 7 days to remove high bacteria concentrations. A 7-day detention time is not possible without compromising the flood control protection provided by this facility. Therefore, it was determined that the construction of an efficient wetland at the Oxford Basin is not feasible. The construction of underground detention vaults with built-in media filters was considered as a “treatment train” option. However, this treatment train alternative was dismissed since it was not technically feasible at this location due to insufficient available space and because it would require costly upgrades to the existing pumping plant and higher operation and maintenance costs. The lack of options for structural upgrades means that neighborhood nuisance flooding could continue during capital storm events.

Finally, without this Project, Oxford Basin will remain a closed retention pond facility without any of the planned park amenities installed to meet public demand for increased recreational opportunities and more attractive, native plant-based landscaping.

Narrative Description of Physical Benefits (with Project)

A. Flood Protection

Increase Basin Retention Volume

The Oxford Retention Basin protects commercial businesses along adjacent Washington Avenue and homes in nearby neighborhoods from flooding. Nuisance flooding occurs twice per year, on average, at the corner of Oxford Avenue and Olive Street, and at the corner of Dickson Street and Olive Avenue. The Los Angeles County Department of Public Works (LACDPW) responds to each incident with emergency pumping to remove the water. The only record of flood damage was one damage claim for flooding reported in 2003; since then, there have been no other structural damage claims reported.

The *Project Design Concept*[52] discusses the basin hydraulic analysis conducted in 2010 which indicates that when the water level of Oxford Basin reaches its maximum 4.9 feet mean sea level (MSL), backflows through the storm drain to the low-lying subarea at the intersection of Oxford Avenue and Olive Street can occur. This will be mitigated by the installation of trash capture devices. In addition, the construction of a parapet wall is required to mitigate flooding that occurs along Washington Boulevard when water overtops the Basin. The analysis indicates that construction of a new parapet wall with the top-of-wall elevation at 8.0 feet above mean sea level (MSL) will prevent flooding the northwestern and southern boundaries of the basin, adding an additional 20 acre-feet of storage and protecting the surrounding area during the 100-year capital storm event and preventing nuisance flooding.

Reduced Localized Flooding

The basin protects commercial businesses along adjacent Washington Avenue, and homes in nearby neighborhoods from flooding. While there was one damage claim for flooding filed in 2003, there have been no other structural damage claims reported. However, there is nuisance flooding at the corner of Oxford Avenue and Olive Street, and at the corner of Dickson Street and Olive Avenue. On average this nuisance flooding occurs twice per year, and the LACDPW

[52] County of Los Angeles Department of Public Works, 2012. *Oxford Retention Basin Multiuse Enhancement Project, Project Design Concept.*

responds to each incident with emergency pumping to remove the water. LACDPW anticipates that the Project will prevent any incidents of nuisance flooding in these areas. [53]

B. Water Quality

Decrease in Bacteria Concentrations

The Los Angeles Regional Water Quality Control Board has identified Mother's Beach and the Marina Del Rey Harbor Back basins (Basins D, E, and F) as impaired water bodies. There are nine TMDL monitoring sites within the Back Basins, and records show that bacteria exceedances occur during dry and wet weather.[54,55] Therefore, improvements are needed in order to meet the TMDL requirements. The *Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL Implementation Plan* identifies the Oxford Basin as a potential location for a regional control opportunity (p. 4-1).[56]

The *Oxford Retention Basin Sediment and Water Quality Characterization Study*[57] prepared in 2010 indicates that the Oxford Retention Basin tested positive for high levels of Enterococci, fecal coliforms and total coliforms (pp. 39, 51). The study summarizes that during wet weather, the Oxford Retention Basin has a negative impact on compliance with the bacteria TMDL in the Marina del Rey Back Basins. The *Project Design Concept* states that the installation of a vegetated circulation berm, trash BMPs at the outlets of storm drains that discharge to the Basin, construction of bioswales, modifications to the tide gate program, and landscaping along the embankment will increase oxygen levels in the water, remove pollutants, and improve the quality of water discharging from the Oxford Basin (p. 5).[52]

Decrease in Toxics Concentrations

As described above, Mother's Beach and the Marina del Rey Harbor Back Basins (Basins D, E, and F) are impaired water bodies, and are 303(d) listed for toxics which include metals, organic compounds and sediment toxicity for which a TMDL was developed in 2005. Stormwater was

[53] Svensson, Josh, 2013. Personal Communication. Los Angeles County Department of Public Works Watershed Management Division.
[54] Los Angeles RWQCB, 2003. *Marina del Rey Back basins Bacteria TMDL*.
[55] Los Angeles RWQCB, 2005. *Marina del Rey Harbor Toxics TMDL.*
[56] Los Angeles RWQCB, 2006. *Marina del Rey Harbor Mothers' Beach and Back basins Bacteria TMDL Implementation Plan*
[57] LACFCD, 2010. *Oxford Retention Basin Sediment and Water Quality Characterization Study.*

identified as a source of toxics, and the Oxford Basin was identified as a major stormwater conduit (p. 26).[58]

The *Oxford Retention Basin Sediment and Water Quality Characterization Study* states that sediment characterization of unconsolidated layers suggests that Oxford Retention Basin contains sediments that exceed the Toxics TMDL compliance targets for copper, lead, zinc, and PCBs. Data collected from water samples did not indicate exceedances for toxics; however, the sediments have the potential to be flushed into the Marina del Rey Back Basins if disturbed (p. 74). [57]

The *Project Design Concept* states that it is expected that the installation of a vegetated circulation berm, implementation of trash BMPs at the outlets of stormdrains that drain to the basin, construction of bioswales, and installation of native plants will reduce the loading of contaminants entering Marina del Rey Harbor via the Oxford Retention Basin. In addition, excavation of sediments contaminated by toxics will reduce the amount of toxics available for release to Marina del Rey (pp. 5-6). [52]

C. Habitat

Increased Native Habitat Area

The proposed Project includes removal of non-native plants and replacement with native plants. The *Existing Biological Conditions at Oxford Basins*[59] document prepared in 2010, and the subsequent revision of this document in 2012[60] indicates that though the site is considered to be in a degraded state, opportunities exist to increase habitat values of the Oxford Retention Basin site, including marshland and wetland habitats (p. 5-1).

The *Project Design Concept*[61] prepared in 2012 supports the claim that 10 acres of habitat area, which includes installation of native plants, will attract wildlife and provide a healthier environment for species. The planting plan in Appendix B of the *Project Design Concept* (see 30% design plan page 9 of 9) specifies the types of native plants and shows the area to be planted around the retention basin.

[58] California Regional Water Quality Control Board Los Angeles Region and US EPA Region 9, 2005. *Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor.* Staff Report.
[59] LACFCD, 2010. *Existing Biological Conditions at Oxford Basins.*
[60] LACFCD, 2012. *Review of Existing Biological Conditions at Oxford Basins.*
[61] LACFCD, 2012. *Project Design Concept.*

D. Recreation

Increased Passive Recreation Features

Communities neighboring Oxford Basin have expressed a strong desire to improve recreational, habitat, and aesthetic aspects of this site, which will be addressed by this Project. Currently, the site is closed to the public. The improvements being made to the site will add passive recreation features, including 3,500 linear feet of trails, and six observation areas. These features are supported in the *Project Design Concept* prepared in 2012 (Appendix B, sheet 3 of 11).

Relationship to other Projects in the Proposal

This Project is not directly related to other projects in this proposal. However, it has several common elements with the other projects, in particular the improvement of water quality in receiving waters. For example, the Vermont Stormwater Capture and Green Street Project, the Citywide Storm Drain Catch Basin Curb Screens Project, and the Dominguez Channel Trash Reduction Project are all expected to reduce the loading of pollutants to the ocean.

Common elements with other Projects in this Proposal are:

- Water quality improvements
- Recreational area increase
- Habitat area increase
- Localized flooding reduction

Facilities, Policies, and Action Needed

Several improvements will be made to the Oxford Retention Basin site in order to implement the Project, including: retaining walls, a trash excluder, tide gates, a water quality berm, bioswales, a boat ramp, an access ramp and walkway, recreational trails, observation areas, signage, fences and gates, and the addition of native plants.

An agreement will need to be executed with the County of Los Angeles Department of Beaches and Harbors in order to implement the Project. No new policies will be necessary.

Uncertainties

Flood protection, native habitat, and recreational improvements of this Project are quantifiable. The water quality aspects, such as volume of water treated, and TMDL reductions have not been quantified and are uncertain at this point, although it is certain that introducing dissolved

oxygen and the circulation berm will have a positive impact on water quality. In order to evaluate this improvement, pre- and post- construction monitoring will be conducted, and an adaptive management approach will be taken to modify the Project as necessary to meet our objectives.

Potential Adverse Effects

No potential adverse effects have been identified at this time.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Reduced Localized Flooding

The table below provides information regarding the benefit of reduction of localized flooding by increasing basin retention volume.

Project Name: Oxford Retention Basin Multi-Use Enhancement Project **Type of Benefit Claimed:** Increased retention volume **Measure of Benefit Claimed (Name of Units):** acre-feet **Additional Information About this Measure:** Not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	--	--
2015	Baseline	Baseline+20	20
2016-2064	Baseline	Baseline+20	20
References: LACDPW, 2012. *Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept.*			

Benefit #2 – Reduced Localized Flooding

The table below provides information regarding the benefit of reduction of localized flooding by preventing nuisance flooding at the corner of Oxford Avenue and Olive Street, and at the corner of Dickson Street and Olive Avenue.

Project Name: Oxford Retention Basin Multi-Use Enhancement Project
Type of Benefit Claimed: Prevent nuisance flooding
Measure of Benefit Claimed (Name of Units): number of nuisance flooding events
Additional Information About this Measure: Not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	2	--	--
2015	2	0	-2
2016-2064	2	0	-2

References: LACDPW, 2012. *Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept.*

Benefit #3 – Increased Native Habitat Area

The table below provides information regarding the benefit of increased native habitat.

Project Name: Oxford Retention Basin Multi-Use Enhancement Project
Type of Benefit Claimed: Increased native habitat
Measure of Benefit Claimed (Name of Units): acres
Additional Information About this Measure: Not applicable.

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0
2015	0	10	10

2016-2064	0	10	10

References: LACDPW, 2012. *Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept.*

Benefit #4 – Increased Passive Recreation Features

The table below provides information regarding the benefit of increased passive recreation features - trails.

Project Name: Oxford Retention Basin Multi-Use Enhancement Project
Type of Benefit Claimed: Increased passive recreation features
Measure of Benefit Claimed (Name of Units): linear feet of trails
Additional Information About this Measure: Not applicable.

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0
2015	0	3,500	3,500
2016-2064	0	3,500	3,500

References: LACDPW, 2012. *Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept.*

Benefit #5 – Increased Passive Recreation Features

The table below provides information regarding the benefit of increased passive recreation features - observation areas.

Oxford Retention Basin Multi-Use Enhancement Project

Project Name: Oxford Retention Basin Multi-Use Enhancement Project
Type of Benefit Claimed: Increased passive recreation features
Measure of Benefit Claimed (Name of Units): number of observation areas
Additional Information About this Measure: Not applicable.

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0
2015	0	6	6
2016-2064	0	6	6

References: LACDPW, 2012. *Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept.*

Pacoima Spreading Grounds Improvements

The Pacoima Spreading Grounds Improvements Project (Project) proposes to make several improvements to the Pacoima Spreading Grounds to improve percolation of stormwater to the San Fernando Groundwater Basin, as well as improve downstream water quality and improve flood protection. These improvements include: replacement of the existing radial gate with an inflatable rubber dam, installation of telemetry, installation of flow measurement equipment, replacement of the intake canal with underground pipes, removal of sediment and clay lenses, and combining and deepening of multiple spreading basins.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-8**.

A. Water Supply
   - Increased percolation of 10,500 acre-feet per year (AFY) of locally captured stormwater to the San Fernando Valley groundwater basin supply

B. Reduced Delta demands to help address CALFED Bay-Delta Program objectives

C. Energy Conservation
   - Reduction of 27.6 million kilowatt hours per year (kWh/year), or 1.70 billion kWh over the 60-year lifespan of the Project

D. Greenhouse Gas Reduction
   - Avoidance of 9,047 metric tons per year of CO_2 equivalents, or 543,000 metric tons of CO_2 equivalents emitted over the 60-year lifespan of the Project

E. Water Quality
   - Avoidance of 50 pounds of ammonia per day that would otherwise be discharged to Los Angeles Harbor
   - Avoidance of 11,000 billion colonies of total coliform bacteria per day that would otherwise be discharged to Los Angeles Harbor
   - Avoidance of 180 billion colonies of E. coli bacteria per day that would otherwise be discharged to Los Angeles Harbor
   - Avoidance of 1.8 pounds of dissolved copper and 2.4 pounds of total recoverable copper per day that would otherwise be discharged to Los Angeles Harbor
   - Reduction in trash in the Pacoima Wash that would otherwise be discharged to Los Angeles Harbor
   - Avoid importation of 3,234 metric tons per year of salts to the region

F. Flood Protection

- Increased detention volume of 667 acre-feet (AF) plus improved percolation enables the Los Angeles County Flood Control District (LACFCD) to capture an additional 10,500 AF of stormwater each year, increasing flood protection capacity
- Reduction of flood peak flows in Pacoima Wash by approximately 77 cubic feet per second (cfs)

G. Open Space
- Increased open space of 6.7 acres surrounding the spreading grounds

Table 7-8: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Increased percolation to the San Fernando Groundwater Basin	acre-feet per year	*Water Conservation Model,* 2011 *Pacoima Spreading Grounds Project Concept Report,* March 2011. Alternative A. *Pacoima Spreading Grounds Geologic Investigation Report*, 2009.
Delta Demands - decreased	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Energy Conservation - reduced energy usage through offset of SWP water	kWh	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308. Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.

Physical Benefit	Unit	Technical Justification
Greenhouse Gas Reduction - reduced emissions	Tons of CO_2 equivalents	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
Water Quality – reduced ammonia loading to receiving waters	pounds per day of ammonia	*Water Conservation Model*, 2011 *Total Maximum Daily Loads for Nitrogen Compounds and Related Effects, Los Angeles River and Tributaries,* 2003
Water Quality - reduced bacteria loading to receiving waters	colonies per day of total coliform bacteria colonies per day of E. coli	*Water Conservation Model*, 2011 *Los Angeles River Watershed Bacteria Total Maximum Daily Load Staff Report*, 2010 *City of Los Angeles Watershed Protection Division, Los Angeles River Bacterial TMDL, Dry-Weather Grab Samples*, 2013
Water Quality - reduced copper loading to receiving waters	pounds of dissolved copper per day pounds of total recoverable copper per day	*Water Conservation Model*, 2011 *Los Angeles River Watershed Metals Total Maximum Daily Load,* Staff Report, 2010 *City of Los Angeles Watershed Protection Division, Los Angeles River Metals TMDL, Dry-Weather Grab Samples*, 2013
Water Quality - reduced trash discharge to receiving waters	Qualitative	*Trash Total Maximum Daily Loads for the Los Angeles River Watershed,* Staff Report, 2007, see page 26
Water Quality – avoided import of salts from outside the region	Pounds per year	Water Conservation Model *Metropolitan Water District of Southern California 2010 Regional Urban Water Management Plan,* Page 4-4.
Flood – Reduced localized flood damage	cfs of peak flow reduction	County of Los Angeles Department of Public Works, 2011. *Pacoima Spreading Grounds Project Concept Report.*

Physical Benefit	Unit	Technical Justification
Open Space – increased open space area	Acres	Calculated using aerial photo

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

The Greater Los Angeles County Region (Region) relies heavily on new sources of water to bridge the gap between water supplies and water demand.

Without the Project, 10,500 AFY of stormwater will be wasted to the Pacific Ocean via the Pacoima Wash and Tujunga Wash, which flows into the Los Angeles River, that won't be utilized to reduce the Region's reliance on imported water. The low percolation rate of the Pacoima Spreading Grounds limits the amount of water that can be captured for recharge, and this rate will continue to be diminished as more sediment enters the facility. During large storms, the Pacoima Spreading Grounds fills up quickly and forces stormwater flows to continue flowing past the facility in Pacoima Wash. In addition, without the Project, there will be no additional flood protection provided for downstream communities.

Without the Project, pollutants which are carried in stormwater will continue on to the Los Angeles River and the ocean rather than being captured in the spreading basin for subsequent removal by soil aquifer treatment. The pollutants that would continue to be discharged to receiving water bodies include ammonia, coliform bacteria, and copper. Without the Project, it will not be possible to increase the amount of open space area surrounding the spreading grounds.

Narrative Description of Physical Benefits (with Project)

A. Water Supply

Increased Percolation to the San Fernando Groundwater Basin

This Project will increase the percolation rate of the Pacoima Spreading Grounds by 10,500 AFY, increasing from the current average percolation rate of 4,874 AFY to 15,374 AFY. The specific components of the Project that will accomplish this are the removal of sediment and clay lenses, and combining of multiple basins. This benefit is supported by the LACFCD Conservation Model.

The shallow clay layer in the upper 12 to 24 feet of the subsurface underlying the spreading grounds will be removed to improve percolation and increase storage capacity. Estimated removal depths for each basin are based on recommendations in the January 2009 *Geological Investigation Report*. Approximately 1,370,000 cubic yards of excavated material will be removed from the site. This improvement will increase the storage capacity of the spreading grounds from 530 to 1,197 acre-feet by deepening and combining basins. Operational efficiency will be enhanced with the proposed inter-basin structures and facility layout shown in the "Alternative A" project concept plans provided in the *Pacoima Spreading Grounds Project Concept Report*. Percolation is expected to increase from 65 to 142 cfs as a result of the clay removal.[62]

Modeling was used to estimate the amount of stormwater that could be recharged given this increase in percolation and storage capacity. It is estimated that an additional 10,500 AFY of stormwater from the Pacoima Wash can be diverted and recharged to the San Fernando Valley Groundwater Basin. The model uses historical inflow data (daily mean flow rate) from a stream gaging station and determines how much water could have been conserved if various spreading grounds parameters were adjusted. In this case, by increasing the percolation rate of the spreading grounds from 65 cfs to 142 cfs and by increasing the storage capacity of the grounds from 530 AF to 1197 AF, annual water conservation increases by 10,500 AF. The model used is similar to a simplified reservoir routing model that takes the historical daily inflow and calculates the daily outflow, percolation and storage. [63]

There are three primary entities that have rights to extract groundwater from the San Fernando Basin: the City of Los Angeles, the City of Burbank, and the City of Glendale, who are planning to pump a combined average of 74,252 AFY between 2011 and 2016[64]. These entities currently rely on a portfolio of imported water, groundwater and recycled water to meet their customers' water needs. By increasing the amount of water available to pump, these entities will benefit directly through the reduction in imported water they will need to purchase.

B. Reduced Delta Demands to Help Address CALFED Bay-Delta Program Objectives

The Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2006 IRWM Plan. Diversion of water from the Delta to southern California has caused damage to the

[62] County of Los Angeles Department of Public Works, 2011. *Pacoima Spreading Grounds Project Concept Report.*
[63] County of Los Angeles Department of Public Works, 2011. *Water Conservation Model.*
[64] Upper Los Angeles River Area Watermaster, 2012. *Groundwater Pumping and Spreading Plan for the Upper Los Angeles River Area 2011-2016 Water Years.* http://ularawatermaster.ladwp.com/

Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps), damages habitats, and reverses river flows. By reducing the Region's reliance on the Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet CALFED Bay-Delta Program objectives to restore tidal marshes and floodplains, and restore fish and wildlife species. This Project is expected to reduce demands on the Delta by the City of Los Angeles by 10,500 AFY by making an additional 10,500 AFY of groundwater available in the San Fernando Valley Groundwater Basin. This is supported by the City of Los Angeles' 2010 Urban Water Management Plan which reports that the City currently has an imported water demand of 263,875 AF in fiscal year 2009-2010. Given that the San Fernando Valley, to which the benefits of this Project take place, relies primarily on groundwater and State Water Project supplies according to the 2011 LADWP *Annual Water Quality Report* (refer to page 6), it can be assumed that the 10,500 AFY of local surface water recharged will directly offset imported water from the State Water Project, thus reducing Delta demands.

C. Energy Conservation

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total GHG emissions.

It has been estimated that the average cost to pump groundwater in the San Fernando Basin was $63/AF[65] in 2004[66], which can be updated to 2012 dollars as $76/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2012 was $0.202/kWh.[67] Using these values, it can be estimated that the energy required to pump groundwater in the San Fernando Basin is 376 kWh/AF. For imported supplies, West Basin Municipal Water District (WBMWD) has estimated that approximately 3,000 kWh per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[68] Assuming a net energy savings of 2,624 kWh/AF and an average annual imported water offset of 10,500 AF, approximately 27.6 million kWh per year of energy will be saved by

[65] Assumed that pumping cost does not include operations and maintenance. Only energy costs.
[66] Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308.
[67] Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
[68] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.

implementing the Project (31.5 million kWh/year used to imported water versus 3.9 million kWh/year used to pump groundwater). Over the 60-year lifespan of the Project, this totals 1.7 billion kWh of conserved energy. These values are not monetized in Attachment 8 because the cost of the energy used to import SWP water is already included in Metropolitan Water District's Tier 1 rates.

D. Greenhouse Gas Reduction

The proposed Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport imported SWP water for the Region. This value may be calculated by applying a factor of 0.724 pounds (lbs) of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[69] By offsetting the demand of 10,500 AF of imported SWP water, the proposed Project will avoid GHG emissions of approximately 9,047 metric tons per year of CO_2 equivalents per year (10,343 metric tons per year to import water versus 1,296 metric tons per year to pump groundwater). Over the 60-year lifespan of the Project, this totals approximately 543,000 metric tons of avoided carbon emissions.

E. Improved Surface Water Quality

The increased diversion of surface water to the Pacoima Spreading Grounds will reduce the contaminant loadings downstream of the spreading grounds, and thus improve surface water quality in the Los Angeles River and Los Angeles Harbor. As discussed above under "Increased Percolation to the San Fernando Basin," the amount of surface water diverted will, on average, equal an additional 10,500 AFY. According to the Los Angeles Regional Water Quality Control Board – Los Angeles Region, the Tujunga Wash, which is immediately downstream of the Pacoima Spreading Grounds, is water quality impaired for ammonia, bacteria, copper and trash.[70] The expected reduction in each of these contaminants is described below.

Reduced Ammonia Loadings to Los Angeles Harbor

In the Tujunga Wash, to which Pacoima Wash is tributary, ammonia concentrations averaged 0.6 mg/L and ranged from non-detectable to 2.4 mg/L when the 1998 303(d) listings were

[69] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

[70] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.

prepared according to the *Total Maximum Daily Loads for Nitrogen Compounds and Related Effects, Los Angeles River and Tributaries.*[71]

Assuming that these concentrations are similar to the concentrations found at the intake of the Pacoima Spreading Grounds, the reduction in ammonia loading can be estimated. Using the average ammonia concentration of 0.6 and the average estimated flow to be diverted to the spreading grounds (10,500 AFY), the following ammonia loading reductions can be estimated:

- **Ammonia loading reduction calculation:** (0.6 mg/L)(1,233,481 L/acre-foot)(1 g/10^3 mg)(10,500 acre feet/year recharged)(1 year/365 days) = **21,290 grams per day = 50 pounds per day or 18,250 pounds per year**

According to this analysis, the Project would help to reduce ammonia loading to the Los Angeles River and ultimately the Los Angeles Harbor by 50 pounds per day. It should be noted that because flow is diverted for recharge, only loadings of ammonia will be decreased; concentration of ammonia will be unchanged in Pacoima Wash.

Reduced Bacteria Loading to Los Angeles Harbor

Water quality monitoring between 2004 and 2009 in the Tujunga Wash has shown the following bacteria levels:

- Total coliform: geometric mean of 31,000 MPN per 100 mL, range of 200 to 240,000 MPN per 100 mL
- E. coli: geometric mean of 500 MPN per 100 mL, 100 to 20,000 MPN per 100 mL

These levels are well above the bacteria TMDL which has been set for the Los Angeles River and its tributaries, including Tujunga Wash, to which Pacoima Wash is a tributary. The Los Angeles River Bacteria TMDL Report specifies the required bacterial loading for E. coli be reduced by 192,725 billions of colonies per day to reach the TMDL E. coli concentration requirement of 235 MPN[72] per 100 mL for a single sample.

Assuming that these concentrations are similar to the concentrations found at the intake of the Pacoima Spreading Grounds, the reduction in bacteria loading can be estimated. Using the geometric mean of each bacteria measurement and the average estimated flow to be diverted to the spreading grounds (10,500 AFY), the following bacteria loading reductions can be estimated:

[71] California Regional Water Quality Control Board, Los Angeles Region, 2003. *Total Maximum Daily Loads for Nitrogen Compounds and Related Effects, Los Angeles River and Tributaries.*
[72] MPN stands for the "most probable number" of bacterial colonies

- **Total coliform:** (31,000 MPN/100 mL)(1,233,481,000 mL/acre-foot)(10,500 acre feet/year recharged)(1 year/365 days) = **11,000 billion colonies per day or 4,015,000 billion colonies per year**
- **E. coli:** (500 MPN/100 mL)(1,233,481,000 mL/acre-foot)(10,500 acre feet/year recharged)(1 year/365 days)(1 MPN/1,000,000 billion MPN) = **180 billion colonies per day or 65,700 billion colonies per year**

It should be noted that because flow is diverted for recharge, only loadings of bacteria will be decreased; concentration of bacteria will be unchanged in the Pacoima Wash.

Reduced Copper Loading to Los Angeles Harbor

The Project is expected to reduce copper loadings. Water quality monitoring between 2004 and 2009 in the Tujunga Wash (to which Pacoima Wash is tributary), has shown that total recoverable copper concentrations averaged 31 micrograms per liter (ug/L), and ranged from 11.6 to 52.5 ug/L. Dissolved copper concentrations from 2008 to 2012 averaged 23 ug/L, and ranged from 1.8 to 47.4 ug/L. The average concentrations are above the targets set in the Los Angeles River Metals TMDL for the Tujunga River, which are 20 ug/L for total recoverable copper, and 19 ug/L for dissolved copper.

Assuming that these concentrations are similar to the concentrations found at the intake of the Pacoima Spreading Grounds, the reduction in copper loading can be estimated. Using the average copper concentrations from 2008 to 2012 and the average estimated flow to be diverted to the spreading grounds (10,500 AFY), the following copper loading reductions can be estimated:

- **Dissolved copper:** (23 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(10,500 acre feet/year recharged)(1 year/365 days) = **800 grams per day = 1.8 pounds per day or 657 pounds per year**
- **Total recoverable copper:** (31 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(10,500 acre feet/year recharged)(1 year/365 days) = **1,100 grams per day = 2.4 pounds per day or 876 pounds per year**

According to this analysis, the Project would help to reduce copper loading to the Los Angeles River and ultimately the Los Angeles Harbor by 2.4 pounds per day of total recoverable copper, and by 1.8 pounds per day of dissolved copper. It should be noted that because flow is diverted for recharge, only loadings of copper will be decreased; concentration of copper will be unchanged in the Pacoima Wash.

Reduced Trash Loading to Los Angeles Harbor

The Tujunga Wash is 303(d) listed for trash. It is expected that diversion of flow from Pacoima Wash to the spreading grounds will carry with it trash from the Wash. This trash will be captured by a screen to be installed on the inlet pipe and cleaned regularly. Data is not available which quantifies the amount of trash present in the Wash, therefore, it is only possible to qualitatively describe this benefit.

Avoidance of salts imported from outside the Region

State Water Project (SWP) water contains total dissolved solids (TDS) or salts. For the purposes of this analysis, it is assumed that all water offset is from the SWP which has a typical TDS value of 250 mg/L. Since this water is imported from outside of the San Gabriel Valley, it represents a net increase in loading of salts to the basin.

Assuming an average TDS concentration of 250 mg/L[73], and assuming that TDS loadings that originate from local surface water are already contained within the San Fernando Valley (and therefore do not represent salt inflows), 10,500 AFY of offset imported SWP water represents approximately 7,131,917 pounds or 3,234 metric tons per year of salts that would no longer be imported. Over the life of the Project, this amounts to approximately 194,066 metric tons of TDS loadings that will not be introduced to the region as a salt input.

F. Flood Protection

Reduced Localized Flood Damage

By diverting additional flow from Tujunga Wash to the spreading grounds, the Project will reduce the peak flood flow by 77 cubic feet per second downstream in the Pacoima Diversion Channel and in the Los Angeles River due to the increased percolation rate.[74] This will result in marginal improvements in flood depths and the width of flooding along the channel. Adjacent land uses are primarily residential, commercial, and industrial. There are residential, commercial, and industrial structures immediately downstream that could potentially benefit from the relatively small reduction in peak flood flow enabled by this Project.

The Project includes installation of an inflatable rubber dam and concrete pipe intake system that will improve operations by eliminating management of the current radial gate and intake

[73] Metropolitan Water District of Southern California, 2010. *2010 Regional Urban Water Management Plan.* Page 4-4.
[74] County of Los Angeles Department of Public Works, 2011. *Pacoima Spreading Grounds Project Concept Report.*

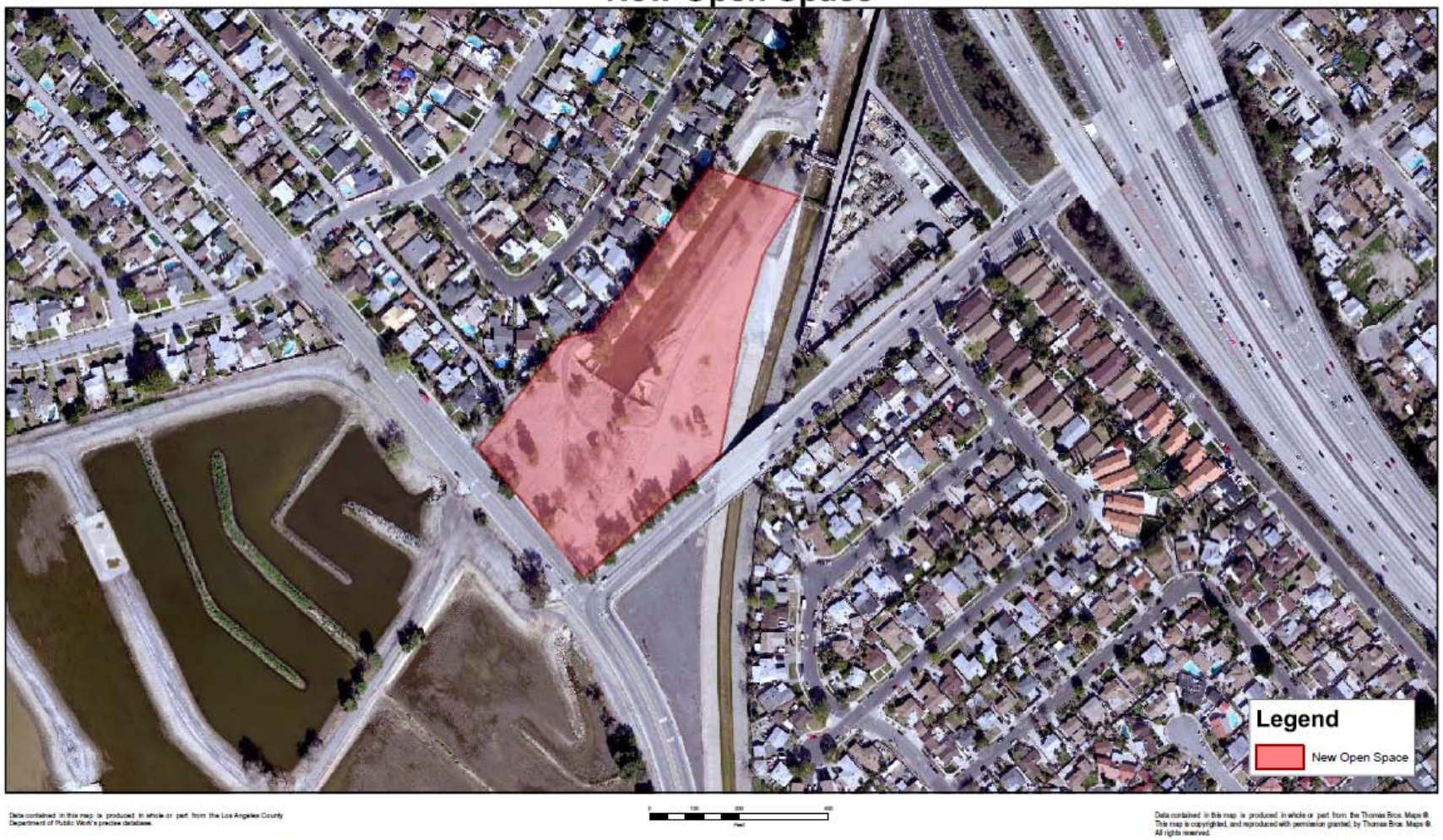
channel during storm events. Using a rubber dam to divert flows into the intake pipes will remove the risk of localized flooding on Arleta Avenue downstream of the intake canal by keeping flows that exceed the capacity of the intake pipes within the Tujunga Wash. Localized flooding of this area was caused by excess flows in the intake canal during a storm which produced flow rates in excess of 600 cfs in Pacoima Diversion Channel.

G. Open Space

Increased Open Space

This Project will allow for the creation of 6.7 acres of open space. This will be possible once the existing intake canal is replaced with underground pipes. The area overlaying the pipes will provide the 6.7 acres of open space. The area was estimated based on the aerial photo shown on the next page. In the future, it will be possible for passive recreation activities to take place at this site.

Pacoima Spreading Grounds Improvement Project
New Open Space



Relationship to other projects in the Proposal

The Pacoima spreading basin is a part of a network of five spreading grounds which LACFCD operates to replenish the San Fernando Valley Basin. Improvements made to any of these spreading grounds will improve the ability of the LACFCD to capture stormwater for replenishment of groundwater, and provide better flood management. In addition, this Project provides primary benefits similar to other projects in the Proposal, including the Dominguez Gap Spreading Grounds West Basin Percolation Enhancements, the Peck Water Conservation Improvements Project, and the Walnut Spreading Basin Improvements Project. Each of these projects will recharge groundwater basins and reduce pollutant loadings in surface waters.

Facilities, Policies and Actions Needed

No new facilities, policies or actions will be needed to implement this project.

Uncertainties

The amount of water supply and quality benefit are both uncertain due to natural variability and the uncertainty of groundwater modeling. Stormwater supplies rely heavily on the number of storms, amount of precipitation, and consequentially the amount of runoff, which varies every year. The water conservation model is also based on historical data that only estimates the amount of water that has been and could be conserved in the future. Therefore, any benefits that utilize the estimation of runoff, such as water quality benefits and energy savings, are also uncertain due to the natural variability and uncertainty of weather and groundwater modeling.

Potential Adverse Effects

No adverse effects of the Project are foreseen.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Increased Groundwater Supply

The table below provides information regarding the water supply benefit of increased percolation of stormwater to the San Fernando Valley Groundwater Basin.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Increased percolation to the San Fernando Valley Groundwater Basin

Measure of Benefit Claimed (Name of Units): acre-feet **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	4,874	n/a	0
2016	4,874	15,374	10,500
2017-2075	4,874	15,374	10,500
References: • *Water Conservation Model, 2011* • *Pacoima Spreading Grounds Project Concept Report, March 2011. Alternative A.* • *Pacoima Spreading Grounds Geologic Investigation Report, 2009.*			

Benefit #2 – Reduced Delta Dependence

The table below provides information regarding reduced demands on the California Delta.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced Delta Demands **Measure of Benefit Claimed (Name of Units):** acre-feet of imported water from SWP **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	10,500	n/a	0
2016	10,500	0	-10,500
2017-2075	10,500	0	-10,500
References: • California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report. Bay-Delta Office.* June 2012.			

Benefit #3 – Reduced energy

The table below provides information regarding energy conservation provided through the offset of SWP water with groundwater.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced energy usage **Measure of Benefit Claimed (Name of Units):** kWh **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	31,500,000	n/a	0
2016	31,500,000	3,900,000	27,600,000
2017-2075	31,500,000	3,900,000	27,600,000
References: • West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H. • Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308. • Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.			

Benefit #4 – Reduced CO_2 emissions

The table below provides information regarding the reduction in CO_2 emissions made possible through the offset of SWP water with groundwater.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced emissions **Measure of Benefit Claimed (Name of Units):** Metric tons of CO_2 equivalent **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	10,343	n/a	0

2016	10,343	1,296	9,047
2017-2075	10,343	1,296	9,047

References:

- West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H.
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308.
- Bureau of Labor Statistics, 2013. Average Energy Prices in the Los Angeles Area.
- Climate Action Registry, General Reporting Protocol

Benefit #5 – Reduced ammonia loading to receiving waters

The table below provides information regarding the reduction in ammonia loading made possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements
Type of Benefit Claimed: Reduced loading of ammonia to receiving waters
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	18,250	n/a	0
2016	18,250	0	-18,250
2017-2075	18,250	0	-18,250

References:

- Water Conservation Model, 2011
- Total Maximum Daily Loads for Nitrogen Compounds and Related Effects, Los Angeles River and Tributaries, 2003

Benefit #6 – Reduced total coliform loading to receiving waters

The table below provides information regarding the reduction in total coliform bacteria loading made possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced loading of total coliform bacteria to receiving waters **Measure of Benefit Claimed (Name of Units):** billions of colonies **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	4,015,000	n/a	0
2016	4,015,000	0	-4,015,000
2017-2075	4,015,000	0	-4,015,000
References: • Water Conservation Model, 2011 • Los Angeles River Watershed Bacteria Total Maximum Daily Load Staff Report, 2010 • City of Los Angeles Watershed Protection Division, Los Angeles River Bacterial TMDL, Dry-Weather Grab Samples, 2013			

Benefit #7 – Reduced E. coli loading to receiving waters

The table below provides information regarding the reduction in E. coli bacteria loading made possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduced loading of E. coli bacteria to receiving waters **Measure of Benefit Claimed (Name of Units):** billions of colonies r **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	65,700	n/a	0
2016	65,700	0	-65,700
2017-2075	65,700	0	-65,700

References:

- Water Conservation Model, 2011
- Los Angeles River Watershed Bacteria Total Maximum Daily Load Staff Report, 2010
- City of Los Angeles Watershed Protection Division, Los Angeles River Bacterial TMDL, Dry-Weather Grab Samples, 2013

Benefit #8 – Reduced dissolved copper loading to receiving waters

The table below provides information regarding the reduction in dissolved copper loading made possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements
Type of Benefit Claimed: Reduced loading of dissolved copper to receiving waters
Measure of Benefit Claimed (Name of Units): pounds per year
Additional Information About this Measure: average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	657	n/a	0
2016	657	0	-657
2017-2075	657	0	-657

References:

- Water Conservation Model, 2011
- Los Angeles River Watershed Bacteria Total Maximum Daily Load Staff Report, 2010
- City of Los Angeles Watershed Protection Division, Los Angeles River Bacterial TMDL, Dry-Weather Grab Samples, 2013

Benefit #9 – Reduced total copper loading to receiving waters

The table below provides information regarding the reduction in total copper loading made possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements
Type of Benefit Claimed: Reduced loading of total copper to receiving waters
Measure of Benefit Claimed (Name of Units): pounds per year
Additional Information About this Measure: average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	876	n/a	0
2016	876	0	-876
2017-2075	876	0	-876

References:

- Water Conservation Model, 2011
- Los Angeles River Watershed Bacteria Total Maximum Daily Load Staff Report, 2010
- City of Los Angeles Watershed Protection Division, Los Angeles River Bacterial TMDL, Dry-Weather Grab Samples, 2013

Benefit #10 - Avoided import of salts from outside the region

The table below provides information regarding the avoided import of salts from outside the region that will be possible through implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements
Type of Benefit Claimed: Avoided import of salts form outside the region
Measure of Benefit Claimed (Name of Units): metric tons per year
Additional Information About this Measure: not applicable

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	3,234	n/a	n/a
2016	3,234	0	-3,234
2017-2075	3,234	0	-3,234

References:

- Water Conservation Model
- *Metropolitan Water District of Southern California 2010 Regional Urban Water Management Plan,* Page 4-4.

Benefit #11 – Reduced peak flows during flooding events

The table below provides information regarding the reduced localized flood damage expected to be available with implementation of the Project because increased percolation rates will allow decreased downstream peak flow rates.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Reduction in peak flows during flood events **Measure of Benefit Claimed (Name of Units):** cubic feet per second **Additional Information About this Measure: not applicable**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	142	n/a	n/a
2016	142	65	77
2017-2075	142	65	77
References: *Pacoima Spreading Grounds Project Concept Report, March 2011. Alternative A.*			

Benefit #12 – Increased open space area

The table below provides information regarding the increase in open space area expected to be available with implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements **Type of Benefit Claimed:** Increased open space **Measure of Benefit Claimed (Name of Units):** acres **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	0	n/a	n/a
2016	0	6.7	6.7
2017-2075	0	6.7	6.7
References: Aerial photo calculation			

Peck Water Conservation Improvement

The Peck Water Conservation Improvement Project (Project) proposes to implement measures to enhance percolation at the Peck Road Spreading Basin, and includes construction of a pump station and 7,000 foot pipeline, which will convey water from the spreading basin to the San Gabriel River, and removal of sediment from the basin. The pump station and pipeline will allow the flexibility to recharge water in the soft bottom channel of the San Gabriel River and increase the overall replenishment of groundwater in the Main San Gabriel Basin. Removal of sediment from the middle of the basin will allow water to flow freely between two pits that have developed from the accumulation of sediment at the Santa Anita Wash outlet. This will improve recharge at the basin and is expected to improve downstream surface water quality.

These improvements will lower water levels in the spreading basin, which will add capacity to the water conservation system and allow for expansion of recreational activities in the future at the existing adjacent Peck Park. LACFCD has met with LA County Parks and Recreation, Amigos De Los Rios, City of Arcadia, and the Upper San Gabriel Valley Municipal Water District (USGVMWD) to discuss park improvements such as upgraded irrigation, habitat enhancements, drought tolerant plants, and low flow facilities at the restrooms which could be included as Phase II of the Project.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in Table 7-1.

A. Water Supply
    - Increased percolation of 1,800 acre-feet/year (AFY) of local captured stormwater to the Main San Gabriel Basin, allowing for 1,800 AFY of additional pumping for water supply
B. Reduced Delta demands to help address Bay-Delta environmental goals
C. Energy Conservation
    - Reduction of 4,545,000 kWh per year, or 409 million kWh over the 90-year life of the Project
D. Greenhouse Gas Reduction
    - Avoidance of 1,492 metric tons per year of CO_2 equivalents, or 134,280 metric tons of CO_2 emitted over the 90-year life of the Project
E. Water Quality

- Reduction of contaminants (bacteria, copper, lead, nickel, cyanide, trash) that would otherwise be discharged to the downstream Los Angeles Harbor other the 90-year life of the Project
- Avoid importation of 555 metric tons per year of salts to the Region

F. Flood Protection
- Decrease in peak flood flows by 50 cubic feet per second (cfs)

Table 7-9: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Increased percolation to the Main San Gabriel Basin	acre-feet per year	*Water Conservation Model* *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report,* 2012
Delta Demands - Reduce Delta Demands to Help Address Bay-Delta Environmental Goals	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Energy Conservation - reduced energy usage through offset of SWP water	kWh	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308. Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.
Greenhouse Gas Reduction - reduced GHG emissions	Tons of CO_2 equivalents	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

Physical Benefit	Unit	Technical Justification
Water Quality - reduced bacteria, copper, lead, zinc, cyanide, and trash loading to receiving waters	Qualitative	*Water Conservation Model,* 2012 *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report,* 2012
Water Quality – avoided import of salts from outside the Region	Metric tons per year	Water Conservation Model *Metropolitan Water District of Southern California 2010 Regional Urban Water Management Plan,* Page 4-4.
Flood – Reduced peak flows during flood events	cfs	*Water Conservation Model*, 2011

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

The Los Angeles region relies heavily on new sources of water to bridge the gap between water supplies and water demand. Without the project, 1,800 AFY of stormwater is wasted to the Pacific Ocean via the Rio Hondo Channel, and won't be utilized to reduce the region's reliance on imported water. The low percolation rate of Peck Spreading Basin limits the amount of water that can be captured for recharge. During large storms, water flows through Peck to the Rio Hondo Coastal Basin Spreading Grounds, where the water still may be wasted to the ocean via the Rio Hondo Channel because of the spreading ground's limited intake capacity. Enhancing recharge at any facilities along the river replenishes the Main San Gabriel Basin and reduces the region's reliance on imported water. In addition, without the Project, there will be no temporary storage of the stormwater to allow it to recharge the groundwater basin. The stormwater would not be diverted from peak flows in the Rio Hondo Channel, and therefore there will be no increase in flood protection.

The Rio Hondo is 303(d) listed for a number of constituents, including bacteria, copper, lead, zinc, cyanide, pH and trash. Without the Project, loadings of these constituents would continue down the Rio Hondo the Los Angeles River and Los Angeles Harbor.

Narrative Description of Physical Benefits (with Project)

A. Water Supply

Increased Percolation to the Main San Gabriel Basin

The Main San Gabriel Basin provides nearly 230,000 acre-feet per year (AFY) of water to over 50 cities and water agencies overlying the basin. To meet this need, the Main San Gabriel Basin Watermaster (Watermaster) reports that 50,000 AFY of untreated imported water was used to recharge the basin in fiscal year 2010/2011. In addition, the Watermaster reports that pumpers require an additional 7,900 AFY of treated, imported water to supplement demand.[75] The Peck Road Spreading Basin recharges only local surface water diverted from the Santa Anita Wash and Sawpit Wash, which combine at the Peck Road Spreading Basin to flow into the Rio Hondo Channel. The limited recharge capacity means that a large amount of local surface water runs past the spreading basin during storm events. The facility can currently percolate approximately 6,300 AFY and the Project will increase this capacity to approximately 8,100 AFY.

This Project will increase the recharge to the Main San Gabriel Basin by 1,800 AFY, increasing recharge from the current average rate of 6,300 AFY to 8,100 AFY. The specific components of the Project that will accomplish this are the removal of sediment and installation of the pump and pipeline that will convey excess stormwater to the San Gabriel River for recharge in the river's soft bottom channel. This benefit is supported by the *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report.* [76]

Modeling was used to estimate the amount of stormwater that could be recharged given this increase in percolation. It is estimated that an additional 1,800 AFY of stormwater from the Rio Hondo can be diverted and recharged to the Main San Gabriel Basin. The model uses historical inflow data (daily mean flow rate) from stream gaging stations and determines how much water could have been conserved if various spreading ground parameters were adjusted. In this case, by pumping water from the Peck Spreading Basin, which has a low percolation rate, to the San Gabriel River where the percolation rate is much higher, annual water conservation increases by 1,800 AF. The model used is similar to a simplified reservoir routing model that takes the historical daily inflow and calculates the daily outflow, percolation and storage. [77]

[75] Main San Gabriel Basin Watermaster, 2011. *2010-2011 Main San Gabriel Basin Annual Report.* Pages D1-D4.
[76] Los Angeles County Department of Public Works, 2012. *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report.*
[77] Los Angeles County Department of Public Works, 2011. *Water Conservation Model.*

B. Reduced Delta Demands to Help Address Bay-Delta Environmental Goals

The Greater Los Angeles County Integrated Regional Water Management (IRWM) Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2006 IRWMP Plan. Diversion of water from the Delta to southern California has caused damage to the Bay Delta's ecosystem due to State Water Project (SWP) and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps) and damages habitats, while operations that reverse river flows impact ecosystems activity. By reducing the Region's reliance on the Bay Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet Bay Delta environmental goals to restore tidal marshes and floodplains, and restore fish and wildlife species. This Project is expected to reduce the San Gabriel Valley's demand on the Delta of 1,800 AFY by making an additional 1,800 AFY of groundwater available in the Main San Gabriel Basin. This is supported by the Main San Gabriel Basin Watermaster Annual Report from 2010-2011 which reports that Main San Gabriel Basin pumpers currently have an imported water demand of 7,900 AF in fiscal year 2010-2011. Given that the San Gabriel Valley, which this Project benefits , relies primarily on groundwater and SWP supplies, it can be concluded that the 1,800 AFY of local surface water recharged will directly offset imported water from the SWP, thus reducing Delta demands.

C. Energy Conservation

Reduced energy from offset of SWP water

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in California, requiring an average of 5,000 gigawatt-hours per year, and contributes 0.6% of California's total greenhouse gas emissions.

It has been estimated that the average cost to pump groundwater in the Main San Gabriel Basin was $85/AF[78] in 2006[79], which can be updated to 2012 dollars as $96/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2012 was

[78] Cost includes power for well operation only.
[79] Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Main San Gabriel and Puente Basins. Report Number 1308.

$0.202/kilowatt-hour (kWh).[80] Using these values, it can be estimated that the energy required to pump groundwater in the Main San Gabriel Basin is 475 kWh/AF. For imported supplies, West Basin Municipal Water District (WBMWD) has estimated that approximately 3,000 kWh per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[81] Assuming a net energy savings of 2,525 kWh/AF (3,000 - 475) and an average annual imported water offset of 1,800 AF, approximately 4,545,000 kWh per year of energy will be saved by implementing the Project. Over the 90-year life of the Project, this totals 409 million kWh of conserved energy.

D. Greenhouse Gas Reduction

Reduced emissions

The proposed Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport imported SWP water for the Region. This value may be calculated by applying a factor of 0.724 lbs. of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[82] By offsetting the demand of 1,800 AF of imported SWP water, the proposed Project will avoid GHG emissions of 1,492 metric tons per year of CO_2 equivalents per year. Over the 90-year life of the Project, this totals 134,280 metric tons of avoided carbon emissions.

E. Water Quality

Reduced bacteria, copper, lead, zinc, cyanide, and trash loading to receiving waters

The increased diversion of surface water from the Rio Hondo will reduce the contaminant loadings downstream of the spreading grounds, and thus improve surface water quality in the Los Angeles River and Los Angeles Harbor. As discussed above under "Increased Percolation to the Main San Gabriel Basin," the amount of surface water diverted will, on average, equal an additional 1,800 AFY. According to the California State Water Quality Control Board, the Rio Hondo is water quality impaired by bacteria, copper, lead, zinc, cyanide, and trash.[83] It is

[80] Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
[81] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.
[82] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
[83] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.

expected that loadings of these constituents will be reduced as flows are diverted to the Peck Road Spreading Basin and percolated through the soil beneath the spreading grounds.

Avoidance of salts imported from outside the Region

State Water Project (SWP) water contains total dissolved solids (TDS) or salts. There are two primary suppliers of imported water for recharge in the San Gabriel Valley: Metropolitan Water District of Southern California (MWDSC) and San Gabriel Valley Municipal Water District (SGVMWD), however, the San Gabriel Valley Municipal Water District only utilizes imported water for recharge. For the purposes of this analysis, only imported water delivered for direct use is considered as this is what will be offset through the Project, and it is assumed that all water offset is from the SWP which has a typical TDS value of 250 mg/L. Since this water is imported from outside of the San Gabriel Valley, it represents a net loading of salts imported to the basin.

Assuming an average TDS concentration of 250 mg/L[84], and assuming that TDS loadings that originate from local surface water are already contained within the San Gabriel Valley (and therefore do not represent salt inflows), 1,800 AFY of offset imported SWP water represents approximately 1,223,076 pounds per year or 555 metric tons per year of salts that would no longer be imported. Over the life of the Project, this amounts to approximately 49,950 metric tons of TDS loading that will not be introduced to the Region as a salt input.

F. Flood

Reduced Downstream Flood Damage

By diverting additional river flow from the Rio Hondo, the Project will reduce the peak flood flow by 50 cfs downstream in the Rio Hondo and the Los Angeles River due to the ability to pump water from the spreading basin to the San Gabriel River.[85] This will result in marginal improvements in flood depths and the width of flooding in the channel. Adjacent land uses are primarily residential, commercial, and industrial. There are residential, commercial, and industrial structures immediately downstream that could potentially benefit from the relatively small reduction in peak flood flow enabled by this Project.

[84] Metropolitan Water District of Southern California, 2010. *2010 Regional Urban Water Management Plan.* Page 4-4.
[85] Los Angeles County Department of Public Works, 2012. *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report.*

Relationship to other Projects in the Proposal

The Peck Road Spreading Basin is a part of a network of 17 spreading grounds which LACFCD operates to replenish the Main San Gabriel Basin. Improvements made to any of these spreading grounds will improve the ability of the LACFCD to capture stormwater for replenishment of groundwater, and provide better flood management. In particular, the Walnut Spreading Basin Improvements Project, which is also a part of this application, will also recharge water to the Main San Gabriel Basin, increasing local water supply.

Common elements with other Projects in this Proposal are:

- Use of local water resources
- Offset Imported water
- Reduce Energy
- Reduce Greenhouse gas emissions
- Reduce imported salt loading to the Region

Facilities, Policies, and Action Needed

The following facilities are needed to implement the Project:

- Two new 25 cfs vertical fixed turbine pumps and a new 7,000 foot pipeline will be required to convey water to the San Gabriel River

The following policies and other actions are needed to implement the Project:

- None anticipated

Agreements are needed with the following stakeholders to implement the Project:

- MOU for cost-share between the USGVMWD and Los Angeles County Flood Control District (LACFCD)

Uncertainties

The amount of water supply and quality benefit are both uncertain due to natural variability and the uncertainty of the groundwater modeling. Water conservation relies heavily on the number of storms, amount of precipitation, and consequentially the amount of runoff, which varies every year. The water conservation model is also based on historical data that only estimates the amount of water that has been and could be conserved in the future.

Potential Adverse Effects

Due to the new Total Maximum Daily Load (TMDL) for Peck Road Park Lake, there are some concerns with transferring the pollutants from the Peck Spreading Basin to the San Gabriel River, including chlordane, DDT, lead, trash, nitrogen, phosphorus, dieldrin and PCB.[86] As part of the adopted TMDL, the water, sediment, and fish were tested. However, the results showed that the water is not excessively impaired, which is reflected by the fact that only a nutrient TMDL has been adopted for Peck Road Park Lake. The water has been regularly tested by the LACFCD and will also be tested prior to pumping after the Project is constructed to ensure that the water is clean.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Increased Percolation to the Main San Gabriel Basin

The table below provides information regarding the supply benefit from increased percolation to the Main San Gabriel Basin.

Project Name: Peck Water Conservation Improvement
Type of Benefit Claimed: Increased percolation to the Main San Gabriel Basin
Measure of Benefit Claimed (Name of Units): acre feet
Additional Information About this Measure: over the average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	6,300	Not applicable	Not applicable
2016	6,300	8,100	1,800
2017-2105	6,300	8,100	1,800
References: Water Conservation Model			

[86] U.S. Environmental Protection Agency (USEPA), 2012. *Los Angeles Area Lakes TMDLs.* http://www.epa.gov/region9/water/tmdl/final.html. Accessed March 22, 2013.

Benefit #2 – Reduced Delta Dependence

The table below provides information regarding reduced demands on the California Delta.

Project Name: Peck Water Conservation Improvement **Type of Benefit Claimed:** Reduced Delta Demands **Measure of Benefit Claimed (Name of Units):** acre-feet per year of imported water from SWP **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	Baseline	Not applicable	Not applicable
2016	Baseline	Baseline - 1,800	-1,800
2017-2105	Baseline	Baseline - 1,800	-1,800
References: • California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report. Bay-Delta Office.* June 2012.			

Benefit #3 – Reduced energy

The table below provides information regarding energy conservation provided through the offset of SWP water with groundwater.

Project Name: Peck Water Conservation Improvement **Type of Benefit Claimed:** Reduced energy usage **Measure of Benefit Claimed (Name of Units):** kWh **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	5,400,000	Not applicable	Not applicable
2016	5,400,000	855,000	-4,545,000
2017-2105	5,400,000	855,000	-4,545,000

References:

- West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H.
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Main San Gabriel and Puente Basins. Report Number 1308.
- Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.

Benefit #4 – Reduced CO_2 emissions

The table below provides information regarding the reduction in CO_2e emissions made possible through the offset of SWP water with groundwater.

Project Name: Peck Water Conservation Improvement
Type of Benefit Claimed: Reduced emissions
Measure of Benefit Claimed (Name of Units): Metric tons of CO_2 equivalent
Additional Information About this Measure: average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	1,773	Not applicable	Not applicable
2016	1,773	281	-1,492
2017-2105	1,773	281	-1,492

References:

- West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H.
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308.
- Bureau of Labor Statistics, 2013. Average Energy Prices in the Los Angeles Area.
- Climate Action Registry, General Reporting Protocol

Project Name: Peck Water Conservation Improvement
Type of Benefit Claimed: Reduced salt import to the region
Measure of Benefit Claimed (Name of Units): metric tons per year
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)

Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	555	Not applicable	Not applicable
2016	555	0	-555
2017-2105	555	0	-555

References:

- Water Conservation Model
- Metropolitan Water District of Southern California, 2010. *Regional Urban Water Management Plan.* Page 4-4.
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Benefit #5 – Reduced Downstream Flood Damage

The table below provides information regarding the reduction in peak flood flows made possible by increased percolation in the spreading basin.

Project Name: Peck Water Conservation Improvement
Type of Benefit Claimed: Reduced peak flows
Measure of Benefit Claimed (Name of Units): pump capacity in cfs and increased percolation capacity
Additional Information About this Measure: over the average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	0	Not applicable	Not applicable
2016	0	50	50
2017-2105	0	50	50

References: *Peck Road Spreading Basin Pump Station and Pipeline Project Concept Report,* 2012

San Jose Creek Water Reclamation Plant East Process Optimization Project

The San Jose Creek Water Reclamation Plant East Process Optimization Project (Project) consists of the construction of process optimization facilities at the San Jose Creek Water Reclamation Plant (SJCWRP) East. The construction includes:

- Addition of flow equalization,
- Implementation of sequential chlorination,
- Replacement of process air compressors (PACs), and
- Optimization of the aeration system.

Flow equalization tanks would reduce flow variability to downstream unit processes thereby improving operation of those processes and the overall quality of the recycled water produced by the plant. The equalization tanks would allow the plant to more efficiently manage both hydraulic and nutrient loadings to the nitrification/denitrification (NDN) unit processes. Flow equalization tanks would also increase the quantity and availability of recycled water by 8,400 acre-feet per year (AFY). Implementation of sequential chlorination[87] would ensure continued compliance with Title 22 disinfection requirements for unrestricted reuse while minimizing the formation of disinfection byproducts. PACs are the SJCWRP's most significant source of power demand, and replacing the existing PACs with newer models that are optimally sized would greatly lower power consumption. Optimization of the aeration system would improve secondary treatment and use process air more efficiently, which would further decrease power demands and greenhouse gas emissions (GHG).

It is assumed that the Project would deliver recycled water to replenishment facilities at the Montebello Forebay Spreading Grounds using existing conveyance facilities with adequate capacity. The recycled water would be replacing existing replenishment with imported water and therefore would not require additional percolation capacity in the spreading grounds.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-10**.

[87] Sequential chlorination is a two-step process. First, free chlorine is added to fully nitrified secondary effluent to inactivate pathogens and to react with N-nitrosodimethylamine (NDMA) precursors, thus reducing NDMA formation. Second, chloramines (ammonia then chlorine) are added to media filtered effluent to stop formation of trihalomethanes (THMs) and haloacetic acids to provide further disinfection. (Sequential Chlorination: A New Approach for Disinfection of Recycled Water, 2009)

A. Water Supply
   - Increase volume of 8,400 AFY of recycled water made available for groundwater replenishment thereby increasing local water supplies over the lifespan of the Project
   - Increase water supply reliability for recycled water customers at all times and groundwater pumpers in the Central Basin during times of drought experienced by the State Water Project (SWP) by offsetting less reliable imported water with more reliable local recycled water.

B. Reduce Delta demands to help address CALFED Bay-Delta Program objectives
C. Water Quality
   - Improve water quality in recycled water
D. Energy Conservation
   - Reduce 1.4 billion kilowatt-hours (kWh) over the 50-year lifespan of the Project
E. Greenhouse Gas Reduction
   - Avoid approximately 461,000 metric tons (MT) of carbon dioxide (CO_2) equivalents emitted over the 50-year lifespan of the Project

Table 7-10: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Increase volume of recycled water available for reuse	acre-feet per year	*Recycled Water Supply for GRIP – August 2010 Update Memorandum* (2010), Option 4 *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013)
Water Supply - Increase reliability	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report*. Bay-Delta Office. June 2012.
Delta Demands – Reduce Delta demands	acre-feet per year	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Water Quality - Improve overall effluent quality	Qualitative	*Sequential Chlorination: A New Approach for Disinfection of Recycled Water* (2009) *Equalization Volume Required for Complete Nitrification at the San Jose Creek East Water Reclamation Plant Memorandum* (2013) *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013) *San Jose Creek WRP Process Air Compressor Efficiency Study R1 Memorandum* (2010) *Update to San Jose Creek East WRP Process Air Compressor*

Physical Benefit	Unit	Technical Justification
		Efficiency Memorandum (2012)
Energy Conservation - Reduce power consumption from offset of SWP water	kWh	*San Jose Creek WRP Process Air Compressor Efficiency Study R1 Memorandum* (2010) *Update to San Jose Creek East WRP Process Air Compressor Efficiency Memorandum* (2012) *SJC WRP East Process Optimization* – O&M Costs and Power Savings Spreadsheet (2013) *Recycled Water Supply for GRIP – August 2010 Update Memorandum* (2010), Option 4 *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013) http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf
Greenhouse Gas Reduction - Reduce emissions	metric tons of CO_2 equivalents	*San Jose Creek WRP Process Air Compressor Efficiency Study R1 Memorandum* (2010) *Update to San Jose Creek East WRP Process Air Compressor Efficiency Memorandum* (2012) *SJC WRP East Process Optimization* – O&M Costs and Power Savings Spreadsheet (2013) *Recycled Water Supply for GRIP – August 2010 Update Memorandum* (2010), Option 4 *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013) Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

In 2004, the Sanitation Districts of Los Angeles County (LACSD) implemented the NDN process at the SJCWRP in order to meet new effluent discharge limits. Since the NDN implementation, the SJCWRP has consistently met permit requirements; however, the NDN process has reduced the secondary treatment system's ability to reliably treat peak flows and constituent loads, especially ammonia. The SJCWRP is transitioning to sequential chlorination[88] for disinfection,

[88] Sequential chlorination is a two-step process. First, free chlorine is added to fully nitrified secondary effluent to inactivate pathogens and to react with (N-nitrosodimethlylamine (NDMA) precursors, thus reducing NDMA formation. Second, chloramines (ammonia then chlorine) are added to media filtered effluent to stop formation of

and incomplete nitrification of secondary effluent can jeopardize the efficacy of virus inactivation. As flows increase over time, this issue would be exacerbated. Furthermore, the existing and anticipated recycled water demands (which are higher than current deliveries of recycled water for reuse) equal or exceed the amount currently produced at the SJCWRP.

Therefore, without the Project, SJCWRP would continue producing recycled water at a limited capacity. Unit processes would continue to be limited by hydraulic and nutrient loading constraints and the SJCWRP would not be able to produce an additional 8,400 AFY of recycled water while complying with Title 22 standards. Other benefits that would not be realized include: the continued use of conventional disinfection techniques[89] would increase the risk of disinfection byproduct formation in the produced recycled water; the continued use of existing PACs as currently operated would consume a net excess of 2.85 million kWh of energy per year, and generate a net excess of emissions of 937 metric tons of CO_2 equivalents per year; the continued use of imported water for replenishment of 8,400 AFY would consume excess energy and generate GHG emissions (see below).

Narrative Description of Physical Benefits (with Project)

To obtain the physical benefits described below, construction of process optimization facilities at the SJCWRP East, including the addition of flow equalization, implementation of sequential chlorination, replacement of the PACs, and optimization of the aeration system, will be required. Facilities required to convey recycled water to spreading basins and the spreading basins themselves are existing and do not constitute additional infrastructure needed to obtain the benefits of the Project. Conveyance facilities owned by LACSD are sized to accommodate treatment plant design flows up to 100 mgd (equivalent to approximately 112,000 AFY). In addition, the existing pipeline and spreading ground facilities have capacity to convey and percolate an additional 8,400 AFY of local recycled water supplies (see the Appendix CD).[90]

trihalomethanes (THMs) and haloacetic acids to provide further disinfection. (Sequential Chlorination: A New Approach for Disinfection of Recycled Water, 2009)

[89] Conventional disinfection at the SJCWRP would be chloramination. Chloramination consist of the addition of chlorine and ammonia to the water stream. The chlorine and ammonia react together to form chloramines, which act as a disinfectant.

[90] Water Replenishment District of Southern California, *Groundwater Basins Master Plan Draft Report*, 2012.

A. Water Supply

Increase Volume of Recycled Water Available for Reuse

This Project will increase the production of local recycled water supplies by 8,400 AFY. This amount was estimated from the average annual flow to SJCWRP (average of a three year period, 2008-2010) of 89,600 AFY minus the average production of reclaimed water of 81,200 AFY during that same time period. This number is associated with Option 4 from the *Recycled Water Supply for GRIP – August 2010 Update Memorandum* and represents the flow that may be accepted by constructing flow equalization, allowing the plant to treat flows that are currently bypassing the plant for treatment downstream. The flow currently being bypassed is the difference between tributary flows and treated flows at SJCWRP. Water supply benefits are assumed to begin in 2019, after all equipment and infrastructure improvements are completed in late 2018.

Increase Supply Reliability

The reliability of a water supply refers to the ability to consistently meet water demands, even in times of drought or other constraints on source water availability. The Project would help increase the reliability of water supplies in the Central Basin by substituting recycled water for imported supplies that were previously used for replenishment or non-potable uses. The SWP Delivery Reliability Report for 2011[91] shows that the long-term reliability of SWP supplies is 60% of the total demand for SWP Table A water, with deliveries during multiple dry year periods averaging 32% to 38% of total demand. In comparison, the reliability of both recycled water supplies (for replenishment or non-potable uses) and pumped groundwater supplies is considered to be essentially 100% in the Central Basin, limited only by system constraints and allowable pumping allocation, respectively. This is reflected in the Draft Central Basin Municipal Water District 2010 Urban Water Management Plan, Chapter 4 which projects that equivalent volumes of both recycled water and groundwater supplies will be available in average, single-dry, and multiple-dry years alike. [92] Water supply reliability benefits are assumed to begin in 2019, after all equipment and infrastructure improvements are completed in late 2018.

[91] California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
[92] Central Basin Municipal Water District, *Draft 2010 Urban Water Management Plan*, March 2011.

B. Reduce Delta Demands to Help Address CALFED Bay-Delta Program Objectives

The Greater Los Angeles County IRWM Region (Region) has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2006 IRWM Plan. Diversion of water from the Delta to southern California has caused damage to the Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps), damages habitats, and reverses river flows. By reducing the Region's reliance on the Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet CALFED Bay-Delta objectives to restore tidal marshes and floodplains, and restore fish and wildlife species.[93] Reduced Delta demand benefits are assumed to begin in 2019, after all equipment and infrastructure improvements are completed in late 2018.

C. Water Quality

Improve Overall Effluent Quality

This Project will improve water quality through the sequential chlorination process which was extensively tested for disinfection efficacy and disinfection byproduct formation in the laboratory, at the pilot scale, and at several water reclamation plants operated by the LACSD.

Each year the quantity and quality of wastewater treated at SJCWRP varies with domestic and industrial wastewater sources outside of LACSD's control. The implementation of process optimization as part of the Project should diminish the impacts associated with peak constituent loads (such as ammonia, BOD, and COD) and improve treatment efficiency, which in turn should minimize the formation of disinfection byproducts. However, the fluctuating influent quality and evolving regulatory standards will result in variable physical benefits. Therefore, although the exact increment cannot be quantified at this time, it is anticipated that implementation of the Project will create long-term improvements in the overall quality of the recycled water produced at SJCWRP.

[93] California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.

Based on the *Sequential Chlorination: A New Approach for Disinfection of Recycled Water (2009),* the sequential chlorination process will (1) provide effective disinfection against total coliform bacteria and viruses at chlorine contact times well below those required by California regulations for disinfected tertiary recycled water; (2) reduce NDMA formation by 50 to 85% in comparison to chloramination; (3) produce effluent consistently meeting the total THM limit for recycled water; (4) generate insignificant amounts of cyanide (a DBP of concern); and (5) cause no aquatic toxicity.

The sequential chlorination process is a new approach for disinfection of fully nitrified effluent produced by wastewater treatment and reclamation facilities. The process can be implemented using existing chloramination infrastructure with minor modifications. Plant-scale testing results have shown that the process significantly reduces NDMA formation in comparison to chloramination. By lowering the NDMA levels in the recycled effluent, sequential chlorination could help save the costs of downstream advanced oxidation process for NDMA removal in indirect potable reuse applications. The process does result in a moderate increase in THM formation, but the levels of total THMs are well below the drinking water standards. Sequential chlorination generates insignificant amounts of cyanide and does not cause aquatic toxicity.

Because of the use of free chlorine, the sequential chlorination process is more efficient than chloramination with respect to pathogen inactivation. Sequential chlorination can achieve the same level of pathogen inactivation as chloramination, but with a much shorter chlorine contact time. This could lead to savings in chlorine contact tank construction for new projects, creation of available space in existing chlorine contact tanks for other uses (e.g., storage, flow equalization), or an increase in treatment capacity.

It is important to note that these water quality benefits apply to all of the current and planned recycled water production from SJCWRP, not only the additional 8,400 AFY made possible by the Project. Water quality benefits are assumed to begin in 2019, after all equipment and infrastructure improvements are completed in late 2018.

D. Energy Conservation

Energy conservation is based on power consumption savings at the SJCWRP and through potential offsets of imported water resulting from an increased amount of recycled water produced. The energy required to pump groundwater from replenished supplies does not need to be included in these calculations because it is assumed that the recycled water from the

Project is simply replacing the same volume of imported water currently replenished in the spreading basins. In other words, groundwater pumping is required in both the with- and without-Project scenarios.

The replacement of the PACs will reduce power consumption by 4.1 million kWh/year. This reduction will be offset by increased power consumption from the new flow equalization pump stations, odor control blowers, and odor control recirculation pumps for a net power consumption savings of approximately 2.85 million kWh/year at the SJCWRP (i.e., inside the plant).[94]

It should be noted that each year the quantity of wastewater treated at SJCWRP varies with domestic and industrial wastewater sources, factors that are outside of LACSD's control. Power consumption at the plant is directly correlated to the volume of wastewater treated. It is anticipated that replacement of the PACs will have an immediate physical benefit of power savings when they go online in early 2017. However, the amount of power savings throughout the plant will vary with the volume of wastewater treated.

Second, energy will be conserved because of the offset of imported water supplies. The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total GHG emissions.

For imported supplies, West Basin Municipal Water District (WBMWD) has estimated that approximately 3,000 (kWh) per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies, including Metropolitan Water District of Southern California that provides SWP water to both WBMWD and Central Basin Municipal Water District (CBMWD), the wholesale provider in the vicinity of the Project.[95] By contrast, the energy required to transfer recycled water from SJCWRP to existing groundwater recharge facilities is zero since the existing conveyance facilities operate by gravity. Assuming 3,000 kWh/AF and an average annual imported water offset of 8,400 AFY, approximately 25.2 million kWh/year of energy will be saved by implementing the Project because of the imported water offset (i.e., outside the plant).

[94] *SJC WRP East Process Optimization* – O&M Costs and Power Savings Spreadsheet, 2013.

[95] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.

Combining energy saved from treatment plant improvements and imported water offset, the total amount of energy conserved from the implementation of the Project is approximately 28 million kWh /year, or approximately 1.4 billion kWh over the 50-year lifespan of the Project. [96]

Energy benefits will begin in two phases. For the energy benefits related to PAC installation (4.1 million kWh/year savings), the benefits will begin in 2017 when those units begin operation. Then the remaining equipment/infrastructure improvements will be complete in late 2018 and will begin operating in 2019; so the reduced energy benefits (because of additional power required by the other equipment/infrastructure) will begin in 2019 (i.e., 2.85 million kWh/year instead of 4.1 million kWh/year). The energy benefits related to avoided imported water (25.2 million kWh/year) are also assumed to begin in 2019 (see Annual Project Physical Benefits tables below).

E. Greenhouse Gas Reduction

The proposed Project would avoid greenhouse gas (GHG) emissions through power consumption savings at the SJCWRP and through potential offsets of imported water resulting from an increased amount of recycled water produced. This value may be calculated by applying a factor of 0.724 pounds (lbs) of CO_2 equivalents per kWh and converting to total metric tons (MT) of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[97] The Project will reduce GHG emissions by 937 MT of CO_2 equivalents per year by constructing flow equalization, implementing sequential chlorination, replacing the PACs, and optimizing the aeration systems. The Project will also reduce GHG emissions by 8,276 MT of CO_2 equivalents per year by offsetting the demand of 8,400 AF of imported SWP water. In total, the proposed Project will avoid 9,213 MT of CO_2 equivalents per year or approximately 461,000 MT of CO_2 equivalents over the 50 year lifespan. [98]

GHG benefits will begin in two phases. For the GHG benefits related to PAC installation (1,348 MT of CO_2 equivalents per year), the benefits will begin in 2017 when those units begin operation. Then the remaining equipment/infrastructure improvements will be complete in late 2018 and will begin operating in 2019; so the reduced GHG benefits (because of additional

[96] It should be noted that PACs will be installed one year before the rest of the new equipment/infrastructure in 2017, so the energy benefits related to PAC installation begin in 2017 (one year prior to the non-PAC energy benefits and other benefits).

[97] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

[98] The approximately 461,000 MT of CO_2e is composed of reduced emissions from more efficient treatment equipment (47,000 MT) and reduced emissions from imported water offset (414,000 MT).

power required by the other new equipment/infrastructure) will begin in 2019 (i.e., 937 MT/year instead of 1,348 MT/year). The GHG benefits related to avoided imported water (8,276 MT/year) are also assumed to begin in 2019 (see Annual Project Physical Benefits tables below).

Relationship to other Projects

The Project helps to address water supply and water quality needs within the Region by providing a larger quantity of higher quality recycled water for reuse through groundwater recharge at the Montebello Forebay and/or through municipal and industrial use. This Project may work in an integrated fashion with other projects in the grant proposal that also offset imported water supplies. All of these projects share the supply, reliability, energy, and greenhouse gas emission benefits of imported water offset.

Potential Adverse Effects

No adverse effects are anticipated as a result of the Project.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit. It is important to note that the new PAC units will be installed in early 2017 (and are assumed to begin providing benefits in 2017), whereas the other improvements will not be in place until very late in 2018 (and are assumed to begin providing benefits in 2019).

Benefit A – Water Supply: Increase Volume of Recycled Water Available for Reuse

The table below provides information regarding the supply benefit from increased volume of recycled water available for reuse.

Project Name: San Jose Creek Water Reclamation Plant East Process Optimization Project **Type of Benefit Claimed:** Increase volume of recycled water available for reuse **Measure of Benefit Claimed (Name of Units):** acre feet **Additional Information About this Measure:** over the average year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**

2012-2018	Baseline. See notes below.	Not applicable	0
2019	Baseline	Baseline + 8,400	8,400
2020-2068	Baseline	Baseline + 8,400	8,400

Notes: To better represent actual treatment plant flows, the baseline will be comprised of several years of data and will be determined when the Project begins.

The estimated last year of project life varies depending on the equipment. For estimating purposes, assume 50 years for equalization tank and 25 years for process equipment (such pumps, PACs, blowers, piping, valves).

Benefit B – Reduce Delta Demands to Help Address CALFED Bay-Delta Program Objectives

The table below provides information regarding the benefit of reducing imported water demands on the Delta.

Project Name: San Jose Creek Water Reclamation Plant East Process Optimization Project
Type of Benefit Claimed: Reduce delta demands (imported water offset)
Measure of Benefit Claimed (Name of Units): acre feet
Additional Information About this Measure: over the average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2018	Baseline. See notes below.	Not applicable	0
2019	Baseline	Baseline + 8,400	8,400
2020-2068	Baseline	Baseline + 8,400	8,400

Notes: To better represent actual treatment plant flows, the baseline will be comprised of several years of data and will be determined when the Project begins.

The estimated last year of project life varies depending on the equipment or infrastructure. For estimating purposes, assume 50 years for equalization tank and 25 years for process equipment (such pumps, PACs, blowers, piping, valves).

Benefit C – Energy Conservation

The table below provides information regarding reduction of power consumption and increased power cost savings.

Project Name: San Jose Creek Water Reclamation Plant East Process Optimization Project
Type of Benefit Claimed: Reduce power consumption
Measure of Benefit Claimed (Name of Units): million kWh
Additional Information About this Measure: over the average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	Treatment: Baseline	--	--
2017[1]	Treatment: Baseline	Treatment: Baseline - 4.1	Treatment: -4.1
2018[1]	Treatment: Baseline	Treatment: Baseline - 4.1	Treatment: -4.1
2019[1]	Treatment: Baseline Imported: Baseline	Treatment: Baseline - 2.85 Imported: Baseline - 25.2	Treatment: -2.85 Imported: -25.2 Total energy: -28.05
2020-2068[1]	Treatment: Baseline Imported: Baseline	Treatment: Baseline - 2.85 Imported: Baseline - 25.2	Treatment: -2.85 Imported: -25.2 Total energy: -28.05

Notes: (1) PACs will be installed two years before the rest of the new equipment/infrastructure, so the initial energy benefits for PACs begin in 2017 whereas the reduced energy benefits (offset by non-PAC energy requirements) begin in 2019.

References: *San Jose Creek WRP Process Air Compressor Efficiency Study R1 Memorandum* (2010); *Update to San Jose Creek East WRP Process Air Compressor Efficiency Memorandum* (2012); *SJC WRP East Process Optimization* – O&M Costs and Power Savings Spreadsheet (2013); *Recycled Water Supply for GRIP – August 2010 Update Memorandum* (2010), Option 4; *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013); http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf

Benefit D – Greenhouse Gas Reduction

The table below provides information regarding reduction of greenhouse gas emissions.

Project Name: San Jose Creek Water Reclamation Plant East Process Optimization Project
Type of Benefit Claimed: Reduce emissions
Measure of Benefit Claimed (Name of Units): metric tons (MT) of CO_2 equivalents
Additional Information About this Measure: over the average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	Treatment: Baseline	--	--
2017[1]	Treatment: Baseline	Treatment: Baseline - 1,348	Treatment: -1,348
2018[1]	Treatment: Baseline	Treatment: Baseline - 1,348	Treatment: -1,348
2019[1]	Treatment: Baseline Imported: Baseline	Treatment: Baseline - 937 Imported: Baseline - 8,276	Treatment: -937 Imported: -8,276 Total GHG: -9,213
2019-2068[1]	Treatment: Baseline Imported: Baseline	Treatment: Baseline - 937 Imported: Baseline - 8,276	Treatment: -937 Imported: -8,276 Total GHG: -9,213

Notes: (1) PACs will be installed two years before the rest of the new equipment/infrastructure, so the initial GHG benefits for PACs begin in 2017 whereas the reduced GHG benefits (offset by non-PAC energy requirements) begin in 2019.

References: *San Jose Creek WRP Process Air Compressor Efficiency Study R1 Memorandum* (2010); *Update to San Jose Creek East WRP Process Air Compressor Efficiency Memorandum* (2012); *SJC WRP East Process Optimization* – O&M Costs and Power Savings Spreadsheet (2013); *Recycled Water Supply for GRIP – August 2010 Update Memorandum* (2010), Option 4; *Flow Equalization Alternatives at San Jose Creek East Water Reclamation Plant Memorandum* (2013); Climate Action Registry, General Reporting Protocol - http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html

South Gardena Recycled Water Pipeline Project

The South Gardena Recycled Water Pipeline Project (Project) will expand West Basin Municipal Water District's (WBMWD) recycled water distribution system to allow for the delivery of an additional 120 AFY of recycled water to four new irrigation customers. The Project includes construction of approximately 1.25 miles of recycled water pipeline, which will extend the existing distribution system into the south of the City of Gardena. The City of Gardena is a disadvantaged community (DAC), as defined by the DAC guidelines included in the PSP for this grant application (see Attachment 10 for additional detail on the City of Gardena DAC).

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-11**.

A. Water Supply
   - Reduction of imported water demand by 120 AFY, offset by 120 AFY of recycled water irrigation use
   - Increased water supply reliability for local pumpers during times of drought experienced by the State Water Project (SWP) from offsetting less reliable imported water with more reliable local recycled water

B. Reduced Delta demands to help address CALFED Bay-Delta Program objectives
C. Energy Conservation
   - Reduction of 12 million kWh over the 40-year lifespan of the Project

D. Greenhouse Gas (GHG) Reduction
   - Avoidance of 3,957 metric tons of CO_2 equivalents emitted over the 40-year lifespan of the Project

E. Fertilizer Use
   - Reduction of 7,440 lbs of fertilizer use per year due to nutrients in the recycled water provided by the project.

F. Avoided wastewater discharge of 120 AFY per year from Hyperion Wastewater Treatment Plant

Table 7-11: Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Reduction of imported water demand	acre-feet per year	2009 West Basin Capital Implementation Master Plan

Physical Benefit	Unit	Technical Justification
Water Supply - increased reliability	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Delta Demands - decreased	Acre-feet per year	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Energy Conservation - Reduction of energy from offsetting SWP water	kWh	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District* (March 2007)
Greenhouse Gas Reduction - Reduction of emissions	Tons of CO_2 equivalents	Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
Fertilizer Use – Avoided fertilizer use due to nutrients in recycled water	lbs	2012 Water Quality from West Basin WRP Title 22 Product Water for Landscape and Industrial Water Users
Wastewater Discharge – avoided discharge from Hyperion due to recycled water use	AFY	2009 West Basin Capital Implementation Master Plan

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

If the Project were not to be implemented, the four customers described in Attachment 3 would continue to use potable water for irrigation instead of recycled water produced locally. Within the WBMWD service area, imported water from the State Water Project (SWP) is the marginal water supply source. Thus, this project will directly offset the use of imported SWP supplies. The availability of imported SWP water is subject to a number of natural and human forces, ranging from increased population growth (and the accompanying increased demands on the SWP system) to drought and earthquakes, to environmental regulations and water rights determinations. Without the South Gardena Recycled Water Pipeline Project, reliance on imported water will continue and water supply reliability will not improve within the City of Gardena as it would with the Project.

Increased use of imported water will also result in increased energy usage [and associated greenhouse gas (GHG) emissions] involved with pumping and distributing imported water over

long distances. The energy requirements would be much lower if locally generated recycled water were used instead of imported water.

In addition, the proposed project will reduce fertilizer costs for the participating recycled water customers. Fertilizing compounds commonly present in recycled water are typically not found in potable water (e.g., nitrogen, phosphorus, potassium). Thus the use of recycled water for landscape irrigation will reduce fertilizer requirements at properties serviced by the project. Without the project, these customers will continue to apply fertilizer in excess of what would be required if the project is implemented.

Finally, the source of the recycled water provided by this project is the City of Los Angeles's Hyperion Wastewater Treatment Plant (Hyperion). WBMWD purchases wastewater effluent from the City (after it has been treated to secondary standards) and treats it to Title 22 and higher water quality standards for delivery to end users. Without the project, wastewater effluent at the plant will continue to be discharged and will not be put to beneficial use.

Narrative Description of Physical Benefits (with Project)

A. Water Supply

Reduction of Imported Water

WBMWD provides nearly 157,000 acre-feet per year (AFY) of water to 17 cities and water agencies inside their service area. To meet this need, the WBMWD procures 104,985 AFY (2010) of imported water from the Metropolitan Water District of Southern California (MWD) and 14,182 AFY (2010) of recycled water to commercial, industrial, and seawater barrier end uses.[99] The Project offsets imported water use with recycled water use and increases WBMWD's recycled water portfolio.

In this manner, the Project would help reduce imported water demand by 120 AFY. This benefit is identified as a replacement of potable water (i.e., imported supplies and/or potentially groundwater).

[99] West Basin Municipal Water District *2010 Urban Water Management Plan*

Increase Supply Reliability

The Project would help increase the reliability of water supply by 120 AFY by substituting recycled water for SWP supply. The SWP Delivery Reliability Report for 2011[100] shows that the long-term reliability of SWP supplies is 60% of the total demand for SWP Table A water, with deliveries during multiple dry year periods averaging 32% to 38% of total demand. In comparison, the West Basin Municipal Water District *2010 Urban Water Management Plan*, Chapter 5, indicates a reliability of 100 percent for recycled water during an average year.

B. Reduced Delta Demands to Help Address Bay-Delta Environmental Goals

The Greater Los Angeles County IRWM Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2007 IRWMP Plan. Diversion of water from the Delta to southern California has caused damage to the Bay Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps), damages habitats, and reverses river flows. By reducing the Region's reliance on the Bay Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet CALFED Bay-Delta Program objectives to restore tidal marshes and floodplains, and restore fish and wildlife species.

C. Energy Conservation

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in the California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total GHG emissions.

For imported supplies, WBMWD has estimated that approximately 3,000 kilowatt-hours (kWh) per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[101] It is assumed that 3,000 kWh/AF is used to bring in imported water. Some energy is also used to convey recycled water to the end users in this Project. The energy use to produce and convey recycled water Title 22 treatment is 490 kWh/AF.[3] To offset 120 AF of imported water, it is assumed 2,510 kWh/AF (3,000 – 490 kWh/AF) would be saved.

[100] California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
[101] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.

Therefore, approximately 301,200 kWh per year of energy will be saved by implementing the Project. Over the 40-year lifespan of the Project, this totals 12 million kWh of conserved energy.

D. Greenhouse Gas Reduction

The proposed Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport SWP water to the Region. This value may be calculated by applying a factor of 0.724 lbs. of CO_2 equivalents per kWh and converting to total tons of CO_2 equivalents, based on the California Action Registry, General Reporting Protocol.[102] By offsetting the demand of 120 AF of imported SWP water, the proposed Project will avoid GHG emissions of 99 metric tons per year of CO_2 equivalents per year. Over the 40-year lifespan of the Project, this totals 3,957 metric tons of avoided carbon emissions.

E. Reduced Fertilizer Use

Fertilizing compounds commonly present in recycled water are typically not found in potable water (e.g., nitrogen, phosphorus, potassium). Thus the use of recycled water for landscape irrigation will reduce fertilizer costs associated with the properties that will be serviced by the Project.

The exact offset of fertilizer use from using recycled water is difficult to predict due to daily and seasonal nutrient variations in the recycled water. However, the amount of nutrients (i.e., pounds of fertilizer) per acre-foot of recycled water can be calculated from average (tertiary-treated) effluent values.

The recycled water provided by WBMWD contains 11 lbs of nitrate (as N) per acre-foot, 49 lbs of potassium per acre-foot, and 2 lbs of total phosphate per acre-foot. [103] Thus for every acre-foot of recycled water used in lieu of potable water, the recycled water customers will avoid the use of approximately 62 lbs of fertilizer in total. Thus, the project will result in avoided fertilizer use of 7,440 lbs per year, or 297,600 over the 40-year project life.

F. Avoided wastewater discharges

To produce recycled water with this project, WBMWD would purchase wastewater effluent from the City (after it has been treated to secondary standards) and treat it to Title 22 standards for delivery to end users. Without the project, 120 AFY of wastewater effluent will

[102] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
[103] 2012 Water Quality from West Basin WRP Title 22 Product Water for Landscape and Industrial Water Users

continue to be discharged to the Pacific Ocean from Hyperion. If the project is implemented, it will avoid this discharge, and its associated costs.

Relationship to other projects in the Proposal

This Project does not have a direct relationship with any other projects in the Proposal other than it meets the following IRWM Plan goal: Optimize local water resources to reduce the Region's reliance on imported water, similar to the other projects in the Proposal.

Facilities, Policies and Actions Needed

The infrastructure to be constructed for this Project is underground pipelines. The physical benefits to be realized will be obtained from monthly meter reads of the actual recycled water deliveries.

Uncertainties

The uncertainty in these physical benefits is the actual water to be used by the four sites. Each year will be different based on local climate conditions. The 120 AFY estimate is based on historical usage of potable water by these four future customers.

Potential Adverse Physical Effects

There are no known adverse physical effects of the Project.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Reduction of Imported Water

The table below provides information regarding the reduction in imported water from implementation of the Project.

Project Name: South Gardena Recycled Water Pipeline **Type of Benefit Claimed:** Reduction of Imported Water **Measure of Benefit Claimed (Name of Units):** acre feet **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			

Year	Without Project	With Project	Change Resulting from Project
2012-2015	0	0	0
2016	0	120	-120
2017-2055	0	120	-120
References: 2009 West Basin Capital Implementation Master Plan, pages 9-4, 9-9, 9-12, 9-13			

Benefit #2 – Energy Conservation

The table below provides information regarding energy consumption for conveyance of SWP imported water, with and without the Project.

Project Name: South Gardena Recycled Water Pipeline **Type of Benefit Claimed:** Energy Consumed **Measure of Benefit Claimed (Name of Units):** kilowatt-hours (kWh) **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	360,000	--	--
2016	360,000	58,800	-301,200
2017-2055	360,000	58,800	-301,200
References: http://www.westbasin.org/files/general-pdfs/Energy--UCSB-energy-study.pdf; Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308; Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm.			

Benefit #3 – Greenhouse Gas (GHG) Emissions

The table below provides information regarding GHG emissions for conveyance of SWP imported water, with and without the Project.

Project Name: South Gardena Recycled Water Pipeline **Type of Benefit Claimed:** CO_2 equivalents emitted **Measure of Benefit Claimed (Name of Units):** metric tons **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	118	--	--
2016	118	19	-99
2017-2055	118	19	-99
References: Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html			

Benefit #4 – Fertilizer Use Offset

The table below provides information regarding reduced fertilizer use due to use of recycled water with the project.

Project Name: South Gardena Recycled Water Pipeline **Type of Benefit Claimed: Offset** Fertilizer Use **Measure of Benefit Claimed (Name of Units):** lbs of fertilizer **Additional Information About this Measure:**			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2015	7,440	--	--
2016	7,440	0	-7,440
2017-2055	7,440	0	-7,440
References: 2012 Water Quality from West Basin WRP Title 22 Product Water for Landscape and Industrial Water Users			

Upper Malibu Creek Watershed Restoration

The Upper Malibu Creek Watershed Restoration Project (Project) proposes to restore channelized sections of creeks in the Upper Malibu Creek Watershed, including Medea Creek and a failed channelized section of Las Virgenes Creek. These restorations will involve the removal of concrete lining, re-engineering of the channels and installation of native plants. As part of the restorations, recreational trails will be constructed that will connect with regional trail systems, and informational signage will be installed.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-12**.

A. Habitat
   - Restore 4 acres of riparian habitat
   - Reconnect 2 migration corridors for a total of 14 miles

B. Recreation
   - Increase recreational access through the addition of 1.7 miles (8,976 feet) of hiking trail at the Las Virgenes Creek site, and 550 feet of hiking trail at the Medea Creek site that will connect to regional trail systems
   - Create 2 connections to regional trail systems

C. Water Quality
   - Increase dissolved oxygen levels in surface waters
   - Decrease surface water temperatures
   - Decrease nutrient (nitrogen and phosphorus) concentrations in surface waters
   - Decrease phosphorus concentrations in surface waters

D. Education
   - Create informational signage for educational use by school staff and parents, field trips, and classroom presentations

E. Flood Protection
   - Reduce sediment blockages downstream of Las Virgenes Creek site
   - Prevent undercutting of Lost Hills Road at Las Virgenes Creek

Table 7-12: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Habitat - Create or restore riparian habitat	acres	Area Determination by City of Agoura Hills Engineering Department Staff
Habitat - Reconnected migration corridors	Qualitative	*Open Space for Habitat and Recreation Plan,* 2012.
Recreation - Increased recreational access	Feet of trail Connection regional trails	*Cheeseboro/Palo Comado Canyons, 2009*
Water Quality - Increased dissolved oxygen levels in surface waters	Qualitative	*Malibu Creek Watershed Monitoring Program Baseline Report*, 2005
Water Quality – Decreased surface water temperatures	Qualitative	*Malibu Creek Watershed Monitoring Program Baseline Report*, 2005
Water Quality – Decreased nutrient (nitrogen and phosphorus) concentrations in surface waters	Qualitative	*Malibu Creek Watershed Monitoring Program Baseline Report*, 2005
Education - Increased	Qualitative	*Las Virgenes Naturalization and Restoration Project,* 2007
Flood Protection – Reduce sediment blockages downstream of Las Virgenes Creek site	Qualitative	Alex Farassati, Environmental Services Manager of the City of Calabasas
Flood Protection – Prevent undercutting of Lost Hills Road at Las Virgenes Creek	Qualitative	Alex Farassati, Environmental Services Manager of the City of Calabasas FEMA Special Flood Hazard Areas

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

Without the Project, the sites proposed for restoration would remain concrete-lined. The Las Virgenes Creek restoration site would require replacement of the concrete lining as the lining is currently failing, and beginning to undercut the bank 50 feet from a roadway. The Medea Creek site would remain unchanged. By maintaining the concrete lining at each of these sites, there will continue to be no riparian habitat, and therefore no improvements to water quality or recreational amenities.

Narrative Description of Physical Benefits (with Project)

A. Habitat

Created or Restored Riparian Habitat

This Project will remove a concrete-lined channel section and replace it with usable riparian habitat and native vegetation. It is estimated that 4 acres of riparian habitat will be created through restoration at both the Las Virgenes Creek and Medea Creek sites. The acres of restored habitat were calculated as an estimate based on observation.

Based on a prior creek restoration project in the City of Calabasas, this Project will help provide habitat for the southern-most documented continuous annual steelhead trout run on the West Coast. In addition to endangered steelhead trout, the watershed provides habitat for Arroyo chub, Southwestern pond turtle, California slender salamander, California newt, Arroyo toad (endangered), Pacific tree frog, American goldfinches, black phoebes, warbling vireos, song sparrows, belted kingfishers, raccoons, ring tailed cats, wrentits, bushtits, Inyo California towhees (threatened), California thrashers, bobcats, western fence lizards, rattlesnakes, various raptors, coyotes and mountain lions.[104,105,106]

Reconnected Migration Corridors

In addition to creating riparian habitat, migration corridors for several species will be reconnected, including the following threatened species: steelhead trout, tidewater goby, brown pelican, peregrine falcon.[107] This is supported through the *Open Space for Habitat and Recreation Plan* prepared for the Greater Los Angeles County IRWM Region, which shows Malibu Creek as a habitat linkage between the ocean and the mountains.[108] This will be possible through the restoration of aquatic habitat for fish species, and through the creation of riparian habitat that will provide linkage between the riparian and upland habitat where terrestrial species are found. It is believed that this benefit will be achieved as a similar restoration project which was completed by the City of Calabasas on Las Virgenes Creek where

[104] Farassati, Alex, 2008. *A Project Report: Las Virgenes Creek Restoration Project – Healing a Stream.*
[105] California Department of Fish and Wildlife, 2013. *State and Federally Listed Endangered and Threatened Animals of California.*
[106] U.S. Fish and Wildlife Service, 2013. *Species Profile – Inyo California towhee.* http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B07Q. Accessed March 24, 2013
[107] Resource Conservation District of the Santa Monica Mountains, 2012. http://www.rcdsmm.org/about-watershed. Accessed March 19, 2013.
[108] RMC Water and Environment, et al, 2012. *The Greater Los Angeles County Open Space for Habitat and Recreation Plan.* Pages 39-40.

Steelhead trout were documented in the creek following the restoration. By restoring the habitat at two sites, two migration corridors will be reconnected, for a total of 14 miles of connection between the ocean and the mountains.

B. Recreation

Increased Recreational Access

This Project will create recreational access with new hiking trails. Along the Las Virgenes Creek restoration site, an additional 1.7 miles of hiking trail will be constructed. Along the Medea Creek site, an additional 550 feet of hiking trail (based on aerial photos) will be constructed which will connect to a regional trail system and Chumash Park, which is one of the City of Agoura Hills' largest and most used parks. The trail at the Las Virgenes Creek Site will be a part of the planned Las Virgenes Creek Trail which connects with existing regional trails (the Las Virgenes Trail and Juan Bautista Trail). The City of Calabasas has prepared a regional trails map on which the Las Virgenes Creek restoration site is shown as adjacent to the planned Las Virgenes Creek trail. The total length of added new trails is 9,526 feet.

C. Water Quality

Decreased Nutrient (Nitrogen and Phosphorus) Concentrations in Surface Waters

Las Virgenes Creek and Medea Creek are both 303(d) listed for nutrient impairments, as shown in the latest 303(d) listing, though a total maximum daily load (TMDL) has yet to be developed.[109] Studies have shown that riparian zones are effective in abating nonpoint source pollution (NPS), including nitrogen and phosphorus loadings, in water bodies.[110] The construction of vegetated habitat along the creeks as part of the restoration is expected to provide for the vegetative uptake of nitrogen and phosphorus and reduce nitrogen and phosphorus concentrations in Las Virgenes and Medea Creeks.

Decreased Surface Water Temperatures

Studies have shown that riparian zones are effective in moderating stream temperatures, which is necessary in order to support aquatic species such as the Steelhead. The U.S. Environmental

[109] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.

[110] United States Environmental Protection Agency, 2012. *Management Measure for Protection of Wetlands and Riparian Areas*. Table 7-1 Effectiveness of Wetlands and Riparian Areas for NPS Pollution Control. http://water.epa.gov/polwaste/nps/czara/table701.cfm. Accessed March 20, 2013.

Protection agency has developed management measures for wetlands and riparian areas in recognition of this benefit.[111] The vegetated canopy which will be restored along the creek will provide shade to the restored reach of the creek, thus decreasing water temperatures.

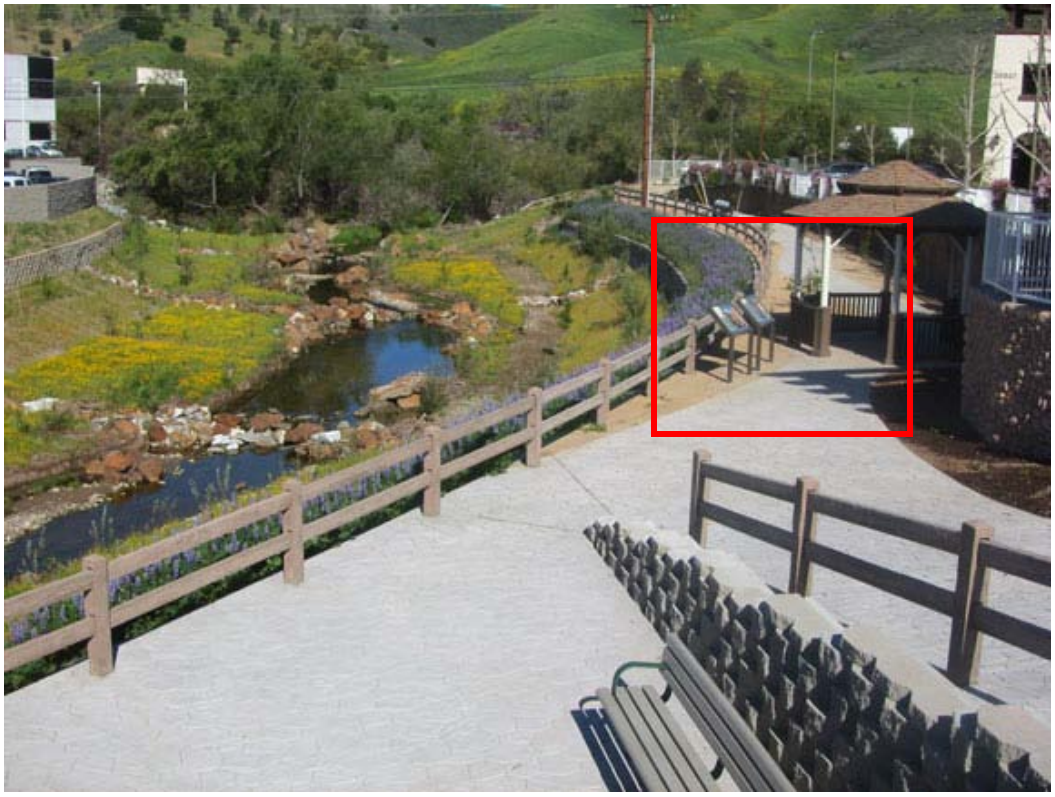
Increased Dissolved Oxygen Levels in Surface Waters

Las Virgenes Creek is 303(d) listed for low dissolved oxygen, as shown in the latest 303(d) listing, though a total maximum daily load (TMDL) has yet to be developed. Restoration of riparian area has been shown to increase dissolved oxygen levels in water bodies. For example, the restoration of Chorro Creek near San Luis Obispo, California resulted in improved dissolved oxygen levels that now "consistently support the creek's cold freshwater habitat designated use."[112] The creek restoration is expected to increase dissolved oxygen levels in the creek by removing the open concrete channel and constructing a vegetated habitat with canopy to deflect the sunlight in summer months, thereby drastically reducing algal blooms and related impacts to this reach and downstream reaches of the creek.

D. Education

The project includes a public interface with story boards educating visitors about water resource issues. Messages regarding the importance of water conservation and information on local water use reduction programs will be included in the sign program. The story boards will feature information on water conservation practices designed to reduce local residential and commercial use of potable water. These story boards will be similar to those completed as part of a previous restoration project in Las Virgenes Creek, as shown in the photo below.[113]

[111] United States Environmental Protection Agency, 2012. *Management Measure for Protection of Wetlands and Riparian Areas*. Table 7-1 Effectiveness of Wetlands and Riparian Areas for NPS Pollution Control. http://water.epa.gov/polwaste/nps/czara/table701.cfm. Accessed March 20, 2013.
[112] United States Environmental Protection Agency, 2012. *California: Chorro Creek. Watershed Restoration Efforts Improve Dissolved Oxygen Levels.* http://water.epa.gov/polwaste/nps/success319/ca_chorro.cfm. Accessed March 20, 2013.
[113] City of Calabasas, 2008. *Las Virgenes Naturalization and Restoration Project.* http://www.cityofcalabasas.com/environmental/las-virgenes-creek-restoration-project.html. Accessed March 20, 2013.

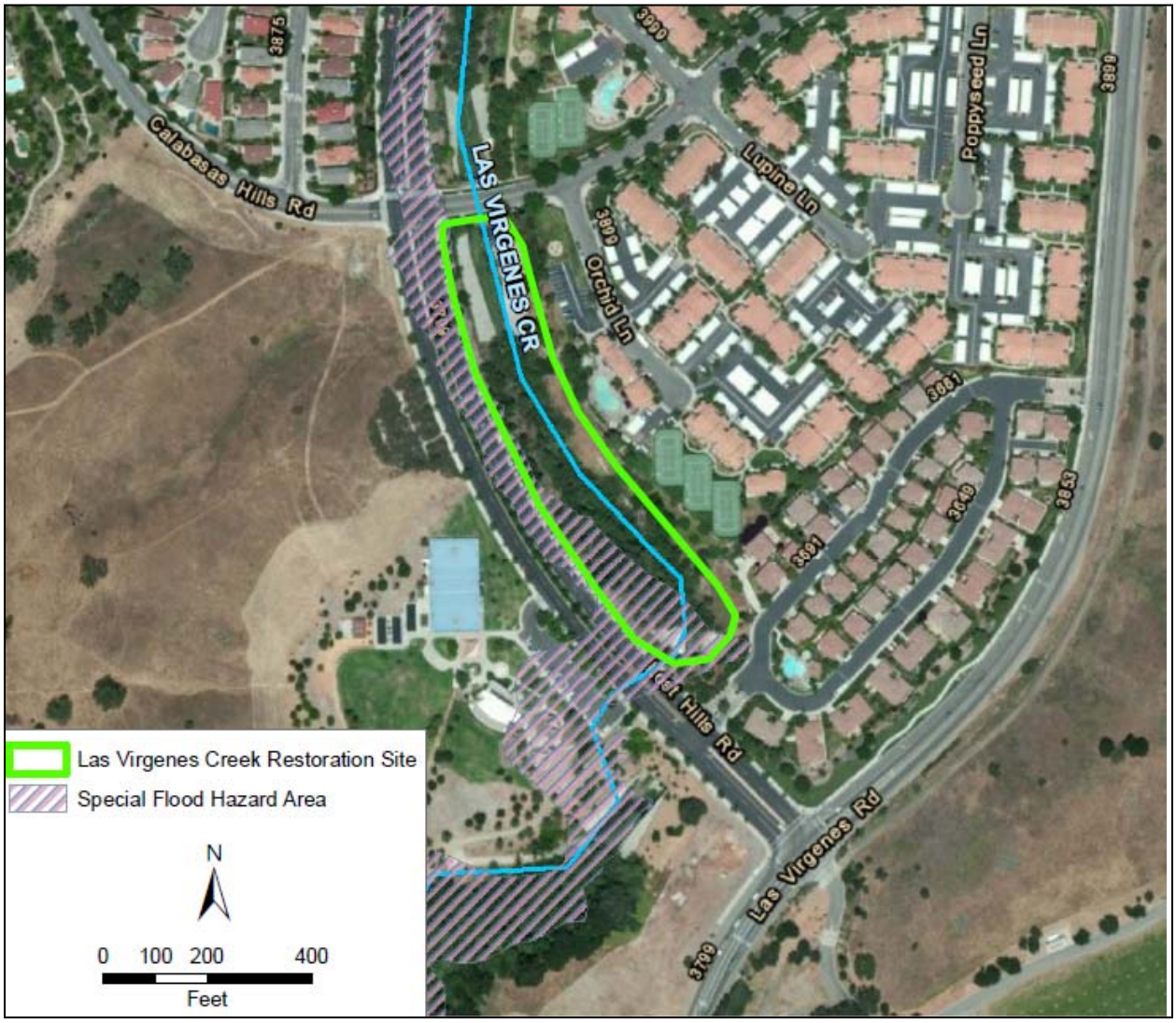


2007 Las Virgenes Creek Restoration storyboards

E. Flood Protection

The Project is expected to reduce flood control problems downstream of the Las Virgenes Creek restoration site which have been caused by sediment and debris (such as broken concrete lining) washing downstream and clogging the channel. The last occurrence of this type of flooding occurred in 2005, according to Alex Farassati, Environmental Services Manager of the City of Calabasas Public Works Department, and required the Los Angeles County Flood Control District to remove the material to restore proper creek flow.

This section of Las Virgenes Creek has also had issues with undercutting of the bank according to City of Calabasas Public Works Department and can be expected to cause damage to a roadway approximately 50 feet away should a 100 year storm event occur. As shown in the aerial photo below, the roadway adjacent to the Las Virgenes Creek restoration site is adjacent to Lost Hills Road. The roadway is within a FEMA-designated Special Flood Hazard Area, defined as an area that is at high risk for flooding. In this case, the area shown on the map below is considered to have a 1% chance of flooding, which is equivalent to a 100 year storm.


Las Virgenes Creek Restoration Site
Special Flood Hazard Area
N
0 100 200 400
Feet
Calabasas Hills Rd
LAS VIRGENES CR
Lupine Ln
Poppyseed Ln
Orchid Ln
Las Virgenes Rd

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Created or Restored Riparian Habitat

The table below provides information regarding the acres of riparian habitat that will be created or restored by the Project.

Project Name: Upper Malibu Creek Watershed Restoration **Type of Benefit Claimed:** Created or restored riparian habitat **Measure of Benefit Claimed (Name of Units):** acres **Additional Information About this Measure:** Not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0
2015	0	4	4
2016-2094	0	4	4
References: Area Determination by City of Agoura Hills Engineering Department Staff			

Benefit #2 – Reconnected Migration Corridors

The table below provides information regarding the number of migration corridors that will be reconnected.

Project Name: Upper Malibu Creek Watershed Restoration **Type of Benefit Claimed:** Reconnected migration corridors **Measure of Benefit Claimed (Name of Units):** number of migration corridors reconnected **Additional Information About this Measure:** Not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**

2012-2014	0	0	0
2015	0	2	2
2016-2094	0	2	2
References: *Open Space for Habitat and Recreation Plan,* 2012.			

Benefit #3 – Increased Recreational Access

The table below provides information regarding increased recreational access.

Project Name: Upper Malibu Creek Watershed Restoration **Type of Benefit Claimed:** Increased recreational access **Measure of Benefit Claimed (Name of Units):** Feet of trail **Additional Information About this Measure:** Not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0
2015	0	9,526	9,526
2016-2094	0	9,526	9,526
References: *Cheeseboro/Palo Comado Canyons, 2009*			

Project Name: Upper Malibu Creek Watershed Restoration **Type of Benefit Claimed:** Increased recreational access **Measure of Benefit Claimed (Name of Units):** Connections to regional trail systems **Additional Information About this Measure:** Not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	0	0

2015	0	2	2
2016-2094	0	2	2
References: *Cheeseboro/Palo Comado Canyons, 2009*			

Vermont Avenue Stormwater Capture and Greenstreet Project

The Vermont Avenue Stormwater Capture and Green Street Project (Project) proposes the installation and development of green street standard plan features along Vermont Avenue and in selected sub-watersheds that drain to storm drains on and slightly upstream of Vermont Avenue. An important component of the Project entails outreaching and educating the community about storm water and Best Management Practices (BMPs) they can use on their property. The proposed Project will be designed to maximize water quality and aesthetic benefits in a simple, low-cost manner to serve as an example for future street construction, retrofits, and improvement projects that can be pre-approved as City of Los Angeles (City) standard plans and implemented by public and private developers at a City-wide scale. The Project will target opportunities for unit BMP installation in the public right-of-way to meet or exceed the runoff volume of a 3/4-inch design storm in a 24-hour period from the sidewalk, parkways, and adjacent roadways. This Project will also promote installation of BMPs on private property through public outreach and education and through the creation of a "BMP Toolbox" for private parcels, with analysis to gage their effectiveness at improving water quality. The Project also seeks to assist in evaluating scale issues of distributed BMPs from local to major street corridors; to develop and to refine BMP cost estimates and storage capacities for the *Green Street Standard Plans* implemented; to evaluate treatment capture, and infiltration potentials along major streets; to provide greater public safety, health, and environmental benefits through installation of vegetated features; and to integrate various public/partner objectives, such as the development of social capital, community education, and ownership of the Project.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-13**.

A. Water Quality
   - Total Suspended Solids (TSS) loading reduction of 1,200 kg/year
   - Total Phosphorus loading reduction of 3.5 kg/year
   - Total Nitrogen loading reduction of 25 kg/year
   - Fecal Coliform loading reduction of 100,000 billion colonies/year
   - Fecal Enterococcus loading reduction of 550,000 billion colonies/year
   - Fecal Streptococcus loading reduction of 110,000 colonies/year
   - Total Coliform loading reduction of 170,000 billion colonies/year

- Copper loading reduction of 0.459 kg/year
- Lead pollutant reduction of 0.170 kg/year
- Zinc pollutant reduction of 3.334 kg/year

B. Flood Protection
   - Reduce urban runoff and stormwater flows by 600,000 cubic feet per year (CFY)

C. Greenhouse Gas Reduction
   - Sequestration of 3,015 kg per year of carbon through the planting of trees

D. Education

Table 7-13: Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Quality – Stormwater runoff reduction	cubic feet per year	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - TSS pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Total Phosphorus pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Total Nitrogen pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Fecal Coliform loading reduction	billion colonies/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Fecal Enterococcus pollutant loading reduction	billion colonies/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Fecal Streptococcus pollutant loading reduction	billion colonies/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Total Coliform pollutant loading reduction	billion colonies/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality - Copper pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Water Quality – Lead pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.

Physical Benefit	Unit	Technical Justification
Water Quality – Zinc pollutant loading reduction	kg/yr	Pollutant calculations: SBPAT and direct calculations using county land-use data.
Flood Protection – Urban runoff and stormwater reduction	CFY	*Vermont Avenue Stormwater Capture and Green Street Project,* 2013 SBPAT
Greenhouse Gas Mitigation - Carbon sequestration	kg/yr	Chau, Haan-Fawn. Green Infrastructure for Los Angeles: Addressing Urban Runoff and Water Supply Through Low Impact Development. April 2009
Education – increased public awareness	qualitative	*Vermont Avenue Stormwater Capture and Green Street Project,* 2013

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

If the proposed Project does not move forward, other projects would continue without the benefits of new and refined local to major highway standard plans. There are no other such efforts proposed by the City in this area or at this time.

Without the Project, this corridor would not gain an example of further greenway development, and urban runoff from the Project area would still drain to the Ballona Creek watershed without the anticipated reductions in storm water volumes and pollutant loads. This Project is designed to maximize water quality in a simple, low-cost manner that offers an alternative to infrastructure-intensive methods. Single purpose measures that consume more energy and require higher maintenance (such as low flow diversions to wastewater treatment plants or in-channel chemical treatments) have been proposed as emergency measures to meet water quality standards.

The community in the Vermont Avenue Corridor would experience a continuation of the status quo without any gains in aesthetic benefits or recreational opportunities. Nuisance flood conditions will continue to affect parking and pedestrian access at major intersections, such as Gage Avenue and Vermont Avenue. At one time the California Redevelopment Association (CRA) proposed a recreational median park project in this stretch of Vermont, but when the state of California dismantled the CRA, no other entity resumed their responsibilities; so redevelopment funds ($5M) were returned to the State. The City of Los Angeles has been in

contact with the Watershed Council working to gain funding for another project on Vermont Avenue in the city of Gardena to replace the median park project.

This Project is also intended to complement a framework plan that uses demonstration of projects involving street construction, retrofits, and other improvements that can later be implemented city-wide. Currently, the City of Los Angeles has low-impact development information applicable to local and residential green streets, but lacks data on BMP installation, pollutant removal, and on detention capacities for major highways. This information gap will continue without this Project, and no information will be gathered to gauge public responses to green stormwater BMP's, their maintenance, or to raise community awareness of these issues and provide local homeowner resources for green technology.

Narrative Description of Physical Benefits (with Project)

A. Water Quality

Ballona Creek is on the 2008 Clean Water Act Section 303(d) List of impaired water bodies for the following impairments: Cadmium (sediment), Coliform Bacteria, Coppe, Cyanide, Lead, Selenium, Shellfish Harvesting Advisory, Toxicity, Trash, Viruses (enteric), and Zinc. To address these listings, the Los Angeles Regional Water Quality Control Board established Total Maximum Daily Loads (TMDLs) for metals, bacteria, toxics, and trash.

As a result, the City of Los Angeles received pollutant load allocations for several constituents. For bacteria, there are different limits set for marine waters and fresh waters, and for waters designated for water contact recreation (REC-1), limited water contact recreation (L-REC1) and non-contact water recreation (REC-2). Bacteria limits are listed below. For each of these limits, allowable exceedance days are set each year for each responsible jurisdiction, including the City of Los Angeles.[114]

Bacteria limits for marine waters – water contact recreation (REC-1) – Ballona Creek Watershed

Bacterial Indicator	Geometric Mean Limit	Single Sample Limit
Total coliform	1,000/100ml	10,000/100ml
Fecal coliform	200/100ml	400/100ml
Enterococcus	35/100ml	104/100ml
Total coliform density if the ratio of fecal-to-total coliform >0.1	n/a	1,000/100ml

[114] California Regional Water Quality Control Board – Los Angeles Region, 2006. *Attachment A to Resolution No. 06-011. Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the TMDL for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel.*

Bacteria limits for fresh waters – Ballona Creek Watershed

Bacterial Indicator	Geometric Mean Limit			Single Sample Limit		
	REC-1	LREC-1	REC-2	REC-1	LREC-1	REC-2
Fecal coliform	200/100ml	200/100ml	2000/100ml	400/100ml	None	4000/100ml
E. coli	126/100ml	126/100ml	None	235/100ml	576/100ml	None

Wet-weather stormwater waste load allocations (WLAs) apportioned between Storm Water Permits (total recoverable metals) are:[115,116]

Dry-weather Storm Water WLAs Apportioned between Storm Water Permits (grams total recoverable metals/day)

	Copper	Lead	Selenium	Zinc
Ballona Creek				
MS4 permittees	807.7	432.6	169	10,273.1

Metals Storm Water WLAs Apportioned between Permits (kg/yr)

	Cadmium	Copper	Lead	Silver	Zinc
MS4 Permittees	8.0	227.3	312.3	6.69	1003

Organics Storm Water WLAs Apportioned between Permits (g/yr)

	Chlordane	DDTs	Total PCBs	Total PAHs
MS4 Permittees	3.34	10.56	152	26,900

To help to meet these TMDLs, this Project is expected to capture the ¾-inch storm over an area of 39 acres, and filter out the above listed constituents. This estimation is based on the capture capacity, which is based on the City of Los Angeles Standard Plans listed below, expected to be implemented as part of the Project (included in the **Appendix CD**).

- S-480: General Requirements for Green Street (see General Requirement G)
- S-481: Parkway Swale in Major/Secondary Highways (see Note 1)
- S-482: Parkway Swale in Local/Collector Streets (see Note 1)
- S-484: Vegetated Stormwater Curb Extension (VSCE) (see Note 1)
- S-494: Dry-well

[115] California Regional Water Quality Control Board – Los Angeles Region, 2007. *Attachment A to Resolution No. R2007-015. Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the Ballona Creek Metals TMDL.*

[116] California Regional Water Quality Control Board – Los Angeles Region, 2005. *Attachment A to Resolution No. R05-008. Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the Ballona Creek Estuary Toxic Pollutants TMDL.*

- S-457: Tree well watering device
- S-489 (Draft): Green Street Infiltration System

The calculated reductions in pollutant loadings presented below are based on this estimated volume of percolated runoff, as well as data for land uses collected by the County of Los Angeles and imperviousness. An assumption is used for the amount of pollutant loading that will occur for each land use type. Using these assumptions, an estimate of pollutant loading per storm event is generated, which can then be translated to an estimated pollutant loading per year. This information is input into the Structural BMP Prioritization and Analysis Tool (SBPAT), which is an open source, GIS-based water quality analysis tool intended to facilitate the prioritization and selection of BMP project opportunities and technologies in urbanized watersheds and quantify benefits, costs, uncertainties and potential risks associated with stormwater quality projects. This model was named by the Los Angeles Regional Water Quality Control Board as a peer-reviewed, public domain, quantitative model that can be used to develop a reasonable assurance analysis in support of a watershed management program. The results from this model run for the Project are available in the **Appendix CD**.

Total Suspended Solids (TSS) pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 1,200 kg/year of TSS pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Total Phosphorus pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 3.5 kg/year of total phosphorus pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Total Nitrogen pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 25 kg/year of total nitrogen pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Fecal Coliform pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 100,000 billion colonies per year of fecal coliform pollutant loading reduction will be achieved. This is an estimated pollutant load reduction calculation based on standardized land-use data, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Fecal Enterococcus pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 550,000 billion colonies per year of fecal enterococcus pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Fecal Streptococcus pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 110,000 billion colonies per year of fecal streptococcus pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Total Coliform pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 170,000 billion colonies per year of total coliform pollutant loading reduction will be achieved, assuming 12 inches of annual rainfall over the 39 acres of Project area.

Copper pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 0.459 kg/year of copper pollutant loading reduction will be achieved. This is an estimated pollutant load reduction calculation assuming 12 inches of annual rainfall over the 39 acres of Project area.

Lead pollutant loading reduction

Through capture of the ¾-inch storm as described above, it is expected that 0.170 kg/year of lead pollutant loading reduction will be achieved. This is an estimated pollutant load reduction calculation assuming 12 inches of annual rainfall over the 39 acres of Project area.

Zinc

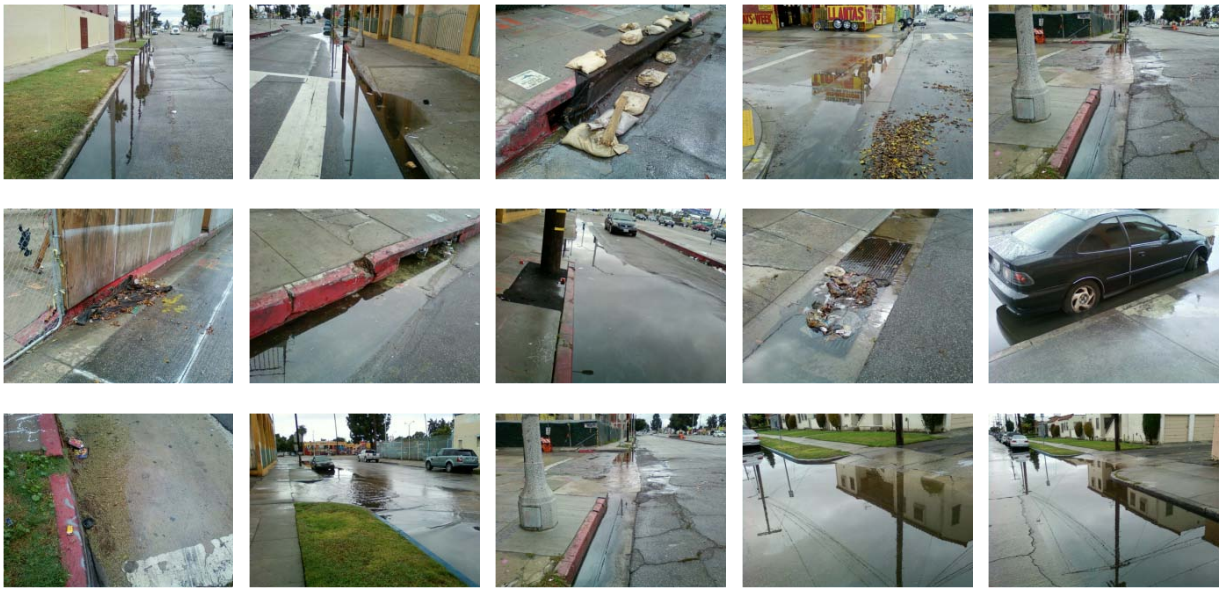
Through capture of the ¾-inch storm as described above, it is expected that 3.334 kg/year of zinc pollutant loading reduction will be achieved. This is an estimated pollutant load reduction calculation assuming 12 inches of annual rainfall over the 39 acres of Project area data.

B. Flood Protection

Urban Runoff and Stormwater Reduction

Nuisance flooding has been documented at the corner of Vermont Avenue and 71st Street. The BMPs to be installed as a part of this Project are expected to reduce the volume of stormwater runoff by approximately 600,000 cubic feet per year (13.77 AFY) based on an average year. This is estimated using the calculations entered into the SBPAT model.

The Project will protect adjacent areas from nuisance flood conditions, such as on 71st street. Damage attributed to this flooding has not been assessed, but like most areas of the City, the watershed drainage area along the Project area is highly impervious. Without modification, these areas will continue to produce the local flooding and ponding conditions seen in the attached photos, taken following recent rain events. These ponding problems will be reduced or alleviated with implementation of the Project BMPs, as noted on pages 4 and 5 of the *Draft Vermont Avenue Stormwater Capture and Green Street Project Report.*



Photos: Existing wet-weather flooding and ponding along the proposed Vermont Avenue Project Site

C. Greenhouse Gas Reduction

Each shade tree in Los Angeles is expected to sequester 4.5 to 11kg of carbon per year, and, by providing shade and reducing heat-island effects, prevents the emission another 18kg/year of carbon through the use of additional power to cool buildings.[117] It is estimated that as part of the Project, 3,015 kg of carbon will be sequestered per year by shade trees to be planted as part of the Project once trees have matured (after 10 years).

D. Education

Public awareness of stormwater quality is expected to be increased through implementation of the Project as it has been demonstrated to be a major factor in reducing pollutant loading. As noted in the *Draft Vermont Avenue Stormwater Capture and Green Street Project Report* on pages 17 and 18, Heal the Bay and the City of Los Angeles' Watershed Protection Division will implement a localized stormwater public education and outreach program targeted to businesses, schools, and residential community members along the Vermont Corridor neighborhood in association with the Project. The public education and outreach program elements could include workshops, community forums, tabling events, and neighborhood clean-ups. The objectives of this public education and outreach program are:

- General Project Education
- Watershed, Water Quality, and Stormwater Education
- Development of social capital for current and future efforts related to water quality programs/projects

In addition, signage and other informative visual elements will adorn the Project.

Relationship to other projects in the Proposal

Though this Project is not directly linked to other projects in the proposal, it, along with projects such as the Citywide Storm Drain Catch Basin Curb Screen Project, the Dominguez Trash Reduction Project, Oxford Retention Basin Multi-Use Enhancement Project, and Marsh Park Phase II will contribute to the overall improvement in water quality in the Region.

Facilities, Policies and Actions Needed

In order to obtain the physical benefits, existing concrete infrastructure will need to be sawcut and removed. Soils will be tested and replaced with material with greatest storage capacity,

[117] Chau, Haan-Fawn. *Green Infrastructure for Los Angeles: Addressing Urban Runoff and Water Supply Through Low Impact Development*. April 2009.

and where feasible, the top 18 inches of topsoil will be amended for plant growth per the soils report. Concrete curbs and gutters will be redesigned to divert flows into the new storm water infiltration facilities. Medians will be redesigned to intercept and to filter roadway runoff before it reaches the stormdrains. Overflows from these facilities will be returned as a decreased volume to the original flow paths via overflows, diversions and with new storm drain connections.

Uncertainties

Variability in human behavior and public acceptance/exposure to educational components of the Project leads to uncertainty in the amount of on-site BMPs installed on private property, and, thus, uncertainty in the amount of runoff captured from private property by these BMPs. Pollutant loading calculations are estimations based on Los Angeles County's land use database and other data. Actual reductions may vary due to site-specific conditions in the Project area.

In addition, the amount of precipitation varies widely from year to year, which is expected to vary the amount of stormwater runoff treated and therefore vary the pollutant loading reduction.

Potential Adverse Effects

If soil infiltration rate is slower than anticipated, the Project may lead to standing water or anaerobic conditions in dry wells that could lead to odor. Potential for this impact will be minimized by use of pre-filtration techniques, such as using filters and vegetated BMPs to restrict clogging particles prior to reaching the drywell. Means of avoiding and mitigating any such problems will be addressed through the Project specific design solutions.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – TSS Pollutant Loading Reduction

The table below provides information regarding the amount of TSS pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** TSS Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	1,200	1,200
2018-2041	0	1,200	1,200
References: SBPAT model results			

Benefit #2 – Total Phosphorus Pollutant Loading Reduction

The table below provides information regarding the amount of total phosphorus pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Total Phosphorus Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	3.5	3.5
2018-2041	0	3.5	3.5
References: SBPAT model results			

Benefit #3 – Total Nitrogen Pollutant Loading Reduction

The table below provides information regarding the amount of total nitrogen pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Total Nitrogen Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	25	25
2018-2041	0	25	25
References: SBPAT model results			

Benefit #4 – Fecal Coliform Pollutant Loading Reduction

The table below provides information regarding the amount of fecal coliform pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Fecal Coliform Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**billions of colonies **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012 - 2016	0	0	0
2017	0	100,000	100,000

2018-2041	0	100,000	100,000
References: SBPAT model results			

Benefit #5 – Fecal Enterococcus Pollutant Loading Reduction

The table below provides information regarding the amount of fecal enterococcus pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Fecal Enterococcus Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**billions of colonies **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012 - 2016	0	0	0
2017	0	55,000	55,000
2018-2041	0	55,000	55,000
References: SBPAT model results			

Benefit #6 – Fecal Streptococcus Pollutant Loading Reduction

The table below provides information regarding the amount of fecal Streptococcus pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed**: Fecal Streptococcus Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**billions of colonies **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	110,000	110,000
2018-2042	0	110,000	110,000
References: SBPAT model results			

Benefit #7 – Total Coliform Pollutant Loading Reduction

The table below provides information regarding the amount of total coliform pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed**: Total Coliform Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**billions of colonies **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	170,000	170,000
2018-2041	0	170,000	170,000
References: SBPAT model results			

Benefit #8 – Copper Pollutant Loading Reduction

The table below provides information regarding the amount of copper pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Copper Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	0.459	0.459
2018-2041	0	0.459	0.459
References: SBPAT model results			

Benefit #9 – Lead Pollutant Loading Reduction

The table below provides information regarding the amount of lead pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Lead Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	0.170	0.170
2018-2041	0	0.170	0.170
References: SBPAT model results			

Benefit #10 – Zinc Pollutant Loading Reduction

The table below provides information regarding the amount of zinc pollutant loading that will be reduced by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Zinc Pollutant Loading Reduction **Measure of Benefit Claimed (Name of Units):**kg **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	3.3	3.3
2018-2041	0	3.3	3.3
References: SBPAT model results			

Benefit #11 – Greenhouse Gas Mitigation

The table below provides information regarding the amount of greenhouse gas mitigation that will be achieved by the Project.

Project Name: Vermont Avenue Stormwater Capture and Green Street Project **Type of Benefit Claimed:** Greenhouse Gas Mitigation **Measure of Benefit Claimed (Name of Units):**kg of sequestered carbon **Additional Information About this Measure:** not applicable			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2026	0	0	0
2027	0	3,015	3,015
2028-2041	0	3,015	3,015
References: Chau, Haan-Fawn. 2009. *Green Infrastructure for Los Angeles: Addressing Urban Runoff and Water Supply Through Low Impact Development.*			

Benefit #12 – Flood Protection - Stormwater Urban Runoff and Stormwater Reduction

The table below provides information regarding the total amount of stormwater that will be reduced by the Project.

Vermont Avenue Stormwater Capture and Greenstreet Project

Project Name: Vermont Avenue Stormwater Capture and Green Street Project
Type of Benefit Claimed: Stormwater Runoff Reduction
Measure of Benefit Claimed (Name of Units): cubic feet
Additional Information About this Measure: over an average year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2016	0	0	0
2017	0	600,000	600,000
2018-2041	0	600,000	600,000

References:

- *Vermont Avenue Stormwater Capture and Green Street Project,* 2013
- SBPAT model results

Walnut Spreading Basin Improvements Project

The Walnut Spreading Basin Improvements Project (Project) will implement improvements to this facility that will allow for increased recharge capacity. These improvements include the following: cleanout of the basin to remove 2-6 feet of fine sediments and clays to increase percolation rates and increased detention volume by 5 acre-feet (AF), installation of a pump station with two pumps to drain the facility, and new flow measurement equipment to monitor flow rates into and out of the basin.

In addition to increasing recharge capacity, these improvements will allow the basin to be used as a combination spreading basin and detention basin (currently it is only used as a spreading basin). Using the basin as a detention basin will allow water to be stored during storms until there is capacity at downstream spreading grounds facilities instead of letting all the water flow down the channel and eventually discharge to the ocean.

Project Physical Benefits

The following physical benefits are claimed for the Project. These physical benefits are further summarized in **Table 7-14**.

A. Water Supply
   - Increased percolation of an annual average 500 acre-feet/year (AFY) of local captured stormwater to the Main San Gabriel Groundwater Basin, allowing for 500 AFY of additional groundwater pumping for water supply
   - Increased water supply reliability for local pumpers during times of drought experienced by the State Water Project (SWP) and the Colorado River Basin by offsetting less reliable imported water with more reliable local surface water

B. Reduced Delta demands to help address Bay-Delta environmental goals

C. Energy Conservation
   - Reduction of 1,262,500 kilowatt-hours (kWh) per year, or 63 million kWh over the 50-year life of the Project

D. Greenhouse Gas Reduction
   - Avoidance of 414 metric tons per year of CO_2 equivalents, or 20,700 metric tons of CO_2 emitted over the 50-year life of the Project

E. Water Quality

- Avoidance of 118 billion colonies per day of total coliform bacteria, and 1.6 billion colonies per day of E. coli that would otherwise be discharged to the San Gabriel River
- Avoidance of 0.05 pounds per day of total copper, and 0.03 pounds per day of dissolved copper that would otherwise be discharged to the San Gabriel River
- Avoidance of 0.004 pounds per day of total lead, and 0.002 pounds per day of dissolved lead that would otherwise be discharged to the San Gabriel River
- Avoidance of 0.01 pounds per day of total recoverable nickel, and 0.01 pounds per day of dissolved nickel that would otherwise be discharged to the San Gabriel River
- Avoid importation of 154 metric tons per year of salts to the Region

F. Flood Protection
- Increased detention volume of 5 AF plus improved percolation enables the Los Angeles County Flood Control District (LACFCD) to capture an additional 500 AF of stormwater each year, increasing flood protection capacity
- Reduction of flood peak flows by approximately 6 cfs in downstream channels

Table 7-14: Project Physical Benefits, Units and Technical Justification

Physical Benefit	Unit	Technical Justification
Water Supply – Increased percolation to the Main San Gabriel Groundwater Basin	acre-feet per year	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
Water Supply - increased reliability	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.
Delta Demands - Reduced Delta Demands to Help Address Bay-Delta Environmental Goals	Qualitative	California Department of Water Resources (DWR). *The 2011 State Water Project Final Delivery Reliability Report.* Bay-Delta Office. June 2012.

Physical Benefit	Unit	Technical Justification
Energy Conservation - reduced energy from offset of SWP water	kWh	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Main San Gabriel and Puente Basins. Report Number 1308. Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.
Greenhouse Gas Reduction - reduced emissions	Tons of CO_2 equivalents	*Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007, p. 4. See Appendix H. Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
Water Quality - reduced bacteria loading to San Gabriel River	Colonies per day	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.* California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.
Water Quality - reduced copper loading to San Gabriel River	Pounds per day	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.* California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Physical Benefit	Unit	Technical Justification
Water Quality – reduced lead loading to San Gabriel River	Pounds per day	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.* California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.
Water Quality – reduced nickel loading to San Gabriel River	Pounds per day	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.* California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.
Water Quality – avoided import of salts from outside the region	Metric tons per year	Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.* *Metropolitan Water District of Southern California 2010 Regional Urban Water Management Plan,* Page 4-4.
Flood – Reduced downstream flood peak flows	cfs of peak flow reduction	Water Conservation Model

The technical justification documents are included in the Appendix CD.

Narrative Description of Without-Project Baseline

The Los Angeles Region relies heavily on new sources of water to bridge the gap between water supplies and water demand. Without the Project, an annual average of 500 AFY of stormwater will be wasted to the Pacific Ocean via Walnut Creek Wash which flows into the San Gabriel River, and will not be utilized to reduce the Region's reliance on imported water. The low percolation rate of the Walnut Spreading Basin limits the amount of water that can be captured for recharge, and will continue to be diminished as more sediment enters the basin. During

large storms, the basin fills up quickly and stormwater flows past the basin via Walnut Creek Wash. Enhancing recharge at any facilities along the river replenishes the Main San Gabriel Groundwater Basin and reduces the Region's reliance on imported water, so this supply benefit will not be realized without the Project. In addition, without the Project there will be no increase in temporary storage of stormwater to allow it to recharge the groundwater table. The stormwater will not be diverted from peak flows in the San Gabriel River and therefore there will be no increase in flood protection.

Without the Project, pollutants which are carried in stormwater will continue on to the San Gabriel River and the ocean rather than being captured in the spreading basin. With the percolation of the water into the ground, soil aquifer treatment will filter out many of the pollutants. The stretch of Walnut Creek Wash adjacent to the spreading basin is 303(d) listed for indicator bacteria, benthic-macroinvertebrate bioassessments, and pH. In addition, the San Gabriel River and San Gabriel River Estuary, to which Walnut Creek Wash is tributary, are 303(d) listed for several constituents, including: coliform bacteria, copper, lead, nickel, dioxin, and cyanide. Without the Project, it is predicted that these constituents would continue to cause water quality impairments.

Narrative Description of Physical Benefits (with Project)

A. Water Supply

Increased Percolation to the Main San Gabriel Groundwater Basin

The Main San Gabriel Groundwater Basin (MSGB) provides nearly 230,000 AFY of water to over 50 cities and water agencies overlying the basin. To meet this need, the Main San Gabriel Basin Watermaster (Watermaster) reports that 50,000 AFY of untreated imported water was used to recharge the basin in fiscal year 2010/2011. In addition, the Watermaster reports that pumpers require an additional 7,900 AFY of treated, imported water to supplement demand.[118] The Walnut Creek Spreading Basin recharges only local surface water diverted from Walnut Creek Wash. The limited recharge capacity means that a large amount of local surface water runs past the spreading basin during storm events.

By removing fine sediments and clays from the basin, percolation capacity and detention capacity will increase, allowing for more stormwater to be recharged. In addition, installation of a pump station to drain the facility will both improve percolation rates in the Walnut Spreading

[118] Main San Gabriel Basin Watermaster, 2011. *2010-2011 Main San Gabriel Basin Annual Report.* Pages D1-D4.

Basin and convey water to other downstream replenishment facilities when optimal. With the pump station, the basin can be drained annually to allow for drying; drying has been shown to improve percolation rates in deep spreading basins.[119]

Modeling was used to estimate the amount of stormwater that could be recharged given this increase in percolation and storage capacity. It is estimated that an additional annual average of 500 AFY of stormwater from the Walnut Creek Wash can be diverted and recharged to the Main San Gabriel Groundwater Basin. The model uses historical inflow data (daily mean flow rate) from a stream gaging station and determines how much water could have been conserved if various spreading basin parameters were adjusted. By increasing the percolation rate of the spreading basin from 2 cfs to 8 cfs, annual water conservation increased by 500 AF. The model used is similar to a simplified reservoir routing model that takes the historical daily inflow and calculates the daily outflow, percolation and storage. [119]

B. Reduced Delta Demands to Help Address Bay-Delta Environmental Goals

The Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Region has made it a priority to reduce dependence on imported water supplies received from the Sacramento-San Joaquin Delta (Delta), a priority that is reflected in the Region's 2006 IRWMP Plan. Diversion of water from the Delta to southern California has caused damage to the Bay Delta's ecosystem due to SWP and Central Valley Project operations. In particular, infrastructure used to divert water to southern California directly impacts species (such as the entrainment of aquatic species in pumps) and damages habitats, while operations that reverse river flows impact ecosystem activity. By reducing the Region's reliance on the Bay Delta, diversions will be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet Bay Delta environmental goals to restore tidal marshes and floodplains, and restore fish and wildlife species. This Project is expected to reduce demands on the Delta by MSGB pumpers by an annual average of 500 AFY by making an additional 500 AFY of groundwater available in the MSGB. This is supported by the 2010-2011 MSGB Watermaster Annual Report which reports that MSGB pumpers currently have a treated imported water demand of approximately 7,900 AF in fiscal year 2010-2011. Given that the San Gabriel Valley, where the benefits of this Project would apply, relies primarily on groundwater and SWP supplies according to the 2010-2011 Main San Gabriel Basin Watermaster Annual

[119] Los Angeles County Flood Control District, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*

Report, it can be assumed that the 500 AFY of local surface water recharged will directly offset imported water from the SWP, thus reducing Delta demands.

C. Energy Conservation

Reduced energy from offset of SWP water

The long-distance transport of water in conveyance systems consumes a significant portion of California's total electricity demand. The SWP, is the largest consumer of electrical energy in California, requiring an average of 5,000 GWh per year, and contributes 0.6% of California's total greenhouse gas emissions.

It has been estimated that the average cost to pump groundwater in the Main San Gabriel Basin was $85/AF[120] in 2006[121], which can be updated to 2012 dollars as $96/AF. According to the U.S. Bureau of Labor Statistics, the average cost of electricity in the Los Angeles area in 2012 was $0.202/kWh.[122] Using these values, it can be estimated that the energy required to pump groundwater in the Main San Gabriel Basin is approximately 475 kWh/AF. For imported supplies, West Basin Municipal Water District (WBMWD) has estimated that approximately 3,000 kWh per AF of energy is required for conveyance and pumping to Southern California SWP contracting agencies.[123] Assuming a net energy savings of 2,525 kWh/AF (3,000 - 475) and an average annual imported water offset of 500 AF, approximately 1,262,500 kWh per year of energy will be saved by implementing the Project. Over the 50-year life of the Project, this totals over 63 million kWh of conserved energy.

D. Greenhouse Gas Reduction

Reduced emissions

The proposed Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport imported SWP water for the Region. This value may be calculated by applying a factor of 0.724 lbs. of CO_2 equivalents per kWh and converting to total tons of CO_2

[120] Cost includes power for well operation only.
[121] Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study.* Chapter 4 – Groundwater Basin Reports, Main San Gabriel and Puente Basins. Report Number 1308.
[122] Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*. http://www.bls.gov/ro9/cpilosa_energy.htm
[123] *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, WBMWD, March 2007.

equivalents, based on the California Action Registry, General Reporting Protocol.[124] By offsetting the demand of 500 AF of imported SWP water, the proposed Project will avoid GHG emissions of 414 metric tons per year of CO_2 equivalents per year. Over the 50-year life of the Project, this totals 20,700 metric tons of avoided carbon emissions.

E. Water Quality

The increased diversion of surface water to the Walnut Spreading Basin will reduce the contaminant loadings downstream of the spreading basin, and thus improve surface water quality in the San Gabriel River and San Gabriel River Estuary. As discussed above under "Increased Percolation to the Main San Gabriel Groundwater Basin," the amount of surface water diverted will, on average, equal an additional 500 AFY. According to the California State Water Quality Control Board, the Walnut Creek Wash is water quality impaired by bacteria, benthic-macroinvertebrate bioassessments, and pH.[125] In addition, the portions of the San Gabriel River and San Gabriel River Estuary that are downstream of Walnut Creek Wash are also 303(d) listed for several constituents, including: coliform bacteria, copper, lead, nickel, dioxin, and cyanide. It is expected that the Project will help reduce loadings of coliform bacteria, copper, lead and nickel.

Reduced Bacteria Loading to San Gabriel River

Water quality monitoring between 2007 and 2008 in the Walnut Creek Wash has shown the following bacteria levels:[126]

- Total coliform: geometric mean of 7,000 MPN per 100 mL, range of 10 to 20,000 MPN per 100 mL
- E. coli: geometric mean of 97 MPN per 100 mL, 60 to 24,000 MPN per 100 mL

Assuming that these concentrations are similar to the concentrations found at the intake of the Walnut Spreading Basin, the reduction in bacteria loading can be estimated. Using the

[124] Climate Action Registry, General Reporting Protocol http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
[125] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.
[126] Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

geometric mean of each bacteria measurement and the average estimated flow to be diverted to the spreading basin (500 AFY), the following bacteria loading reductions can be estimated:

- **Total coliform:** (7,000 MPN/100 mL)(1,233,481,000 mL/acre-foot)(500 acre feet/year recharged)(1/365 days) (1 MPN/1,000,000 billion MPN) = **118 billion colonies per day**
- **E. coli:** (97 MPN/100 mL)(1,233,481,000 mL/acre-foot)(500 acre feet/year recharged)(1/365 days)(1 MPN/1,000,000 billion MPN) = **1.6 billion colonies per day**

According to this analysis, the Project would help to reduce total coliform bacteria loading by 118 billion colonies per day or 43,070 billion colonies per year, and E. coli bacterial loading by 1.6 billion colonies per day or 584 billion colonies per year in Walnut Creek Wash, and the downstream San Gabriel River and San Gabriel River Estuary. It should be noted that because flow is diverted for recharge, loadings of bacteria will be decreased but concentrations of bacteria will be unchanged since flows in the river are also being reduced.

Reduced Copper Loading to San Gabriel River

The Project is expected to reduce copper loadings. Water quality monitoring in the Walnut Creek Wash has shown that total recoverable copper concentrations from 2005 to 2009 averaged 14 micrograms per liter (ug/L), and ranged from 8.2 to 26.7 ug/L. Dissolved copper concentrations from 2005 to 2009 averaged 7 ug/L, and ranged from 3.2 to 10.7 ug/L.[127] Assuming that these concentrations are similar to the concentrations found at the intake of the Walnut Spreading Basin, the reduction in copper loading can be estimated. Using the average copper concentrations from 2005 to 2009 and the average estimated flow to be diverted to the spreading basin (500 AFY), the following copper loading reductions can be estimated:

- **Total recoverable copper:** (14 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **24 grams per day = 0.05 pounds per day**
- **Dissolved copper:** (7 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **12 grams per day = 0.03 pounds per day**

According to this analysis, the Project would help to reduce copper loading to the San Gabriel River and its estuary by 0.05 pounds per day or 20 pounds per year of total recoverable copper, and by 0.03 pounds per day, or 10 pounds per year of dissolved copper. It should be noted that

[127] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.

because flow is diverted for recharge, loadings of copper will be decreased but concentrations of copper will be unchanged as flows in the river are also being reduced.

Reduced Lead Loading to San Gabriel River

The Project is expected to reduce lead loadings. Water quality monitoring in the Walnut Creek Wash has shown that total recoverable lead concentrations from 2005 to 2009 averaged 1.1 micrograms per liter (ug/L), and ranged from 0.3 to 3.5 ug/L. Dissolved lead concentrations from 2005 to 2009 averaged 0.6 ug/L, and ranged from non-detectable to 2.31 ug/L.[128]

Assuming that these concentrations are similar to the concentrations found at the intake of the Walnut Spreading Basin, the reduction in lead loading can be estimated. Using the average lead concentrations from 2005 to 2009 and the average estimated flow to be diverted to the spreading basin (500 AFY), the following lead loading reductions can be estimated:

- **Total recoverable lead:** (1.1 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **2 grams per day = 0.004 pounds per day**
- **Dissolved lead:** (0.6 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **1 grams per day = 0.002 pounds per day**

According to this analysis, the Project would help to reduce lead loading to the San Gabriel River and its estuary by 0.004 pounds per day or 2 pounds per year of total recoverable lead, and by 0.002 pounds per day, or 1 pound per year of dissolved lead. It should be noted that because flow is diverted for recharge, loadings of lead will be decreased but concentrations of lead will be unchanged as flows in the river are also being reduced.

Reduced Nickel Loading to San Gabriel River

The Project is expected to reduce nickel loadings. Water quality monitoring in the Walnut Creek Wash has shown that total recoverable nickel concentrations from 2005 to 2009 averaged 4.0 micrograms per liter (ug/L), and ranged from 2.3 to 9.5 ug/L. Dissolved nickel concentrations from 2005 to 2009 averaged 3.3 ug/L, and ranged from 2.2 to 9.3 ug/L.[128]

[128] California Regional Water Quality Control Board, Los Angeles Region, 2009. *Los Angeles Region Integrated Report Clean Water Act Section 305(b) Report and Section 303(d) List of Impaired Waters.* See Appendix F, Page 18: Dominguez Channel.

Assuming that these concentrations are similar to the concentrations found at the intake of the Walnut Spreading Basin, the reduction in nickel loading can be estimated. Using the average nickel concentrations from 2005 to 2009 and the average estimated flow to be diverted to the spreading basin (500 AFY), the following nickel loading reductions can be estimated:

- **Total recoverable nickel:** (4.0 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **6.8 grams per day = 0.01 pounds per day**
- **Dissolved nickel:** (3.3 ug/L)(1,233,481 L/acre-foot)(1 g/10^6 ug)(500 acre feet/year recharged)(1/365 days) = **5.6 grams per day = 0.01 pounds per day**

According to this analysis, the Project would help to reduce nickel loading to the San Gabriel River and its estuary by 0.01 pounds per day or 4 pounds per year of total recoverable nickel, and by 0.01 pounds per day, or 4 pounds per year of dissolved nickel. It should be noted that because flow is diverted for recharge, loadings of nickel will be decreased but concentrations of nickel will be unchanged as flows in the river are also being reduced.

Avoidance of salts imported from outside the Region

State Water Project (SWP) water contains total dissolved solids (TDS) or salts. There are two primary suppliers of imported water for recharge in the San Gabriel Valley: Metropolitan Water District of Southern California (MWDSC) and San Gabriel Valley Municipal Water District (SGVMWD), however, the San Gabriel Valley Municipal Water District only utilizes imported water for recharge. For the purposes of this analysis, only imported water delivered for direct use is considered as this is what will be offset with the Project, and it is assumed that all water offset is from the SWP which has a typical TDS value of 250 mg/L. Since this water is imported from outside of the San Gabriel Valley, it represents a loading of salts imported to the basin.

Assuming an average TDS concentration of 250 mg/L[129], and assuming that TDS loadings that originate from local surface water are already contained within the San Gabriel Valley (and therefore do not represent salt inflows), 500 AFY of offset imported SWP water represents approximately 339,615 pounds or 154 metric tons per year of salts that would no longer be imported. Over the life of the Project, this amounts to approximately 7,700 metric tons of TDS loadings that will not be introduced to the region as a salt input.

[129] Metropolitan Water District of Southern California, 2010. *2010 Regional Urban Water Management Plan.* Page 4-4.

F. Flood Protection

Reduced Downstream Flood Damage

By diverting additional river flow from Walnut Creek Wash to the spreading basin, the Project is assumed to reduce the peak flood flow by 6 cubic feet per second downstream in the Walnut Creek Wash and the San Gabriel River due to the increased percolation rate estimated by the *Water Conservation Model*.[130] This will result in marginal improvements in flood depths and the width of flooding in the channel. Adjacent land uses are primarily residential, commercial, and industrial. There are residential, commercial, and industrial structures immediately downstream that could potentially benefit from the relatively small reduction in peak flood flow enabled by this Project.

Relationship to other projects in the Proposal

The Walnut spreading basin is a part of a network of 17 spreading grounds which LACFCD operates to replenish the Main San Gabriel Groundwater Basin. Improvements made to any of these spreading grounds will improve the ability of the LACFCD to capture stormwater for replenishment of groundwater, and provide better flood management. In particular, the Peck Water Conservation Improvement Project, which is also a part of this application, will also recharge water to the Main San Gabriel Basin, increasing local water supply.

Facilities, Policies and Actions Needed

A new pump will be installed as part of this Project that will used to obtain the improvements to water supply and quality and reduction in flooding. In addition, the operation plan for Walnut Spreading Basin will need to be modified to add the use of the pump during pre-storm and summer conditions.

Uncertainties

The amount of water supply and quality benefit are both uncertain due to natural variability and the uncertainty of the groundwater modeling. Water conservation relies heavily on the number of storms, amount of precipitation, and consequentially the amount of runoff, which vary every year. The water conservation model is also based on historical data that only estimates the amount of water that has been and could be conserved in the future.

[130] Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*

Potential Adverse Effects

No adverse effects of the Project are foreseen.

Annual Project Physical Benefits

The following tables present the physically quantifiable benefits for the Project. One table is completed for each physically quantifiable benefit.

Benefit #1 – Increased Percolation to the Main San Gabriel Basin

The table below provides information regarding the supply benefit from increased percolation to the Main San Gabriel Basin.

Project Name: Walnut Spreading Basin Improvements **Type of Benefit Claimed:** Increased percolation to the Main San Gabriel Groundwater Basin **Measure of Benefit Claimed (Name of Units):** acre feet **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	1,378	Not applicable	Not applicable
2015	1,378	1,878	500
2016-2064	1,378	1,878	500
References: Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*			

Benefit #2 – Reduced Delta Demands to Help Address Bay-Delta Environmental Goals

The table below provides information regarding the reduced demand on the Delta to help to address Bay-Delta environmental goals.

Project Name: Walnut Spreading Basin Improvements **Type of Benefit Claimed:** Decreased Delta Demands **Measure of Benefit Claimed (Name of Units):** acre-feet **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**

Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 500	-500
2016-2064	Baseline	Baseline - 500	-500

- **References:** Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*

Benefit #3 – Reduced Energy

The table below provides information regarding energy conservation provided through the offset of SWP water with groundwater.

Project Name: Walnut Spreading Basin Improvements Projects
Type of Benefit Claimed: Reduced energy usage
Measure of Benefit Claimed (Name of Units): kWh
Additional Information About this Measure: Based on energy required for imported water without Project vs. energy required for groundwater pumping with Project

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	1,500,000	Not applicable	Not applicable
2015	1,500,000	237,500	-1,262,500
2016-2064	1,500,000	237,500	-1,262,500

References:

- West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H.
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Upper Los Angeles River Basins. Report Number 1308.
- Bureau of Labor Statistics, 2013. *Average Energy Prices in the Los Angeles Area*.

Benefit #4 – Reduced CO_2e Emissions

The table below provides information regarding the reduction in CO_2 emissions made possible through the offset of SWP water with groundwater.

Project Name: Walnut Spreading Basin Improvements Projects **Type of Benefit Claimed:** Reduced emissions **Measure of Benefit Claimed (Name of Units):** Metric tons of CO_2 equivalent **Additional Information About this Measure:** average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	492	Not applicable	Not applicable
2015	492	78	-414
2016-2064	492	78	-414

References:

- West Basin MWD, 2007. *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District*, p. 4. See Appendix H.
- Metropolitan Water District of Southern California, 2007. *Groundwater Assessment Study*. Chapter 4 – Groundwater Basin Reports, Main San Gabriel and Puente Basins. Report Number 1308.
- Bureau of Labor Statistics, 2013. Average Energy Prices in the Los Angeles Area.
- Climate Action Registry, General Reporting Protocol

Benefit #5 – Reduced bacteria loading to San Gabriel River

The table below provides information regarding the reduction in bacteria loading (total coliform and E. coli) to the San Gabriel River.

Project Name: Walnut Spreading Basin Improvements **Type of Benefit Claimed:** Reduced total coliform bacteria loading to San Gabriel River **Measure of Benefit Claimed (Name of Units):** billions of colonies **Additional Information About this Measure:** based on average precipitation year			
(a)	**(b)**	**(c)**	**(d)**
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	Not applicable	Not applicable
2015	Baseline	Baseline - 43,070 billion	-43,070 billion
2016-2064	Baseline	Baseline - 43,070 billion	-43,070 billion

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project*

Concept Report.
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced E. coli bacteria loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): billion colonies per year
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	0	Not applicable	Not applicable
2015	Baseline	Baseline - 584 billion	-584 billion
2016-2064	Baseline	Baseline - 584 billion	-584 billion

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Benefit #6 – Reduced copper loading to San Gabriel River

The table below provides information regarding the reduction in copper loading (total and dissolved) to the San Gabriel River.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced total copper loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 20	-20

2016-2064	Baseline	Baseline - 20	-20

References:

- Los Angeles County Department of Public Works, 2011. *Water Conservation Model*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced dissolved copper loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 10	-10
2016-2064	Baseline	Baseline - 10	-10

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Benefit #7 – Reduced lead loading to San Gabriel River

The table below provides information regarding the reduction in lead loading (total and dissolved) to the San Gabriel River.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced total lead loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**

2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 2	-2
2016-2064	Baseline	Baseline - 2	-2

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced dissolved lead loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 1	-1
2016-2064	Baseline	Baseline - 1	-1

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Benefit #8 – Reduced nickel loading to San Gabriel River

The table below provides information regarding the reduction in nickel loading (total and dissolved) to the San Gabriel River.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced total nickel loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)

Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 4	-4
2016-2064	Baseline	Baseline - 4	-4

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced dissolved nickel loading to San Gabriel River
Measure of Benefit Claimed (Name of Units): pounds
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 4	-4
2016-2064	Baseline	Baseline - 4	-4

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Project Name: Walnut Spreading Basin Improvements
Type of Benefit Claimed: Reduced salt import to the region
Measure of Benefit Claimed (Name of Units): metric tons
Additional Information About this Measure: based on average precipitation year

(a)	(b)	(c)	(d)
Physical Benefits			

Year	Without Project	With Project	Change Resulting from Project
2012-2014	Baseline	Not applicable	Not applicable
2015	Baseline	Baseline - 154	-154
2016-2064	Baseline	Baseline - 154	-154

References:

- Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*
- Metropolitan Water District of Southern California, 2010. *Regional Urban Water Management Plan.* Page 4-4.
- Council for Watershed Health, 2013. *San Gabriel Water Quality Data Portal.* http://108.168.216.185:86/sg-portal/. Accessed March 18, 2013.

Benefit #9 – Reduced peak flows during flooding events

The table below provides information regarding the reduced peak flood flow expected to be available with implementation of the Project.

Project Name: Pacoima Spreading Grounds Improvements
Type of Benefit Claimed: Reduced peak flows during flood events
Measure of Benefit Claimed (Name of Units): cubic feet per second of reduced peak flows
Additional Information About this Measure: based on 500 AFY of additional percolation capacity

(a)	(b)	(c)	(d)
Physical Benefits			
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2012-2014	8	n/a	n/a
2015	8	2	-6
2016-2064	8	2	-6

References: Los Angeles County Department of Public Works, 2010. *Walnut Creek Spreading Basin Pump Station Project Concept Report.*