Attachment 8

Greater Los Angeles County Region

Implementation Grant Proposal

Benefits and Cost Analysis

Attachment 8 consists of the following items:

Project Costs and Benefits. The body of this attachment provides an overview of the project costs and benefits of this proposed funding package, as well as the benefits associated with each individual project.

Table of Contents

Introduction

This attachment contains estimations of the costs and benefits of the projects contained within this Greater Los Angeles County IRWM Implementation Grant Proposal.

Section 1 provides a summary of the costs and benefits that may be expected from the implementation and operation of the collective projects in this proposal.

Section 2 contains a detailed narrative description of the expected costs and benefits of each project. Where possible, each benefit was quantified in Attachment 7 and is presented in physical or economic terms in this attachment. In cases where quantitative analyses were not feasible, this attachment provides complimentary qualitative analyses. In addition, this attachment provides a description of economic factors that may affect or qualify the amount of economic benefits to be realized. This attachment also includes a discussion regarding uncertainties about the future that might affect the level of benefit received. **Appendix 8-1** contains the water rate tables used in the analysis of avoided costs.

Section 1: Summary of Proposal Benefits and Costs

The Proposal for the Greater Los Angeles County Region offers a high level of benefit for the state relative to lifetime costs. Combined, the projects in this application have a benefit to cost ration of nearly 2.8, showing that the benefits of these projects outweigh the costs. A number of projects are highly valuable from a water supply and reliability standpoint. The projects also contains a number of water quality, flood improvement, habitat enhancement and recreation improvement benefits which are difficult to quantify, but nevertheless provide a higher quality of life to local residents and improve waterways and beaches which have been identified as priorities in the Region's IRWM Plan.

Below is a summary of the costs and benefits of each project listed in this Proposal.

Table 8-1: Proposal Benefits and Costs Summary (PSP Table 20)							
Project	Project Proponent	Total Present Value Project Costs	Total Present Value Project Benefits			D1 – Cost-Effectiveness Analysis	From Section D2 – Briefly describe the main Non-monetized benefits
			Section D3 – Monetized	Flood Damage Reduction	Total		
(a)	(b)	(c)	(d)	(e)	(f) = (d) + (e)	(g)	(h)
Citywide Storm Drain Catch Basin Curb Screens	City of Calabasas	$1,810,550	$2,183,532	none monetized	$2,183,532	Not Applicable	Facilitates compliance with TMDL, Enhances recreational opportunities, Reduces street flooding hazards
Dominguez Channel Trash Reduction	City of Carson	$2,164,608	$3,468,987	none monetized	$3,468,987	Not Applicable	Protects habitat and water quality, Enhances recreational opportunities, Enables compliance with TMDL
Dominguez Gap Spreading Ground Improvement	LA County Flood Control District	$4,350,529	$15,659,640	none monetized	$15,659,640	Not Applicable	Reduces net imports from Bay-Delta Improves water quality, Improves water supply reliability
Foothill MWD Recycled Water Project	Foothill Municipal Water District	$3,776,055	$7,133,550	none monetized	$7,133,550	Not Applicable	Reduces long-term demand on Delta, Provides education and tech. benefits
Marsh Park, Phase II	Mountains Recreation and Conservation Authority	$6,113,933	$15,824,205	none monetized	$15,824,205	Not Applicable	Provides beneficial effects to a DAC, Enhances wildlife and habitats, Promotes social health and recreation

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			Section D3 – Monetized	**Flood Damage Reduction**	**Total**		
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f) = (d) + (e)**	**(g)**	**(h)**
Oxford Retention Basin	Los Angeles County Flood Control District	$12,368,859	$95,390	none monetized	$95,390	Not Applicable	Creates recreational opportunities, Reduces flood risk and damage, Restores native habitat
Pacoima Spreading Ground Improvement	Los Angeles County Flood Control District	$30,538,952	$181,779,403	none monetized	$181,779,403	Not Applicable	Reduce net imports from Bay-Delta Improve water supply reliability
Peck Water Conservation Improvement	Los Angeles County Flood Control District	$7,978,974	$30,532,049	none monetized	$30,532,049	Not Applicable	Reduces long-term demand on Delta, Improves water quality, Enhances recreation opportunities
San Jose Creek Water Recycling Plant Optimization	County Sanitation Districts of Los Angeles County	$62,821,022	$138,043,451	none monetized	$138,043,451	Not Applicable	Reduces long-term demand on Delta, Promotes large energy savings
South Gardena Recycled Water Pipeline	West Basin Municipal Water District	$2,238,849	$1,940,644	none monetized	$1,940,644	Not Applicable	Improves water quality, Improves water supply reliability, Reduces long-term demand on Delta

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			Section D3 – Monetized	**Flood Damage Reduction**	**Total**		
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f) = (d) + (e)**	**(g)**	**(h)**
Upper Malibu Creek Watershed Restoration Projects	City of Agoura Hills	$2,868,398	$2,223,860	none monetized	$2,223,860.0	Not Applicable	Restores & creates wildlife habitat, Provides recreational access, Improves water quality
Vermont Stormwater Capture	City of Los Angeles Bureau of Sanitation	$4,269,719	none monetized	none monetized	none monetized	Not Applicable	Provides educational & tech. benefits Improves water quality and habitat, Provides recreational access
Walnut Spreading Basin Improvements	Los Angeles County Flood Control District	$4,157,695	$7,932,479	none monetized	$7,932,479.0	Not Applicable	Reduces long-term demand on Delta, Promotes large energy savings
Region-wide Totals		**$145,458,143**	**$406,817,190**		**$406,817,190**		

Section 2: Project Level Benefits and Cost Analysis

The following section contains a benefit and cost analysis for each project.

Citywide Storm Drain Catch Basin Curb Screens

This attachment presents the economic analysis for the Citywide Storm Drain Catch Basin Curb Screens Project. A Project Overview and Project Benefit-Cost Summary table are followed by the following sections as outlined in the Proposal Solicitation Package (PSP): Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), Flood Damage Reduction Benefit Analysis (Section D4) and Project Benefits and Costs Summary (Section D5).

Project Overview

The Citywide Storm Drain Catch Basin Curb Screens Project (Project) proposes to install curb screens onto all of the City of Calabasas 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. The City performs multiple activities to prevent trash from entering the watershed but despite the City's efforts, it is not currently in compliance with total maximum daily load (TMDL) requirements for trash. Without the Project, beginning in 2017 the City would be out of compliance and subject to daily fines. The Project presents the best option for Calabasas to protect the L.A. River and Malibu Creek Watersheds by preventing trash (and associated bacteria and other pollutants associated with the trash) from entering the storm water system where it impairs water quality, harms wildlife, and creates a visually undesirable landscape.

Over the 20 year life of the Project, anticipated benefits of the Project include reduced operations and maintenance (O&M) costs, improved water quality, protection of wildlife, avoided fines (not included in benefit cost analysis), reduced localized flooding, and creation of more visually appealing recreation opportunities. The Project also provides benefits to local disadvantaged communities (DAC).

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-2**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require quantification are described in Attachment 7.

Table 8-2: Benefit-Cost Analysis Overview (present values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$1,810,550
Monetized Benefits	
Avoided O&M (staff time for volunteer events, regular catch basin cleanout, flood damage repair to City property, and continuous deflection system (CDS) cleanout)	$2,139,637
Avoided volunteer time	$43,895
Total Monetized Benefits	$2,183,532
Physically Quantified Benefit or Cost	Project Life Total
Trash prevented from entering storm water	482 tons
Qualitative Benefit or Cost	**Qualitative Indicator***
Enhanced recreation opportunities (Provide social recreation or access benefits)	+
Social health and safety (avoided flood risk)	+
Avoidance of public water resource conflicts	+
Other social benefits	+
Improvements to water quality	+
Protection of habitat	+
Provide a long-term solution	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-3 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following table are explained further in the narrative of qualitative benefits section.

Table 8-3: (PSP Table 12) Citywide Storm Drain Catch Basin Curb Screens Project Non-monetized Benefits Checklist		
No.	**Question**	**Enter "Yes," "No" or "Neg"**
	Community/Social Benefits	
	Will the proposal	
1	**Provide education or technology benefits?**	**No**
	Examples are not limited to, but may include:	
	- Include educational features that should result in water supply, water quality, or flood damage reduction benefits?	
	- Develop, test, or document a new technology for water supply, water quality, or flood damage reduction management?	
	- Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	**Yes**
	Examples are not limited to, but may include:	
	- Provide new or improved outdoor recreation opportunities?	
	- Provide more access to open space?	
	- Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	**Yes**
	Examples are not limited to, but may include:	
	- Provide more opportunities for public involvement in water management?	
	- Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	**Yes**
	Examples are not limited to, but may include:	

Table 8-3: (PSP Table 12) Citywide Storm Drain Catch Basin Curb Screens Project Non-monetized Benefits Checklist		
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events?	
	- Reduce risk to life from dam failure or flooding?	
	- Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	**Yes**
	Examples are not limited to, but may include:	
	- Redress or increase inequitable distribution of environmental burdens?	
	- Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits:	
	Will the proposal	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	**Yes**
	Examples are not limited to, but may include:	
	- Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat?	
	- Contribute to an existing biological opinion or recovery plan for a listed special status species?	
	- Preserve or restore designated critical habitat of a listed species?	
	- Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	**Yes**
	Examples are not limited to, but may include:	
	- Cause an improvement in water quality in an impaired water body or sensitive habitat?	
	- Prevent water quality degradation?	
	- Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	**No**
	Examples are not limited to, but may include:	
	- Reduce net production of greenhouse gasses?	

Table 8-3: (PSP Table 12) Citywide Storm Drain Catch Basin Curb Screens Project Non-monetized Benefits Checklist		
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3, or D4?**	**No**
	Sustainability Benefits:	
	Will the proposal	
10	**Improve the overall, long-term management of California groundwater resources?**	**No**
	Examples are not limited to, but may include:	
	- Reduce extraction of non-renewable groundwater?	
	- Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	**No**
12	**Provide a long-term solution in place of a short-term one?**	**Yes**
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	**No**
	Examples are not limited to, but may include:	
	- Reduce net energy use on a permanent basis?	
	- Increase renewable energy production?	
	- Include new buildings or modify buildings to include certified LEED features?	
	- Provide a net increase in recycling or reuse of materials?	
	- Replace unsustainable land or water management practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	**No**
	Examples are not limited to, but may include:	
	- Provide a more flexible mix of water sources?	
	- Reduce likelihood of catastrophic supply outages?	
	- Reduce supply uncertainty?	
	- Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	**N/A**

Narrative Description of Qualitative Benefits

Social recreation or access benefits

Provide new or improved outdoor recreational opportunities

The City of Calabasas receives numerous complaints throughout the year regarding trash and debris in and along local trails, creeks and open spaces. This on-going problem is noticeable to hikers and trail-users along creeks and other open space areas used for recreation. In Calabasas large volumes of trash and debris detract from recreation. This Project would reduce the presence of trash along the L.A. River and Malibu Creek to the benefit of the local population. This reduction in trash will help to improve the recreational experience and may attract additional visitors.

Avoidance of public water resource conflicts

Help meet an existing state mandate for water quality

The City of Calabasas is currently out of compliance with trash TMDLs, despite several ongoing efforts to come into compliance. This Project, which the City estimates will reduce trash entering the waterways of the Los Angeles River and Malibu Creek from Calabasas by 86%, will help the City come into compliance by 2017 for the Los Angeles River and 2020 for Malibu Creek. However, if this Project is not implemented and no other alternative is found, the City could be subject to fines of up to $10,000 per day, for each of the waterways. In 2017 this could potentially cost the City $3,650,000 annually, and in 2020 this would potentially cost the City $7,300,000 annually. This Project will help avoid this significant financial burden and potential source of conflict in the future. These potential fines are described here to illustrate a potential fiscal impact but are not included in the monetized estimates of benefits (avoided costs).

Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation

There are examples of lawsuits filed against regional entities for being out of compliance with TMDLs. One of the more prominent/recent cases involves the Natural Resource Defense Council (NRDC), Inc. v. the Los Angeles County Flood Control District (LACFCD) (2011). In this case the NRDC wanted the LACFCD to be held liable under the Clean Water Act for pollutant loading in waterways that flow through conveyances and re-enter a main waterway, alleging the LACFCD was polluting from point sources. While the LACFCD successfully defended itself in this case, this is an example of a costly lawsuit (SCOTUS, 2013; Lewis & Clark 2013). Calabasas' has not been subject to any lawsuits, but could it be in the future if it does not reach its TMDL requirements for trash starting in 2017. This Project will help avoid these potential conflicts by significantly reducing the trash in the L.A. River and Malibu Creek and supporting TMDL compliance for Calabasas.

Social health and safety

Reduce exposure to water-related hazards

In Calabasas there are periodic incidents of flooding attributable to catch basin clogging, posing possible flood risks to residents, homes, and businesses. 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

For each event of flooding at these (or other) locations, emergency crews must be called out at an average cost of $5,000 per event (Farassati, 2013). For water to flow freely through the storm water system, it is not uncommon for work crews to damage the street, curbs, sidewalks/pavement, landscaping, or other infrastructure. This Project will help reduce these flooding events thereby improving the safety of local residents and businesses while also reducing the City's costs.

Other social benefits

Beneficial effects on disadvantaged communities

Improvements to local water quality, through an 86% reduction in trash from the City of Calabasas, will provide recreational, safety, and wildlife benefits. These improvements could be beneficial for disadvantaged communities along the Los Angeles River.

Wildlife or habitat benefits

Reduce hazards of trash to wildlife and habitat

The Los Angeles River and Malibu Creek are home to many common types of wildlife including small mammals and many varieties of birds. Fish species present in these water bodies include Common Carp, Largemouth Bass, Tilapia, Green Sunfish, Amazon Sailfin Catfish, Bluegill, Black Bullhead, Brown Bullhead, Channel Catfish, Fathead Minnow, Crayfish, and Mosquito Fish. Trash can present hazards to local wildlife. This Project will reduce these types of threats.

Environmental impacts of trash to habitat are wide ranging and can be both direct and indirect. Direct impacts occur when wildlife is physically harmed by debris through ingestion or entanglement (e.g., a turtle mistakes a plastic bag for food) or debris physically alters a sensitive ecosystem. Environmental impacts can also be indirect, such as when a waterway cleanup results in ecological changes.

Wildlife often ingests debris that they mistake for food. For example, birds often mistake plastic pellets for fish eggs. At other times, animals accidentally eat debris while feeding on natural food. Ingesting debris can seriously harm wildlife. It can lead to starvation or malnutrition when the debris collects in the animal's stomach causing the animal to feel full. Starvation also occurs when ingested debris in the animal's system prevents vital nutrients from being absorbed. Internal injuries and infections may also result from ingestion. Some debris, especially some plastics, contain toxic substances that can cause death or reproductive failure in fish or other wildlife. In fact, some plastic particles have even been determined to contain certain chemicals up to one million times the amount found in the water alone (USEPA, 2013).

Wildlife can become entangled in debris causing serious injury or death. Entanglement can lead to suffocation, starvation, drowning, increased vulnerability to predators, or other injury. Trash can constrict an entangled animal's movement which results in exhaustion or development of an infection from deep wounds caused by tightening material.

Water quality benefits

Reduce trash, sediment, vegetation, and reduce bacteria loading to receiving waters

Trash and organic materials such as leaves, sediment, and pet droppings in waterways can harbor bacteria or other contaminants that degrade water quality. Through the use of catch basin screens, and the subsequent reduction of trash in local waterways, the Project may help to reduce harmful bacteria or other pollutants in area waterways (Jones, 2013; Southern California Coastal Water Research Project, 2012). The City is hopeful that the reduction in trash and bacteria will help reduce the number of closures at nearby beaches. Additionally, water quality improvements will benefit local plants and wildlife.

Long term solution

Prevent need to employ less effective BMPs to control stormwater quality

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

- Installing 3 CDS units and 41 Abtech Filters within the Los Angeles River watershed (note that the Abtech Filters will be replaced as part of the project)
- Establishing weekly street sweeping
- Banning single-use plastic bags and styrofoam containers
- Installing trash cans at all bus stops
- Installing markers and painted information near catch basins to notify the public that storm drain catch basins drain to the ocean
- Conducting volunteer creek clean-ups to collect trash in waterways
- Testing 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. In addition, many of these measures, such as volunteer creek clean-ups, are only a short-term solution, and therefore constitute a “band aid” approach. The curb screens being proposed have a project life of 20 years and prevent trash from reaching waterways, making the Project Calabasas’ best long-term option to protect the L.A. River and the Malibu Creek (Eric Taylor, G2 Construction, Inc., Personal communication, March 4, 2013).

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 20 year life of the Project. The benefits primarily include avoided costs such as:

- Avoided costs associated with cleaning out catch basins
- Avoided costs from cleaning out CDSs
- Avoided staff time at waterway cleanup events
- Avoided flood damage costs incurred by the City
- Avoided volunteer hours at waterway cleanup events

Avoided costs associated with cleaning out catch basins & CDSs

Currently the LACFCD and Calabasas expend significant effort and money maintaining catch basins. For example, the LACFCD currently cleans trash from each one of the 900 catch basins at an annual cost of $375 per screen, or $337,500 per year (LACFCD, 2012). However, once the catch basin screens are installed the LACFCD's costs will drop significantly. The LACFCD estimates that with the catch basin screens installed, each catch basin will cost just $182 to clean per year, or $163,800 in total. This significant savings is due to the lower maintenance costs associated with the reduced amount of trash that can enter each catch basin.

Similarly, the Project will help reduce costs associated with cleaning out the City's CDS units. The new screens should prevent trash from entering catch basins, reducing the amount of debris captured by CDSs. Current costs to maintain the CDSs are roughly $48,000 per year and the City expects a 25% reduction in costs, saving $12,000 annually.

Avoided staff time at waterway cleanup events

Each year Calabasas organizes 6 community clean-up events to remove trash and other debris, such as tires, from waterways. These events use valuable staff time. For example, the average event uses 4 staff for 4 hours each. At $50 per hour of staff time, cleanup events cost the City at least $4,800 per year. With the Project the City hopes to reduce trash and cut the number of annual cleanup events in half, spending just $2,400 (Alex Farassati, City of Calabasas Environmental Services Manager, Personal communication, March 14, 2013).

Avoided flood damage costs incurred by the City

Avoided flood damage costs incurred by the City are discussed in Section D4 below.

Avoided volunteer hours at waterway cleanup events

Each year Calabasas organizes up to 6 community clean-up events. These events have traditionally used volunteer hours to remove trash from Malibu Creek. Volunteer time is a very important and valuable resource to the City. Without these volunteers the City would have to expend its resources to remove trash from the Malibu Creek and inlets.

The value of a volunteer hour can vary greatly depending on the skill and experience of the volunteer, and the task they are being asked to accomplish. For instance, *Independent Sector* reports that one hour of volunteer time in California is worth $24.18 (USD 2010; *Independent Sector*, 2011). Conversely, a volunteer's time could be valued at the State minimum wage of

$8.00 an hour. Calabasas assumes a conservative value of $10.00 per hour for this analysis (Alex Farassati, City of Calabasas Environmental Services Manager, Personal communication, March 14, 2013).

Given this, the City of Calabasas expects to reduce the need for volunteer time at waterway cleanup events by 86%, or 430 hours per year. This avoids approximately $4,300 per year in volunteer time.

The table below summarizes the annual avoided costs from the Project, reflecting the lower costs associated with periodically cleaning out catch basins once the screens are in place, the lower cost of cleaning out CDSs, the avoided staff time at waterway cleanup events, the avoided emergency flood response costs (see Section D4), and the avoided volunteer time at waterway cleanup events. The below table provides a summary of annual avoided costs, which are constant year-to-year for the lifetime of the Project.

Summary of annual avoided Project costs		
Cost	**Without Project**	**With Project**
CDS Cleanout	$48,000	$36,000
Catch basin cleanout	$337,500	$163,800
Staff time	$4,800	$2,400
Volunteer time	$30,700	$26,400
Flood damage to City property	$25,000	$3,500
Total	$446,000	$232,100

Table 8-4: (PSP Table 15)
Citywide Storm Drain Catch Basin Curb Screens Project
Avoided Annual Costs
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2012	Avoided Cost	Dollars	$0	$0	$0		$0	1.000	**$0**
2013	Avoided Cost	Dollars	$0	$0	$0		$0	0.943	**$0**
2014	Avoided Cost	Dollars	$0	$0	$0		$0	0.890	**$0**
2015	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.840	**$179,595**
2016	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.792	**$169,429**
2017	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.747	**$159,839**
2018	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.705	**$150,791**
2019	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.665	**$142,256**
2020	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.627	**$134,204**
2021	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.592	**$126,607**
2022	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.558	**$119,441**
2023	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.527	**$112,680**
2024	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.497	**$106,302**

Table 8-4: (PSP Table 15)
Citywide Storm Drain Catch Basin Curb Screens Project
Avoided Annual Costs
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2025	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.469	**$100,285**
2026	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.442	**$94,608**
2027	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.417	**$89,253**
2028	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.394	**$84,201**
2029	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.371	**$79,435**
2030	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.350	**$74,939**
2031	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.331	**$70,697**
2032	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.312	**$66,695**
2033	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.294	**$62,920**
2034	Avoided Cost	Dollars	$419,600	$205,700	$213,900		$213,900	0.278	**$59,358**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$2,183,532**

Flood Damage Reduction Benefit Analysis (Section D4)

In Calabasas there are periodic incidents of flooding attributable to catch basin clogging, posing possible flood risks to residents, homes, and businesses. For each flooding event emergency crews must be called out. To alleviate flooding it is not uncommon for work crews to damage the street, curbs, sidewalks/pavement, landscaping, or other infrastructure. This Project will help reduce flooding events thereby improving the safety of local residents and businesses while also reducing the City's costs. It costs the City $25,000 per year to alleviate emergency flooding and repair any damages to City property. With the Project the City hopes to reduce this cost by 86% to just $3,500 per year (CLADPW, 2006; Farassati, 2013). These O&M cost savings for the City are incorporated into the avoided cost analysis (Section D3). Additional flood-related damages beyond City-borne response costs are not quantifiable because of insufficient data, hence further quantifiable flood damage reduction benefits are not included here.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-5 summarizes the economic costs for the Project. As is evident in the table, initial capital costs of $1,385,000 will accrue through 2015. Beginning in 2015 annual O&M costs of $56,000 begin. These annual costs include ongoing administration and operations. Maintenance and replacement costs allow for periodic cleaning of catch basins, repairs to damaged screens, and parts that may need to be replaced over time. O&M costs also include a replacement fund (indicated in the "other" column) for screens that are damaged beyond repair. The present value cost of the Project over its lifetime, including capital and O&M costs, sums to $1,810,550.

Project benefits, primarily the lower costs to the LACFCD for regular catch basin maintenance, are substantial. These lower O&M costs are expected to save the LACFCD and City $2,183,532 in present value terms over the life of the Project.

Table 8-5: (PSP Table 19) Citywide Storm Drain Catch Basin Curb Screens Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012										$
2013	$150,000							**$150,000**	0.943	**$141,509**
2014	$1,200,000							**$1,200,000**	0.890	**$1,067,996**
2015	$35,000		$15,000	$5,000	$30,000	$5,000	$1,000	**$91,000**	0.840	**$76,405**
2016			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.792	**$44,357**
2017			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.747	**$41,846**
2018			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.705	**$39,478**
2019			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.665	**$37,243**
2020			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.627	**$35,135**
2021			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.592	**$33,146**
2022			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.558	**$31,270**
2023			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.527	**$29,500**

Table 8-5: (PSP Table 19) Citywide Storm Drain Catch Basin Curb Screens Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2024			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.497	**$27,830**
2025			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.469	**$26,255**
2026			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.442	**$24,769**
2027			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.417	**$23,367**
2028			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.394	**$22,044**
2029			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.371	**$20,796**
2030			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.350	**$19,619**
2031			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.331	**$18,509**
2032			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.312	**$17,461**
2033			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.294	**$16,473**
2034			$15,000	$5,000	$30,000	$5,000	$1,000	**$56,000**	0.278	**$15,540**
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$1,810,550**

Benefits and Costs Summary

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis the main uncertainties are associated with the estimated levels of trash reduction and the effectiveness of the catch basin screens. While the City feels the 86% estimated reduction is conservative based on a 2006 pilot project (CLADPW, 2006), a reduction level of less than 86% would raise O&M costs for cleaning catch basins, CDSs, and also impact costs associated with minor repairs to City infrastructure as a result of flood damage. Likewise, a lesser level of trash reduction would increase the staff time required at regular waterway cleanup events. These issues are listed in **Table 8-6**.

Table 8-6: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Trash Reduction	U	This analysis is based on a specific effectiveness of screens and an estimated 80% reduction in trash; however, it is difficult to predict these levels precisely. These estimates impact the monetized estimates of staff time at waterway cleanup events, and O&M for catch basins, CDSs and flood damage repairs.
Catch basin O&M	U	Depending on the achieved level of trash reduction quantified estimates could vary.
CDS O&M	U	Depending on the achieved level of trash reduction quantified estimates could vary.
Flood damage repair	U	Depending on the achieved level of trash reduction quantified estimates could vary.
Staff time for cleanup events	+	Depending on the achieved level of trash reduction quantified estimates could vary.

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

References

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Dominguez Channel Trash Reduction

This attachment presents the economic analysis for the Dominguez Channel Trash Reduction Project (Project). A project overview and project benefit-cost summary table are followed by the following sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), Flood Damage Reduction Benefit Analysis (Section D4) and Project Benefits and Costs Summary (Section D5).

Project Overview

The Dominguez Channel Trash Reduction Project aims to reduce trash levels in the Dominguez Channel Estuary from the City of Carson by 75%, or an estimated 37.5 tons of trash annually. In order to meet this objective, the City of Carson plans to eliminate trash discharges to the Estuary by installing "Keep Carson Beautiful" automatic retractable catch basin screens at the curb face openings of the 1,800 catch basins within the City that drain to the Dominguez Channel Estuary (Figure 8-1). These retractable screens will capture trash and other debris at the street where it can then be removed through weekly street sweeping. The screens are made of a high quality stainless steel with an anticipated lifetime of 20 years (Brian Martello, West Coast Storm, personal communication, March 4, 2013). This Project will significantly reduce the amount of trash, leaves and other debris entering the waters of the Dominguez Channel.

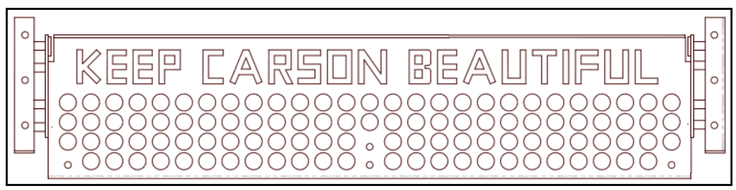

Figure 8-1: Artist rendering of a Keep Carson Beautiful catch basin screen.

The Dominguez Channel watershed and its receiving waters (the Dominguez Estuary and Los Angeles Harbor) are listed on the Clean Water Act 303(d) list of impaired water bodies for a number of constituents, including sediment, metals, nutrients, pesticides, and bacteria. Currently, the 140-acre Estuary is an accumulation area for trash from the watershed, with roughly 25 tons of floating trash collected annually from 4 floating trash booms. In order to meet National Pollutant Discharge Elimination System (NPDES) Permit requirements the City must implement this Project.

While the City had explored other alternatives, none presented as an effective method of preventing trash from entering the Estuary. For instance, the City sweeps every street weekly, maintains trash receptacles at 300 bus stops, and conducts several annual waterway cleanup events with the help of volunteers; yet the City's 4 floating trash booms and the County's single trash boom still collect tons of floating trash each year. The best option for Carson to protect the Estuary is by preventing trash (and associated bacteria and other pollutants associated with the trash) from entering the storm water system where it impairs water quality, harms wildlife, and creates a visual impairment. Without the Project, the City would implement a smaller-scale version of the Project on only 40 Priority A catch basins. However, this limited implementation would also have limited benefits.

The full implementation of the Project will provide several benefits, including financial savings, improvements to water quality in the Dominguez Estuary, protection of tidal habitats, enhanced education and recreation experiences, and preservation of the Albertoni Farms Marsh. The Project will also reduce flooding potential in the City of Carson by reducing the accumulation of trash that reduces the already-limited conveyance capacity of the drainage system.

The product design is complete and field verification of installation locations has begun. The primary implementing agency for this Project is the City of Carson. The Los Angeles County Flood Control District (LACFCD) and County of Los Angeles Department of Public Works (LADPW) are the primary cooperating agencies.

Summary Project Benefits and Costs

A summary of all benefits and costs for the Project are provided in **Table 8-7**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-7: Benefit-Cost Analysis Overview (present values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$2,164,608
Monetized Benefits	
Avoided floating boom and catch basin trash collection O&M	$3,412,489
Avoided volunteer time	$56,498
Total Monetized Benefits	$3,468,987
Physically Quantified Benefit or Cost	**Project Life Total**
Estimated debris diverted from the Dominguez Channel Estuary	750 tons
Qualitative Benefit or Cost	**Qualitative Indicator***

Enhanced recreation opportunities	++
Help avoid, reduce or resolve various public water resources conflicts	+
Social health and safety (avoided flood risk)	+
Protection of habitat	+
Improvements to water quality	+
Long-term solution	++

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-8 shows the non-monetized benefits checklist for the Project. Narrative descriptions of the benefit categories marked "Yes" in the following table are provided in the qualitative benefits section after the table.

Table 8-8: (PSP Table 12)
The Dominguez Channel Trash Reduction Project
Non-monetized Benefits Checklist

No.	Question	Enter "Yes," "No" or "Neg"
	Community/Social Benefits	
	Will the proposal	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include:	
	- Include educational features that should result in water supply, water quality, or flood damage reduction benefits?	
	- Develop, test, or document a new technology for water supply, water quality, or flood damage reduction management?	
	- Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include:	

Table 8-8: (PSP Table 12) The Dominguez Channel Trash Reduction Project Non-monetized Benefits Checklist		
	- Provide new or improved outdoor recreation opportunities?	
	- Provide more access to open space?	
	- Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include:	
	- Provide more opportunities for public involvement in water management?	
	- Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include:	
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events?	
	- Reduce risk to life from dam failure or flooding?	
	- Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include:	
	- Redress or increase inequitable distribution of environmental burdens?	
	- Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits:	
	Will the proposal	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat?	
	- Contribute to an existing biological opinion or recovery plan for a listed special status species?	
	- Preserve or restore designated critical habitat of a listed species?	
	- Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Cause an improvement in water quality in an impaired water body or sensitive habitat?	
	- Prevent water quality degradation?	

Table 8-8: (PSP Table 12) The Dominguez Channel Trash Reduction Project Non-monetized Benefits Checklist		
	- Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include:	
	- Reduce net production of greenhouse gasses?	
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3, or D4?**	No
	Sustainability Benefits:	
	Will the proposal	
10	**Improve the overall, long-term management of California groundwater resources?**	No
	Examples are not limited to, but may include:	
	- Reduce extraction of non-renewable groundwater?	
	- Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No
	Examples are not limited to, but may include:	
	- Reduce net energy use on a permanent basis?	
	- Increase renewable energy production?	
	- Include new buildings or modify buildings to include certified LEED features?	
	- Provide a net increase in recycling or reuse of materials?	
	- Replace unsustainable land or water management practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	No
	Examples are not limited to, but may include:	
	- Provide a more flexible mix of water sources?	
	- Reduce likelihood of catastrophic supply outages?	
	- Reduce supply uncertainty?	
	- Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	No

Narrative Description of Qualitative Benefits

Social recreation or access benefits

Provide new or improved outdoor recreational opportunities

The large volumes of trash that enter the Dominguez Channel Estuary detract from recreation. For instance, the bike and walking path that surrounds the area is underutilized, and trash associated bacteria which reach the channel and estuary pose a danger to recreation (California Coastal Commission, 2012). However, this Project would reduce the presence of trash and may attract additional users, and improve the experience for current users. Additionally, the City hopes that within a few years of the implementation of the Project the Estuary will reach water contact recreation status, thereby expanding the range of water-oriented recreational activities available and increasing annual visitors.

Avoidance of public water resource conflicts

Help meet an existing state mandate for water quality

This Project, which the City estimates will reduce trash entering the Dominguez Channel from the watershed by approximately 75%, will also help the City meet the December 2016 compliance deadline for the NPDES requirements related to trash management. However, if this Project is not implemented and no other alternative is found, the City could be subject to fines of up to $10,000 per day, for each of the waterways (RWQCB, 2012). In 2017 this could potentially cost the city $3,650,000 annually. This Project will help avoid this significant financial burden and potential source of conflict in the future. These potential fines are described here to illustrate a potential fiscal impact, but are not included in the monetized estimates of benefits (avoided costs).

Social health and safety

Reduce exposure to water-related hazards

The City and the LACFCD maintain pumps that lift storm water from low areas to discharge points. Trash accumulates in and around these pumps causing them to fail, resulting in periodic flooding. This flooding poses possible risks to residents, homes, and businesses. These incidents are not readily predicted and often need to be addressed in a short turn-around period by emergency work crews that pump stormwater until the lift stations are repaired, thereby reducing the flood risk. This Project will help reduce these emergency events and improve the safety of local residents and businesses.

Wildlife or habitat benefits

Reduce hazards of trash to wildlife and habitat

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 Dominguez 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 (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, 2004).

Environmental impacts of marine debris to habitat are wide ranging and can be both direct and indirect. Direct impacts occur when marine life is physically harmed by marine debris through ingestion or entanglement (e.g., a turtle mistakes a plastic bag for food) or marine debris physically alters a sensitive ecosystem (e.g., a fishing net is dragged along the ocean floor by strong ocean currents and breaks and smothers a coral reef; **Figure 8-2**). Environmental impacts can also be indirect, such as when a marine debris cleanup results in ecological changes.

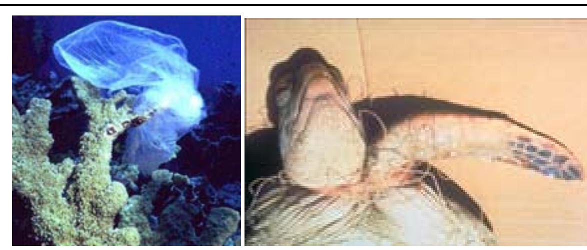

Figure 8-2: Environmental hazards posed by trash, including animal entanglement (National Oceanic and Atmospheric Administration)

Seabirds, sea turtles, fish, and marine mammals often ingest marine debris that they mistake for food. For example, whales and sea turtles often mistake plastic bags for squid, and birds often mistake plastic pellets for fish eggs. Moreover, a study of 38 green turtles found that 61 percent had ingested some form of marine debris including plastic bags, cloth, and rope or string. At other times, animals accidentally eat the marine debris while feeding on natural food. (USEPA, 2013)

Ingesting marine debris can seriously harm marine life. Ingestion can lead to starvation or malnutrition when the marine debris collects in the animal's stomach causing the animal to feel full. Starvation also occurs when ingested marine debris in the animal's system prevents vital nutrients from being absorbed. Internal injuries and infections may also result from ingestion. Some marine debris, especially some plastics, contains toxic substances that can cause death or reproductive failure in fish, shellfish, or any marine life. In fact, some plastic particles have even been determined to contain certain chemicals up to one million times the amount found in the water alone. (USEPA, 2013)

Marine life can become entangled in marine debris causing serious injury or death. Entanglement can lead to suffocation, starvation, drowning, increased vulnerability to predators, or other injury. Marine debris can constrict an entangled animal's movement which results in exhaustion or development of an infection from deep wounds caused by tightening material. For example, volunteers participating in the 2008 International Coastal Cleanup event discovered 443 animals and birds entangled or trapped by marine debris. (USEPA, 2013)

"The direct impacts of marine debris are not limited to mobile animals. Plants, other immobile living organisms, and sensitive ecosystems can all be harmed by marine debris. Plants can be smothered by plastic bags and fishing nets. The ocean floor ecosystems can be damaged and altered by the movement of an abandoned vessel or other marine debris (USEPA, 2013)."

Trash and marine debris can present hazards to local plants and wildlife. This Project will reduce these types of threats.

Water quality benefits

Reduce trash, sediment, and vegetation loading, reduce bacteria loading, and reduce toxic pollutant loading to receiving waters

Trash and organic materials such as leaves, sediment, and pet droppings in waterways can harbor bacteria, toxic pollutants or other contaminants that degrade water quality. (Jones, 2003; Southern California Coastal Water Research Project, 2012) As noted in the Santa Monica Bay Nearshore and Offshore Debris TMDL Report, "of particular concern are the bacteria and viruses associated with diapers, medical waste, and human or pet waste (RWQCB, 2010, pp. 21)." Through the use of catch basin screens, and the subsequent reduction of trash in local waterways, the Project may help to reduce harmful bacteria or other pollutants in area waterways by preventing the discharge of such materials. The City aspires to make the Estuary suitable to contact recreation activities. This Project may improve water quality and help Carson to reach this goal. Additionally, water quality improvements will benefit local plants and wildlife (RWQCB, 2010).

Long-term solution

Prevent need to employ less effective BMPs to control stormwater quality

While the City had explored other alternatives, none present as an effective or long-term method of preventing trash from entering the watershed. For instance, the City sweeps every street weekly, provides trash receptacles at 300 bus stops, and conducts several annual waterway cleanup events with the help of volunteers including participating in the Ocean Conservancy's Coastal Cleanup Day and Keep America Beautiful's Great American Cleanup. Yet, the City's 4 floating trash booms and the County's single trash boom collect tons of floating trash each year. Several of these solutions, such as creek cleanups, are short term solutions and do not prevent trash and debris from reaching the Dominguez Channel. This Project is Carson's best long-term option to protect the Estuary by preventing trash (and associated bacteria and other pollutants associated with the trash) from entering the storm water system where it impairs water quality, harms wildlife, and creates a visual impairment.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 20 year life of the Project. The benefits primarily include avoided costs as a result of cleanup efforts to manage trash after it has entered catch basins or the Estuary. Additional benefits are monetized through avoided volunteer hours at waterway cleanup events.

Avoided floating boom and catch basin trash collection O&M

Currently the LACFCD and the City expend significant effort and money maintaining catch basins and removing floating trash and debris from the Estuary. For example, the LACFCD currently cleans trash from the 1,800 catch basins at an annual cost of $375 each, or $675,000 per year (LACFCD, 2012). However, once the catch basin screens are installed the County's costs will drop significantly. The County estimates that with the catch basin screens each catch basin will cost just $182 per year to maintain, or $327,600 (LACFCD, 2012). This significant savings is due to the lower maintenance costs associated with the reduced amount of trash that will enter each catch basin.

The City also maintains a set of 4 floating trash booms in the Estuary that require regular trash removal. The City currently pays a contractor $20,000 per year to maintain and service these booms. While the booms will remain after the Project, the City believes contractor costs will be reduced by 75% to just $5,000 per year due to a significant reduction in trash (Expert Opinion: Patricia Elkins, 2013).

Avoided volunteer hours at waterway cleanup events

Each year the City organizes 2-3 community clean-up events. These events, held in conjunction with the California Coastal Cleanup Day and The Great American Cleanup, have traditionally used volunteer hours to remove trash from the Estuary and its surroundings. In fact, the City estimates that each year roughly 800 volunteer hours are used for waterway cleanup activities alone. Volunteer time is a very important and valuable resource to the City. Without these volunteers the City would have to expend its resources to remove trash from the Estuary and inlets.

The value of a volunteer hour can vary greatly depending on the skill and experience of the volunteer, and the task they are being asked to accomplish. For instance, Independent Sector reports that one hour of volunteer time in California is worth $24.18 (USD 2010; Independent Sector, 2011). Conversely, a volunteer's time could be valued at the State minimum wage, of $8.00 an hour. For this analysis a conservative value of $10.00 per hour is used. This is the same value used for volunteer time in nearby communities.

The City of Carson expects to reduce the need for volunteer time at waterway cleanup events by 75%, to just 200 hours per year. This avoids approximately $6,000 per year in volunteer time for trash removal that could be directed toward other civic needs.

Table 8-9 summarizes the annual avoided costs from the Project, reflecting the reduced need to periodically clean out catch basins once the screens are in place. Note that the avoided costs are scaled down marginally toward the bottom of the table to reflect the 40 catch basin screens that would be installed on Priority A catch basins if the full Project were not implemented. (RWQCB, 2012)

Table 8-9: (PSP Table 15) The Dominguez Channel Trash Reduction Project Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value	Discount Factor	Discounted Benefits
2012	Avoided Cost	Dollars	$0	$0	$0		$0	1.000	**$0**
2013	Avoided Cost	Dollars	$0	$0	$0		$0	0.943	**$0**
2014	Avoided Cost	Dollars	$0	$0	$0		$0	0.890	**$0**
2015	Avoided Cost	Dollars	$0	$0	$0		$0	0.840	**$0**
2016	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.792	**$291,807**
2017	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.747	**$275,290**
2018	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.705	**$259,707**
2019	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.665	**$245,007**
2020	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.627	**$231,139**
2021	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.592	**$218,055**
2022	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.558	**$205,713**
2023	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.527	**$194,069**
2024	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.497	**$183,084**
2025	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.469	**$172,720**
2026	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.442	**$162,944**
2027	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.417	**$153,720**
2028	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.394	**$145,019**

Table 8-9: (PSP Table 15) The Dominguez Channel Trash Reduction Project Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value	Discount Factor	Discounted Benefits
2029	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.371	**$136,811**
2030	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.350	**$129,067**
2031	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.331	**$121,761**
2032	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.312	**$114,869**
2033	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.294	**$108,367**
2034	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.278	**$102,233**
2035	Avoided Cost	Dollars	$703,000	$334,600	$368,400		$368,400	0.262	**$96,446**
Total Present Value of Discounted Benefits									**$3,547,827**
(%) Avoided Cost Claimed by Project for 40 Priority A catch basin screens									**97.78%**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$3,468,987**

Flood Damage Reduction Benefit Analysis (Section D4)

Flood damage reduction benefits from this Project are not quantifiable and are addressed in Section D2 with non-monetized benefits.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-10 summarizes the economic project costs. As is evident in the table, initial capital costs of $1,970,000 will accrue through 2015. Beginning in 2016 annual O&M costs of $50,000 begin. These of annual costs include ongoing administration and operations. Maintenance and replacement costs allow for periodic cleaning of catch basins, repairs to damaged screens, and parts that may need to be replaced over time. O&M costs also include a replacement fund (indicated in the "other" column) that will accrue funds to cover replacement of screens as they reach the end of their effective service lives. The present value cost of the Project over its lifetime, including capital and O&M costs, sums to $2,164,608. This cost reflects that the City will install 40 catch basin screens even if the Project is not funded. Water quality testing will not be part of Project costs, the City has been able to fund this via other channels, and the Project will not impact these costs.

Project Economic Benefits

Project benefits, primarily the lower costs to the County for regular catch basin maintenance, are substantial. These lower O&M costs and avoided volunteer hours are expected to save the LACFCD and the City $3,468,987 over the lifetime of the Project.

Table 8-10: (PSP Table 19) The Dominguez Channel Trash Reduction Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs	Discount Factor - Present Value Coeff (O&M)	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012	$0							**$0**	1.000	**$0**
2013	$50,000							**$50,000**	0.943	**$47,170**
2014	$1,450,000							**$1,450,000**	0.890	**$1,290,495**
2015	$470,000							**$470,000**	0.840	**$394,621**
2016			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.792	**$39,605**
2017			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.747	**$37,363**
2018			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.705	**$35,248**
2019			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.665	**$33,253**
2020			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.627	**$31,371**
2021			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.592	**$29,595**
2022			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.558	**$27,920**
2023			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.527	**$26,339**
2024			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.497	**$24,848**
2025			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.469	**$23,442**
2026			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.442	**$22,115**
2027			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.417	**$20,863**

Table 8-10: (PSP Table 19)
The Dominguez Channel Trash Reduction Project
Project Annual Costs
(2012 Dollars)

	Initial Costs Grand Total Cost	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs	Discount Factor - Present Value Coeff (O&M)	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2028			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.394	**$19,682**
2029			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.371	**$18,568**
2030			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.350	**$17,517**
2031			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.331	**$16,526**
2032			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.312	**$15,590**
2033			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.294	**$14,708**
2034			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.278	**$13,875**
2035			$5,000	$20,000	$20,000	$2,500	$2,500	**$50,000**	0.262	**$13,090**
Total Present Value of Discounted Costs										**$2,213,804**
(%) Cost Claimed by Project by Project for 40 Priority A catch basin screens										**97.78%**
Total Present Value of Discounted Costs										**$2,164,608**

Benefits and Costs Summary

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis the main uncertainties are associated with the achieved trash reduction levels. The City can substantiate that catch basin screens will reduce the levels of trash that enter the Estuary by 75%. Additionally, the LACFCD predicts a savings of $347,400 annually from lower catch basin cleanout costs. If the screens are not as effective as predicted or trash reduction levels are less than 75%, O&M costs for cleaning out catch basins and the City's 4 floating trash booms could increase and reduce the Project benefits. These issues are listed in **Table 8-11**.

Table 8-11: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Trash Reduction	U	We have assumed a 75% reduction in trash and specific effectiveness of the catch basin screens; however, it is difficult to estimate these precisely. These estimates impact the monetized estimates of catch basin and floating trash boom O&M.
Catch basin O&M	U	Depending on the achieved level of trash reduction quantified, O&M cost estimates could vary.
Floating boom O&M	U	Depending on the achieved level of trash reduction, quantified estimates could vary.

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

References

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Dominguez Gap Spreading Grounds West Basin Percolation Enhancements

This attachment presents the economic analysis for the Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project (Project). A project abstract and project benefit summary table are followed by the following sections as outlined in the Proposal Solicitation Package: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project (Project), managed by the Los Angeles County Flood Control District (LACFCD), will increase local water supplies by 1,000 acre feet (AF) annually for the Central Groundwater Basin. The Dominguez Gap Spreading Grounds are a 54-acre groundwater replenishment facility made up of two basins that recharge the Central Groundwater Basin using local surface water flows from the Los Angeles River. The main aspect of the Project is removal of five to ten feet of clay sediment in the West Basin to increase percolation and allow for increased recharge capacity. The Project also includes improving the connection between the East and West Basins to facilitate water transfer between the two, thereby aiding groundwater recharge for the entire Dominguez Gap Spreading Grounds.

This Project is important to secure local water supplies in a water scarce region for long-term water supply reliability. Currently over 40% of water supplies are imported, and demand is not waning[1]. At least 31 entities, including numerous municipalities, pump from the Central Groundwater Basin.[1] This Project is one part of a much larger goal to improve water security in the Region. The potential beneficiaries of the Project are:

Aqua Capital Management, LP
City of Bell Gardens
City of Bellflower
Bellflower-Somerset Mutual Water Co.
California-American Water Co.
City of Cerritos
City of Commerce
City of Compton
City of Downey
Maywood Mutual Water Co.
Montebello Land and Water Co.
City of Norwalk
Orchard Dale Water District
City of Paramount
City of Pico Rivera
Pico Water District
San Gabriel Valley Water Co.
City of Santa Fe Springs

[1] Central Basin Watermaster Annual Report, June 2011 - June 2012

Dominguez Gap Spreading Grounds West Basin Percolation Enhancements

Golden State Water Co.
City of Huntington Park
La Habra Heights County Water District
City of Lakewood
City of Long Beach
City of Los Angeles
City of Lynwood
City of Signal Hills
South Montebello Irrigation District
City of South Gate
Suburban Water Systems
Tract Number One Hundred and Eighty Water Co
City of Vernon

The Project will allow the Region to reduce the amount of water imported from the Bay Delta and provide other non-monetizable benefits including social health and safety, and water quality benefits. Monetized benefits from the Project include avoided water import costs and reduced net carbon emissions from importing water.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-12**. Present value costs of this Project are far outweighed by Project benefits. Additionally, the Project provides non-monetized benefits such as improved water quality and reduced demand for net diversions from the Delta. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-12: Benefit-Cost Analysis Overview (Present Values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$4,350,529
Monetizable Benefits	
Increased local water supply (water supply reliability, reduced energy costs, and better management of groundwater resources)	$16,184,223
Reduced net carbon emissions	$455,127
Local groundwater pumping costs (negative benefit)	($979,710)
Total Monetizable Benefits	$15,659,640
Physically Quantified Benefit or Cost	**Project Life Total**
1,000 acre feet water per year	50,000 AF
2,646,000 kWh per year of conserved energy	132 million kWh
958 metric tons per year of CO2e emissions avoided	47,900 metric tons
Qualitative Benefit or Cost	**Qualitative Indicator***
Social health and safety	+
Other social benefits	+
Improve water quality	+
Improve long-term management of California groundwater resources	+
Reduce demand for net diversions from the Delta	++
Provide a long-term solution	+
Improve water supply reliability	+

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

"USD" = United States dollars

Non-Monetized Benefits Analysis (Section D2)

Table 8-13 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table, are provided in the narrative of qualitative benefits section after the table.

Table 8-13: (PSP Table 12): Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	No
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical	

No.	Question	Enter "Yes", "No" or "Neg"
	services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	Yes
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those**	No

No.	Question	Enter "Yes", "No" or "Neg"
	claimed in Sections D1, D3 or D4?	
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No[1]
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	N/A

[1] This benefit category is marked as "no" because it is a quantified benefit, as described in Attachment 7.

Narrative Description of Qualitative Benefits

The narrative below explains the "yes" answers in **Table 8-13** above. Some of the benefits described below are explained in more detail and/or are physically quantified in Attachment 7.

Promote social health and safety

The Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project provides several social health and safety benefits. The main benefit provided by the Project is flood risk mitigation. The nearby Compton Creek levees are no longer able to contain a 100 year flood, as projected by the U.S. Federal Emergency Management Agency.[2] Some of the downstream area, past Dominguez Gap, is a part of the flood zone, requiring mandatory flood insurance. This Project will help mitigate flood risk downstream of the Project and along the upstream Compton Creek by increasing percolation rates in the spreading grounds and decreasing overall flow rates in the Los Angeles River.

Other social benefits

In the absence of this Project, untreated water would flow through the Los Angeles River and outlet in the Pacific Ocean near Long Beach. While this Project does not claim to benefit disadvantaged communities (DACs) directly, this Project will provide some benefit to the Long Beach DAC located adjacent to the Project site through decreasing non-point source pollutant loadings to these water bodies.

Additionally, once complete, the Project might provide additional passive recreation opportunities for local DACs. For example, the East Basin was transformed into a wetland area in 2008 and is now used by the surrounding community for horse-back riding, hiking, picnicking, and dog-walking.

Improve water quality in ways that were not quantified in Attachment 7

Cause an improvement in water quality in an impaired water body or sensitive habitat

The Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project will result in infiltrating an additional 1,000 AFY. In the absence of this Project, this water would be untreated and flow through the Los Angeles River and outlet in the Pacific Ocean near Long Beach and therefore increase pollutant loadings to these water bodies. The pollutants are

[2] Personal communication with Alison Wong, Los Angeles County Department of Public Works, March 2013

primarily from non-point sources and include nutrients, heavy metals, organic compounds, and oil and grease. Surface water percolating to the groundwater basin will be treated through soil-aquifer treatment.

Improve the overall, long-term management of California groundwater resources

Increase groundwater recharge

Local groundwater supply is a key resource that has historically been utilized to support approximately 60% of the water demand for customers served by the Central Basin (DWR, 2012). Since over 40% of demand is met with imported supplies, the increased use of groundwater and replenishment of groundwater basins is vital to sustain the long-term reliability of the Region's supply and to reduce the Region's dependence on imported water. This Project will increase groundwater recharge at the Dominguez Gap Spreading Grounds, replenish the Central Groundwater Basin, and increase local groundwater supply while reducing dependence on imported water.

Reduce demand for net diversions from the Delta

By reducing the use of imported State Water Project (SWP) water, the Dominguez Gap Spreading Grounds Project will augment in-stream flows in the Bay-Delta or will offset other diversions that may otherwise reduce flows. Reduced demands on Delta supplies also will help reduce the overall salinity of the Delta and improve Delta habitat.

Maintaining the Delta's environmental condition is vital to maintaining and improving the viability of the Region. The Delta provides drinking water to 25 million people, supports thousands of industries and irrigation of 750,000 acres of agriculture, and serves as home to hundreds of plant, animal, and fish species – some of which are listed as threatened or endangered. The Delta's 1,600 square miles of marshes, islands, and sloughs support at least half of migratory water birds on the Pacific Flyway; 80% of California's commercial fisheries; and recreational uses including boating, fishing, and windsurfing.

Delta resources are in a state of crisis. Fish populations, including salmon and Delta-smelt, have declined dramatically in recent years. The levee system is aging, and vulnerability of the Delta to flooding, sea level rise, or a major earthquake has contributed to concerns about possible levee collapse. In addition, water quality problems continue, and there is little consensus on how to manage water resources through storage.

Accordingly, by reducing reliance of SWP waters, this Project reduces extractions of water from the Bay-Delta system and helps preserve this vital resource. In addition, by reducing demand for Bay-Delta extractions, this Project may help free up some SWP water for other potential users.

Provide a long-term solution

As is discussed in the section above on improving long-term management of California's groundwater resources, and will be discussed below regarding increased water supply reliability, this Project helps to address growing demands on local water resources. The Project is one part of a much larger goal to improve long-term water security in the Region.

Improve water supply reliability in ways not quantified in Attachment 7

The availability of imported water is subject to a number of natural and human forces, including increased population growth (and accompanying increased demands), drought, changes in snowpack, earthquakes, environmental regulations, and water rights determinations with associated legal challenges and Court rulings. Increasing locally available groundwater helps to reduce dependence on imported water and provide a long-term solution. The Project will also enhance reliability by offsetting the use of imported water. It will improve the Region's ability to meet water demands on a consistent basis even in times of drought or other constraints on source water availability.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies; see for example Carson and Mitchell, 1987, CUWA, 1994, Griffen and Mjelde, 2000, Raucher et al., 2013). Due to the uncertainty involved, this benefit estimate is not included in the monetized benefits tables.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 50-year life of the Project. The benefits primarily include:

- Increased local groundwater recharge, reduced water imports, and energy savings
- Reduced net greenhouse gas emissions from the import of water

Increase local groundwater recharge, reduce water imports, and promote energy savings

Local groundwater supply is a key resource that has historically been utilized to support approximately 60% of the water demand in the Central Groundwater Basin region (DWR, 2012). This Project will increase groundwater recharge at the Dominguez Gap Spreading Grounds, replenish the Central Groundwater Basin, and increase local groundwater supply while reducing dependence on imported water.

This Project increases groundwater recharge and local groundwater supplies by 1,000 AFY beginning in 2016. The value of avoided water imports includes the avoided cost of importing water, which inherently includes energy savings associated with no longer needing to transport water. These two benefits are monetized using a single value, the value of importing a single AF of treated Tier 1 water.

For 2013, LADWP pays $830 (2012 USD) to import a single AF of treated water. However, as water demand increases, this value is expected to increase. Therefore, through 2020 the value of imported water is expected to increase in real terms (i.e., above general inflation) by 3.5% or more each year. Beginning in 2021 this rate is adjusted to 1.5% (see **Appendix 8-1**). Over the 50-year life of the Project, the Project will provide 50,000 AF of groundwater resources to the Region. This added resource supports significant monetized benefits. As is evidenced in Table 8-14, this Project supports a present value benefit of $16,184,223.

However, there are several costs associated with increased local water supply. Primarily, there are the costs associated with pumping the recharged groundwater from the aquifer at the point of extraction. In this case, that cost is $74.03 per AF of local groundwater (2012 USD), for a total of $979,710 in present value terms, over the life of the Project (MWDSC, 2007).

Reduced net emissions

Reduced reliance on imported water will avoid the extensive energy requirements associated with transporting water from the Bay Delta. This in turn will result in avoided greenhouse gas emissions associated with the production of this energy.

The Project would avoid greenhouse gas (GHG) emissions generated by the additional energy needed to transport imported SWP water to the Region. This value was 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.[3] By offsetting

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

the demand of 1,000 AF of imported SWP water, the 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.

To monetize this benefit, we apply a dollar value to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalents (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT (updated from 2012 values using CPI). The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions.

The mean value of $22.53/ MT to calculate social benefits and costs, produces conservative estimates for the benefits and costs associated with greenhouse gas emissions. To determine total costs over the 50-year Project period, we escalate the social cost of carbon by 2.4% per year. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change. The total present value benefits over the 50-year life of the Project, are listed in Table 8-3. Over the Project life, total present value benefits associated with avoided social costs of carbon amount to $455,127.

Table 8-14 summarizes the monetized benefits of the Project from increased local groundwater supplies (i.e., offsetting imported water) and benefits gained by reducing emissions associated with importing water.

Table 8-14: (PSP Table 15) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2016	Local groundwater recharge (i.e., reduced imported water)	Acre Feet	0	1000	1000	$913.75	$913,755	0.792	**$723,779**
	CO_2 emissions reduction	Metric Tons	958	0	958	$24.77	$23,732	0.792	**$18,798**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.792	**($58,639)**
2017	Local groundwater recharge	Acre Feet	0	1000	1000	$945.74	$945,736	0.747	**$706,709**
	CO_2 emissions reduction	Metric Tons	958	0	958	$25.37	$24,301	0.747	**$18,159**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.747	**($55,320)**
2018	Local groundwater recharge	Acre Feet	0	1000	1000	$978.84	$978,837	0.705	**$690,042**
	CO_2 emissions reduction	Metric Tons	958	0	958	$25.98	$24,884	0.705	**$17,542**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.705	**($52,188)**
2019	Local groundwater recharge	Acre Feet	0	1000	1000	$1,013.10	$1,013,096	0.665	**$673,767**
	CO_2 emissions reduction	Metric Tons	958	0	958	$26.60	$25,482	0.665	**$16,947**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.665	**($49,234)**
2020	Local groundwater recharge	Acre Feet	0	1000	1000	$1,048.55	$1,048,555	0.627	**$657,876**
	CO_2 emissions reduction	Metric Tons	958	0	958	$27.24	$26,093	0.627	**$16,371**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.627	**($46,447)**
2021	Local groundwater recharge	Acre Feet	0	1000	1000	$1,064.28	$1,064,283	0.592	**$629,948**
	CO_2 emissions reduction	Metric Tons	958	0	958	$27.89	$26,719	0.592	**$15,815**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.592	**($43,818)**

Table 8-14: (PSP Table 15)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Annual Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2022	Local groundwater recharge	Acre Feet	0	1000	1000	$1,080.25	$1,080,247	0.558	**$603,204**
	CO_2 emissions reduction	Metric Tons	958	0	958	$28.56	$27,361	0.558	**$15,278**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.558	**($41,338)**
2023	Local groundwater recharge	Acre Feet	0	1000	1000	$1,096.45	$1,096,451	0.527	**$577,597**
	CO_2 emissions reduction	Metric Tons	958	0	958	$29.25	$28,017	0.527	**$14,759**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.527	**($38,998)**
2024	Local groundwater recharge	Acre Feet	0	1000	1000	$1,112.90	$1,112,898	0.497	**$553,076**
	CO_2 emissions reduction	Metric Tons	958	0	958	$29.95	$28,690	0.497	**$14,258**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.497	**($36,791)**
2025	Local groundwater recharge	Acre Feet	0	1000	1000	$1,129.59	$1,129,591	0.469	**$529,596**
	CO_2 emissions reduction	Metric Tons	958	0	958	$30.67	$29,378	0.469	**$13,774**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.469	**($34,708)**
2026	Local groundwater recharge	Acre Feet	0	1000	1000	$1,146.54	$1,146,535	0.442	**$507,114**
	CO_2 emissions reduction	Metric Tons	958	0	958	$31.40	$30,083	0.442	**$13,306**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.442	**($32,744)**
2027	Local groundwater recharge	Acre Feet	0	1000	1000	$1,163.73	$1,163,733	0.417	**$485,585**
	CO_2 emissions reduction	Metric Tons	958	0	958	$32.16	$30,805	0.417	**$12,854**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.417	**($30,890)**
2028	Local groundwater recharge	Acre Feet	0	1000	1000	$1,181.19	$1,181,189	0.394	**$464,971**
	CO_2 emissions reduction	Metric Tons	958	0	958	$32.93	$31,545	0.394	**$12,417**

Table 8-14: (PSP Table 15)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Annual Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project***	**With Project***	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.394	**($29,142)**
2029	Local groundwater recharge	Acre Feet	0	1000	1000	$1,198.91	$1,198,907	0.371	**$445,231**
	CO_2 emissions reduction	Metric Tons	958	0	958	$33.72	$32,302	0.371	**$11,996**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.371	**($27,492)**
2030	Local groundwater recharge	Acre Feet	0	1000	1000	$1,216.89	$1,216,891	0.350	**$426,330**
	CO_2 emissions reduction	Metric Tons	958	0	958	$34.53	$33,077	0.350	**$11,588**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.350	**($25,936)**
2031	Local groundwater recharge	Acre Feet	0	1000	1000	$1,235.14	$1,235,144	0.331	**$408,231**
	CO_2 emissions reduction	Metric Tons	958	0	958	$35.36	$33,871	0.331	**$11,195**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.331	**($24,468)**
2032	Local groundwater recharge	Acre Feet	0	1000	1000	$1,253.67	$1,253,671	0.312	**$390,901**
	CO_2 emissions reduction	Metric Tons	958	0	958	$36.20	$34,684	0.312	**$10,815**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.312	**($23,083)**
2033	Local groundwater recharge	Acre Feet	0	1000	1000	$1,272.48	$1,272,476	0.294	**$374,306**
	CO_2 emissions reduction	Metric Tons	958	0	958	$37.07	$35,516	0.294	**$10,447**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.294	**($21,776)**
2034	Local groundwater recharge	Acre Feet	0	1000	1000	$1,291.56	$1,291,563	0.278	**$358,415**
	CO_2 emissions reduction	Metric Tons	958	0	958	$37.96	$36,369	0.278	**$10,092**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.278	**($20,544)**
2035	Local groundwater recharge	Acre Feet	0	1000	1000	$1,310.94	$1,310,937	0.262	**$343,200**

Table 8-14: (PSP Table 15) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project***	**With Project***	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	CO_2 emissions reduction	Metric Tons	958	0	958	$38.87	$37,241	0.262	**$9,750**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.262	**($19,381)**
2036	Local groundwater recharge	Acre Feet	0	1000	1000	$1,330.60	$1,330,601	0.247	**$328,630**
	CO_2 emissions reduction	Metric Tons	958	0	958	$39.81	$38,135	0.247	**$9,419**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.247	**($18,284)**
2037	Local groundwater recharge	Acre Feet	0	1000	1000	$1,350.56	$1,350,560	0.233	**$314,679**
	CO_2 emissions reduction	Metric Tons	958	0	958	$40.76	$39,050	0.233	**$9,099**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.233	**($17,249)**
2038	Local groundwater recharge	Acre Feet	0	1000	1000	$1,370.82	$1,370,818	0.220	**$301,320**
	CO_2 emissions reduction	Metric Tons	958	0	958	$41.74	$39,988	0.220	**$8,790**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.220	**($16,273)**
2039	Local groundwater recharge	Acre Feet	0	1000	1000	$1,391.38	$1,391,381	0.207	**$288,528**
	CO_2 emissions reduction	Metric Tons	958	0	958	$42.74	$40,947	0.207	**$8,491**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.207	**($15,351)**
2040	Local groundwater recharge	Acre Feet	0	1000	1000	$1,412.25	$1,412,251	0.196	**$276,279**
	CO_2 emissions reduction	Metric Tons	958	0	958	$43.77	$41,930	0.196	**$8,203**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.196	**($14,482)**
2041	Local groundwater recharge	Acre Feet	0	1000	1000	$1,433.44	$1,433,435	0.185	**$264,550**
	CO_2 emissions reduction	Metric Tons	958	0	958	$44.82	$42,936	0.185	**$7,924**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.185	**($13,663)**

Table 8-14: (PSP Table 15)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Annual Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2042	Local groundwater recharge	Acre Feet	0	1000	1000	$1,454.94	$1,454,937	0.174	**$253,319**
	CO_2 emissions reduction	Metric Tons	958	0	958	$45.89	$43,967	0.174	**$7,655**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.174	**($12,889)**
2043	Local groundwater recharge	Acre Feet	0	1000	1000	$1,476.76	$1,476,761	0.164	**$242,565**
	CO_2 emissions reduction	Metric Tons	958	0	958	$47.00	$45,022	0.164	**$7,395**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.164	**($12,160)**
2044	Local groundwater recharge	Acre Feet	0	1000	1000	$1,498.91	$1,498,912	0.155	**$232,268**
	CO_2 emissions reduction	Metric Tons	958	0	958	$48.12	$46,103	0.155	**$7,144**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.155	**($11,471)**
2045	Local groundwater recharge	Acre Feet	0	1000	1000	$1,521.40	$1,521,396	0.146	**$222,407**
	CO_2 emissions reduction	Metric Tons	958	0	958	$49.28	$47,209	0.146	**$6,901**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.146	**($10,822)**
2046	Local groundwater recharge	Acre Feet	0	1000	1000	$1,544.22	$1,544,217	0.138	**$212,965**
	CO_2 emissions reduction	Metric Tons	958	0	958	$50.46	$48,342	0.138	**$6,667**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.138	**($10,210)**
2047	Local groundwater recharge	Acre Feet	0	1000	1000	$1,567.38	$1,567,380	0.130	**$203,924**
	CO_2 emissions reduction	Metric Tons	958	0	958	$51.67	$49,502	0.130	**$6,441**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.130	**($9,632)**
2048	Local groundwater recharge	Acre Feet	0	1000	1000	$1,590.89	$1,590,891	0.123	**$195,267**
	CO_2 emissions reduction	Metric Tons	958	0	958	$52.91	$50,690	0.123	**$6,222**

Table 8-14: (PSP Table 15) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.123	**($9,086)**
2049	Local groundwater recharge	Acre Feet	0	1000	1000	$1,614.75	$1,614,754	0.116	**$186,977**
	CO_2 emissions reduction	Metric Tons	958	0	958	$54.18	$51,907	0.116	**$6,010**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.116	**($8,572)**
2050	Local groundwater recharge	Acre Feet	0	1000	1000	$1,638.98	$1,638,975	0.109	**$179,040**
	CO_2 emissions reduction	Metric Tons	958	0	958	$55.48	$53,153	0.109	**$5,806**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.109	**($8,087)**
2051	Local groundwater recharge	Acre Feet	0	1000	1000	$1,663.56	$1,663,560	0.103	**$171,439**
	CO_2 emissions reduction	Metric Tons	958	0	958	$56.81	$54,428	0.103	**$5,609**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.103	**($7,629)**
2052	Local groundwater recharge	Acre Feet	0	1000	1000	$1,688.51	$1,688,513	0.097	**$164,161**
	CO_2 emissions reduction	Metric Tons	958	0	958	$58.18	$55,735	0.097	**$5,419**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.097	**($7,197)**
2053	Local groundwater recharge	Acre Feet	0	1000	1000	$1,713.84	$1,713,841	0.092	**$157,192**
	CO_2 emissions reduction	Metric Tons	958	0	958	$59.57	$57,072	0.092	**$5,235**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.092	**($6,790)**
2054	Local groundwater recharge	Acre Feet	0	1000	1000	$1,739.55	$1,739,549	0.087	**$150,519**
	CO_2 emissions reduction	Metric Tons	958	0	958	$61.00	$58,442	0.087	**$5,057**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.087	**($6,406)**
2055	Local groundwater recharge	Acre Feet	0	1000	1000	$1,765.64	$1,765,642	0.082	**$144,129**

Table 8-14: (PSP Table 15) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	CO_2 emissions reduction	Metric Tons	958	0	958	$62.47	$59,845	0.082	**$4,885**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.082	**($6,043)**
2056	Local groundwater recharge	Acre Feet	0	1000	1000	$1,792.13	$1,792,126	0.077	**$138,010**
	CO_2 emissions reduction	Metric Tons	958	0	958	$63.97	$61,281	0.077	**$4,719**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.077	**($5,701)**
2057	Local groundwater recharge	Acre Feet	0	1000	1000	$1,819.01	$1,819,008	0.073	**$132,151**
	CO_2 emissions reduction	Metric Tons	958	0	958	$65.50	$62,752	0.073	**$4,559**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.073	**($5,378)**
2058	Local groundwater recharge	Acre Feet	0	1000	1000	$1,846.29	$1,846,293	0.069	**$126,541**
	CO_2 emissions reduction	Metric Tons	958	0	958	$67.07	$64,258	0.069	**$4,404**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.069	**($5,074)**
2059	Local groundwater recharge	Acre Feet	0	1000	1000	$1,873.99	$1,873,988	0.065	**$121,169**
	CO_2 emissions reduction	Metric Tons	958	0	958	$68.68	$65,800	0.065	**$4,255**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.065	**($4,787)**
2060	Local groundwater recharge	Acre Feet	0	1000	1000	$1,902.10	$1,902,098	0.061	**$116,025**
	CO_2 emissions reduction	Metric Tons	958	0	958	$70.33	$67,379	0.061	**$4,110**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.061	**($4,516)**
2061	Local groundwater recharge	Acre Feet	0	1000	1000	$1,930.63	$1,930,629	0.058	**$111,099**
	CO_2 emissions reduction	Metric Tons	958	0	958	$72.02	$68,996	0.058	**$3,970**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.058	**($4,260)**

Table 8-14: (PSP Table 15)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Annual Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project*	With Project*	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2062	Local groundwater recharge	Acre Feet	0	1000	1000	$1,959.59	$1,959,589	0.054	**$106,383**
	CO_2 emissions reduction	Metric Tons	958	0	958	$73.75	$70,652	0.054	**$3,836**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.054	**($4,019)**
2063	Local groundwater recharge	Acre Feet	0	1000	1000	$1,988.98	$1,988,982	0.051	**$101,867**
	CO_2 emissions reduction	Metric Tons	958	0	958	$75.52	$72,348	0.051	**$3,705**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.051	**($3,791)**
2064	Local groundwater recharge	Acre Feet	0	1000	1000	$2,018.82	$2,018,817	0.048	**$97,542**
	CO_2 emissions reduction	Metric Tons	958	0	958	$77.33	$74,084	0.048	**$3,579**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.048	**($3,577)**
2065	Local groundwater recharge	Acre Feet	0	1000	1000	$2,049.10	$2,049,099	0.046	**$93,401**
	CO_2 emissions reduction	Metric Tons	958	0	958	$79.19	$75,862	0.046	**$3,458**
	Local Pumping Costs	Acre Feet	0	1000	(1000)	$74.03	($74,030)	0.046	**($3,374)**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$15,659,640**
* Some values rounded									

Flood Damage Reduction Benefit Analysis (Section D4)

Quantifiable flood damage reduction benefits are not available for this Project.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-15 summarizes the economic Project costs for the Project. As is evidenced in the table, initial capital costs of $4,394,933 will accrue through 2015. Beginning in 2016 annual O&M costs of $23,361 begin. Annual O&M costs include administration, operations costs related to additional labor needed, and “other” costs, which include monitoring and oversight of the Project. Periodic maintenance costs of $350,000 will be incurred every 10 years. These are required to periodically clean out the spreading grounds to make certain that percolation rates remain high and that water is flowing between the two basins. The present value costs for the full lifetime of the Project total $4,350,529. It should be underscored that present value benefits of the Project far exceed present value costs.

Table 8-15: (PSP Table 19) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012										$
2013	$225,940							**$225,940**	0.943	**$213,151**
2014	$225,940							**$225,940**	0.890	**$201,086**
2015	$3,943,053							**$3,943,053**	0.840	**$3,310,663**
2016			$10,000	$10,000			$3,361	**$23,361**	0.792	**$18,504**
2017			$10,000	$10,000			$3,361	**$23,361**	0.747	**$17,457**
2018			$10,000	$10,000			$3,361	**$23,361**	0.705	**$16,469**
2019			$10,000	$10,000			$3,361	**$23,361**	0.665	**$15,536**
2020			$10,000	$10,000			$3,361	**$23,361**	0.627	**$14,657**
2021			$10,000	$10,000			$3,361	**$23,361**	0.592	**$13,827**
2022			$10,000	$10,000			$3,361	**$23,361**	0.558	**$13,045**
2023			$10,000	$10,000			$3,361	**$23,361**	0.527	**$12,306**
2024			$10,000	$10,000			$3,361	**$23,361**	0.497	**$11,610**
2025			$10,000	$10,000			$3,361	**$23,361**	0.469	**$10,953**
2026			$10,000	$10,000	$350,000		$3,361	**$373,361**	0.442	**$165,138**
2027			$10,000	$10,000			$3,361	**$23,361**	0.417	**$9,748**
2028			$10,000	$10,000			$3,361	**$23,361**	0.394	**$9,196**

Table 8-15: (PSP Table 19)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2029			$10,000	$10,000			$3,361	**$23,361**	0.371	**$8,675**
2030			$10,000	$10,000			$3,361	**$23,361**	0.350	**$8,184**
2031			$10,000	$10,000			$3,361	**$23,361**	0.331	**$7,721**
2032			$10,000	$10,000			$3,361	**$23,361**	0.312	**$7,284**
2033			$10,000	$10,000			$3,361	**$23,361**	0.294	**$6,872**
2034			$10,000	$10,000			$3,361	**$23,361**	0.278	**$6,483**
2035			$10,000	$10,000			$3,361	**$23,361**	0.262	**$6,116**
2036			$10,000	$10,000	$350,000		$3,361	**$373,361**	0.247	**$92,212**
2037			$10,000	$10,000			$3,361	**$23,361**	0.233	**$5,443**
2038			$10,000	$10,000			$3,361	**$23,361**	0.220	**$5,135**
2039			$10,000	$10,000			$3,361	**$23,361**	0.207	**$4,844**
2040			$10,000	$10,000			$3,361	**$23,361**	0.196	**$4,570**
2041			$10,000	$10,000			$3,361	**$23,361**	0.185	**$4,311**
2042			$10,000	$10,000			$3,361	**$23,361**	0.174	**$4,067**
2043			$10,000	$10,000			$3,361	**$23,361**	0.164	**$3,837**
2044			$10,000	$10,000			$3,361	**$23,361**	0.155	**$3,620**
2045			$10,000	$10,000			$3,361	**$23,361**	0.146	**$3,415**

Table 8-15: (PSP Table 19)
Dominguez Gap Spreading Grounds West Basin Percolation Enhancements
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2046			$10,000	$10,000	$350,000		$3,361	$373,361	0.138	$51,491
2047			$10,000	$10,000			$3,361	$23,361	0.130	$3,039
2048			$10,000	$10,000			$3,361	$23,361	0.123	$2,867
2049			$10,000	$10,000			$3,361	$23,361	0.116	$2,705
2050			$10,000	$10,000			$3,361	$23,361	0.109	$2,552
2051			$10,000	$10,000			$3,361	$23,361	0.103	$2,407
2052			$10,000	$10,000			$3,361	$23,361	0.097	$2,271
2053			$10,000	$10,000			$3,361	$23,361	0.092	$2,143
2054			$10,000	$10,000			$3,361	$23,361	0.087	$2,021
2055			$10,000	$10,000			$3,361	$23,361	0.082	$1,907
2056			$10,000	$10,000	$350,000		$3,361	$373,361	0.077	$28,752
2057			$10,000	$10,000			$3,361	$23,361	0.073	$1,697
2058			$10,000	$10,000			$3,361	$23,361	0.069	$1,601
2059			$10,000	$10,000			$3,361	$23,361	0.065	$1,510
2060			$10,000	$10,000			$3,361	$23,361	0.061	$1,425
2061			$10,000	$10,000			$3,361	$23,361	0.058	$1,344
2062			$10,000	$10,000			$3,361	$23,361	0.054	$1,268

Table 8-15: (PSP Table 19) Dominguez Gap Spreading Grounds West Basin Percolation Enhancements Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2063			$10,000	$10,000			$3,361	**$23,361**	0.051	**$1,196**
2064			$10,000	$10,000			$3,361	**$23,361**	0.048	**$1,129**
2065			$10,000	$10,000			$3,361	**$23,361**	0.046	**$1,065**
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$4,350,529**

Benefits and Costs Summary

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis the main uncertainties are associated with the future cost of importing water, the percolation and recharge rates of the Dominguez Gap Spreading Grounds West Basin and the frequency of periodic maintenance and component replacement. These issues are listed in **Table 8-16**.

Table 8-16: Omissions, Biases, and Uncertainties, and Their Likely Impact on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Future cost of importing water	+	This analysis assumes that the cost of importing an acre foot of water will increase in real terms over time. Given the anticipated population growth regionally, potential climate change impacts on supply and demand, the demand for water and price of importing water will continue to increase, but it is not known by how much. Conservative real price escalation rates are used in this analysis.
Recharge rates of the Dominguez Gap Spreading Grounds West Basin	U	The Los Angeles County Flood Control District has conducted multiple technical studies to evaluate the West Basin and predict enhanced percolation rates. Nevertheless, these percolation and recharge rates are not guaranteed. Drought or deluge conditions could increase or decrease anticipated recharge rates, for example.
Frequency of periodic maintenance and component replacement	-	Two key components of the Project will need to be replaced over time. First of these is the slide gate on the interbasin structure between the two basins. This is anticipated to last 50 years. If the gate needs to be replaced sooner, the Project will incur additional costs. Second of these is the pipeline that connects the two basins. It has an expected 100 year lifetime. If the pipeline needs to be replaced sooner, the Project will also incur additional costs.

*Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.

++ = Likely to increase net benefits significantly.
– = Likely to decrease benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

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Foothill Municipal Water District Recycled Water Project

This attachment presents the economic analysis for the Foothill Municipal Water District (FMWD) Recycled Water Project (Project). A project overview and project benefit summary table are followed by the following sections as outlined in the Proposal Solicitation Package: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The FMWD Recycled Water 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 scalp municipal wastewater flows from a separate influent connection stemming from a Sanitation Districts of Los Angeles County (LACSD) 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 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 development of a local, alternative supply reduces FMWD's and its member agencies' dependence on imported water deliveries. Recycled water from the proposed 0.25 MGD MBR plant will help to replenish the Raymond Groundwater Basin for increased future production. 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. Implementation of the Project will reduce costs associated with imported water, while decreasing both energy consumption and greenhouse gas emissions. Development of a conservation component of the Project will help to meet the statutory mandate of SBx7-7 that requires a 20% reduction in per capita urban potable water use by 2020.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-17**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justifications are described in Attachment 7.

Table 8-17: Benefit-Cost Analysis Overview (Present Values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$3,776,055
Monetizable Benefits	
Avoided Imported Water Supply Costs	$5,085,680
Avoided Costs of Constructing an Above-Ground Storage Tank	$1,957,455[4]
Avoided Social Costs of Carbon Emissions	$90,415
Total Monetizable Benefits	$7,133,550
Qualitative Benefit or Cost	**Qualitative Indicator***
Provide education or technology benefits	++
Provide social recreation or access benefits	+
Help avoid, reduce or resolve various public water resources conflicts?	+
Benefit wildlife or habitat in ways that were not quantified in Attachment 7	+
Improve water quality in ways that were not quantified in Attachment 7	+

[4] From FMWD Master Plan. In 2006 dollars and includes piping.

Improve the overall, long-term management of California groundwater resources	+
Reduce demand for net diversions for the regions from the Delta?	+
Provide a long-term solution in place of a short-term one?	+
Improve water supply reliability in ways not quantified in Attachment 7	++

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

"USD" = United States dollars

Non-Monetized Benefits Analysis (Section D2)

Table 8-18 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table are provided in the narrative of qualitative benefits section after the table.

Table 8-18: (PSP Table 12): Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	Yes
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes

No.	Question	Enter "Yes", "No" or "Neg"
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	No
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species?	

No.	Question	Enter "Yes", "No" or "Neg"
	- Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No[1]
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features?	

No.	Question	Enter "Yes", "No" or "Neg"
	- Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15 **16**	**Assist in development of MBR Policy** **Provide demonstration of infiltration project for other communities**	Yes

Narrative Description of Qualitative Benefits

Provide education or technology benefits

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

The University departments involved in the Project received a grant through the Cal Poly Pomona Strategic Interdisciplinary Research Grant Program to assist FMWD. The relationship between FMWD and Cal Poly Pomona provides a unique opportunity for students to gain real world experience in project design and implementation.

Within the Civil Engineering department, the proposed Project will be the focus of a one-year capstone course, which is required for graduation. In addition to developing a 3D model of the infiltration galleries, ten Civil Engineering students will develop preliminary facility designs and analyses needed to demonstrate the feasibility of the Project. Because most of the engineering work is below ground, seven Landscape Architecture students will design the above ground space (adjacent to the MBR plant and above the infiltration gallery) to incorporate drought tolerant, low water use landscaping. Additionally, two Urban and Regional Planning students will assess the impact of water recycling on city planning and examine the ideal policies to encourage these types of projects moving forward. For the Landscape Architecture and Urban and Regional Planning students, this Project will provide a project-based elective course that contributes to their overall degree programs.

The work developed by the Cal Poly Pomona students will provide educational benefits for the broader community. First, the low water use landscaping developed by the Department of Landscape Architecture (for both the MBR plant and infiltration gallery project sites) will serve as an important water conservation education tool. The landscaped sites will be incorporated into public tours in order to showcase Southern California-friendly landscaping (drought tolerant and low water use) and improved irrigation technologies. In addition, appropriate signage will be placed in the landscaped sites and information will be posted on FMWD's website. This will provide a natural learning opportunity as the sites are used every day by both adults and students.

In addition, the University will assist FMWD in developing a water-related education curriculum for 5th graders within the La Cañada United School District. The curriculum will conform to and enhance new state standards for water-related education and will include a social science component related to careers in water resources and the environment.

Public and school group tours of the MBR plant will also be provided to promote further education on recycled water. The 3D model of the infiltration galleries developed by the Cal Poly Pomona team will serve as an important educational tool during these tours. Tours will also 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.

Most importantly, the proposed Project will provide educational and community benefits beyond the local scope of the Project, since the infiltration system design, landscape palate, educational curricula, and ecosystem field trips will be created in such a way that they can be modeled for use by other water agencies, school districts, and community groups throughout the state. This is the first stormwater infiltration gallery Project of its type in California and offers a new era of innovation for local source water reliability and sustainability.

Provide social recreation or access benefits

FMWD plans to make the recycled water facility available for public tours, which will be the primary social recreation benefit associated with the Project. In addition, the proposed site for the facility lays barren and was previously used as a staging area for construction. With the Project, it will be developed to include native landscaping, and in conjunction with the public tours, will increase the aesthetics and enjoyment of the area.

Finally, the existing artificial turf football field located on the LCHS campus is nearing the end of its life expectancy and will need to be replaced by 2015. Funds associated with this Project will be allocated to assist in artificial turf removal as the infiltration galleries will need to be constructed underneath. La Cañada High School will then pay for the replacement of the turf as it was already determined that the artificial turf was approaching its useful life cycle and a fundraising campaign was started in 2011. This will reduce overall costs for the high school.

Help avoid, reduce or resolve various public water resources conflicts

This Project helps to meet requirements set forth in California Senate Bill X7-7 (2009), which sets an overall goal for urban water suppliers of reducing per capita water use by 20% by December 31, 2020 (and by at least 10% by December 31, 2015). Under this legislation, recycled water does not count against an agency's per capita use calculation, and therefore essentially counts as "conserved" water. This Project also helps to meet statewide goals to increase use of recycled wastewater by at least 1 million AFY by 2020 and by at least 2 million AFY by 2030 (State Water Resources Control Board, 2009).

Improve water quality in ways that were not quantified in Attachment 7

The 280 AFY of municipal wastewater to be treated by the MBR facility will be supplied by the LACSD District No. 28 Joint Outfall B – Unit 6 Trunk Sewer located in the City of La Cañada Flintridge. Typically this wastewater, which is classified as a residential wastewater supply, travels to the Whittier Narrows Water Reclamation Plant for treatment prior to being discharged to the San Gabriel River (and ultimately the Pacific Ocean). Thus, the Project will avoid the discharge of 280 AFY of treated wastewater to the Ocean.

In addition, the MBR facility will capture and treat an additional 38 AFY from a combination 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. FMWD will capture this potential supply, treat the flows within the MBR facility, and then discharge the effluent into the infiltration galleries for groundwater recharge. This will reduce pollutant loading to the L.A. River and the Pacific Ocean of constituents typical of surface runoff, including: Nitrate, Phosphates, Ammonia, Sulfate, Chloride, Heavy Metals, Total Dissolved Solids (TDS), Coliform (Total and Fecal).

Improve the overall long-term management of California's groundwater resources

The FMWD Recycled Water Project seeks to replenish the Raymond Basin for the purpose of acquiring groundwater pumping credits from the Raymond Basin Management Board to distribute to its participating member agencies. FMWD will recharge an initial 318 AFY prior to withdrawing any groundwater, resulting in a net recharge amount of 318 AFY.

Reduce demand for net diversions from the Delta

FMWD purchases imported water from the Metropolitan Water District of Southern California (MWD). MWD obtains its water from two sources: the Colorado River Authority (CRA), which it owns and operates, and the SWP, with which MWD has a water supply contract through the state of California. Currently, imported water purchases from MWD account for 100% of the supplies FMWD provides to its member agencies. About three-fourths of this water is imported through the CRA, while the remainder comes from the SWP (FMWD UWMP, 2011). For this analysis, it is assumed that this Project will avoid the use of SWP supplies from MWD, as this is the most expensive and energy intensive source of supply for MWD to provide.

By reducing the use of imported SWP water, the proposed Project will augment in-stream flows in the Sacramento-San Joaquin River Delta (which provides the means by which the SWP delivers water from Northern California to the south) or will offset other diversions that may otherwise reduce flows. Reduced demands on Delta supplies will also help reduce the overall salinity of the Delta and improve Delta habitat.

Maintaining the Delta's environmental condition is vital to maintaining and improving the viability of the region. The Delta provides drinking water to 25 million people, supports irrigation of 4.5 million acres of agriculture, and serves as home to 750 plant and animal species. The Delta's 1,600 square miles of marshes, islands, and sloughs support at least half of migratory water birds on the Pacific Flyway; 80% of California's commercial fisheries; and recreational uses including boating, fishing, and windsurfing (AECOM, 2012).

Delta resources are in a state of crisis. Fish populations, including salmon and Delta-smelt, have declined dramatically in recent years. The levee system is aging, and the vulnerability of the Delta to flooding, sea level rise, or a major earthquake has contributed to concerns about possible levee collapse. In addition, water quality problems continue, and there is little consensus on how to manage water resources through storage.

Provide a long-term solution in place of a short-term one

The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands), drought, changes in snowpack, earthquakes, environmental regulations, water rights determinations, and associated legal challenges and Court rulings. Because FMWD is 100% reliant on MWD imported water supplies, the agency recognizes the need to develop additional, local, reliable sources of water to meet current and future demands. The proposed Project offers a drought-resistant water supply source and long-term solution that will help reduce continued reliance on imported water supplies.

Improve water supply reliability in ways not quantified in Attachment 7

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The proposed Project will help address reliability issues for FMWD (and its member agencies) by offsetting the use of imported water provided by MWD. As noted above, the reliability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands), drought, earthquakes, environmental regulations and water rights determinations.

Only a few studies have directly attempted to quantify the value of water supply reliability (i.e., through nonmarket valuation studies; see for example Carson and Mitchell, 1987, CUWA, 1994, Griffen and Mjelde, 2000, Raucher et al., 2013). Results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that water customers are willing to pay approximately $100 to more than $500 per household per year in 2012 dollars for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought).

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

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

For example, the Project will offset 318 AFY of imported water. In 2020, total FMWD imported water demand will be about 11,259 AFY (FMWD, 2011). Thus, about 2.82% of total imported demand will be met by recycled water made available as a result of the project. To obtain a lower bound estimate for the value of improved reliability associated with this water, it is assumed that households within the service areas of FMWD wholesale agencies are willing to pay about $2.82 per year for improved reliability of supplies ($100 multiplied by 2.82%). Applying this per household dollar value to the approximately 32,000 households within the collective service areas in 2020[5] would result in $90,240 of benefits. Taking into account increasing population and changing demands, this calculation could be completed for each year of the project’s useful life.

[5] Estimate calculated based on the projected 2020 population documented in the 2010 FMWD UWMP. Population was divided by 2.99 persons per household (based on Census data for L.A. County) to obtain household estimate.

Due to FMWD's status as a wholesale water provider, and due to the uncertainty involved in applying these numbers to this situation, this benefit estimate is not included in the monetized benefit tables. However, it is provided here to give an idea of the potential magnitude of this benefit.

Assist in Development of MBR Policy

LACSD is currently developing an MBR policy that uses the FMWD Recycled Water Project as the model to further develop MBR facilities within the County of Los Angeles. Without the proposed Project, the policy may be further delayed and lack significant data and input from an existing MBR project.

Provide Demonstration of Infiltration Project for Other Communities

In addition, the proposed Project will provide an incentive for other agencies interested in developing recycled water with infiltration galleries. Specifically, the Project will serve as an example of how an agency without access to a central recycled water system or groundwater recharge basins, due to cost and geographic restrictions, can make such a project feasible.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 50-year life of the Project, including:

- Avoided imported water supply costs
- Avoided costs associated with construction of an above ground storage tank
- Reduced social costs associated with CO_2 emissions

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).

Avoided imported water supply costs

FMWD is a wholesale distributor of imported water to seven retail agencies located in the foothills of the San Gabriel Mountains. FMWD is a member agency of MWD and currently has only one connection with that entity. Although FMWD is 100% reliant on imported MWD supplies, FMWD's retail agencies supplement imported water with local supplies. On average in the service area, about 60% of demands are met through imported water while 40% is local water.

By expanding the use of recycled water and capturing stormwater and urban runoff, this Project will directly offset the use of 318 AFY of imported water provided to FMWD by MWD. Although FMWD's member agencies use a mix of imported water and local sources to supply their customers, imported water is more expensive to provide than other sources, and it is not considered to be a very reliable source of supply (see reliability discussion above). For this analysis, imported water is therefore considered the marginal water source. Thus, reduced overall water demand due to increased use of recycled water will be used to reduce reliance on imported water supplies exclusively.

To calculate the avoided costs of imported water over time, the amount of imported water avoided each year is multiplied by the projected cost of imported water. For this analysis, it is assumed that the Project will avoid Tier 1 treated MWD water supplies because this is the primary source of water obtained by FMWD, and the extent of Tier 2 versus Tier 1 future usage is unknown. In 2013, the cost of Tier 1 treated water for FMWD amounted to $847 per AF of water delivered ($830 in 2012 USD).

In recent years, annual MWD rate increases have averaged about 6% in nominal terms (i.e., including inflation). For this analysis, we assume that the cost of imported supplies will continue to increase at this rate through 2020 due to current and planned MWD financial commitments. After adjusting for projected annual inflation of about 2.3%[6], the cost of imported water is therefore expected to increase annually by 3.5% or more in real terms over this time period. Beginning in 2021, a 1.5% annual real increase in water rates is assumed through the end of the Project life. **Appendix 8.1** provides additional documentation on the escalation rates for imported water costs assumed for this analysis.

The Project will begin providing recycled water in 2016 and will avoid a total of up to 15,900 AF of imported water over the expected 50-year project life. Based on the assumptions described above and applying a discount rate of 6% (per DWR's PSP Guidelines), total present value benefits associated with the avoided purchase of imported water from MWD amount to $5,085,680 million.

6 Based on long-range Consumer Price Index (CPI) projections from the Federal Reserve Bank of Philadelphia of 2.3% per year, for 2013 through 2022.

Avoided costs associated with construction of an above-ground storage tank

The FMWD system includes 6 storage tanks at 3 pressure zone locations with a total storage capacity of 6.8 million gallons (about 21 AF). 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 the service area, and full development of property in the remaining area, property has not been identified for construction of an additional (above ground) storage tank to relieve this peaking.

With the Project, the groundwater basin will provide additional storage, helping to avoid the construction (and associated costs) of a steel or concrete storage tank above ground or expansions/retrofits of existing reservoirs. The California Department of Public Health has recommended that FMWD construct another potable water storage tank within its service area. However, based on the planned development of alternative resources, including recycled water, CDPH in a letter dated August 26, 2010 indicated that the District may not need additional storage capacity. Without the Project, FMWD would need to begin the process of building additional storage or expanding/retrofitting existing reservoirs, immediately.

FMWD estimates that the capital cost of a new 1 MG storage tank would amount to about $2.1 million including piping but excluding costs associated with land purchase. O&M costs associated with a new storage tank project would be about $10,000 per year. For this analysis, it is assumed that a new storage tank project would be implemented over 2 years, with construction beginning in 2014 and operation beginning in 2017. Based on these assumptions, and a discount rate of 6% (per PSP guidelines), total present value costs associated with the construction of the storage tank would amount to $1,957,455 through mid-2066, the end of the expected life of the proposed Project. With the proposed Project, these costs will be avoided. The present value avoided costs are shown in Table 8-19.

Reduced social costs of carbon emissions

As described in Attachment 7, reduced reliance on imported water will avoid the extensive energy requirements associated with transporting water from Northern California to FMWD (SWP water is considered to be MWD's marginal water source for this analysis). This in turn will result in avoided CO_2 emissions (a GHG) associated with the production of this energy.

To calculate avoided CO_2 emissions with the Project, we multiplied the amount of energy required to treat and convey 318 AF of water by the average carbon emissions rate associated with energy production in California (0.724 lbs/kWh or 0.328 MT/MWh). [7] The same calculation was used for treating, infiltrating, and pumping the recharged recycled water and capturing stormwater and urban runoff. This provided the annual net reduction in CO_2 emissions resulting from the Project and the calculations are described in detail in Attachment 7.

By avoiding 318 AFY of imported water (at full implementation), the Project will result in a net reduction in CO_2 emissions of 195 MT per year. Given the schedule for Project construction (with some benefits beginning to accrue in 2016), total net CO_2 emissions reductions amount to 9,750 MT over the 50-year project life.

To monetize this benefit, we applied the dollar value assigned to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalent (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT (updated from 2010 values using CPI), with a range of values from $4.95 to $68.33 per MT. The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions. Estimates of the portions of the net benefits occurring in the United States range from 7% to 23% of the worldwide social cost of carbon.

For this analysis, the average value of $22.53/MT was used when calculating social benefits and costs, which produces conservative estimates for the benefits and costs associated with GHG emissions. To determine total costs over the 50-year project period, we escalate the social cost of carbon by 2.4% per year[8], which is above the general rate of inflation. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change.

Over the 50-year project life, total present value benefits associated with avoided social costs of carbon amount to $90,415.

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

[8] The United Kingdom has established an official estimate of the social cost of carbon for use in many of its project evaluations and models the growth rate of the real cost at 2.4% per year.

Summary of Monetized Benefits

Table 8-19 summarizes the annual benefits from the Project, including avoided imported water purchases and reduced social costs associated with greenhouse gas emissions. **Table 8-20** shows the avoided costs associated with having to construct an additional storage tank if the Project is not implemented.

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2012									
2013									
2014									
2015									
2016	Imported water supply	AF	80	0	80	$913.75	$72,643	0.792	**$57,540**
	Social costs of CO_2 emissions	MT	93	44	49	$24.77	$1,209	0.792	**$958**
2017	Imported water supply	AF	318	0	318	$945.73	$300,743	0.747	**$224,732**
	Social costs of CO_2 emissions	MT	371	175	195	$25.37	$4,954	0.747	**$3,702**
2018	Imported water supply	AF	318	0	318	$978.83	$311,269	0.705	**$219,432**
	Social costs of CO_2 emissions	MT	371	175	195	$25.98	$5,073	0.705	**$3,576**
2019	Imported water supply	AF	318	0	318	$1,013.09	$322,163	0.665	**$214,257**
	Social costs of CO_2 emissions	MT	371	175	195	$26.60	$5,194	0.665	**$3,455**
2020	Imported water supply	AF	318	0	318	$1,048.55	$333,439	0.627	**$209,204**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	Social costs of CO_2 emissions	MT	371	175	195	$27.24	$5,319	0.627	**$3,337**
2021	Imported water supply	AF	318	0	318	$1,064.28	$338,440	0.592	**$200,322**
	Social costs of CO_2 emissions	MT	371	175	195	$27.89	$5,447	0.592	**$3,224**
2022	Imported water supply	AF	318	0	318	$1,080.24	$343,517	0.558	**$191,818**
	Social costs of CO_2 emissions	MT	371	175	195	$28.56	$5,578	0.558	**$3,114**
2023	Imported water supply	AF	318	0	318	$1,096.45	$348,670	0.527	**$183,675**
	Social costs of CO_2 emissions	MT	371	175	195	$29.25	$5,711	0.527	**$3,009**
2024	Imported water supply	AF	318	0	318	$1,112.89	$353,900	0.497	**$175,877**
	Social costs of CO_2 emissions	MT	371	175	195	$29.95	$5,848	0.497	**$2,906**
2025	Imported water supply	AF	318	0	318	$1,129.59	$359,208	0.469	**$168,411**
	Social costs of CO_2 emissions	MT	371	175	195	$30.67	$5,989	0.469	**$2,808**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2026	Imported water supply	AF	318	0	318	$1,146.53	$364,596	0.442	**$161,261**
	Social costs of CO_2 emissions	MT	371	175	195	$31.40	$6,133	0.442	**$2,712**
2027	Imported water supply	AF	318	0	318	$1,163.73	$370,065	0.417	**$154,415**
	Social costs of CO_2 emissions	MT	371	175	195	$32.16	$6,280	0.417	**$2,620**
2028	Imported water supply	AF	318	0	318	$1,181.18	$375,616	0.394	**$147,860**
	Social costs of CO_2 emissions	MT	371	175	195	$32.93	$6,430	0.394	**$2,531**
2029	Imported water supply	AF	318	0	318	$1,198.90	$381,250	0.371	**$141,583**
	Social costs of CO_2 emissions	MT	371	175	195	$33.72	$6,585	0.371	**$2,445**
2030	Imported water supply	AF	318	0	318	$1,216.88	$386,969	0.350	**$135,572**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	371	175	195	$34.53	$6,743	0.350	**$2,362**
2031	Imported water supply	AF	318	0	318	$1,235.14	$392,774	0.331	**$129,817**
	Social costs of CO_2 emissions	MT	371	175	195	$35.36	$6,905	0.331	**$2,282**
2032	Imported water supply	AF	318	0	318	$1,253.66	$398,665	0.312	**$124,306**
	Social costs of CO_2 emissions	MT	371	175	195	$36.20	$7,070	0.312	**$2,205**
2033	Imported water supply	AF	318	0	318	$1,272.47	$404,645	0.294	**$119,029**
	Social costs of CO_2 emissions	MT	371	175	195	$37.07	$7,240	0.294	**$2,130**
2034	Imported water supply	AF	318	0	318	$1,291.56	$410,715	0.278	**$113,975**
	Social costs of CO_2 emissions	MT	371	175	195	$37.96	$7,414	0.278	**$2,057**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
2035	Imported water supply	AF	318	0	318	$1,310.93	$416,876	0.262	**$109,137**
	Social costs of CO_2 emissions	MT	371	175	195	$38.87	$7,592	0.262	**$1,987**
2036	Imported water supply	AF	318	0	318	$1,330.59	$423,129	0.247	**$104,504**
	Social costs of CO_2 emissions	MT	371	175	195	$39.81	$7,774	0.247	**$1,920**
2037	Imported water supply	AF	318	0	318	$1,350.55	$429,476	0.233	**$100,067**
	Social costs of CO_2 emissions	MT	371	175	195	$40.76	$7,960	0.233	**$1,855**
2038	Imported water supply	AF	318	0	318	$1,370.81	$435,918	0.220	**$95,819**
	Social costs of CO_2 emissions	MT	371	175	195	$41.74	$8,152	0.220	**$1,792**
2039	Imported water supply	AF	318	0	318	$1,391.37	$442,457	0.207	**$91,751**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	371	175	195	$42.74	$8,347	0.207	**$1,731**
2040	Imported water supply	AF	318	0	318	$1,412.24	$449,093	0.196	**$87,856**
	Social costs of CO_2 emissions	MT	371	175	195	$43.77	$8,548	0.196	**$1,672**
2041	Imported water supply	AF	318	0	318	$1,433.43	$455,830	0.185	**$84,126**
	Social costs of CO_2 emissions	MT	371	175	195	$44.82	$8,753	0.185	**$1,615**
2042	Imported water supply	AF	318	0	318	$1,454.93	$462,667	0.174	**$80,555**
	Social costs of CO_2 emissions	MT	371	175	195	$45.89	$8,963	0.174	**$1,561**
2043	Imported water supply	AF	318	0	318	$1,476.75	$469,607	0.164	**$77,135**
	Social costs of CO_2 emissions	MT	371	175	195	$47.00	$9,178	0.164	**$1,508**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2044	Imported water supply	AF	318	0	318	$1,498.90	$476,651	0.155	**$73,861**
	Social costs of CO_2 emissions	MT	371	175	195	$48.12	$9,398	0.155	**$1,456**
2045	Imported water supply	AF	318	0	318	$1,521.39	$483,801	0.146	**$70,725**
	Social costs of CO_2 emissions	MT	371	175	195	$49.28	$9,624	0.146	**$1,407**
2046	Imported water supply	AF	318	0	318	$1,544.21	$491,058	0.138	**$67,723**
	Social costs of CO_2 emissions	MT	371	175	195	$50.46	$9,855	0.138	**$1,359**
2047	Imported water supply	AF	318	0	318	$1,567.37	$498,424	0.130	**$64,848**
	Social costs of CO_2 emissions	MT	371	175	195	$51.67	$10,091	0.130	**$1,313**
2048	Imported water supply	AF	318	0	318	$1,590.88	$505,900	0.123	**$62,095**
	Social costs of CO_2 emissions	MT	371	175	195	$52.91	$10,333	0.123	**$1,268**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2049	Imported water supply	AF	318	0	318	$1,614.75	$513,489	0.116	**$59,459**
	Social costs of CO_2 emissions	MT	371	175	195	$54.18	$10,581	0.116	**$1,225**
2050	Imported water supply	AF	318	0	318	$1,638.97	$521,191	0.109	**$56,934**
	Social costs of CO_2 emissions	MT	371	175	195	$55.48	$10,835	0.109	**$1,184**
2051	Imported water supply	AF	318	0	318	$1,663.55	$529,009	0.103	**$54,517**
	Social costs of CO_2 emissions	MT	371	175	195	$56.81	$11,095	0.103	**$1,143**
2052	Imported water supply	AF	318	0	318	$1,688.50	$536,944	0.097	**$52,203**
	Social costs of CO_2 emissions	MT	371	175	195	$58.18	$11,362	0.097	**$1,105**
2053	Imported water supply	AF	318	0	318	$1,713.83	$544,998	0.092	**$49,987**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	371	175	195	$59.57	$11,634	0.092	**$1,067**
2054	Imported water supply	AF	318	0	318	$1,739.54	$553,173	0.087	**$47,865**
	Social costs of CO_2 emissions	MT	371	175	195	$61.00	$11,914	0.087	**$1,031**
2055	Imported water supply	AF	318	0	318	$1,765.63	$561,471	0.082	**$45,833**
	Social costs of CO_2 emissions	MT	371	175	195	$62.47	$12,199	0.082	**$996**
2056	Imported water supply	AF	318	0	318	$1,792.12	$569,893	0.077	**$43,887**
	Social costs of CO_2 emissions	MT	371	175	195	$63.97	$12,492	0.077	**$962**
2057	Imported water supply	AF	318	0	318	$1,819.00	$578,442	0.073	**$42,024**
	Social costs of CO_2 emissions	MT	371	175	195	$65.50	$12,792	0.073	**$929**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2058	Imported water supply	AF	318	0	318	$1,846.28	$587,118	0.069	**$40,240**
	Social costs of CO_2 emissions	MT	371	175	195	$67.07	$13,099	0.069	**$898**
2059	Imported water supply	AF	318	0	318	$1,873.98	$595,925	0.065	**$38,531**
	Social costs of CO_2 emissions	MT	371	175	195	$68.68	$13,413	0.065	**$867**
2060	Imported water supply	AF	318	0	318	$1,902.09	$604,864	0.061	**$36,896**
	Social costs of CO_2 emissions	MT	371	175	195	$70.33	$13,735	0.061	**$838**
2061	Imported water supply	AF	318	0	318	$1,930.62	$613,937	0.058	**$35,329**
	Social costs of CO_2 emissions	MT	371	175	195	$72.02	$14,065	0.058	**$809**
2062	Imported water supply	AF	318	0	318	$1,959.58	$623,146	0.054	**$33,830**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	Social costs of CO_2 emissions	MT	371	175	195	$73.75	$14,403	0.054	**$782**
2063	Imported water supply	AF	318	0	318	$1,988.97	$632,493	0.051	**$32,393**
	Social costs of CO_2 emissions	MT	371	175	195	$75.52	$14,748	0.051	**$755**
2064	Imported water supply	AF	318	0	318	$2,018.81	$641,980	0.048	**$31,018**
	Social costs of CO_2 emissions	MT	371	175	195	$77.33	$15,102	0.048	**$730**
2065	Imported water supply	AF	318	0	318	$2,049.09	$651,610	0.046	**$29,701**
	Social costs of CO_2 emissions	MT	371	175	195	$79.19	$15,465	0.046	**$705**
2066	Imported water supply	AF	239	0	239	$2,079.82	$496,038	0.043	**$21,330**
	Social costs of CO_2 emissions	MT	278	132	146	$81.09	$11,877	0.043	**$511**

Table 8-19: (PSP Table 15) Foothill Municipal Water District Water Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									$5,085,680
Comments:									

Table 8-20: (PSP Table 16) Foothill Municipal Water District Recycled Water Project Annual Costs of Avoided Projects (2012 Dollars)						
(a)	Costs				Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Costs Avoided for Individual Alternatives (b) + (C) + (d)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(b)	(c)	(d)	(e)	(i)	(j)
2012						
2013						
2014	$ 1,050,000			$ 1,050,000	0.899	$ 943,950
2015	$ 1,050,000			$ 1,050,000	0.839	$ 880,950
2016			$ 10,000	$ 10,000	0.792	$ 7,921
2017			$ 10,000	$ 10,000	0.747	$ 7,473
2018			$ 10,000	$ 10,000	0.705	$ 7,050
2019			$ 10,000	$ 10,000	0.665	$ 6,651
2020			$ 10,000	$ 10,000	0.627	$ 6,274
2021			$ 10,000	$ 10,000	0.592	$ 5,919
2022			$ 10,000	$ 10,000	0.558	$ 5,584
2023			$ 10,000	$ 10,000	0.527	$ 5,268
2024			$ 10,000	$ 10,000	0.497	$ 4,970
2025			$ 10,000	$ 10,000	0.469	$ 4,688
2026			$ 10,000	$ 10,000	0.442	$ 4,423

Table 8-20: (PSP Table 16) Foothill Municipal Water District Recycled Water Project Annual Costs of Avoided Projects (2012 Dollars)						
(a)	Costs				Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Costs Avoided for Individual Alternatives (b) + (C) + (d)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(b)	(c)	(d)	(e)	(i)	(j)
2027			$ 10,000	$ 10,000	0.417	**$ 4,173**
2028			$ 10,000	$ 10,000	0.394	**$ 3,936**
2029			$ 10,000	$ 10,000	0.371	**$ 3,714**
2030			$ 10,000	$ 10,000	0.350	**$ 3,503**
2031			$ 10,000	$ 10,000	0.331	**$ 3,305**
2032			$ 10,000	$ 10,000	0.312	**$ 3,118**
2033			$ 10,000	$ 10,000	0.294	**$ 2,942**
2034			$ 10,000	$ 10,000	0.278	**$ 2,775**
2035			$ 10,000	$ 10,000	0.262	**$ 2,618**
2036			$ 10,000	$ 10,000	0.247	**$ 2,470**
2037			$ 10,000	$ 10,000	0.233	**$ 2,330**
2038			$ 10,000	$ 10,000	0.220	**$ 2,198**
2039			$ 10,000	$ 10,000	0.207	**$ 2,074**
2040			$ 10,000	$ 10,000	0.196	**$ 1,956**
2041			$ 10,000	$ 10,000	0.185	**$ 1,846**
2042			$ 10,000	$ 10,000	0.174	**$ 1,741**
2043			$ 10,000	$ 10,000	0.164	**$ 1,643**

Table 8-20: (PSP Table 16) Foothill Municipal Water District Recycled Water Project Annual Costs of Avoided Projects (2012 Dollars)						
(a)	Costs				Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Costs Avoided for Individual Alternatives (b) + (C) + (d)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(b)	(c)	(d)	(e)	(i)	(j)
2044			$ 10,000	$ 10,000	0.155	**$ 1,550**
2045			$ 10,000	$ 10,000	0.146	**$ 1,462**
2046			$ 10,000	$ 10,000	0.138	**$ 1,379**
2047			$ 10,000	$ 10,000	0.130	**$ 1,301**
2048			$ 10,000	$ 10,000	0.123	**$ 1,227**
2049			$ 10,000	$ 10,000	0.116	**$ 1,158**
2050			$ 10,000	$ 10,000	0.109	**$ 1,092**
2051			$ 10,000	$ 10,000	0.103	**$ 1,031**
2052			$ 10,000	$ 10,000	0.097	**$ 972**
2053			$ 10,000	$ 10,000	0.092	**$ 917**
2054			$ 10,000	$ 10,000	0.087	**$ 865**
2055			$ 10,000	$ 10,000	0.082	**$ 816**
2056			$ 10,000	$ 10,000	0.077	**$ 770**
2057			$ 10,000	$ 10,000	0.073	**$ 727**
2058			$ 10,000	$ 10,000	0.069	**$ 685**
2059			$ 10,000	$ 10,000	0.065	**$ 647**
2060			$ 10,000	$ 10,000	0.061	**$ 610**

Table 8-20: (PSP Table 16) Foothill Municipal Water District Recycled Water Project Annual Costs of Avoided Projects (2012 Dollars)						
(a)	Costs				Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Costs Avoided for Individual Alternatives (b) + (C) + (d)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(b)	(c)	(d)	(e)	(i)	(j)
2061			$ 10,000	$ 10,000	0.058	**$ 575**
2062			$ 10,000	$ 10,000	0.054	**$ 543**
2063			$ 10,000	$ 10,000	0.051	**$ 512**
2064			$ 10,000	$ 10,000	0.048	**$ 483**
2065			$ 10,000	$ 10,000	0.046	**$ 456**
2066			$ 5,000	$ 5,000	0.043	**$ 215**
Total Present Value of Discounted Costs (Sum of column (g))						**$ 1,957,455**
(%) Avoided Cost Claimed by Project						**100%**
Total Present Value Discounted Avoided Project Costs Claimed by Alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)						**$ 1,957,455**

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Capital costs for the Project total is $2,935,300. Direct construction and implementation costs (including construction administration and contingency) account for $2,212,000 (about 75%) of total capital costs. Project administration, planning, design, environmental documentation and compliance, and mitigation costs account for the remainder of the capital budget. In addition to the project capital costs, the value of the easement for the land at the proposed MBR site is estimated to be $70,000. This is included as an additional project cost for the purposes of this analysis (pursuant to PSP guidelines).

O&M costs associated with the Project will total $100,000 per year. This includes an estimated $25,000 in administrative costs, $50,000 in operations costs, $15,000 in general maintenance costs, and $5,000 in other costs. In addition, periodic replacement costs associated with the Project are expected to average about $5,000 per year.

In total, the present value capital and O&M costs associated with the Project amount to $3,776,055 over the 50-year project life. **Table 8-21** summarizes the economic project costs for the Project.

Table 8-21 (PSP Table 19)
Foothill Municipal Water District Recycled Water Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012								$0	1.000	$0
2013	$199,503	$70,000						$269,503	0.943	$254,248
2014	$432,668							$432,668	0.890	$385,073
2015	$951,600							$951,600	0.840	$798,982
2016	$1,351,529		$6,250	$12,500	$3,750	$1,250	$1,250	$1,376,529	0.792	$1,090,340
2017			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.747	$74,726
2018			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.705	$70,496
2019			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.665	$66,506
2020			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.627	$62,741
2021			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.592	$59,190
2022			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.558	$55,839
2023			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.527	$52,679
2024			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.497	$49,697
2025			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.469	$46,884
2026			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.442	$44,230
2027			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.417	$41,727
2028			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.394	$39,365
2029			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.371	$37,136

Table 8-21 (PSP Table 19) Foothill Municipal Water District Recycled Water Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2030			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.350	$35,034
2031			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.331	$33,051
2032			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.312	$31,180
2033			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.294	$29,416
2034			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.278	$27,751
2035			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.262	$26,180
2036			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.247	$24,698
2037			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.233	$23,300
2038			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.220	$21,981
2039			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.207	$20,737
2040			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.196	$19,563
2041			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.185	$18,456
2042			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.174	$17,411
2043			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.164	$16,425
2044			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.155	$15,496
2045			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.146	$14,619
2046			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.138	$13,791
2047			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.130	$13,011

Table 8-21 (PSP Table 19) Foothill Municipal Water District Recycled Water Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost(1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2048			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.123	$12,274
2049			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.116	$11,579
2050			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.109	$10,924
2051			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.103	$10,306
2052			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.097	$9,722
2053			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.092	$9,172
2054			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.087	$8,653
2055			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.082	$8,163
2056			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.077	$7,701
2057			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.073	$7,265
2058			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.069	$6,854
2059			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.065	$6,466
2060			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.061	$6,100
2061			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.058	$5,755
2062			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.054	$5,429
2063			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.051	$5,122
2064			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.048	$4,832
2065			$25,000	$50,000	$15,000	$5,000	$5,000	$100,000	0.046	$4,558

Table 8-21 (PSP Table 19)
Foothill Municipal Water District Recycled Water Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2066			$18,750	$37,500	$11,250	$3,750	$3,750	$75,000	0.043	$3,225
	$2,935,300	$70,000	$1,250,000	$2,500,000	$750,000	$250,000	$250,000	$8,005,300	Total Present Value:	$3,776,055
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										

Comments:
(1) If any, based on opportunity costs, sunk costs and associated costs
(2) (2) The incremental change in O&M costs attributable to the project

Benefits and Costs Summary

As shown in the Tables 8-19 – 8-21 above, the total present value benefits associated with the FMWD Recycled Water Project amount to $7,133,550 over the expected 50-year project life. The total present value cost of the Project (including capital and O&M costs) is $3,776,055. The proposed Project will therefore result in total present value net benefits of $3,357,495.

Total monetized benefits include avoided imported water supply costs, avoided costs associated with the construction of an additional (above ground) storage tank, and reduced social costs associated with CO_2 emissions.

In addition to monetized benefits and costs, the proposed Project will also result in the following physically quantifiable and non-monetized benefits:

- Provide education and/or technology benefits through collaboration with Cal Poly Pomona, development of water related curriculum and tours of the MBR plant, native landscape sites, and local watershed park
- Social recreation/access benefits through public tours and installation of native landscaping at previously undeveloped half-acre site of MBR plant
- Help avoid, reduce, or resolve various public water resources conflicts by helping to meet state mandates associated with water recycling
- Improve water quality due to avoided surface runoff
- Improve the overall long-term management of California's groundwater resources
- Reduce demand for net diversions from the Delta
- Provide a long-term solution in place of a short-term one
- Improve water supply reliability by offsetting the use of imported water with locally-generated recycled water
- Provide example for development of LACSD MBR Policy
- Provide example of feasibility of infiltration projects for other communities

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the total amount of avoided imported water supplies and reduced social costs of CO_2 emissions. These issues are listed in **Table 8-22**.

Table 8-22: Omissions, Biases, and Uncertainties, and Their Likely Impact on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided imported water supply costs	U	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, this would potentially result in more irrigation, which would increase the possibility of capturing more urban runoff
Reduced social costs of CO_2 emissions	U	The amount of imported water supply avoided will directly affect the reduction in GHG emissions generated by the Project.

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

References

AECOM. 2012. The State Water Project Final Delivery Reliability Report 2011. Prepared for the State of California Natural Resources Agency, Department of Water Resources. Available: http://baydeltaoffice.water.ca.gov/swpreliability/FINAL2011DRR_DWR_Review_File-clean-6-25-12.pdf

Marsh Park, Phase II

This attachment presents the economic analysis for the Marsh Park, Phase II Project (Project). A Project overview and Project benefit summary table are followed by the following sections as outlined in the Proposal Solicitation Package: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

Marsh Park is located in the City of Los Angeles' Elysian Valley neighborhood, adjacent to the Los Angeles River. 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 1.0 acre in size. Phase II (the Project described here) will add 3.0 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.

The costs and benefits associated with Marsh Park, Phase II are independent from the other two phases since each phase has its own set of costs and benefits that will accrue regardless of whether the other phases are built.

Marsh Park, Phase II will provide park amenities and river access benefits to the local disadvantaged and park-poor community, as well as to regional area users of the park. Other benefits include expanding habitat connections to significant ecological areas; recharging groundwater with stormwater; capturing, retaining, and reusing stormwater; reducing imported water demand; improving Los Angeles River water quality; and revitalizing the river. It should be noted that the Phase II park will detain, infiltrate, and filter stormwater runoff from a 5.8 acre drainage area (i.e., the total park area for Phase II plus 2.8 acres of tributary neighborhood streets and lots).

Pavement and buildings in the existing industrial space will be removed and the materials will be recycled to the extent possible (e.g., pavement will be crumbled up and used as a road base). The park's three acres will contain the following components:

- 1.25 acres of riparian habitat that will be planted with native California riparian plants. These areas will include bioswales and stormwater filter inserts to provide detainment and bio-filtration for stormwater runoff before being slowly released into the Los

Angeles River. This area will provide habitat for wildlife that uses the soft-bottom areas of the Los Angeles River and the adjacent open space parkland.

- 0.2 acres of open space and free-play meadows will be provided where un-programmed recreation can take place on a surface planted with drought-tolerant grasses, including both native grass and turf.
- More than 1.55 acres of hardscape and buildings will be provided, which will include a picnic shelter, restroom, and parking lot.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-23**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-23: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$6,113,944
Monetizable Benefits	
Social recreation and access benefits	$15,722,024
Other social benefits: Increased property values	$102,182
Total Monetizable Benefits	$15,824,205
Physically Quantified Benefit or Cost	**Project Life Total**
Imported offset - permanent reduction of onsite irrig. demands	101 acre-feet
Imported offset - recharge with urban runoff and stormwater	214 acre-feet
Capture stormwater during a 50-year storm	1.5 acre feet
Stormwater filtered	214 acre-feet
Reduction in peak flow during 50-year storm	0.77 cubic feet per second
Energy conservation	826,600 kWh
Greenhouse gas avoidance	200 metric tons
Area of residential and park land that will benefit from improved stormwater drainage	5.8 acres
Creation of park area	3 acres
Creation of riparian habitat within park	1.25 acres (42% of land)
Conversion of impervious industrial land into park land	3 acres
Qualitative Benefit or Cost	**Qualitative Indicator***
Education benefits	+
Promote social health and safety	+
Other social benefits: redress distribution of environmental benefits, provide beneficial effects to DACs	++
Benefit wildlife and habitats	++
Improve water quality (in ways not quantified in Att. 7)	+
Reduce net emissions of Greenhouse Gases (in ways not quantified in Att. 7)	+
	+

Improve overall, long-term management of California groundwater resources	+
Promote energy savings	+
Other: reduce flood risks	

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

"USD" = United States dollars

Non-Monetized Benefits Analysis (Section D2)

Table 8-24 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table, are provided in the narrative of qualitative benefits section after the table.

Table 8-24: (PSP Table 12): Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	Yes
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities?	

No.	Question	Enter "Yes", "No" or "Neg"
	- Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	Yes
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	

No.	Question	Enter "Yes", "No" or "Neg"
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	No
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	Yes
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	

No.	Question	Enter "Yes", "No" or "Neg"
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	Yes

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

The narrative below explains the "yes" answers in Table 8-24 above. Some of the benefits described below are explained in more detail and/or are physically quantified in Attachment 7.

Provide education or technology benefits

Include educational features that should result in water supply, water quality, or flood damage reduction benefits

The Marsh Park II Project will provide year-round environmental and outdoor education programs intended to build environmental stewardship among the park's neighbors and regional visitors, and it will ultimately enhance water quality, water conservation, and plant and wildlife habitats in the area. More than 100 people per year are anticipated to participate in these programs.

These interpretive programs will be led by naturalists from the Mountains Recreation and Conservation Authority (MRCA) who will teach participants about gardening with native plants, the ecologies of the Los Angeles River, outdoor skills, general resource management tips to apply at home, and other topics.

These educational benefits will serve both the immediate underserved neighborhood of Elysian Village and the Los Angeles River's regional visitors.

Promote social health and safety

Marsh Park Phase II will help create a more livable, healthy, and safe community for both the children and adult residents. This is particularly important for the low-income, park-poor Elysian Valley community (see "Other social benefits," below), since the social health and safety benefits that accrue from parkland and open space have been disproportionately applied to higher-income communities with more park space. Marsh Park Phase II will provide a safe place for neighborhood children and adults to exercise and to reap the health benefits of these activities.

Other social benefits

Redress inequitable distribution of environmental burdens

The Project will convert three acres of industrial land, which currently blocks neighborhood access to the Los Angeles River, into park land that provides access to the river and many other park amenities. Currently, most of the three acres is a paved, vacant lot. One building on the site is currently being used by a dancewear manufacturing company. In the past, this area was also home to a moving and storage company warehouse and a truck company. Conversion of this industrial parcel to parkland will redress the inequitable distribution of environmental burdens in numerous ways. The Elysian Valley community where the proposed park is located is a low-income, residential neighborhood that is severely under-represented with park space. Conversion from industrial to park use will greatly reduce visual blight, provide park amenities, provide access to the river, reduce stormwater runoff issues, and provide other benefits (as described in this attachment) that, to date, have not been available to the community.

Disproportionate beneficial effects on disadvantaged communities

The Project will provide the benefits of park space to a disadvantaged community (DAC). As described above, the Elysian Valley community where this Project is located is a predominantly minority, low-income community, which is considered park-poor by Greater Los Angeles County (GLAC) Integrated Regional Water Management (IRWM) Region park standards. The GLAC *Open Space for Habitat and Recreation* Plan uses a standard of 4 acres of parkland per 1,000 residents, where parkland includes neighborhood and community parks that offer active and passive recreation opportunities. The Los Angeles County General Plan reflects this goal, and California Legislation AB 31 determines a site is park-poor if it has less than 3 acres of park space per 1,000 residents. This standard is often complemented with the goal of a park being within a ¼ to ½ mile radius of all residents. Not meeting one or both of these standards is often considered to be the definition of an "underserved community" from a parkland provision perspective.

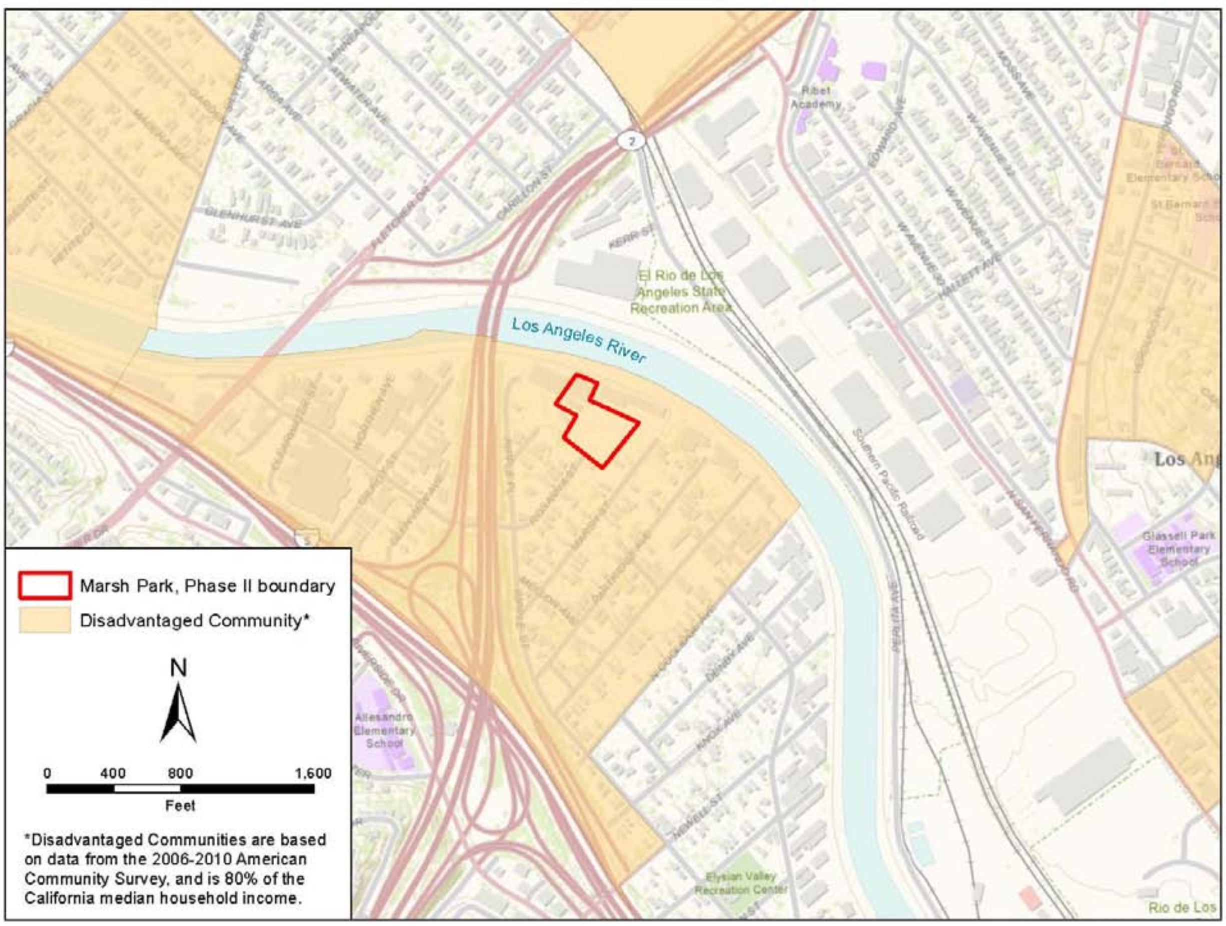
The Elysian Valley community is considered "park-poor" using these standards. According to the Community Fact Finder Report (see Appendix A to this Attachment), the usable park space per 1,000 residents within a 0.5 mile radius of the Project is only 0.21 acres[9]. To further illustrate the need for a park in this community, during community meetings residents have voiced their desire for more parkland to accommodate a large range of activities, and many neighborhood organizations and advocacy groups have supported the Marsh Park Phase II proposal over the past six years of community planning.

An additional community grievance is that even though the Los Angeles River and the adjacent Los Angeles River Greenway Trail run along the edge of the community and are used by other

[9] California DPR, 2013

Los Angeles and regional users, the large industrial spaces in the Elysian Valley community block community access to these amenities. The Project will finally connect the neighborhood to the Los Angeles River. The Project will be the largest park in the neighborhood that provides education and recreation amenities.

The DAC community that will benefit from the Project includes a relatively high percentage of families with low to middle income levels. The residents are primarily of Latino origin. As described in the Community Fact Finder Report, which calculates demographic data based on a 0.5 mile radius of the proposed park, the median household income in 2010 was $44,723 (California Department of Parks and Recreation (DPR) 2013). This represents about 73% of the median household income for the state of California during 2007-2011 of $61,632 (U.S. Bureau of Census 2013). Of the 6,024 people living in this area, about 18.7% (1,124 people) are living below the poverty line (California DPR 2013).



Benefit wildlife or habitat in ways that were not quantified in Attachment 7

Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat

The Project site will be planted with native Californian plants. The 0.2 acres of open space and free-play meadows will be converted from industrial use and planted with native grasses. Turf will be planted where needed to protect against active use. The Project will restore another 1.25 acres by converting the existing paved industrial use to a riparian habitat. This will support special status species including Western red bat, Hoary bat, Yuma myotis, and Mexican free-tailed bat. It will include a Southern Cottonwood Willow Riparian Forest that will function as a wildlife corridor connecting fauna to significant ecological areas in the nearby mountains. In addition, a wide range of native riparian shrubs, groundcover, and vines will be planted in the park.

Improve water quality in ways that were not quantified in Attachment 7

Cause an improvement in water quality in an impaired water body or sensitive habitat

The Project's natural filtration system will help decrease pollutants flowing into the Los Angeles River, thereby helping the City meet Total Maximum Daily Load (TMDL) requirements for trash. 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 TMDL for trash is located at: http://ofmpub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=CAR4052100019990202090157&p_cycle=2004&p_state=CA&p_report_type=T#causes

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.

Reduce net emissions in ways that were not quantified in Attachment 7

Reduce net production of greenhouse gasses

As described above, the park will convert a paved, industrial area to a park planted with a range of California native trees, shrubs, and grasses. This increased vegetation will provide carbon sequestration and related reductions in greenhouse gas emissions. Reduced Greenhouse Gas (GHG) emissions may also occur due to relatively lower energy use. As described in the next section ("Improve the overall, long-term management of California groundwater resources"), the increased groundwater recharge will offset imported water use downstream from Marsh Park. The provision of local water resources will decrease the energy used to move water from the north to the south.

Improve the overall, long-term management of California groundwater resources

Increase groundwater recharge

The Marsh Park II Project will result in increased groundwater recharge and infiltration as compared with the existing paved industrial lot. The Project will recharge 2.14 acre-feet per year. This is likely to lead to several benefits that will improve the overall, long-term management of groundwater resources. First, the captured water will recharge the groundwater and be retained in the San Fernando Basin, rather than being sent into the river and downstream to the ocean. Second, the recharged groundwater may be used by a downstream community, thus offsetting imported water usage. Finally, the Project 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. Although we have not conducted modeling to identify the impacts to the plume from the Project, MRCA's civil engineers and the Upper Los Angeles River Area (ULARA) Watermaster have confirmed that infiltrated water from the park will not exacerbate the groundwater contamination. According to the ULARA Watermaster, it is possible that benefits could be incurred from the infiltrated water. The ULARA Watermaster stated in a recent letter that, from a hydrogeologic perspective, "whenever and wherever deep percolation (infiltration) of 'treated' stormwater can be appropriately enhanced, then recharge to the underlying ground water reservoir (in this case, the San Fernando Groundwater Basin) can be beneficially increased."[10]

Promote energy savings

Reduce net energy use on a permanent basis

Energy uses in Marsh Park will be from electric lighting and pumping of water for irrigation. Data are not available on these and other current energy uses in the industrial space that would be replaced by the Project. However, when compared with other parks, it is anticipated that

[10] Letter from Upper LA River Area Watermaster dated 2/8/13 Re: Potential Stormwater Infiltration Project Proposed New Development, Job No. 500-LAS04

Marsh Park will use a relatively low amount of energy for lighting. With the exception of special events, the park will be locked at night and will not be lighted during that time. Large, stadium lights will not be used to light the park. In terms of pumping water for irrigation, the related energy costs might be offset by the energy benefits from avoidance of imported water downstream from Marsh Park II (see "Improve the overall, long-term management of California groundwater resources." above).

Improve water supply reliability in ways not quantified in Attachment 7

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The proposed Project will help address reliability issues for the City of Los Angeles water supply by offsetting the use of imported water. As noted above, the reliability of imported water is subject to a number of natural and human forces. Local groundwater supplies are regarded as more reliable than imported water due to these and other factors. Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. It is difficult to monetize the benefits associated with reliability since the level of reliability is difficult to quantify.

Other

Reduce flood risks

The stormwater management actions (e.g., bioswales, filter inserts, topography, riparian habitat) included in the Marsh Park II Project will help slow and infiltrate stormwater runoff into the Los Angeles River, thereby reducing downstream flood risk. The stormwater management actions will also serve as a buffer from possible river flooding. However, these benefits are not likely to be dramatic or easy to quantify. While minor pooling and flooding do occur on streets and other impervious surfaces in the neighborhood, building or property damage has not resulted from flooding during storms.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 100 year life of the Project. These include:

- Social recreation and access benefits
- Other social benefits: increase property values

Social recreation and access benefits

Marsh Park II will offer community residents and regional visitors a variety of social recreation and access opportunities on the three acres of open space, riparian habitat, and built environment, including:

- Passive recreation such as picnicking, strolling, sitting, reading, photography, and bird watching. Picnic tables, benches, and grills will be scattered throughout the park. Based on current use of Phase I of Marsh Park, an estimated 20 people per weekday and 50-70 people per weekend day will use the park for these purposes once Phase II is completed.[11]
- Active recreation such as frisbie, catch, one-on-one soccer practices, and free play (e.g., tag, hide and seek, exploring, running, climbing). A series of health and fitness zones will be installed throughout the park to provide active nodes within the natural setting. An estimated 5 people per weekday and 30 people were weekend day will engage in these activities.[3]
- Access to river-related activities, such as fishing and providing access for to the Los Angeles River Bike Path. An estimated 15 people per weekday and 20 people per weekend day will use the park for these purposes.[3] Marsh Park Phase II provides the only location for miles along the river where bikers can find water fountains, restrooms, and picnic areas. There will also be bike racks. Marsh Park Phase II connects the neighborhood to the regional Los Angeles River Bike Path, which in turn connects users to more than 11 other parks.
- Social gatherings at the picnic shelter and the picnic tables that will be scattered throughout the park for large organized parties, meetings, and other events. The goal is

[11] Personal communication with Melissa Guerrero, Mountains Recreation and Conservation Authority, March 2013

for Elysian Valley to become a regional gathering hub along the Los Angeles River. An estimated 40 to 100 people will use the park each week for these activities. [3]

The number of park users cited above was estimated based on anecdotal observations of the number of people who currently use Phase I of Marsh Park, and scaling up these numbers to account for the larger size and number of resources that will be provided by Phase II. These observations were conducted as part of a preliminary assessment of recreation use at the Marsh Park by MRCA in 2013. Based on the user estimates above and assumptions of (1) 115 weekend and holiday days per year and (2) 250 weekdays per year, Marsh Park Phase II would generate about 26,290 user days per year.

To estimate the monetary benefit associated with new recreation user days, we applied the average consumer surplus values per user day averaged over several relevant recreation activities from the Recreation Use Values Database (Oregon State University 2013). This database summarizes recreation use value estimates from multiple economic valuation studies for various activities and geographic scales. The average consumer surplus values per user day for picnicking, sightseeing, wildlife viewing, general recreation, and other recreation for the Western U.S. is $40.44 (2012$). Applying this average use value to the expected 26,290 user days per year, we estimate the annual use values associated with social recreation and access benefits to be $1,063,000. Over the 100 year life of the Project, applying a discount rate of 6%, our total estimated benefits have a present value of $15,722,024.

It is critical to note that increased access includes newly provided access to the river (as described above) and to parks. The limited numbers of parks in the area are not easy to get to because the neighborhood is cut off by highways and other infrastructure. Even parks that might be in walking distance are not safely accessible. Thus, construction of Marsh Park Phase II will provide the community with a safe, accessible, multi-use park.

Other social benefits: increase property values

Because of the multiple benefits provided by Marsh Park Phase II, the park is expected to help increase housing property values in close proximity to the park. The Trust for Public Land (Harnik and Welle 2009), estimated that the average value of property increased by 5% for properties within 500 feet of parks. To estimate the number of residences within 500 feet of the park, we conducted a visual count using Google Earth and estimated that approximately 25 residences would be within 500 feet. To obtain an estimate of property values in the area, we compiled listing prices and estimated values from Zillow.com for the Elysian Valley. We used the lower of the listing price or estimated value and obtained an average property value of $486,800. Applying the increased park value of 5%, we estimate that the increased property value associated with the park for residences within 500 feet of the park will be approximately $121,700 collectively. This is likely to be a very conservative value because property value increases are likely to extend to other local properties that are more than 500 feet from the park, but still within the immediate neighborhood. As this is a one-time capitalization of the benefits, assumed to accrue with park completion in 2015, applying a discount rate of 6%, the present value benefits in terms of increased property values is $102,182.

Table 8-25 summarizes the annual benefits from the Project. As shown, the total present value of benefits from improved park recreation and access is estimated to be $15,722,024, and the total present value of increased property values is estimated to be $102,182. Total present value of monetizable benefits is $15,824,205. There are no avoided costs associated with the Project.

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2012									
2013									
2014									
2015	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.840	**$892,556**
	property value	$	486,800	608,500	121,700	$1	$121,700	0.840	**$102,182**
2016	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.792	**$842,034**
	property value	$			0	$1	$0	0.792	**$0**
2017	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.747	**$794,372**
	property value	$	0	0	0	$1	$0	0.747	**$0**
2018	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.705	**$749,408**
	property value	$	0	0	0	$1	$0	0.705	**$0**
2019	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.665	**$706,988**
	property value	$	0	0	0	$1	$0	0.665	**$0**
2020	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.627	**$666,970**
	property value	$	0	0	0	$1	$0	0.627	**$0**
2021	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.592	**$629,217**
	property value	$	0	0	0	$1	$0	0.592	**$0**
2022	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.558	**$593,601**
	property value	$	0	0	0	$1	$0	0.558	**$0**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2023	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.527	**$560,001**
	property value	$	0	0	0	$1	$0	0.527	**$0**
2024	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.497	**$528,303**
	property value	$	0	0	0	$1	$0	0.497	**$0**
2025	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.469	**$498,399**
	property value	$	0	0	0	$1	$0	0.469	**$0**
2026	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.442	**$470,188**
	property value	$	0	0	0	$1	$0	0.442	**$0**
2027	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.417	**$443,573**
	property value	$	0	0	0	$1	$0	0.417	**$0**
2028	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.394	**$418,465**
	property value	$	0	0	0	$1	$0	0.394	**$0**
2029	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.371	**$394,779**
	property value	$	0	0	0	$1	$0	0.371	**$0**
2030	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.350	**$372,433**
	property value	$	0	0	0	$1	$0	0.350	**$0**
2031	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.331	**$351,352**
	property value	$	0	0	0	$1	$0	0.331	**$0**
2032	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.312	**$331,464**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	property value	$	0	0	0	$1	$0	0.312	**$0**
2033	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.294	**$312,702**
	property value	$	0	0	0	$1	$0	0.294	**$0**
2034	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.278	**$295,002**
	property value	$	0	0	0	$1	$0	0.278	**$0**
2035	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.262	**$278,303**
	property value	$	0	0	0	$1	$0	0.262	**$0**
2036	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.247	**$262,550**
	property value	$	0	0	0	$1	$0	0.247	**$0**
2037	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.233	**$247,689**
	property value	$	0	0	0	$1	$0	0.233	**$0**
2038	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.220	**$233,669**
	property value	$	0	0	0	$1	$0	0.220	**$0**
2039	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.207	**$220,442**
	property value	$	0	0	0	$1	$0	0.207	**$0**
2040	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.196	**$207,964**
	property value	$	0	0	0	$1	$0	0.196	**$0**
2041	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.185	**$196,193**
	property value	$	0	0	0	$1	$0	0.185	**$0**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2042	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.174	**$185,088**
	property value	$	0	0	0	$1	$0	0.174	**$0**
2043	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.164	**$174,611**
	property value	$	0	0	0	$1	$0	0.164	**$0**
2044	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.155	**$164,727**
	property value	$	0	0	0	$1	$0	0.155	**$0**
2045	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.146	**$155,403**
	property value	$	0	0	0	$1	$0	0.146	**$0**
2046	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.138	**$146,607**
	property value	$	0	0	0	$1	$0	0.138	**$0**
2047	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.130	**$138,308**
	property value	$	0	0	0	$1	$0	0.130	**$0**
2048	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.123	**$130,479**
	property value	$	0	0	0	$1	$0	0.123	**$0**
2049	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.116	**$123,094**
	property value	$	0	0	0	$1	$0	0.116	**$0**
2050	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.109	**$116,126**
	property value	$	0	0	0	$1	$0	0.109	**$0**
2051	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.103	**$109,553**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	property value	$	0	0	0	$1	$0	0.103	**$0**
2052	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.097	**$103,352**
	property value	$	0	0	0	$1	$0	0.097	**$0**
2053	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.092	**$97,502**
	property value	$	0	0	0	$1	$0	0.092	**$0**
2054	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.087	**$91,983**
	property value	$	0	0	0	$1	$0	0.087	**$0**
2055	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.082	**$86,776**
	property value	$	0	0	0	$1	$0	0.082	**$0**
2056	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.077	**$81,864**
	property value	$	0	0	0	$1	$0	0.077	**$0**
2057	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.073	**$77,231**
	property value	$	0	0	0	$1	$0	0.073	**$0**
2058	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.069	**$72,859**
	property value	$	0	0	0	$1	$0	0.069	**$0**
2059	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.065	**$68,735**
	property value	$	0	0	0	$1	$0	0.065	**$0**
2060	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.061	**$64,844**
	property value	$	0	0	0	$1	$0	0.061	**$0**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2061	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.058	**$61,174**
	property value	$	0	0	0	$1	$0	0.058	**$0**
2062	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.054	**$57,711**
	property value	$	0	0	0	$1	$0	0.054	**$0**
2063	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.051	**$54,445**
	property value	$	0	0	0	$1	$0	0.051	**$0**
2064	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.048	**$51,363**
	property value	$	0	0	0	$1	$0	0.048	**$0**
2065	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.046	**$48,455**
	property value	$	0	0	0	$1	$0	0.046	**$0**
2066	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.043	**$45,713**
	property value	$	0	0	0	$1	$0	0.043	**$0**
2067	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.041	**$43,125**
	property value	$	0	0	0	$1	$0	0.041	**$0**
2068	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.038	**$40,684**
	property value	$	0	0	0	$1	$0	0.038	**$0**
2069	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.036	**$38,381**
	property value	$	0	0	0	$1	$0	0.036	**$0**
2070	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.034	**$36,209**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	property value	$	0	0	0	$1	$0	0.034	**$0**
2071	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.032	**$34,159**
	property value	$	0	0	0	$1	$0	0.032	**$0**
2072	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.030	**$32,226**
	property value	$	0	0	0	$1	$0	0.030	**$0**
2073	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.029	**$30,402**
	property value	$	0	0	0	$1	$0	0.029	**$0**
2074	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.027	**$28,681**
	property value	$	0	0	0	$1	$0	0.027	**$0**
2075	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.025	**$27,057**
	property value	$	0	0	0	$1	$0	0.025	**$0**
2076	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.024	**$25,526**
	property value	$	0	0	0	$1	$0	0.024	**$0**
2077	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.023	**$24,081**
	property value	$	0	0	0	$1	$0	0.023	**$0**
2078	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.021	**$22,718**
	property value	$	0	0	0	$1	$0	0.021	**$0**
2079	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.020	**$21,432**
	property value	$	0	0	0	$1	$0	0.020	**$0**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2080	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.019	**$20,219**
	property value	$	0	0	0	$1	$0	0.019	**$0**
2081	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.018	**$19,074**
	property value	$	0	0	0	$1	$0	0.018	**$0**
2082	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.017	**$17,995**
	property value	$	0	0	0	$1	$0	0.017	**$0**
2083	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.016	**$16,976**
	property value	$	0	0	0	$1	$0	0.016	**$0**
2084	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.015	**$16,015**
	property value	$	0	0	0	$1	$0	0.015	**$0**
2085	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.014	**$15,109**
	property value	$	0	0	0	$1	$0	0.014	**$0**
2086	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.013	**$14,253**
	property value	$	0	0	0	$1	$0	0.013	**$0**
2087	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.013	**$13,447**
	property value	$	0	0	0	$1	$0	0.013	**$0**
2088	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.012	**$12,685**
	property value	$	0	0	0	$1	$0	0.012	**$0**
2089	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.011	**$11,967**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	property value	$	0	0	0	$1	$0	0.011	**$0**
2090	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.011	**$11,290**
	property value	$	0	0	0	$1	$0	0.011	**$0**
2091	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.010	**$10,651**
	property value	$	0	0	0	$1	$0	0.010	**$0**
2092	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.009	**$10,048**
	property value	$	0	0	0	$1	$0	0.009	**$0**
2093	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.009	**$9,479**
	property value	$	0	0	0	$1	$0	0.009	**$0**
2094	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.008	**$8,943**
	property value	$	0	0	0	$1	$0	0.008	**$0**
2095	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.008	**$8,437**
	property value	$	0	0	0	$1	$0	0.008	**$0**
2096	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.007	**$7,959**
	property value	$	0	0	0	$1	$0	0.007	**$0**
2097	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.007	**$7,509**
	property value	$	0	0	0	$1	$0	0.007	**$0**
2098	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.007	**$7,084**
	property value	$	0	0	0	$1	$0	0.007	**$0**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2099	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.006	**$6,683**
	property value	$	0	0	0	$1	$0	0.006	**$0**
2100	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.006	**$6,304**
	property value	$	0	0	0	$1	$0	0.006	**$0**
2101	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.006	**$5,947**
	property value	$	0	0	0	$1	$0	0.006	**$0**
2102	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.005	**$5,611**
	property value	$	0	0	0	$1	$0	0.005	**$0**
2103	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.005	**$5,293**
	property value	$	0	0	0	$1	$0	0.005	**$0**
2104	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.005	**$4,994**
	property value	$	0	0	0	$1	$0	0.005	**$0**
2105	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.004	**$4,711**
	property value	$	0	0	0	$1	$0	0.004	**$0**
2106	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.004	**$4,444**
	property value	$	0	0	0	$1	$0	0.004	**$0**
2107	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.004	**$4,193**
	property value	$	0	0	0	$1	$0	0.004	**$0**
2108	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.004	**$3,955**

Table 8-25: (PSP Table 15) Marsh Park, Phase II Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	property value	$	0	0	0	$1	$0	0.004	**$0**
2109	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.004	**$3,732**
	property value	$	0	0	0	$1	$0	0.004	**$0**
2110	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.003	**$3,520**
	property value	$	0	0	0	$1	$0	0.003	**$0**
2111	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.003	**$3,321**
	property value	$	0	0	0	$1	$0	0.003	**$0**
2112	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.003	**$3,133**
	property value	$	0	0	0	$1	$0	0.003	**$0**
2113	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.003	**$2,956**
	property value	$	0	0	0	$1	$0	0.003	**$0**
2114	user days/yr	$	0	1,063,049	1,063,049	$1	$1,063,049	0.003	**$2,788**
	property value	$	0	0	0	$1	$0	0.003	**$0**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$15,824,205**
Comments:									

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-26 summarizes the economic Project costs for the Project. Planning for Marsh Park II began in 2006, but was halted from 2008 to 2011 due to a bond freeze. Some design development and construction document costs are accounted for in 2012 ($112,985). Work on the Project was reinitiated in late 2010. As shown in the table, costs of $1,038,290 are allocated to the Project in 2013 and $4,153,158 is expected to occur in 2014. The total present value of Project capital costs over the 100 year life of the projects are estimated at $4,788,800.

In addition to the costs shown in **Table 8-26**, the property was purchased by the Trust for Public Land in 2001 for $3,500,000. Land ownership was then transferred to the Santa Monica Mountains Conservancy (SMMC), which in turn transferred it to the MRCA. A deed restriction states that the property must be developed into a public park and set aside in perpetuity for this use. Because of these requirements, land acquisition costs are not included in the total Project cost.

Annual operations and maintenance (O&M) costs include $6,750 for administration, $20,250 for operations, $40,500 for maintenance, and $22,100 for ongoing education costs. Replacement costs (e.g., costs of replacing stolen equipment and materials) are included under operations and maintenance. The total present value of O&M costs over the Project life is $1,325,144.

The total present value for capital plus O&M costs over the 100-year Project lifetime is $6,113,944.

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)											
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012	$112,985							**$ 112,985**	1.000	**$ 112,985**
2013	$1,038,290							**$ 1,038,290**	0.943	**$ 979,518**
2014	$4,153,158							**$ 4,153,158**	0.890	**$ 3,696,296**
2015	$ -		$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.840	**$ 75,230**
2016			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.792	**$ 70,972**
2017			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.747	**$ 66,954**
2018			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.705	**$ 63,164**
2019			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.665	**$ 59,589**
2020			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.627	**$ 56,216**
2021			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.592	**$ 53,034**
2022			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.558	**$ 50,032**
2023			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.527	**$ 47,200**
2024			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.497	**$ 44,528**
2025			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.469	**$ 42,008**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)											
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)							Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)		Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)		(i)	(j)
2026			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.442	**$ 39,630**
2027			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.417	**$ 37,387**
2028			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.394	**$ 35,271**
2029			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.371	**$ 33,274**
2030			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.350	**$ 31,391**
2031			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.331	**$ 29,614**
2032			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.312	**$ 27,938**
2033			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.294	**$ 26,356**
2034			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.278	**$ 24,864**
2035			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.262	**$ 23,457**
2036			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.247	**$ 22,129**
2037			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.233	**$ 20,877**
2038			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.220	**$ 19,695**
2039			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**		0.207	**$ 18,580**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +...+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2040			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.196	**$ 17,528**
2041			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.185	**$ 16,536**
2042			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.174	**$ 15,600**
2043			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.164	**$ 14,717**
2044			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.155	**$ 13,884**
2045			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.146	**$ 13,098**
2046			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.138	**$ 12,357**
2047			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.130	**$ 11,657**
2048			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.123	**$ 10,998**
2049			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.116	**$ 10,375**
2050			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.109	**$ 9,788**
2051			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.103	**$ 9,234**
2052			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.097	**$ 8,711**
2053			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.092	**$ 8,218**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2054			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.087	**$ 7,753**
2055			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.082	**$ 7,314**
2056			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.077	**$ 6,900**
2057			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.073	**$ 6,509**
2058			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.069	**$ 6,141**
2059			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.065	**$ 5,793**
2060			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.061	**$ 5,465**
2061			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.058	**$ 5,156**
2062			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.054	**$ 4,864**
2063			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.051	**$ 4,589**
2064			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.048	**$ 4,329**
2065			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.046	**$ 4,084**
2066			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.043	**$ 3,853**
2067			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.041	**$ 3,635**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +...+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2068			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.038	**$ 3,429**
2069			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.036	**$ 3,235**
2070			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.034	**$ 3,052**
2071			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.032	**$ 2,879**
2072			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.030	**$ 2,716**
2073			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.029	**$ 2,562**
2074			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.027	**$ 2,417**
2075			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.025	**$ 2,281**
2076			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.024	**$ 2,151**
2077			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.023	**$ 2,030**
2078			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.021	**$ 1,915**
2079			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.020	**$ 1,806**
2080			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.019	**$ 1,704**
2081			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.018	**$ 1,608**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)											
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2082			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.017	**$ 1,517**
2083			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.016	**$ 1,431**
2084			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.015	**$ 1,350**
2085			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.014	**$ 1,273**
2086			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.013	**$ 1,201**
2087			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.013	**$ 1,133**
2088			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.012	**$ 1,069**
2089			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.011	**$ 1,009**
2090			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.011	**$ 952**
2091			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.010	**$ 898**
2092			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.009	**$ 847**
2093			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.009	**$ 799**
2094			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.008	**$ 754**
2095			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.008	**$ 711**

Table 8-26: (PSP Table 19)
Marsh Park, Phase II
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2096			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.007	**$ 671**
2097			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.007	**$ 633**
2098			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.007	**$ 597**
2099			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.006	**$ 563**
2100			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.006	**$ 531**
2101			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.006	**$ 501**
2102			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.005	**$ 473**
2103			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.005	**$ 446**
2104			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.005	**$ 421**
2105			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.004	**$ 397**
2106			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.004	**$ 375**
2107			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.004	**$ 353**
2108			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.004	**$ 333**
2109			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.004	**$ 315**

Table 8-26: (PSP Table 19) Marsh Park, Phase II Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2110			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.003	**$ 297**
2111			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.003	**$ 280**
2112			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.003	**$ 264**
2113			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.003	**$ 249**
2114			$ 6,750	$20,250	$ 40,500	$ -	$ 22,100	**$ 89,600**	0.003	**$ 235**
2115			$ -	$ -	$ -	$ -	$ -	**$ -**	0.002	**$ -**
Column Sums	$5,304,433	$ -	$675,000	$2,025,000	$4,050,000	$ -	2,210,000	$14,264,433		$ 6,113,944
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$6,113,944**

Comments:

(1) If any, based on opportunity costs, sunk costs and associated costs

(2) The incremental change in O&M costs attributable to the project

Benefits and Costs Summary

The total present value for capital plus O&M costs over the 100-year Project lifetime is $6,113,944.

Monetized benefits, which include social recreation and access benefits and property value increases, are estimated at $15,824,205. In addition to these monetized benefits, construction of Marsh Park Phase II will provide the following benefits that can be quantified but are not easily monetized: reduction in imported water demand, recharging groundwater, capturing and reusing stormwater, capturing stormwater during a 50-year storm, filtering stormwater, reducing the flow of untreated stormwater in the Los Angeles River, creating a park, creating riparian habitat, converting impervious industrial land into park land, and creating open space and free-play meadows. Finally, unquantifiable benefits are numerous, including education, social health and safety, redressing inequitable distribution of environmental burdens, improving benefits related to park availability to a DAC, improving habitats for flora and fauna, improving water quality, reducing net GHG emissions, improving the overall, long-term management of California groundwater resources, promoting energy savings, and reducing flood risks.

As demonstrated above, the monetized benefits of the Project are expected to outweigh the costs by almost $10 million. Additional benefits that provide value but cannot be monetized show this to be a very solid investment.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with increased property values and recreational use values. These issues are listed in **Table 8-27**.

Table 8-27: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Increased property values	U	The peer reviewed empirical literature provides a range of property value impact estimates adding parks or other similar amenities in urban neighborhoods. We have used a moderate property value increase of 5% (the literature includes estimates of 7% or more. for literature). Moreover, we applied this to only a small number of residential properties within 500 feet of the

		park, whereas impacts are likely to extend to additional homes in the adjacent neighborhood beyond 500 feet..
Recreational use values	U	Projections of future park use, and the monetary values assigned, are subject to uncertainty. We believe the recreational use projections are modest and reasonable, and the valuation is based on well accepted values drawn from the large empirical peer reviewed literature.

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

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Oxford Retention Basin Multi-Use Enhancement Project

This attachment presents the economic analysis for the Oxford Retention Basin Multi-Use Enhancement Project (Project). A project overview and project benefit summary table are followed by the following sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), Flood Damage Reduction Benefit Analysis (Section D4), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Los Angeles County Flood Control District (LACFCD) will partner with the County of Los Angeles Department of Public Works (LACDPW) and the County of Los Angeles Department of Beaches & Harbors to implement a suite of improvements to an existing 10.7-acre retention pond facility owned and operated by LACFCD that will serve several distinct purposes, including:

- **Augment flood protection**. The Oxford Basin is inundated year-round with urban and stormwater runoff, high groundwater, and tidal inflows from Basin E of the Marina del Rey Harbor. Under a 50-year capital storm event, there is the potential for flooding along the southerly and westerly perimeters of the basin. This need will be addressed by the construction of a 2-foot-high parapet wall along the northwestern and southern boundaries of the basin. The Project will also mitigate localized flooding by modifying existing catch basins on Oxford Avenue.
- **Improve water quality**. The Oxford Basin discharges storm flows into Marina del Rey Basin E, which has been identified by the Los Angeles Regional Water Quality Control Board (RWQCB) as an impaired water body. Water quality deficiencies will be addressed by construction of a vegetated circulation berm, installation of trash best management practices (BMPs) at the outlets of storm drains which are draining to the basin, construction of bio-swales, and establishing native plants within the basin.
- **Enhance native habitat**. This Project will mitigate contaminated soils along the perimeter of the basin, which will allow the replacement of non-native plants with drought-tolerant native plants.
- **Create passive recreation features**. The significantly compromised habitat at the facility lacks recreational amenities and aesthetic appeal. This will be rectified by replacement of the existing sidewalk along Admiralty Way with a landscaped parkway and construction of decomposed granite walking trail around the basin. Additionally, there will be improved fencing, informational signage, and six observation areas with park benches overlooking Oxford Basin.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-28**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-28: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$12,368,859
Monetizable Benefits	
Avoided Nuisance Flood Pumping Costs	$95,390
Total Monetizable Benefits	**$95,390**
Physically Quantified Benefit or Cost	**Project Life Total**
Reduce number of nuisance flooding events	100
Restore Native Habitat	10 acres
Recreation Trail	3,500 Linear Feet
Passive Recreation Features	6 Observation Areas
Qualitative Benefit or Cost	**Qualitative Indicator***
Education or Technology Benefit	+
Social Recreation or Access Benefit	+
Avoid, Reduce, or Resolve Water Resources Conflicts	+
Social Health and Safety Benefit	+
Water Quality Benefit	+
Reduced Flood Damage	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-29 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table are provided in the narrative of qualitative benefits section after the table.

Table 8-29 (PSP Table 12) Oxford Retention Basin Multi-Use Enhancement Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	Yes
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	

Table 8-29 (PSP Table 12) Oxford Retention Basin Multi-Use Enhancement Project Non-monetized Benefits Checklist		
No.	Question	Enter “Yes”, “No” or “Neg”
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or	

Table 8-29 (PSP Table 12) Oxford Retention Basin Multi-Use Enhancement Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	No
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	No
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment**	No

Table 8-29 (PSP Table 12) Oxford Retention Basin Multi-Use Enhancement Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	7?	
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	No

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

Education or Technology Benefit

Install informational signage

As members of community use the new decomposed granite trail installed as a part of this Project, they will encounter informational signage. The public will encounter wayfinding signs, which will encourage them to experience the nature loop and benefit from the improved aesthetics of the Basin. In addition to wayfinding signs, there will be five interpretive signs which will provide valuable information such as General Details, Wildlife, Native Habitat, Tide Gates functionality, and the History of Oxford Basin. These interpretive signs will engage visitors and attract future visitors to Oxford Basin.

Social Recreation or Access Benefit

Add recreational amenities and native landscaping

Communities neighboring Oxford Basin have expressed a strong desire to improve recreational and habitat aspects of this site while introducing more aesthetically pleasing amenities. This

Project will replace a 10-foot chain link fence and unappealing shrubbery with more attractive alternatives and provide public access to the facility grounds with six new observational decks overlooking the basin, approximately 3,500 linear feet of walking/jogging trail, and a renovated bike path. These modifications will have a positive impact on the recreational aspect and will attract more people to Oxford Basin. Recreational attendance is expected to increase from almost nothing to as high as 100 visitors per day.

Avoid, Reduce, or Resolve Water Resources Conflicts

Reduce water quality impact of Oxford Retention Basin on Marina del Rey TMDL compliance

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 this area, and records show bacteria exceedances during dry and wet weather (with six dry weather exceedances reported during November of 2012). Therefore, improvements are needed in order to meet the TMDL requirements. As this Project is designed to reduce pollutant loadings that would otherwise contribute to ongoing impairment, as mentioned in the Oxford Retention Basin Multiuse Enhancement Project – Project Design Concept, it will assist local agencies in avoiding monetary fines associated with TMDL violations.

The *Oxford Retention Basin Sediment and Water Quality Characterization Study* prepared in 2010 indicates that the Oxford Retention Basin tested positive for high levels 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).

Social Health and Safety Benefit

Reduce water quality impact of Oxford Retention Basin on Marina del Rey and beaches

Marina del Rey Harbor is located one block south of Oxford Basin in the unincorporated community of Marina del Rey (TG 671-J6), and Oxford Basin discharges storm flows into Marina del Rey Basin E. The harbor's back basins are widely used for recreational purposes. Particularly, the open swimming area at Mother's Beach exposes the public to pollutants. Water quality improvements to Oxford Basin will therefore improve the back basins, reducing public exposure to water-related hazards.

Enhanced recreational opportunities may lead to community health benefits by encouraging interactive outdoor activities, such as walking, jogging, and bicycling.

Water Quality Benefit

Improve water quality in Oxford Retention Basin

LACFCD plans to study the resulting water quality improvements upon Project completion. The pollutants of concern are bacteria (i.e., Total Coliform, Fecal Coliform or E-Coli, and Enterococcus). It is not practical to quantify the bacteria load reduction with modeling prior to construction because bacteria counts depend on many different factors that are not easily determined. Any modeling efforts would require extensive amounts of time, funding, and experimental data.

However, a pre- and post-construction monitoring plan will assess the pollutant load reduction and determine the Project’s effectiveness by looking at the change in bacteria loading. An adaptive management approach will ensure project objectives are achieved. And although specific water quality improvements (e.g., volume treated and TMDL reductions) cannot be quantified at this time, some positive outcomes can be predicted.

For example, Oxford Basin currently experiences lack of circulation due to manually-operated tide gates. The resulting stagnant water leads to bacterial and algal growth, which ultimately impair the water quality. The proposed vegetated berm, installation of programmable tide gates, introduction of dissolved oxygen, and removal of deposited sediment will improve circulation within the basin. The project scope also includes removal of contaminated soils along the perimeter of Oxford Basin and replacement with clean imported fill, which will also improve the water quality. LACFCD is planning to complete a monitoring plan that will begin monitoring at the basin in May 2013.

Monetized Benefit Analysis (Section D3)

Monetized benefits from avoided nuisance flood pumping are expected to accrue over the expected 50-year life of the Project. These are described below, and summarized in Table 8-30.

Avoided Nuisance Flood Pumping Cost

Oxford Retention Basin Multi-Use Enhancement Project

The Oxford Retention Basin is a flood control facility covering approximately 10.7 acres which collects urban and storm water runoff from approximately 700 acres of the Marina del Rey Watershed. It contains runoff in a large retention pond, which drains into the marina when water surface elevation in the marina is lower than that of the basin.

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 responds to each incident with emergency pumping to remove the water. LACDPW estimates that pumping water from the intersection requires a pumping truck in addition to two employees to work a total of 16 hours over two separate flooding episodes per year. At $150/hour overtime rate, labor costs total $2,400 per event, with an additional pumping truck cost of $1,000 per event ($2,000/2 events) for a total of $6,800 in annual costs associated with nuisance flooding. As is shown in Table 8-30, the present value of avoided nuisance flooding due to the project totals $95,390 over the assumed 50-year project life.

Table 8-30 summarizes the annual benefits from the Project.

Table 8-30 (PSP Table 15) Oxford Retention Basin Multi-Use Enhancement Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2012	Avoided Pumping Costs	Flood Events	0	0	0	$3,400	$0	1.000	**$0**
2013	Avoided Pumping Costs	Flood Events	0	0	0	$3,400	$0	0.943	**$0**
2014	Avoided Pumping Costs	Flood Events	0	0	0	$3,400	$0	0.890	**$0**
2015	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.840	**$5,709**
2016	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.792	**$5,386**
2017	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.747	**$5,081**
2018	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.705	**$4,794**
2019	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.665	**$4,522**
2020	Avoided Pumping	Flood Events	2	0	2	$3,400	$6,800	0.627	**$4,266**

Table 8-30 (PSP Table 15) Oxford Retention Basin Multi-Use Enhancement Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
	Costs								
2021	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.592	**$4,025**
2022	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.558	**$3,797**
2023	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.527	**$3,582**
2024	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.497	**$3,379**
2025	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.469	**$3,188**
2026	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.442	**$3,008**
2027	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.417	**$2,837**
2028	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.394	**$2,677**

Table 8-30 (PSP Table 15)
Oxford Retention Basin Multi-Use Enhancement Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
2029	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.371	**$2,525**
2030	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.350	**$2,382**
2031	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.331	**$2,247**
2032	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.312	**$2,120**
2033	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.294	**$2,000**
2034	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.278	**$1,887**
2035	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.262	**$1,780**
2036	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.247	**$1,679**
2037	Avoided Pumping	Flood Events	2	0	2	$3,400	$6,800	0.233	**$1,584**

Table 8-30 (PSP Table 15) Oxford Retention Basin Multi-Use Enhancement Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
	Costs								
2038	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.220	**$1,495**
2039	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.207	**$1,410**
2040	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.196	**$1,330**
2041	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.185	**$1,255**
2042	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.174	**$1,184**
2043	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.164	**$1,117**
2044	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.155	**$1,054**
2045	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.146	**$994**

Table 8-30 (PSP Table 15)
Oxford Retention Basin Multi-Use Enhancement Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value [(1)]	(h) Annual $ Value [(1)] (f) x (g)	(i) Discount Factor [(1)]	(j) Discounted Benefits [(1)] (h) x (i)
2046	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.138	**$938**
2047	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.130	**$885**
2048	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.123	**$835**
2049	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.116	**$787**
2050	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.109	**$743**
2051	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.103	**$701**
2052	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.097	**$661**
2053	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.092	**$624**
2054	Avoided Pumping	Flood Events	2	0	2	$3,400	$6,800	0.087	**$588**

Table 8-30 (PSP Table 15) Oxford Retention Basin Multi-Use Enhancement Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
	Costs								
2055	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.082	**$555**
2056	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.077	**$524**
2057	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.073	**$494**
2058	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.069	**$466**
2059	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.065	**$440**
2060	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.061	**$415**
2061	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.058	**$391**
2062	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.054	**$369**

Table 8-30 (PSP Table 15) Oxford Retention Basin Multi-Use Enhancement Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
2063	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.051	**$348**
2064	Avoided Pumping Costs	Flood Events	2	0	2	$3,400	$6,800	0.048	**$329**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$95,390**

Flood Damage Reduction Benefit Analysis (Section D4)

The Oxford Retention Basin is a flood control facility covering approximately 10.7 acres which collects urban and storm water runoff from approximately 700 acres of the Marina del Rey Watershed. It contains runoff in a large retention pond, which drains into the marina when water surface elevation in the marina is lower than that of the basin.

Two 2010 hydrological studies by the LACDPW provide maximum water surface elevations for 10- and 50-year storm events. These studies show that there is no expected flooding damage to residential or commercial structures during either storm event. However, it is expected that without the Project, sea level rise projected over the 21st century will progressively lessen the ability of the basin to retain floodwaters. California's coast is predicted to experience sea level rise over the next century due to glacial melting and thermal expansion of oceans (Caltrans/HQ, 2011). There is some agreement among climate models on the amount of sea level rise through 2050, with sea level rise of approximately 17 inches possible. The models diverge when providing estimates for years past 2050 due to uncertainty surrounding future reductions in greenhouse gases. Caltrans estimates that sea level can rise by as much as 69 inches by 2100.

The Oxford Retention Basin currently provides flooding protection for a 50-year storm, during which only nuisance flooding occurs at the areas mentioned above. By constructing a parapet wall along the northwestern and southern edges of the retention pond, Oxford Basin will provide flooding protection up to eight feet (MSL). Based on an LACDPW contour map of the Oxford Basin Area, we expect the Project to prevent or alleviate flooding at roughly 60-70 residential structures in the watershed boundary, between Oxford Avenue, Marr Street, and Olive Street on the North side of Washington Avenue, and between Oxford Avenue and Howard Street on the south side of Washington Avenue. These structures lay between the six- and eight-foot contour levels, and are therefore susceptible to flooding in any storm event where the maximum water surface elevation exceeds six feet. No flood reduction benefits are realized for storm events which produce a water surface elevation greater than eight feet, since that is the limit of flood protection provided by this Project.

Given the uncertainty of exact parcel elevation and maximum water surface elevation produced by storms under varying sea level conditions, we do not monetize these flood reduction benefits. However, it appears that significant damage to residential structures will be avoided in the future if sea levels rise in line with projections.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Initial costs for the project total $10,775,174. This includes expenditures for direct project administration, final design and environmental documentation, construction and implementation, construction administration and contingencies, and other costs. Operations and maintenance costs are limited to $150,000 annually for administration expenditures. The present value of all future costs is $12,368,859.

Table 8-31 summarizes the economic costs for the Project.

Table 8-31 (PSP Table 19) Oxford Retention Basin Multi-Use Enhancement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost from Table 7 (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2009	$17,538							$17,538	1.030	**$18,064**
2010	$269,643							$269,643	1.020	**$275,036**
2011	$737,200							$737,200	1.010	**$744,572**
2012	$ 2,904,336							$2,904,336	1.000	**$2,904,336**
2013	$ 4,632,849							$4,632,849	0.943	**$4,370,612**
2014	$ 2,213,608							$2,213,608	0.890	**$1,970,103**
2015			$150,000					$150,000	0.840	**$125,943**
2016			$150,000					$150,000	0.792	**$118,814**
2017			$150,000					$150,000	0.747	**$112,089**
2018			$150,000					$150,000	0.705	**$105,744**
2019			$150,000					$150,000	0.665	**$99,759**
2020			$150,000					$150,000	0.627	**$94,112**
2021			$150,000					$150,000	0.592	**$88,785**
2022			$150,000					$150,000	0.558	**$83,759**
2023			$150,000					$150,000	0.527	**$79,018**
2024			$150,000					$150,000	0.497	**$74,545**

Table 8-31 (PSP Table 19)
Oxford Retention Basin Multi-Use Enhancement Project
Project Annual Costs
(2012 Dollars)

	Initial Costs Grand Total Cost from Table 7 (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2025			$150,000					$150,000	0.469	**$70,326**
2026			$150,000					$150,000	0.442	**$66,345**
2027			$150,000					$150,000	0.417	**$62,590**
2028			$150,000					$150,000	0.394	**$59,047**
2029			$150,000					$150,000	0.371	**$55,705**
2030			$150,000					$150,000	0.350	**$52,552**
2031			$150,000					$150,000	0.331	**$49,577**
2032			$150,000					$150,000	0.312	**$46,771**
2033			$150,000					$150,000	0.294	**$44,123**
2034			$150,000					$150,000	0.278	**$41,626**
2035			$150,000					$150,000	0.262	**$39,270**
2036			$150,000					$150,000	0.247	**$37,047**
2037			$150,000					$150,000	0.233	**$34,950**
2038			$150,000					$150,000	0.220	**$32,972**
2039			$150,000					$150,000	0.207	**$31,105**
2040			$150,000					$150,000	0.196	**$29,345**
2041			$150,000					$150,000	0.185	**$27,684**
2042			$150,000					$150,000	0.174	**$26,117**

Table 8-31 (PSP Table 19) Oxford Retention Basin Multi-Use Enhancement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost from Table 7 (row (i), column (d))	Adjusted Grant Total Cost[(1)]	Annual Costs [(2)]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2043			$150,000					$150,000	0.164	**$24,638**
2044			$150,000					$150,000	0.155	**$23,244**
2045			$150,000					$150,000	0.146	**$21,928**
2046			$150,000					$150,000	0.138	**$20,687**
2047			$150,000					$150,000	0.130	**$19,516**
2048			$150,000					$150,000	0.123	**$18,411**
2049			$150,000					$150,000	0.116	**$17,369**
2050			$150,000					$150,000	0.109	**$16,386**
2051			$150,000					$150,000	0.103	**$15,458**
2052			$150,000					$150,000	0.097	**$14,583**
2053			$150,000					$150,000	0.092	**$13,758**
2054			$150,000					$150,000	0.087	**$12,979**
2055			$150,000					$150,000	0.082	**$12,244**
2056			$150,000					$150,000	0.077	**$11,551**
2057			$150,000					$150,000	0.073	**$10,898**
2058			$150,000					$150,000	0.069	**$10,281**
2059			$150,000					$150,000	0.065	**$9,699**
2060			$150,000					$150,000	0.061	**$9,150**

Table 8-31 (PSP Table 19) Oxford Retention Basin Multi-Use Enhancement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost from Table 7 (row (i), column (d))	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2061			$150,000					$150,000	0.058	**$8,632**
2062			$150,000					$150,000	0.054	**$8,143**
2063			$150,000					$150,000	0.051	**$7,682**
2064			$150,000					$150,000	0.048	**$7,247**
Total Present Value of Discounted Costs (Sum of column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$12,368,859**

Benefits and Costs Summary

The construction of a two-foot parapet wall along the northwestern and southern perimeter of the current Oxford Retention Basin retention pond and the removal of sediment from the pond will directly avoid $95,390 in present value pumping costs associated with nuisance flooding at two intersections. Additional non-monetized benefits include reduced flooding damage to 60-70 structures, education benefits from signage, increased social recreation and access, increased riparian habitat, achieving TMDLs for bacteria, social health benefits, and improved water quality from sediment removal.

With a present value project cost of $12,368,859 and a present value benefit of $95,390, the Project appears to have a net cost of $12,273,469. However, reduced flooding damage to residential structures could easily provide millions of dollars of benefits, depending on the extent of the damage to buildings and their contents, as well as the additional costs associated with displacing and providing emergency relief for residents.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with avoided nuisance flood pumping costs and reduced flooding damage to residential structures. These issues are listed in **Table 8-32**.

Table 8-32: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided Nuisance Flood Pumping Cost	U	Pumping Costs for nuisance flooding at two intersections are based on two flood events per year. This is a reasonable average over the life of the Project; however some years will likely have a smaller or greater number of flood events. Given that benefits further in the future are discounted, this variation could have a small impact on the present value of benefits.
Reduced Flooding Damage to Residential Structures	+	Benefits from reduced structural and inventory damage depend largely on the period of inundation and depth of flooding produced by storm events. Given the variability in sea level rise over the life of the Project, and therefore the water surface elevation produced by flooding events, the number of buildings affected is likely to vary. Since significant rise in sea level is expected, the Project is likely to reduce flood damage costs during the life of the Project.

*Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

References

Caltrans/HQ, 2011. *Guidance on Incorporating Sea Level Rise: For use in the planning and development of Project Initiation Documents.* Prepared by the Caltrans Climate Change Workgroup, and the HQ Divisions of Transportation Planning, Design, and Environmental Analysis. California Department of Transportation. May.

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LACFCD, 2010. *Oxford Retention Basin Sediment and Water Quality Characterization Study.*

Pacoima Spreading Grounds Improvements Project

This attachment presents the economic analysis for the Pacoima Spreading Grounds Improvements Project (Project). A project overview and project benefit-cost summary table are followed by sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Pacoima Spreading Grounds is a 169-acre groundwater replenishment facility comprised of twelve shallow basins that recharge the San Fernando Valley Groundwater Basin using local surface water flows and imported water, and is owned and operated by the Los Angeles County Flood Control District (LACFCD). The primary goal of this Project is to improve the groundwater recharge ability of the Pacoima Spreading Grounds by increasing the facility's storage capacity and percolation rate. This will be achieved by removal of sediment and clay at the bottom of the spreading basins. This Project is expected to yield an additional recharge of 10,500 AFY that will be used to reduce the use of imported water that is purchased from the Metropolitan Water District (MWD). The Project includes replacement of a radial gate and open intake canal with four 54-inch diameter reinforced concrete pipes and a rubber dam. A trash rack will be installed on the intake to prevent trash from entering the spreading grounds. The new intake system will eliminate occasional flooding that occurs on Arleta Avenue near the intake canal due to storm flows which exceed the capacity of the intake canal. The Project will also reduce the peak flow rate in the channels downstream of the Project, including the Pacoima Diversion Channel and the Los Angeles River. There are also plans to make new open space available for future development as a park/recreation area by covering the new intake pipes with soil, although the park/recreation development is not a part of this Project. Finally, operation of the spreading grounds will be improved through installation of flow monitors and telemetry.

Summary Project Benefits and Costs

A summary of all benefits and costs of Project are provided in **Table 8-33**. A description of the monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7. As shown in Table 8-33, the present value (PV) of monetized benefits outweighs the PV costs by a considerable margin – the monetized benefits are approximately six times the costs.

Table 8-33: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$30,538,952[12]
Monetizable Benefits	
Avoided imported water supply costs	$177,209,979
Reduced social costs of CO2 emissions	$4,569,423
Total Monetizable Benefits	**$181,779,403**
Physically Quantified Benefits	**Project Life Total**
10,500 acre feet local water per year	630,000 AF
27.6 million kWh of energy conserved per year	1.7 billion kWh
9,047 metric tons per year of avoided CO_2e emissions	543,000 metric tons
18,250 pounds of ammonia reduced per year	1,095,000 pounds
4,015,000 billion colonies of total coliform bacteria loadings reduced per year	2.4×10^{17} colonies
65,700 billion colonies of E. coli bacteria loadings reduced per year	3.9×10^{15} colonies
876 pounds total copper reduced per year	52,560 pounds
657 pounds dissolved copper reduced per year	39,420 pounds
3,234 metric tons TDS per year	194,040 metric tons

Qualitative Benefit or Cost	Qualitative Indicator*
Provide more access to open space	+
Eliminate localized flooding risk	+
Increase groundwater supply available	+
Improve water supply reliability	+

* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.

[12] Includes only capital costs and replacement of rubber dam in 30 years. The O&M costs associated with desilting and cleaning up are expected to remain the same with and without the project.

– = Likely to decrease net benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

Non-Monetized Benefits Analysis (Section D2)

Table 8-34 shows the non-monetized benefits checklist for Project. Descriptions of the benefit categories marked "Yes" in the following table are provided in the narrative of qualitative benefits section after the table.

Table 8-34: (PSP Table 12)
Pacoima Spreading Grounds Improvements Project
Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include:	

Table 8-34: (PSP Table 12) Pacoima Spreading Grounds Improvements Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	

Table 8-34: (PSP Table 12) Pacoima Spreading Grounds Improvements Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	No
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No[1]
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	No

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

Provide social recreation or access benefits

Provide more access to open space

The Project will create new 6.7 acres of open space by filling in the intake canal which provides an opportunity for future recreational uses. The area, which is currently closed to public access, can be redesigned as a recreational/open space area open to the public in the future (not included as a benefit for this Project at this time).

Promote social health or safety

Reduce localized flooding risk

By diverting additional river flow from Tujunga Wash to the spreading grounds, the Project will reduce the peak flood flow by 77 cubic feet per second (cfs) downstream in the Pacoima Diversion Channel and the Los Angeles River due to increased storage and percolation rate.[13] 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 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.

Improve the overall, long-term management of California groundwater resources

Increase groundwater supply available

Local groundwater supply is a key resource that has historically been utilized to support approximately 12% of the City of Los Angeles' (City) total water demand. Since over 85% of demand is met with imported supplies, the City's increased use of groundwater and replenishment of groundwater basins is vital to sustain the long-term reliability of the Region's supply and to reduce the Region's dependence on imported water. This Project will help improve operations and increase groundwater recharge at Pacoima Spreading Grounds. This will in turn replenish the San Fernando Valley Groundwater Basin, increase local groundwater supply, and reduce the City's dependence on imported water.

[13] County of Los Angeles Department of Public Works, 2011. *Pacoima Spreading Grounds Project Concept Report.*

Improve water supply reliability in ways not quantified in Attachment 7

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The proposed Project will help address reliability issues for the City's water supply by offsetting the use of imported water. As noted above, the reliability of imported water is subject to a number of natural and human factors. Local groundwater supplies are regarded as more reliable than imported water due to these and other factors. Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. It is difficult to monetize the benefits associated with reliability since the level of reliability is difficult to quantify.

Monetized Benefit Analysis (Section D3)

Monetized benefits are expected to accrue over the expected 60-year life of the Project, from avoided costs of imported water and the social costs associated with avoided CO_2 emissions from imported water.

Avoided imported water supply costs

Local groundwater supply has historically been utilized to support approximately 12% of the City's total water demand. Since over 85% of demand is met with imported supplies, the City's increased use of groundwater and replenishment of groundwater basins is vital to sustain the long-term reliability of the Region's supply and to reduce the Region's dependence on imported water. The proposed improvement of the Pacoima Spreading Grounds will increase local water supply by an average of 10,500 acre-feet per year starting in 2016 when the Project is expected to be completed and in operation. This will offset the use of imported water for which the Los Angeles Department of Water and Power (LADWP) pays approximately $794 per acre foot (AF).

To calculate the avoided costs of imported water over time, the amount of imported water avoided each year is multiplied by the projected cost of imported water. For this analysis, it is assumed that the Project will avoid Tier 1 treated MWD water supplies because this is a primary source of imported water for the City. In 2012, the cost of Tier 1 treated water amounted to $794 per AF of water delivered.

Please note that value of imported water is expected to increase over the rate of inflation as water demand increases. This increased cost of importing a single AF of treated water is reflected in **Table 8-35**. Additional information on escalation methodology can be found in **Appendix 8-1**.

The Project will avoid a total of 630,000 AF of imported water over the expected 60-year life of the Project. Applying a discount rate of 6% (per DWR's PSP Guidelines), total present value benefits associated with the avoided purchase of this water amounts to about $177,209,979 over the life of the Project.

Reduced Social Costs of Greenhouse Gas Emissions

As described in Attachment 7, reduced reliance on imported water will avoid the extensive energy requirements associated with transporting water from Northern California and the Colorado River to the City of Los Angeles. This in turn will result in avoided greenhouse gas (GHG) emissions associated with the production of this energy.

By avoiding 10,500 AFY of imported water (at full implementation), the Project will result in a net reduction in CO_2 emissions of approximately 9,047 MT per year. Given that the Project will be operational in 2016, total net CO_2 emissions reductions amount to 543,000 MT over the 60-year Project life. These calculations are described in detail in Attachment 7.

To monetize this benefit, we applied the dollar value assigned to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalents (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommended values for the social cost of carbon for use in regulatory benefit-cost analyses. The recommended mean estimate of the social benefit of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT (updated from 2010 values using CPI), with a range of values from $4.70 to $64.90 per MT. The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions. Estimates of the portions of the net benefits occurring in the United States range from 7% to 23% of the worldwide social cost of carbon.

For this analysis, the average value of $22.53/MT was used when calculating social benefits and costs, which produces conservative estimates for the benefits and costs associated with GHG emissions. To determine total costs over the 60-year Project period, we escalate the social cost of carbon at a real rate of 2.4% per year, which is above the general rate of inflation. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change.

Over the 60-year life of the Project, total present value benefits associated with avoided social costs of carbon amount to $4,569,423.

Project Benefits and Costs Summary (Section D5)

Project Economic Benefits

The total economic benefits associated with this Project are $181,779,403 in present value. **Table 8-35** summarizes the annual benefits from the Project.

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value (1)**	**Annual $ Value (1) (f) x (g)**	**Discount Factor (1)**	**Discounted Benefits (1) (h) x (i)**
2012	Avoided imported water	Acre Feet				$794	$0	1.000	**$0**
2012	Reduced GHG emissions	Metric Tons				$22.53	$0	1.000	**$0**
2013	Avoided imported water	Acre Feet				$822	$0	0.943	**$0**
2013	Reduced GHG emissions	Metric Tons				$23.07	$0	0.943	**$0**
2014	Avoided imported water	Acre Feet				$851	$0	0.890	**$0**
2014	Reduced GHG emissions	Metric Tons				$23.62	$0	0.890	**$0**
2015	Avoided imported water	Acre Feet				$880	$0	0.840	**$0**
2015	Reduced GHG emissions	Metric Tons				$24.19	$0	0.840	**$0**
2016	Avoided imported water	Acre Feet	4,874	15,374	10,500	$911	$9,566,899	0.792	**$7,577,880**
2016	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$24.77	$224,112	0.792	**$177,518**
2017	Avoided imported water	Acre Feet	4,874	15,374	10,500	$943	$9,901,741	0.747	**$7,399,157**

Table 8-35: (PSP Table 15)
Pacoima Spreading Grounds Improvements Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
2017	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$25.37	$229,491	0.747	**$171,489**
2018	Avoided imported water	Acre Feet	4,874	15,374	10,500	$976	$10,248,302	0.705	**$7,224,648**
2018	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$25.98	$234,999	0.705	**$165,665**
2019	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,010	$10,606,992	0.665	**$7,054,256**
2019	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$26.60	$240,639	0.665	**$160,038**
2020	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,046	$10,978,237	0.627	**$6,887,882**
2020	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$27.24	$246,414	0.627	**$154,603**
2021	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,061	$11,142,910	0.592	**$6,595,472**
2021	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$27.89	$252,328	0.592	**$149,353**
2022	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,077	$11,310,054	0.558	**$6,315,475**
2022	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$28.56	$258,384	0.558	**$144,280**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2023	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,093	$11,479,705	0.527	**$6,047,365**
2023	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$29.25	$264,585	0.527	**$139,380**
2024	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,110	$11,651,901	0.497	**$5,790,638**
2024	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$29.95	$270,935	0.497	**$134,646**
2025	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,126	$11,826,679	0.469	**$5,544,809**
2025	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$30.67	$277,438	0.469	**$130,074**
2026	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,143	$12,004,079	0.442	**$5,309,416**
2026	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$31.40	$284,096	0.442	**$125,656**
2027	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,160	$12,184,140	0.417	**$5,084,016**
2027	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$32.16	$290,914	0.417	**$121,388**
2028	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,178	$12,366,903	0.394	**$4,868,185**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2028	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$32.93	$297,896	0.394	**$117,266**
2029	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,195	$12,552,406	0.371	**$4,661,517**
2029	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$33.72	$305,046	0.371	**$113,283**
2030	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,213	$12,740,692	0.350	**$4,463,622**
2030	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$34.53	$312,367	0.350	**$109,436**
2031	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,232	$12,931,803	0.331	**$4,274,129**
2031	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$35.36	$319,864	0.331	**$105,719**
2032	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,250	$13,125,780	0.312	**$4,092,680**
2032	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$36.20	$327,540	0.312	**$102,129**
2033	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,269	$13,322,666	0.294	**$3,918,934**
2033	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$37.07	$335,401	0.294	**$98,660**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2034	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,288	$13,522,506	0.278	**$3,752,564**
2034	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$37.96	$343,451	0.278	**$95,309**
2035	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,307	$13,725,344	0.262	**$3,593,257**
2035	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$38.87	$351,694	0.262	**$92,072**
2036	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,327	$13,931,224	0.247	**$3,440,713**
2036	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$39.81	$360,135	0.247	**$88,945**
2037	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,347	$14,140,192	0.233	**$3,294,645**
2037	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$40.76	$368,778	0.233	**$85,925**
2038	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,367	$14,352,295	0.220	**$3,154,778**
2038	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$41.74	$377,628	0.220	**$83,007**
2039	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,387	$14,567,580	0.207	**$3,020,849**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2039	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$42.74	$386,691	0.207	**$80,187**
2040	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,408	$14,786,093	0.196	**$2,892,606**
2040	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$43.77	$395,972	0.196	**$77,464**
2041	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,429	$15,007,885	0.185	**$2,769,806**
2041	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$44.82	$405,475	0.185	**$74,833**
2042	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,451	$15,233,003	0.174	**$2,652,220**
2042	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$45.89	$415,207	0.174	**$72,292**
2043	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,473	$15,461,498	0.164	**$2,539,626**
2043	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$47.00	$425,172	0.164	**$69,837**
2044	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,495	$15,693,421	0.155	**$2,431,812**
2044	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$48.12	$435,376	0.155	**$67,465**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2045	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,517	$15,928,822	0.146	**$2,328,574**
2045	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$49.28	$445,825	0.146	**$65,173**
2046	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,540	$16,167,754	0.138	**$2,229,720**
2046	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$50.46	$456,525	0.138	**$62,960**
2047	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,563	$16,410,271	0.130	**$2,135,062**
2047	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$51.67	$467,481	0.130	**$60,822**
2048	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,586	$16,656,425	0.123	**$2,044,422**
2048	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$52.91	$478,701	0.123	**$58,756**
2049	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,610	$16,906,271	0.116	**$1,957,631**
2049	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$54.18	$490,190	0.116	**$56,761**
2050	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,634	$17,159,865	0.109	**$1,874,524**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2050	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$55.48	$501,954	0.109	**$54,833**
2051	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,659	$17,417,263	0.103	**$1,794,945**
2051	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$56.81	$514,001	0.103	**$52,971**
2052	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,684	$17,678,522	0.097	**$1,718,745**
2052	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$58.18	$526,337	0.097	**$51,172**
2053	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,709	$17,943,700	0.092	**$1,645,779**
2053	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$59.57	$538,969	0.092	**$49,434**
2054	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,735	$18,212,855	0.087	**$1,575,911**
2054	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$61.00	$551,905	0.087	**$47,755**
2055	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,761	$18,486,048	0.082	**$1,509,009**
2055	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$62.47	$565,150	0.082	**$46,133**

Table 8-35: (PSP Table 15)
Pacoima Spreading Grounds Improvements Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
2056	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,787	$18,763,339	0.077	**$1,444,947**
2056	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$63.97	$578,714	0.077	**$44,566**
2057	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,814	$19,044,789	0.073	**$1,383,605**
2057	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$65.50	$592,603	0.073	**$43,053**
2058	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,841	$19,330,461	0.069	**$1,324,867**
2058	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$67.07	$606,825	0.069	**$41,590**
2059	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,869	$19,620,418	0.065	**$1,268,623**
2059	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$68.68	$621,389	0.065	**$40,178**
2060	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,897	$19,914,724	0.061	**$1,214,766**
2060	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$70.33	$636,303	0.061	**$38,813**
2061	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,925	$20,213,445	0.058	**$1,163,196**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2061	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$72.02	$651,574	0.058	**$37,495**
2062	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,954	$20,516,646	0.054	**$1,113,815**
2062	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$73.75	$667,212	0.054	**$36,222**
2063	Avoided imported water	Acre Feet	4,874	15,374	10,500	$1,983	$20,824,396	0.051	**$1,066,531**
2063	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$75.52	$683,225	0.051	**$34,992**
2064	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,013	$21,136,762	0.048	**$1,021,253**
2064	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$77.33	$699,622	0.048	**$33,803**
2065	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,043	$21,453,814	0.046	**$977,898**
2065	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$79.19	$716,413	0.046	**$32,655**
2066	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,074	$21,775,621	0.043	**$936,384**
2066	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$81.09	$733,607	0.043	**$31,546**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2067	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,105	$22,102,255	0.041	**$896,632**
2067	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$83.03	$751,214	0.041	**$30,475**
2068	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,137	$22,433,789	0.038	**$858,567**
2068	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$85.03	$769,243	0.038	**$29,440**
2069	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,169	$22,770,296	0.036	**$822,118**
2069	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$87.07	$787,704	0.036	**$28,440**
2070	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,201	$23,111,850	0.034	**$787,217**
2070	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$89.16	$806,609	0.034	**$27,474**
2071	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,234	$23,458,528	0.032	**$753,798**
2071	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$91.30	$825,968	0.032	**$26,541**
2072	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,268	$23,810,406	0.030	**$721,797**

Table 8-35: (PSP Table 15) Pacoima Spreading Grounds Improvements Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2072	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$93.49	$845,791	0.030	**$25,640**
2073	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,302	$24,167,562	0.029	**$691,154**
2073	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$95.73	$866,090	0.029	**$24,769**
2074	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,336	$24,530,075	0.027	**$661,813**
2074	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$98.03	$886,876	0.027	**$23,928**
2075	Avoided imported water	Acre Feet	4,874	15,374	10,500	$2,371	$24,898,026	0.025	**$633,717**
2075	Reduced GHG emissions	Metric Tons	0	9,047	9,047	$100.38	$908,161	0.025	**$23,115**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$181,779,403**

Project Economic Costs

The major portion of these costs are associated with removal of sediment, replacement of the existing radial gate with a rubber dam, replacement of the open intake canal with four 54-inch diameter reinforced concrete pipes, installation of a trash rack on the intake, and installation of flow monitors and telemetry.

There are no additional operations and maintenance costs for increased recharge at the Pacoima Spreading Basin under this Project, other than $200,000 in costs assumed in 2045 for replacement of the rubber dam. The present value of the initial and replacement costs for this Project total $30,538,952 in discounted 2012 dollars.

Table 8-36: (PSP Table 19) Pacoima Spreading Grounds Improvements Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4. Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2010								$ -	1.000	$ -
2011								$ -	1.000	$ -
2012								$ -	1.000	$ -
2013	$2,206,337							**$2,206,337**	0.943	**$2,081,450**
2014	$16,436,174							**$16,436,174**	0.890	**$14,628,136**
2015	$16,436,174							**$16,436,174**	0.840	**$13,800,129**
2016								$ -	0.792	$ -
2017								$ -	0.747	$ -
2018								$ -	0.705	$ -
2019								$ -	0.665	$ -
2020								$ -	0.627	$ -
2021								$ -	0.592	$ -
2022								$ -	0.558	$ -
2023								$ -	0.527	$ -
2024								$ -	0.497	$ -
2025								$ -	0.469	$ -
2026								$ -	0.442	$ -

Table 8-36: (PSP Table 19) Pacoima Spreading Grounds Improvements Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4. Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2027								$ -	0.417	$ -
2028								$ -	0.394	$ -
2029								$ -	0.371	$ -
2030								$ -	0.350	$ -
2031								$ -	0.331	$ -
2032								$ -	0.312	$ -
2033								$ -	0.294	$ -
2034								$ -	0.278	$ -
2035								$ -	0.262	$ -
2036								$ -	0.247	$ -
2037								$ -	0.233	$ -
2038								$ -	0.220	$ -
2039								$ -	0.207	$ -
2040								$ -	0.196	$ -
2041								$ -	0.185	$ -
2042								$ -	0.174	$ -
2043								$ -	0.164	$ -
2044								$ -	0.155	$ -

Table 8-36: (PSP Table 19) Pacoima Spreading Grounds Improvements Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4. Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +...+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2045						$200,000		**$200,000**	0.146	**$29,237**
2046								$ -	0.138	$ -
2047								$ -	0.130	$ -
2048								$ -	0.123	$ -
2049								$ -	0.116	$ -
2050								$ -	0.109	$ -
2051								$ -	0.103	$ -
2052								$ -	0.097	$ -
2053								$ -	0.092	$ -
2054								$ -	0.087	$ -
2055								$ -	0.082	$ -
2056								$ -	0.077	$ -
2057								$ -	0.073	$ -
2058								$ -	0.069	$ -
2059								$ -	0.065	$ -
2060								$ -	0.061	$ -
2061								$ -	0.058	$ -
2062								$ -	0.054	$ -

Table 8-36: (PSP Table 19) Pacoima Spreading Grounds Improvements Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4. Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2063								$ -	0.051	$ -
2064								$ -	0.048	$ -
2065								$ -	0.046	$ -
2066								$ -	0.043	$ -
2067								$ -	0.041	$ -
2068								$ -	0.038	$ -
2069								$ -	0.036	$ -
2070								$ -	0.034	$ -
2071								$ -	0.032	$ -
2072								$ -	0.030	$ -
2073								$ -	0.029	$ -
2074								$ -	0.027	$ -
2075								$ -	0.025	$ -
Total Present Value of Discounted Costs (Sum of column (j))										$30,538,952

Benefits and Costs Summary

The estimated present value benefits of this Project are $181,779,403. Benefits quantified are for avoided imported water and reduced emissions of GHGs. The present value cost of this Project is $30,538,952. Therefore the benefit to cost ratio for this Project is slightly less than 6:1.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated the increased volume of groundwater available for reuse and the energy savings due to reduced power consumption (and associated emissions benefits). These issues are listed in **Table 8-37**.

Table 8-37: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Recharge rates of the Pacoima Spreading Grounds	U	The Los Angeles County Flood Control District has conducted multiple technical studies to evaluate the Pacoima Spreading Grounds and predict enhanced percolation rates. Nevertheless, these percolation and recharge rates are not guaranteed. Drought or deluge conditions could increase or decrease anticipated recharge rates, for example.
Future cost of importing water	+	This analysis assumes that the cost of importing an acre foot of water will increase in real terms over time (see the appendix). Given the anticipated population growth regionally, potential climate change impacts on supply and demand, the demand for water and price of importing water price will continue to increase, but it is not known by how much. Conservative real price escalation rates are used in this analysis.

*Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.

++ = Likely to increase net benefits significantly.

– = Likely to decrease benefits.

– – = Likely to decrease net benefits significantly.

U = Uncertain, could be + or –.

References

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.

Los Angeles County Flood Control District, 2011. *Pacoima Spreading Grounds Project Concept Report.*

Peck Water Conservation Improvement Project

This attachment presents the economic analysis for the Peck Water Conservation Improvement Project. A project overview and project benefit-cost summary table are followed by sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), Flood Damage Reduction Benefit Analysis (Section D4) and Project Benefits and Costs Summary (Section D5).

Project Overview

The Peck Road Spreading Basin is a 157-acre groundwater replenishment facility comprised of two deep pits that recharge the Main San Gabriel Basin using local surface water flows from Sawpit Wash and Santa Anita Wash, both of which are tributaries to the Rio Hondo. This facility is owned and operated by the Los Angeles County Flood Control District (LACFCD). The Main San Gabriel Basin is an adjudicated groundwater basin managed by the Main San Gabriel Watermaster and is dependent upon replenishment to maintain basin levels. The Peck Road Spreading Basin currently has a maximum intake of 30,100 cfs with a total water storage capacity of approximately 3,347 acre-feet and a low percolation rate of approximately 25 cfs. The public can access this area for recreation through the Peck Road Water Conservation Park which provides the public with green areas, fishing, walking and bicycle trails.

The Peck Water Conservation Improvement Project will implement improvements to this facility that will allow for increased recharge capacity. These improvements include the following:

- Two 25 cubic feet per second (cfs) vertical fixed turbine pumps are proposed to be placed inside a concrete underground pump station at the north end of Peck Road Spreading Basin and would pump during the storm season when the basin elevation is between 290 and 315 feet. The water will flow through 7,000 feet of pipeline along Clark Street as well as some Hansen Quarry private property in the City of Arcadia. The pipeline will outlet into the San Gabriel River, where the water can percolate into the soft-bottom channel. This will allow for recharge of water in the San Gabriel River and increase the replenishment of groundwater in the Main San Gabriel Basin.
- The proposed improvements will also remove approximately 101,000 cubic yards of sediment from the middle of Peck Road Spreading Basin near the outlet of the Santa Anita Wash. A large portion of the concrete-lined channel of the Santa Anita Wash has been buried under years of accumulated sediment. Removal of sediment will allow water to flow freely between two pits that have developed from the accumulation of

the sediment. This will improve recharge at the basin and allow the pump station to convey water from both pits.

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 at the park in the future. The facility can currently percolate approximately 6,300 AFY and the Project will increase this capacity to approximately 8,100 AFY. The LACFCD is this Project's primary implementing agency and they are partnering with the Upper San Gabriel Valley Municipal Water District (USGVMWD).

Summary Project Benefits and Costs

A summary of all benefits and costs of the Peck Water Conservation Improvement Project are provided in **Table 8-38**. A description of the monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7. As shown in Table 8-1, the present value (PV) of monetized benefits outweighs the PV costs by a considerable margin – the monetized benefits are more than three times the costs.

Table 8-38: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$7,978,974
Monetizable Benefits	
Avoided imported water supply costs, for 1,800 AFY	$32,254,905
Reduced social costs of CO_2 emissions	$823,548
Local Pumping Costs (negative benefit)	($2,546,404)
Total Monetizable Benefits	$30,532,049
Physically Quantified Benefit or Cost	**Project Life Total**
1,800 acre feet local water per year	162,000 AF
555 metric tons of reduced salt import per year	49,950 metric tons
Qualitative Benefit or Cost	**Qualitative Indicator***
Avoid pollutant loadings into the San Gabriel River	+
Eliminate localized flooding risk	+
Increase water availability to a DAC	+
Improve water quality by infiltration	+

Improve water reliability	+
Provide long term solution	+
Reduce demand for net diversions for the Region from the Delta	++
Create opportunity for enhanced recreational activities	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-39 shows the non-monetized benefits checklist for Peck Water Conservation Improvement Project. Descriptions of the benefit categories marked "Yes" in the following the table are provided in the narrative of qualitative benefits section after the table.

Table 8-39: (PSP Table 12)
Peck Water Conservation Improvement Project
Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits	
	Will the proposal	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include:	
	- Include educational features that should result in water supply, water quality, or flood damage reduction benefits?	
	- Develop, test or document a new technology for water supply, water quality, or flood damage reduction management?	
	- Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include:	
	- Provide new or improved outdoor recreation opportunities?	
	- Provide more access to open space?	

Table 8-39: (PSP Table 12)
Peck Water Conservation Improvement Project
Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	- Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
	Examples are not limited to, but may include:	
	- Provide more opportunities for public involvement in water management?	
	- Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include:	
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events?	
	- Reduce risk to life from dam failure or flooding?	
	- Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	Yes
	Examples are not limited to, but may include:	
	- Redress or increase inequitable distribution of environmental burdens?	
	- Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits:	
	Will the proposal	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include:	
	- Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat?	
	- Contribute to an existing biological opinion or recovery plan for a listed special status species?	

Table 8-39: (PSP Table 12) Peck Water Conservation Improvement Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	- Preserve or restore designated critical habitat of a listed species?	
	- Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Cause an improvement in water quality in an impaired water body or sensitive habitat?	
	- Prevent water quality degradation?	
	- Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include:	
	- Reduce net production of greenhouse gasses?	
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits:	
	Will the proposal	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include:	
	- Reduce extraction of non-renewable groundwater?	
	- Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No[1]
	Examples are not limited to, but may include:	
	- Reduce net energy use on a permanent basis?	
	- Increase renewable energy production?	

Table 8-39: (PSP Table 12) Peck Water Conservation Improvement Project Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	- Include new buildings or modify buildings to include certified LEED features?	
	- Provide a net increase in recycling or reuse of materials?	
	- Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Provide a more flexible mix of water sources?	
	- Reduce likelihood of catastrophic supply outages?	
	- Reduce supply uncertainty?	
	- Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	No

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

Provide social recreation or access benefits

Increase area available for recreation at Peck Park

The surrounding area is a public park that is owned and maintained by the Los Angeles County Department of Parks and Recreation. The park includes picnic tables, walking trails and fishing areas. The Peck Water Conservation Improvement Project will result in lower water levels in the basin, on average, and create approximately five acres of new land available for future open space and recreational opportunities.

Promote social health and safety

Improve management of stormwater runoff

The Project will have direct flood protection benefits. It will modify Peck Road Spreading Basin to improve management of stormwater runoff to increase safety and reduce the potential for flood damage to downstream communities within the inundation zones that could result from a large storm event. The Project will reduce the peak flow rate in the channels downstream of the Project, including the Rio Hondo Wash and the Los Angeles River. Adjacent land uses are primarily residential, commercial, and industrial.

The Project will also yield benefits from addressing localized flooding. Portions of the public park surrounding the Peck Road Spreading Basin are inundated when the basin fills up with water. Past storm events have inundated portions of the park area causing some infrastructure damage. While infrequent, this is a possibility during any major storm, and may become more important with climate change.

Have other social benefits

Provide a supply benefit to the City of El Monte

The Water Department of City of El Monte serves water to a disadvantaged community (DAC), and directly benefits from increased groundwater recharge from the Project. All the water served by the City of El Monte is from groundwater pumped from the Main San Gabriel Basin (see Attachment 10 for additional information on DAC issues).

Improve water quality in ways that were not quantified in Attachment 7

Reduce pollutant loadings in the Rio Hondo

The Peck Water Conservation Improvement Project will treat an additional 1,800 acre-feet of water per year through infiltration and soil aquifer treatment. In the absence of this Project, this water would be untreated and flow through will flow through the Rio Hondo Wash, the Los Angeles River, and outlet in the Pacific Ocean near Long Beach, potentially increasing pollutant loadings to these water bodies. The pollutants of concern are primarily from non-point sources and include polychlorinated biphenyls (PCBs) and organochlorine pesticides (DDT, Chlordane, and Dieldrin), and nutrients.

Improve the overall, long-term management of California groundwater resources

The availability of imported water is subject to a number of natural and human forces, including increased population growth (and accompanying increased demands), drought, changes in snowpack and earthquakes, environmental regulations, and water rights determinations with associated legal challenges and court rulings. Increasing locally available groundwater helps to reduce dependence on imported water and provide a long-term solution. The Project will also enhance reliability by offsetting the use of imported water. It will improve the region's ability to meet water demands on a consistent basis even in times of drought or other constraints on source water availability.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies; see for example Carson and Mitchell, 1987, CUWA, 1994, Griffen and Mjelde, 2000, Raucher et al., 2013). Due to the uncertainty involved, this benefit estimate is not included in the monetized benefits tables.

Reduce demand for net diversions for the regions from the Delta

Offset demand for Delta supplies with groundwater

By reducing the use of imported State Water Project (SWP) water, the Project will augment in-stream flows in the Sacramento-San Joaquin Delta (Delta) or will offset other diversions that may otherwise reduce flows. Reduced demands on Delta supplies also will help reduce the overall salinity of the Delta and improve Delta habitat.

Maintaining the Delta's environmental condition is vital to maintaining and improving the viability of the region. The Delta provides drinking water to 25 million people, supports thousands of industries and irrigation of 750,000 acres of agriculture, and serves as home to hundreds of plant, animal, and fish species – some of which are listed as threatened or endangered. The Delta's 1,600 square miles of marshes, islands, and sloughs support at least half of migratory water birds on the Pacific Flyway; 80% of California's commercial fisheries; and recreational uses including boating, fishing, and windsurfing.

Delta resources are in a state of crisis. Fish populations, including salmon and Delta-smelt, have declined dramatically in recent years. The levee system is aging, and vulnerability of the Delta to flooding, sea level rise, or a major earthquake has contributed to concerns about possible levee collapse. In addition, water quality problems continue, and there is little consensus on how to manage water resources through storage.

Accordingly, by reducing reliance of SWP waters, this Project reduces extractions of water from the Delta system and helps preserve this vital resource. In addition, by reducing demand for Delta extractions, this Project may help free up some SWP water for other potential users.

Provide a long-term solution in place of a short-term one

Prevent need to employ supply solutions that will more expensive in the long run

The availability of imported water is subject to a number of natural and human forces, including increased population growth (and accompanying increased demands), drought, changes in snowpack and earthquakes, environmental regulations, and water rights determinations with associated legal challenges and Court rulings. Increasing locally available groundwater helps to reduce dependence on imported water and provide a long-term solution to address the region's demand for water.

Improve water supply reliability in ways not quantified in Attachment 7

Increase supply in the Main San Gabriel Basin to provide local supply reliability

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. The proposed Project will help address reliability issues for the region's water supply by offsetting the use of imported water. As noted above, the reliability of imported water is subject to a number of natural and human forces. Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. It is difficult to quantify and monetize the benefits associated with reliability since the level of reliability is difficult to quantify.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 90 year life of the Project. The benefits primarily include:

- Increased local groundwater recharge, enabling offset of imported water, with some added costs due to new groundwater pumping
- Reduced net carbon dioxide (CO_2) and related greenhouse gas (GHG) emissions from reducing the import of water and associated energy use.

Avoided imported water supply costs

Local groundwater supply is a key resource that has historically been utilized to support over 90% of the water demand in the Main San Gabriel Basin region (Main San Gabriel Basin Watermaster, 2011), though the area is still highly dependent on imported water to meet both retail demand and replenishment needs. Replenishment of the Main San Gabriel Basin is vital to sustain the long-term reliability of the local groundwater supply and reduce the Region's dependence on imported water.

This Project will increase groundwater recharge and local groundwater supplies by 1,800 AFY, starting in 2016 when the Project is expected to be completed and in operation. To calculate the avoided costs of imported water over time, the amount of imported water avoided each year is multiplied by the projected cost of imported water. For this analysis, it is assumed that the Project will avoid Tier 1 treated Metropolitan Water District (MWD) water supplies because this is the primary source of water obtained by the participating agencies.

An important aspect in monetizing the value of avoided imports entails predicting the future cost of imported SWP water. The economic analyses in these grant applications are developed in real terms (based on 2012 dollars), meaning that the future stream of benefits and costs typically are not adjusted for general inflation. This is because most outcomes are expected to see price changes that generally align with broader measures of inflation, such as the Consumer Price Index (CPI), which is measured and reported by the federal Bureau of Labor Statistics (ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt).

The price of imported SWP water is an important exception, because various factors have led to rate increases that have considerably outpaced general inflation over the past two decades (as detailed below). This trend of real price increases for imported water (i.e., above the projected CPI) is likely to continue in the future as well, because the same factors that have driven these prices upward will remain relevant for several years to come. These factors principally include limitations on overall supply, due to a variety of factors primarily linked to the declining health of the Bay-Delta system from which these waters are extracted.

To reflect real prices of imported water in the future, we have adopted the following conservative assumptions:

1. For water imported from 2013 and 2014, we use rates published by MWD as of March 2013 (http://www.mwdh2o.com/mwdh2o/pages/finance/finance_03.html), but adjusted to reflect real 2012 price levels (e.g., the 2013 nominal rates posted by MWD are reduced by the 2.07% CPI for 2012).

2. For water imported between 2015 and 2020 (inclusive), we derive a 2012 real cost by escalating by 3.5%.

3. For water imported in 2021 and years thereafter, we escalate at a rate of 1.5% per year to obtain real prices.

More detailed information on escalation rates is provided in **Appendix 8-1**.

The Peck Water Conservation Improvement Project will avoid a total of 162,000 AF of imported water over the expected 90-year Project life. Applying a discount rate of 6% (per DWR's Project Solicitation Package Guidelines), total present value benefits associated with the avoided purchase of this water amounts to about $32,254,905 over the 90-year Project life.

However, there are costs incurred by water suppliers for pumping the groundwater (1,800 AF) from the Main San Gabriel Basin in lieu of imports at $101.63/AF (89.24/AF in 2006 adjusted to 2012 USD) (MWDSC, 2007). These costs reduce the overall benefit by $2,546,404.

Reduced net emissions

Reduced reliance on imported water will avoid the extensive energy requirements associated with transporting water from the Bay Delta. This in turn will result in avoided greenhouse gas emissions associated with the production of this energy.

To calculate the avoided carbon dioxide equivalent (CO_2e) emissions associated with the Project, we multiply the amount of energy required to treat and convey water by the average carbon emissions rate associated with energy production in California. Imported water is sourced by the State Water Project. The water comes from the Bay Delta to through the West Branch of the California Aqueduct (DWR, 2012b; LADWP, 2010). It requires approximately 3,000 kilowatt hours (kWh)/AF to pump and convey each of the 1,800 AF imported (LADWP, 2010).

The average carbon emissions rate associated with energy production in California is 0.724 pounds (lb)/kWh. These energy and emissions savings will be partially offset by local energy use. The 1,800 AFY of water recharge supported by the Project will require energy use locally to treat and pump water, this requires approximately 475 kWh/AF, as calculated in Attachment 7. These calculations provide an annual net reduction in CO_2 emissions resulting from the Project of 1,492 metric tons (MT). The total net CO_2 emissions reductions amount to 134,280 MT over the 90-year Project life.

To monetize this benefit, we apply a dollar value to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalent (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one MT of CO_2 in 2012 is $22.53/MT (updated to 2012 values using CPI). The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions.

The mean value of $22.53/ MT to calculate social benefits and costs produces conservative estimates for the benefits and costs associated with greenhouse gas emissions. To determine total costs over the 90-year Project period, we escalate the social cost of carbon by 2.4% per year (Stern, 2006). The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change. The total present value costs over the 90-year Project period, applying a discount rate of 6% (per DWR's PSP Guidelines), are listed in Table 8-40. Over the Project life, total present value benefits associated with avoided social costs of carbon amount to $823,548.

Table 8-40 summarizes the monetized benefits of the Project from increased local groundwater supplies (i.e., offsetting imported water) and benefits gained by reducing emissions associated with importing water.

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2012	Avoided imported water	Acre Feet	-	-	-	$913.75	$0	1.000	**$0**
	Reduced CO2 emissions	MT	-	-	-	$24.77	$0	1.000	**$0**
	Local Pumping Costs	Acre Feet	-	-	-	$101.63	$0	1.000	**$0**
2013	Avoided imported water	Acre Feet	-	-	-	$913.75	$0	0.943	**$0**
	Reduced CO2 emissions	MT	-	-	-	$24.77	$0	0.943	**$0**
	Local Pumping Costs	Acre Feet	-	-	-	$101.63	$0	0.943	**$0**
2014	Avoided imported water	Acre Feet	-	-	-	$913.75	$0	0.890	**$0**
	Reduced CO2 emissions	MT	-	-	-	$24.77	$0	0.890	**$0**
	Local Pumping Costs	Acre Feet	-	-	-	$101.63	$0	0.890	**$0**
2015	Avoided imported water	Acre Feet	-	-	-	$913.75	$0	0.840	**$0**
	Reduced CO2	MT	-	-	-	$24.77	$0	0.840	**$0**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	-	-	-	$101.63	$0	0.840	**$0**
2016	Avoided imported water	Acre Feet	6,300	8,100	1,800	$913.75	$1,644,759	0.792	**$1,302,803**
	Reduced CO2 emissions	MT	1,773	281	1,492	$24.77	$36,960	0.792	**$29,276**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.792	**($144,901)**
2017	Avoided imported water	Acre Feet	6,300	8,100	1,800	$945.74	$1,702,325	0.747	**$1,272,077**
	Reduced CO2 emissions	MT	1,773	281	1,492	$25.37	$37,847	0.747	**$28,281**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.747	**($136,699)**
2018	Avoided imported water	Acre Feet	6,300	8,100	1,800	$978.84	$1,761,907	0.705	**$1,242,075**
	Reduced CO2 emissions	MT	1,773	281	1,492	$25.98	$38,755	0.705	**$27,321**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.705	**($128,961)**
2019	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,013.10	$1,823,574	0.665	**$1,212,781**
	Reduced CO2	MT	1,773	281	1,492	$26.60	$39,685	0.665	**$26,393**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.665	**($121,662)**
2020	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,048.55	$1,887,399	0.627	**$1,184,177**
	Reduced CO2 emissions	MT	1,773	281	1,492	$27.24	$40,638	0.627	**$25,497**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.627	**($114,775)**
2021	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,064.28	$1,915,710	0.592	**$1,133,906**
	Reduced CO2 emissions	MT	1,773	281	1,492	$27.89	$41,613	0.592	**$24,631**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.592	**($108,278)**
2022	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,080.25	$1,944,445	0.558	**$1,085,768**
	Reduced CO2 emissions	MT	1,773	281	1,492	$28.56	$42,612	0.558	**$23,794**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.558	**($102,149)**
2023	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,096.45	$1,973,612	0.527	**$1,039,674**
	Reduced CO2	MT	1,773	281	1,492	$29.25	$43,634	0.527	**$22,986**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.527	**($96,367)**
2024	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,112.90	$2,003,216	0.497	**$995,537**
	Reduced CO2 emissions	MT	1,773	281	1,492	$29.95	$44,682	0.497	**$22,205**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.497	**($90,913)**
2025	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,129.59	$2,033,264	0.469	**$953,274**
	Reduced CO2 emissions	MT	1,773	281	1,492	$30.67	$45,754	0.469	**$21,451**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.469	**($85,767)**
2026	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,146.54	$2,063,763	0.442	**$912,805**
	Reduced CO2 emissions	MT	1,773	281	1,492	$31.40	$46,852	0.442	**$20,723**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.442	**($80,912)**
2027	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,163.73	$2,094,720	0.417	**$874,053**
	Reduced CO2	MT	1,773	281	1,492	$32.16	$47,977	0.417	**$20,019**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.417	**($76,332)**
2028	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,181.19	$2,126,141	0.394	**$836,947**
	Reduced CO2 emissions	MT	1,773	281	1,492	$32.93	$49,128	0.394	**$19,339**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.394	**($72,011)**
2029	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,198.91	$2,158,033	0.371	**$801,417**
	Reduced CO2 emissions	MT	1,773	281	1,492	$33.72	$50,307	0.371	**$18,682**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.371	**($67,935)**
2030	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,216.89	$2,190,403	0.350	**$767,394**
	Reduced CO2 emissions	MT	1,773	281	1,492	$34.53	$51,514	0.350	**$18,048**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.350	**($64,090)**
2031	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,235.14	$2,223,259	0.331	**$734,816**
	Reduced CO2	MT	1,773	281	1,492	$35.36	$52,751	0.331	**$17,435**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.331	**($60,462)**
2032	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,253.67	$2,256,608	0.312	**$703,621**
	Reduced CO2 emissions	MT	1,773	281	1,492	$36.20	$54,017	0.312	**$16,843**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.312	**($57,040)**
2033	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,272.48	$2,290,457	0.294	**$673,750**
	Reduced CO2 emissions	MT	1,773	281	1,492	$37.07	$55,313	0.294	**$16,271**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.294	**($53,811)**
2034	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,291.56	$2,324,814	0.278	**$645,148**
	Reduced CO2 emissions	MT	1,773	281	1,492	$37.96	$56,641	0.278	**$15,718**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.278	**($50,765)**
2035	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,310.94	$2,359,686	0.262	**$617,759**
	Reduced CO2	MT	1,773	281	1,492	$38.87	$58,000	0.262	**$15,184**

Table 8-40: (PSP Table 15)
Peck Water Conservation Improvement Project
Project Annual Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.262	**($47,892)**
2036	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,330.60	$2,395,082	0.247	**$591,534**
	Reduced CO2 emissions	MT	1,773	281	1,492	$39.81	$59,392	0.247	**$14,669**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.247	**($45,181)**
2037	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,350.56	$2,431,008	0.233	**$566,421**
	Reduced CO2 emissions	MT	1,773	281	1,492	$40.76	$60,818	0.233	**$14,170**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.233	**($42,623)**
2038	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,370.82	$2,467,473	0.220	**$542,375**
	Reduced CO2 emissions	MT	1,773	281	1,492	$41.74	$62,277	0.220	**$13,689**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.220	**($40,211)**
2039	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,391.38	$2,504,485	0.207	**$519,350**
	Reduced CO2	MT	1,773	281	1,492	$42.74	$63,772	0.207	**$13,224**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.207	**($37,935)**
2040	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,412.25	$2,542,052	0.196	**$497,302**
	Reduced CO2 emissions	MT	1,773	281	1,492	$43.77	$65,302	0.196	**$12,775**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.196	**($35,787)**
2041	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,433.44	$2,580,183	0.185	**$476,190**
	Reduced CO2 emissions	MT	1,773	281	1,492	$44.82	$66,870	0.185	**$12,341**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.185	**($33,762)**
2042	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,454.94	$2,618,886	0.174	**$455,975**
	Reduced CO2 emissions	MT	1,773	281	1,492	$45.89	$68,474	0.174	**$11,922**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.174	**($31,851)**
2043	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,476.76	$2,658,169	0.164	**$436,617**
	Reduced CO2	MT	1,773	281	1,492	$47.00	$70,118	0.164	**$11,517**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.164	**($30,048)**
2044	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,498.91	$2,698,042	0.155	**$418,082**
	Reduced CO2 emissions	MT	1,773	281	1,492	$48.12	$71,801	0.155	**$11,126**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.155	**($28,347)**
2045	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,521.40	$2,738,512	0.146	**$400,333**
	Reduced CO2 emissions	MT	1,773	281	1,492	$49.28	$73,524	0.146	**$10,748**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.146	**($26,742)**
2046	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,544.22	$2,779,590	0.138	**$383,338**
	Reduced CO2 emissions	MT	1,773	281	1,492	$50.46	$75,288	0.138	**$10,383**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.138	**($25,229)**
2047	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,567.38	$2,821,284	0.130	**$367,064**
	Reduced CO2	MT	1,773	281	1,492	$51.67	$77,095	0.130	**$10,031**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.130	**($23,801)**
2048	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,590.89	$2,863,603	0.123	**$351,481**
	Reduced CO2 emissions	MT	1,773	281	1,492	$52.91	$78,946	0.123	**$9,690**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.123	**($22,453)**
2049	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,614.75	$2,906,557	0.116	**$336,559**
	Reduced CO2 emissions	MT	1,773	281	1,492	$54.18	$80,840	0.116	**$9,361**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.116	**($21,183)**
2050	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,638.98	$2,950,155	0.109	**$322,272**
	Reduced CO2 emissions	MT	1,773	281	1,492	$55.48	$82,781	0.109	**$9,043**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.109	**($19,983)**
2051	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,663.56	$2,994,408	0.103	**$308,590**
	Reduced CO2	MT	1,773	281	1,492	$56.81	$84,767	0.103	**$8,736**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.103	**($18,852)**
2052	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,688.51	$3,039,324	0.097	**$295,490**
	Reduced CO2 emissions	MT	1,773	281	1,492	$58.18	$86,802	0.097	**$8,439**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.097	**($17,785)**
2053	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,713.84	$3,084,914	0.092	**$282,945**
	Reduced CO2 emissions	MT	1,773	281	1,492	$59.57	$88,885	0.092	**$8,152**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.092	**($16,779)**
2054	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,739.55	$3,131,187	0.087	**$270,934**
	Reduced CO2 emissions	MT	1,773	281	1,492	$61.00	$91,018	0.087	**$7,876**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.087	**($15,829)**
2055	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,765.64	$3,178,155	0.082	**$259,432**
	Reduced CO2	MT	1,773	281	1,492	$62.47	$93,203	0.082	**$7,608**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.082	**($14,933)**
2056	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,792.13	$3,225,828	0.077	**$248,418**
	Reduced CO2 emissions	MT	1,773	281	1,492	$63.97	$95,439	0.077	**$7,350**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.077	**($14,088)**
2057	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,819.01	$3,274,215	0.073	**$237,872**
	Reduced CO2 emissions	MT	1,773	281	1,492	$65.50	$97,730	0.073	**$7,100**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.073	**($13,290)**
2058	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,846.29	$3,323,328	0.069	**$227,774**
	Reduced CO2 emissions	MT	1,773	281	1,492	$67.07	$100,076	0.069	**$6,859**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.069	**($12,538)**
2059	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,873.99	$3,373,178	0.065	**$218,104**
	Reduced CO2	MT	1,773	281	1,492	$68.68	$102,477	0.065	**$6,626**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.065	**($11,828)**
2060	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,902.10	$3,423,776	0.061	**$208,845**
	Reduced CO2 emissions	MT	1,773	281	1,492	$70.33	$104,937	0.061	**$6,401**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.061	**($11,159)**
2061	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,930.63	$3,475,132	0.058	**$199,979**
	Reduced CO2 emissions	MT	1,773	281	1,492	$72.02	$107,455	0.058	**$6,184**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.058	**($10,527)**
2062	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,959.59	$3,527,259	0.054	**$191,489**
	Reduced CO2 emissions	MT	1,773	281	1,492	$73.75	$110,034	0.054	**$5,974**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.054	**($9,931)**
2063	Avoided imported water	Acre Feet	6,300	8,100	1,800	$1,988.98	$3,580,168	0.051	**$183,360**
	Reduced CO2	MT	1,773	281	1,492	$75.52	$112,675	0.051	**$5,771**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.051	**($9,369)**
2064	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,018.82	$3,633,871	0.048	**$175,576**
	Reduced CO2 emissions	MT	1,773	281	1,492	$77.33	$115,379	0.048	**$5,575**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.048	**($8,839)**
2065	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,049.10	$3,688,379	0.046	**$168,122**
	Reduced CO2 emissions	MT	1,773	281	1,492	$79.19	$118,148	0.046	**$5,385**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.046	**($8,338)**
2066	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,079.84	$3,743,705	0.043	**$160,985**
	Reduced CO2 emissions	MT	1,773	281	1,492	$81.09	$120,984	0.043	**$5,202**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.043	**($7,866)**
2067	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,111.03	$3,799,860	0.041	**$154,151**
	Reduced CO2	MT	1,773	281	1,492	$83.03	$123,888	0.041	**$5,026**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.041	**($7,421)**
2068	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,142.70	$3,856,858	0.038	**$147,606**
	Reduced CO2 emissions	MT	1,773	281	1,492	$85.03	$126,861	0.038	**$4,855**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.038	**($7,001)**
2069	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,174.84	$3,914,711	0.036	**$141,340**
	Reduced CO2 emissions	MT	1,773	281	1,492	$87.07	$129,906	0.036	**$4,690**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.036	**($6,605)**
2070	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,207.46	$3,973,432	0.034	**$135,340**
	Reduced CO2 emissions	MT	1,773	281	1,492	$89.16	$133,023	0.034	**$4,531**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.034	**($6,231)**
2071	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,240.57	$4,033,033	0.032	**$129,594**
	Reduced CO2	MT	1,773	281	1,492	$91.30	$136,216	0.032	**$4,377**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.032	**($5,878)**
2072	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,274.18	$4,093,529	0.030	**$124,093**
	Reduced CO2 emissions	MT	1,773	281	1,492	$93.49	$139,485	0.030	**$4,228**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.030	**($5,546)**
2073	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,308.30	$4,154,932	0.029	**$118,825**
	Reduced CO2 emissions	MT	1,773	281	1,492	$95.73	$142,833	0.029	**$4,085**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.029	**($5,232)**
2074	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,342.92	$4,217,256	0.027	**$113,780**
	Reduced CO2 emissions	MT	1,773	281	1,492	$98.03	$146,261	0.027	**$3,946**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.027	**($4,935)**
2075	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,378.06	$4,280,514	0.025	**$108,950**
	Reduced CO2	MT	1,773	281	1,492	$100.38	$149,771	0.025	**$3,812**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.025	**($4,656)**
2076	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,413.73	$4,344,722	0.024	**$104,325**
	Reduced CO2 emissions	MT	1,773	281	1,492	$102.79	$153,365	0.024	**$3,683**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.024	**($4,393)**
2077	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,449.94	$4,409,893	0.023	**$99,896**
	Reduced CO2 emissions	MT	1,773	281	1,492	$105.26	$157,046	0.023	**$3,558**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.023	**($4,144)**
2078	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,486.69	$4,476,041	0.021	**$95,655**
	Reduced CO2 emissions	MT	1,773	281	1,492	$107.79	$160,815	0.021	**$3,437**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.021	**($3,909)**
2079	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,523.99	$4,543,182	0.020	**$91,594**
	Reduced CO2	MT	1,773	281	1,492	$110.37	$164,675	0.020	**$3,320**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.020	**($3,688)**
2080	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,561.85	$4,611,330	0.019	**$87,706**
	Reduced CO2 emissions	MT	1,773	281	1,492	$113.02	$168,627	0.019	**$3,207**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.019	**($3,479)**
2081	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,600.28	$4,680,500	0.018	**$83,982**
	Reduced CO2 emissions	MT	1,773	281	1,492	$115.73	$172,674	0.018	**$3,098**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.018	**($3,282)**
2082	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,639.28	$4,750,707	0.017	**$80,417**
	Reduced CO2 emissions	MT	1,773	281	1,492	$118.51	$176,818	0.017	**$2,993**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.017	**($3,097)**
2083	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,678.87	$4,821,968	0.016	**$77,003**
	Reduced CO2	MT	1,773	281	1,492	$121.36	$181,062	0.016	**$2,891**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.016	**($2,921)**
2084	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,719.05	$4,894,297	0.015	**$73,734**
	Reduced CO2 emissions	MT	1,773	281	1,492	$124.27	$185,407	0.015	**$2,793**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.015	**($2,756)**
2085	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,759.84	$4,967,712	0.014	**$70,604**
	Reduced CO2 emissions	MT	1,773	281	1,492	$127.25	$189,857	0.014	**$2,698**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.014	**($2,600)**
2086	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,801.24	$5,042,227	0.013	**$67,606**
	Reduced CO2 emissions	MT	1,773	281	1,492	$130.30	$194,414	0.013	**$2,607**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.013	**($2,453)**
2087	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,843.26	$5,117,861	0.013	**$64,736**
	Reduced CO2	MT	1,773	281	1,492	$133.43	$199,080	0.013	**$2,518**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.013	**($2,314)**
2088	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,885.90	$5,194,629	0.012	**$61,988**
	Reduced CO2 emissions	MT	1,773	281	1,492	$136.63	$203,858	0.012	**$2,433**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$102	($182,934)	0.012	**($2,183)**
2089	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,929.19	$5,272,548	0.011	**$59,357**
	Reduced CO2 emissions	MT	1,773	281	1,492	$139.91	$208,750	0.011	**$2,350**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.011	**($2,059)**
2090	Avoided imported water	Acre Feet	6,300	8,100	1,800	$2,973.13	$5,351,636	0.011	**$56,837**
	Reduced CO2 emissions	MT	1,773	281	1,492	$143.27	$213,760	0.011	**$2,270**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.011	**($1,943)**
2091	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,017.73	$5,431,911	0.010	**$54,424**
	Reduced CO2	MT	1,773	281	1,492	$146.71	$218,890	0.010	**$2,193**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.010	**($1,833)**
2092	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,062.99	$5,513,390	0.009	**$52,113**
	Reduced CO2 emissions	MT	1,773	281	1,492	$150.23	$224,144	0.009	**$2,119**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.009	**($1,729)**
2093	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,108.94	$5,596,090	0.009	**$49,901**
	Reduced CO2 emissions	MT	1,773	281	1,492	$153.84	$229,523	0.009	**$2,047**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.009	**($1,631)**
2094	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,155.57	$5,680,032	0.008	**$47,783**
	Reduced CO2 emissions	MT	1,773	281	1,492	$157.53	$235,032	0.008	**$1,977**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.008	**($1,539)**
2095	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,202.91	$5,765,232	0.008	**$45,754**
	Reduced CO2	MT	1,773	281	1,492	$161.31	$240,672	0.008	**$1,910**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.008	**($1,452)**
2096	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,250.95	$5,851,711	0.007	**$43,812**
	Reduced CO2 emissions	MT	1,773	281	1,492	$165.18	$246,449	0.007	**$1,845**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.007	**($1,370)**
2097	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,299.71	$5,939,486	0.007	**$41,952**
	Reduced CO2 emissions	MT	1,773	281	1,492	$169.14	$252,363	0.007	**$1,782**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.007	**($1,292)**
2098	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,349.21	$6,028,579	0.007	**$40,171**
	Reduced CO2 emissions	MT	1,773	281	1,492	$173.20	$258,420	0.007	**$1,722**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.007	**($1,219)**
2099	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,399.45	$6,119,007	0.006	**$38,465**
	Reduced CO2	MT	1,773	281	1,492	$177.36	$264,622	0.006	**$1,663**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.006	**($1,150)**
2100	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,450.44	$6,210,792	0.006	**$36,832**
	Reduced CO2 emissions	MT	1,773	281	1,492	$181.62	$270,973	0.006	**$1,607**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$102	($182,934)	0.006	**($1,085)**
2101	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,502.20	$6,303,954	0.006	**$35,269**
	Reduced CO2 emissions	MT	1,773	281	1,492	$185.98	$277,476	0.006	**$1,552**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.006	**($1,023)**
2102	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,554.73	$6,398,514	0.005	**$33,772**
	Reduced CO2 emissions	MT	1,773	281	1,492	$190.44	$284,136	0.005	**$1,500**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.005	**($966)**
2103	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,608.05	$6,494,491	0.005	**$32,338**
	Reduced CO2	MT	1,773	281	1,492	$195.01	$290,955	0.005	**$1,449**

Table 8-40: (PSP Table 15) Peck Water Conservation Improvement Project Project Annual Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	emissions								
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$102	($182,934)	0.005	**($911)**
2104	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,662.17	$6,591,909	0.005	**$30,965**
	Reduced CO2 emissions	MT	1,773	281	1,492	$199.69	$297,938	0.005	**$1,400**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$101.63	($182,934)	0.005	**($859)**
2105	Avoided imported water	Acre Feet	6,300	8,100	1,800	$3,717.10	$6,690,787	0.004	**$29,650**
	Reduced CO2 emissions	MT	1,773	281	1,492	$204.48	$305,089	0.004	**$1,352**
	Local Pumping Costs	Acre Feet	0	1,800	(1,800)	$102	($182,934)	0.004	**($811)**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$30,532,049**

Flood Damage Reduction Benefit Analysis (Section D4)

Quantifiable flood damage reduction benefits are not available for this Project.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-41 summarizes the economic project costs for the Project. The majority of the Project's $7,750,856 capital costs are incurred through 2015. Some lagging capital costs are incurred in 2016; however, this is also the year where project O&M begins. Annual O&M costs include Project administration, operation and energy costs associated with the pumping station, ongoing maintenance and sediment removal, and monitoring (as is identified in the "other" category). Every 10 years, the Project will incur $300,000 to clean out the area near the outlet of Santa Anita Wash. Additionally, every 30 years the two pumps will need to be replaced for $500,000, or $250,000 each.

Table 8-41: (PSP Table 19)
Peck Water Conservation Improvement Project
Project Annual Costs
(2012 Dollars)

	Initial Costs Grand Total Cost	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2012									1.000	**$0**
2013	$861,743								0.943	**$812,965**
2014	$826,078								0.890	**$735,206**
2015	$6,053,407								0.840	**$5,082,557**
2016	$9,628		$10,000	$35,000	$10,000		$14,112	$78,740	0.792	**$62,369**
2017			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.747	**$51,645**
2018			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.705	**$48,721**
2019			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.665	**$45,963**
2020			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.627	**$43,362**
2021			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.592	**$40,907**
2022			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.558	**$38,592**
2023			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.527	**$36,407**
2024			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.497	**$34,347**
2025			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.469	**$32,402**
2026			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.442	**$163,259**
2027			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.417	**$28,838**
2028			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.394	**$27,206**
2029			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.371	**$25,666**

Table 8-41: (PSP Table 19) Peck Water Conservation Improvement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost	Adjusted Grant Total Cost (1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2030			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.350	**$24,213**
2031			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.331	**$22,842**
2032			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.312	**$21,549**
2033			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.294	**$20,330**
2034			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.278	**$19,179**
2035			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.262	**$18,093**
2036			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.247	**$91,163**
2037			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.233	**$16,103**
2038			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.220	**$15,192**
2039			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.207	**$14,332**
2040			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.196	**$13,520**
2041			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.185	**$12,755**
2042			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.174	**$12,033**
2043			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.164	**$11,352**
2044			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.155	**$10,709**
2045			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.146	**$10,103**
2046			$10,000	$35,000	$310,000	$500,000	$14,112	**$869,112**	0.138	**$119,861**
2047			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.130	**$8,992**

Table 8-41: (PSP Table 19) Peck Water Conservation Improvement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost	Adjusted Grant Total Cost(1)	Annual Costs (2)						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2048			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.123	**$8,483**
2049			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.116	**$8,003**
2050			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.109	**$7,550**
2051			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.103	**$7,122**
2052			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.097	**$6,719**
2053			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.092	**$6,339**
2054			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.087	**$5,980**
2055			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.082	**$5,642**
2056			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.077	**$28,425**
2057			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.073	**$5,021**
2058			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.069	**$4,737**
2059			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.065	**$4,469**
2060			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.061	**$4,216**
2061			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.058	**$3,977**
2062			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.054	**$3,752**
2063			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.051	**$3,540**
2064			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.048	**$3,339**
2065			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.046	**$3,150**

Table 8-41: (PSP Table 19)
Peck Water Conservation Improvement Project
Project Annual Costs
(2012 Dollars)

	Initial Costs Grand Total Cost	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2066			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.043	**$15,872**
2067			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.041	**$2,804**
2068			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.038	**$2,645**
2069			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.036	**$2,495**
2070			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.034	**$2,354**
2071			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.032	**$2,221**
2072			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.030	**$2,095**
2073			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.029	**$1,976**
2074			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.027	**$1,865**
2075			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.025	**$1,759**
2076			$10,000	$35,000	$310,000	$500,000	$14,112	**$869,112**	0.024	**$20,869**
2077			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.023	**$1,566**
2078			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.021	**$1,477**
2079			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.020	**$1,393**
2080			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.019	**$1,314**
2081			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.018	**$1,240**
2082			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.017	**$1,170**
2083			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.016	**$1,104**

Table 8-41: (PSP Table 19) Peck Water Conservation Improvement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2084			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.015	**$1,041**
2085			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.014	**$982**
2086			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.013	**$4,949**
2087			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.013	**$874**
2088			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.012	**$825**
2089			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.011	**$778**
2090			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.011	**$734**
2091			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.010	**$692**
2092			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.009	**$653**
2093			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.009	**$616**
2094			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.008	**$581**
2095			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.008	**$548**
2096			$10,000	$35,000	$310,000		$14,112	**$369,112**	0.007	**$2,764**
2097			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.007	**$488**
2098			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.007	**$461**
2099			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.006	**$434**
2100			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.006	**$410**
2101			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.006	**$387**

Table 8-41: (PSP Table 19) Peck Water Conservation Improvement Project Project Annual Costs (2012 Dollars)										
	Initial Costs Grand Total Cost	Adjusted Grant Total Cost[1]	Annual Costs [2]						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2102			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.005	**$365**
2103			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.005	**$344**
2104			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.005	**$325**
2105			$10,000	$35,000	$10,000		$14,112	**$69,112**	0.004	**$306**
Total Present Value of Discounted Costs (Sum of column (j)) **Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries**										**$7,978,974**

Benefits and Costs Summary

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the future cost of importing water, groundwater recharge rates, and periodic maintenance and replacement costs. These issues are listed in **Table 8-42**.

Table 8-42: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Future cost of importing water	+	This analysis assumes that the cost of importing an AF of water will increase in real terms over time. Given the anticipated population growth regionally, potential climate change impacts on supply and demand, the demand for water and price of importing water will continue to increase, but it is not known by how much. Conservative real price escalation rates are used in this analysis.
Groundwater recharge levels	U	The Los Angeles County Flood Control District has conducted multiple technical studies to evaluate this Project. Nevertheless, these recharge rates are not guaranteed. Drought or deluge conditions could increase or decrease anticipated recharge rates, for example.
Frequency of periodic maintenance and component replacement	-	Two key components of the Project will need to be replaced over time. First of these are the two pumps. They are anticipated to last 30 years. If they need to be replaced more frequently, the Project will incur additional costs. Second of these is the pipeline. It has an expected 100 year lifetime. If the pipeline needs to be replaced sooner, the Project will also incur additional costs.

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

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San Jose Creek Water Reclamation Plant East Process Optimization Project

This attachment presents the economic analysis for the San Jose Creek Water Reclamation Plant (SJCWRP) East Process Optimization Project (Project). A project overview and project benefit summary table are followed by the following sections as outlined in the Proposal Solicitation Package: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Project consists of the construction of process optimization facilities at the 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 will 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[14] 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).

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-43**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

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

Table 8-43: Benefit-Cost Analysis Overview (Present Values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$62,821,022
Monetizable Benefits	
Increased volume of recycled water available for reuse	$125,151,496
Reduced power consumption	$5,280,772
Value of reduced greenhouse gas emissions	$3,996,370
Avoided cost of equipment replacement	$3,614,813
Total Monetizable Benefits	**$138,043,451**
Physically Quantified Benefit or Cost	**Project Life Total**
Reduced greenhouse gas emissions from more efficient treatment process	47,000 MT CO_2e
Reduced greenhouse gas emissions from reduced use of imported water	414,000 MT CO_2e
Qualitative Benefit or Cost	**Qualitative Indicator***
Meeting a state mandate	+
Improve water quality	+
Improve long-term management of California groundwater resources	+
Reduce demand for net diversions for the regions from the Delta	+
Provide a long-term solution in place of a short-term one	+
Promote energy savings	++
Improve reliability of water supply	+

* Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.
– = Likely to decrease net benefits.

– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

"USD" = United States dollars

Non-Monetized Benefits Analysis (Section D2)

Table 8-44 shows the non-monetized benefits checklist for the Project. Narrative descriptions of the benefit categories marked "Yes" in the following the table, are provided in the narrative description of qualitative benefits section after the table.

Table 8-44: (PSP Table 12): Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	No
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	

No.	Question	Enter "Yes", "No" or "Neg"
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	No
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment**	No

No.	Question	Enter "Yes", "No" or "Neg"
	7?	
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	Yes
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-**	No

No.	Question	Enter "Yes", "No" or "Neg"
	monetized benefit description)?	

Narrative Description of Qualitative Benefits

The narrative below explains the "yes" answers in **Table 8-44** above. Some of the benefits described below are explained in more detail and/or are physically quantified in Attachment 7.

Help avoid, reduce or resolve various public water resources conflicts - Meeting a state mandate

The State Water Resources Control Board Recycled Water Policy has mandated an increase in the use of recycled water in California of 200,000 AFY by 2020 and of an additional 300,000 AFY by 2030. Implementation of process optimization at the SJCWRP East would increase the volume and availability of recycled water and reduce demand for imported water, thus helping meet this mandate prior to 2020.

Improve water quality in ways that were not quantified in Attachment 7 - Prevent water quality degradation

The implementation of this Project, including flow equalization, sequential chlorination, and improvements to the PACs and aeration process, will improve the quality of the recycled water at the plant by decreasing peak constituent loading and minimizing disinfection byproducts. 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. The higher quality recycled water produced at the SJCWRP will be beneficially reused for non-potable reuse applications, groundwater recharge in spreading basins or discharged to San Jose Creek or the San Gabriel River. This higher quality recycled water will prevent water quality degradation.

Improve the overall, long-term management of California groundwater resources - Promote aquifer storage or recharge

Implementation of the Project would increase the volume and availability of recycled water for groundwater recharge. Groundwater recharge is currently accomplished by sending recycled water to the Montebello Forebay. 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 the Sanitation Districts are sized to accommodate treatment plant design flows (100 mgd or 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 recycled water.[15]

Reduce demand for net diversions for the regions from the Delta

The Project will offset the need for 8,400 AFY of water imported from the Sacramento-San Joaquin Delta (Delta). Diversion of water from the Delta to southern California has caused damage to the 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 likely be reduced, thus reducing operations that impact native species and habitats. This reduction in operations will help to meet the CALFED Bay Delta Program objectives to restore tidal marshes and floodplains, and restore fish and wildlife species.

Provide a long-term solution in place of a short-term one

The availability of imported water is becoming increasingly unreliable. The increased amount of recycled water produced locally as a result of this Project will reduce the need for imported water in the Region. The Project will also reduce supply uncertainty and variability because recycled water yields are not impacted by weather factors such as drought and snowpack levels. Thus supply reliability is considerably enhanced by increasing the availability and volume of recycled water throughout the year, particularly when other sources such as imported and rain water are not available. Recycled water, which can be used for both groundwater recharge and municipal/industrial uses, contributes to establishing a flexible and reliable portfolio of local water sources.

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

Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources - reduce net energy use on a permanent basis

Implementation of the Project will reduce net energy use both from the offset of imported water and from increased efficiency provided by properly-sized process units and additional operational flexibility. PACs are the plant's most significant source of power demand, and replacing the existing PACs with new units that are optimally sized would greatly lower power consumption. In addition to the power consumption savings associated with new PACs, the implementation of flow equalization should reduce peak electrical loads throughout the plant, thereby allowing plant equipment to operate more efficiently. Implementation of the Project will reduce net energy use on a permanent basis through the use of more efficient equipment and the reduction of peak electrical loads throughout the plant. It is estimated that approximately 2.85 million kWh per year would be avoided from implementation of the Project's treatment system upgrades, and approximately 25.2 million kWh per year would be avoided from the offset of imported water supplies. See Attachment 7 for additional details.

Improve water supply reliability in ways not quantified in Attachment 7 - reduce supply uncertainty and variability

The availability of imported water is becoming increasingly unreliable as a long-term permanent water supply solution. The increased amount of recycled water produced locally as a result of this Project will reduce the need for imported water. The Project will also reduce supply uncertainty and variability because recycled water yields are not impacted by weather factors such as drought and snowpack levels. Thus supply reliability is considerably enhanced by increasing the availability and volume of recycled water throughout the year, particularly when other sources such as imported and rain water are not available.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 50 year life of the Project. Those include 1) Increased volume of recycled water available for reuse, 2) energy savings due to reduced power consumption in importing water and at the reclamation treatment facility, and 3) reduction in emissions of GHGs.

Increased volume of recycled water available for reuse

This Project will increase the volume of local recycled water supplies produced by capturing the flow of water that currently bypasses the treatment facility during peak loading and making it available for beneficial reuse. Currently it is estimated that 8,400 AFY bypasses the treatment facility that could be captured if the Project were implemented. 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[16].

The increased volume of recycled water would be used to offset imported water delivered for recharge to the Central Basin. The estimated saving from not needing to purchase imported water was based on the purchase price of MWD-furnished Tier 1 treated water at $794/AF in 2012. Assuming a 3.5% increase in the real (above general inflation) cost of this water per year through 2020, it is estimated that this water will be valued at $1003/AF when this Project begins producing benefits in 2018. There is also a $20/AF infrastructure surcharge imposed by the Central Basin Municipal Water District (CBMWD) to cover the costs of delivering imported water to customer agencies. The value of this water is assumed to continue increasing at 3.5% in 2020, and then at 1.5% from 2021 onwards throughout the 50 year lifetime of this project. The savings due to avoided imported water amount to over $125 million over the life of the Project.

Energy savings due to reduced power consumption

Significant energy savings will be obtained by replacing the PACs at SJCWRP with new high efficiency units. Before the Project, the facility used 19.7 million kWh/year. With the new more efficient PACs, power consumption would be reduced to 15.6 million kWh/year, resulting in a 4.1 million kWh annual savings[17]. The savings due to the process improvements have an annual value of $446,900, and a present value of more than $5 million over the life of the Project.

When the energy savings from the new PACs is combined with the new power requirements of the other treatment upgrades, the overall net energy savings from implementation of the Project is reduced to approximately 2.85 million kWh/year. However, the energy costs for the other treatment upgrades (i.e., other than PAC energy savings) are embedded in the Project operating costs and therefore will not be counted again here against Project benefits. In other words, the non-PAC-related energy costs are already monetized.

Reduced emissions of greenhouse gases

[16] LACSD, 2010: Recycled Water Supply for GRIP – August 2010 Update Memorandum
[17] LACSD, 2012: Update to SJCWRP Process Air Compressor Efficiency Study Memorandum

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. Between 2017 and 2019, the Project will reduce GHG emissions by 1,348 MT of CO_2 equivalents per year by replacing the PACs and optimizing the aeration systems. Then, from 2019 through 2068, the construction of flow equalization and implementation of sequential chlorination will offset the GHG benefit somewhat, lowering it to only 937 MT of CO_2 equivalents per year (because these processes require new power consumption). However, also between 2019 and 2068, the Project will reduce GHG emission by an additional 8,276 metric tons of CO_2 equivalents per year by offsetting the demand of 8,400 AF of imported SWP water. In summary, the total reduction in GHG emissions between 2017 and 2019 from the Project will be 1,348 MT of CO_2 equivalents per year. And between 2019 and 2068, the total reduction in GHG emissions from the Project will be 9,213 MT per year (937 + 8,276 MT).

To monetize this benefit, we applied the dollar value assigned to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalent (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT(updated from 2010 values using CPI), with a range of values from $4.95 to $68.33 per MT. The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions. Estimates of the portions of the net benefits occurring in the United States range from 7% to 23% of the worldwide social cost of carbon.

For this analysis, the average value of $22.53/MT was used when calculating social benefits and costs, which produces conservative estimates for the benefits and costs associated with GHG emissions. To determine total costs over the 50-year project period, we escalate the social cost of carbon by 2.4% per year[18], which is above the general rate of inflation. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change.

[18] The United Kingdom has established an official estimate of the social cost of carbon for use in many of its project evaluations and models the growth rate of the real cost at 2.4% per year.

The Project will in total reduce GHG emissions by 1,348 MT per year between 2017 and 2019, and by 9,213 MT per year from 2019 onwards. Valuing these GHG emissions reductions at $22.53/MT (2012 estimate, in 2012$s), and escalating at a real rate of 2.4% per year as applied in the United Kingdom, the present value of the reduced emissions amounts to almost $4.0 million over the Project life.

Avoided cost of equipment replacement

Some existing facilities in the SJCWRP are currently near the end of their useful lifetime. The PACs have an estimated lifetime of 50 years. Approximately half of the current compressors (as of 2013) are 42 years old and the other half are 31 years old. With a 50 year life expectancy, these are scheduled to be replaced in 8 and 19 years, respectively, at a cost of $8.0 million total (2012$, from Attachment 4 - Budget, including 30% contingency). This analysis assumes that 50% of avoided PAC replacement costs apply in 2021 ($4 million) and 50% apply in 2032 ($4 million).[19] In 2012 dollars, this amount to approximately $3.6 million in avoided costs.

Project Benefits and Costs Summary (Section D5)

This section summarizes the benefits and costs of implementing the Project.

Project Economic Benefits

The total economic benefits associated with this Project have a present value of $138,043,451, including the present value of avoided costs. **Tables 8-45, 8-46, and 8-47** summarize the annual benefits from the Project.

Project Economic Costs

The total initial and capital costs associated with this Project are $73,807,000. The major portion of these costs are associated with the design and construction of the flow equalization systems (i.e., equalization tank, pump station, odor control, yard piping) and design and installation of PACs and aeration system upgrades.

Operations costs are estimated to be $101,000/year and maintenance costs are estimated to be $82,000/year. It is estimated that 5% of the operations and maintenance costs be attributed to administrative costs. Operations costs include power, chemicals, and materials (such as carbon for the odor control system). Maintenance costs assume general maintenance of the Project

[19] Personal communication with Angela Chang, LACSD, March 18, 2013.

facilities, including parts and labor. For the purposes of this analysis, it is assumed that these annual operations and maintenance costs begin in 2017 with the startup of the PACs.

Major replacement for equipment, piping, and valves will occur every 25 years in the amount of $7.31 million for the flow equalization facilities ($3.74 million, 2012$) and for PACs ($3.57 million, 2012$).[20]

Table 8-46 summarizes the annual costs of the Project; and **Table 8-47** summarizes the avoided costs of the Project.

[20] Personal communication with Angela Chang, LACSD, March 18, 2013.

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2012									1.00	
2013									0.94	
2014									0.89	
2015									0.84	
2016									0.79	
2017	Energy savings at RWF due to process optimization	kWh	Baseline	Baseline - 4,100,000	4,100,000	$0.11		$446,900	0.75	$333,950
2017	value of avoided GHG emissions	Metric Tonnes	Baseline	Baseline - 1,348	1348	$25.37		$34,196	0.75	$25,553
	Energy savings at RWF due to process optimization	kWh	Baseline	Baseline - 4,100,000	4,100,000	$0.11		$446,900	0.70	$315,047
	value of avoided GHG emissions	Metric Tonnes	Baseline	Baseline - 1,348	1348	$25.98		$35,016	0.70	$24,685
2019	Energy saved	kWh	Baseline	Baseline - 4,100,001	4,100,000	$0.11		$446,900	0.67	$297,214
	GHG avoided	MT	Baseline	Baseline -	9213	$26.60		$245,066	0.67	$162,983

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
				9,213						
	Increased reuse water	AFY	81,200	89,600	8400	$1,038.28	$20	$8,889,552	0.67	$5,912,060
2020	Energy saved	kWh	Baseline	Baseline - 4,100,002	4,100,000	$0.11		$446,900	0.63	$280,391
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$27.24		$250,947	0.63	$157,447
	Increased reuse water	AFY	81,200	89,600	8400	$1,074.62	$20	$9,194,806	0.63	$5,768,935
2021	Energy saved	kWh	Baseline	Baseline - 4,100,003	4,100,000	$0.11		$446,900	0.59	$264,519
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$27.89		$256,970	0.59	$152,100
	Increased reuse water	AFY	81,200	89,600	8400	$1,090.74	$20	$9,330,208	0.59	$5,522,536
2022	Energy saved	kWh	Baseline	Baseline - 4,100,004	4,100,000	$0.11		$446,900	0.56	$249,547
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$28.56		$263,137	0.56	$146,935
	Increased reuse	AFY	81,200	89,600	8400	$1,107.10	$20	$9,467,642	0.56	$5,286,682

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	water									
2023	Energy saved	kWh	Baseline	Baseline - 4,100,005	4,100,000	$0.11		$446,900	0.53	$235,421
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$29.25		$269,453	0.53	$141,944
	Increased reuse water	AFY	81,200	89,600	8400	$1,123.71	$20	$9,607,136	0.53	$5,060,919
2024	Energy saved	kWh	Baseline	Baseline - 4,100,006	4,100,000	$0.11		$446,900	0.50	$222,096
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$29.95		$275,920	0.50	$137,124
	Increased reuse water	AFY	81,200	89,600	8400	$1,140.56	$20	$9,748,723	0.50	$4,844,817
2025	Energy saved	kWh	Baseline	Baseline - 4,100,007	4,100,000	$0.11		$446,900	0.47	$209,524
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$30.67		$282,542	0.47	$132,467
	Increased reuse water	AFY	81,200	89,600	8400	$1,157.67	$20	$9,892,434	0.47	$4,637,959
2026	Energy saved	kWh	Baseline	Baseline -		$0.11		$446,900	0.44	$197,664

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
				4,100,008	4,100,000					
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$31.40		$289,323	0.44	$127,968
	Increased reuse water	AFY	81,200	89,600	8400	$1,175.04	$20	$10,038,301	0.44	$4,439,950
2027	Energy saved	kWh	Baseline	Baseline - 4,100,009	4,100,000	$0.11		$446,900	0.42	$186,476
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$32.16		$296,266	0.42	$123,622
	Increased reuse water	AFY	81,200	89,600	8400	$1,192.66	$20	$10,186,355	0.42	$4,250,410
2028	Energy saved	kWh	Baseline	Baseline - 4,100,010	4,100,000	$0.11		$446,900	0.39	$175,921
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$32.93		$303,377	0.39	$119,423
	Increased reuse water	AFY	81,200	89,600	8400	$1,210.55	$20	$10,336,630	0.39	$4,068,976
2029	Energy saved	kWh	Baseline	Baseline - 4,100,011	4,100,000	$0.11		$446,900	0.37	$165,963
	GHG avoided	MT	Baseline	Baseline -	9213	$33.72		$310,658	0.37	$115,367

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	Unit $ value - Infra. Surcharge	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
				9,213						
	Increased reuse water	AFY	81,200	89,600	8400	$1,228.71	$20	$10,489,160	0.37	$3,895,301
2030	Energy saved	kWh	Baseline	Baseline - 4,100,012	4,100,000	$0.11		$446,900	0.35	$156,569
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$34.53		$318,114	0.35	$111,449
	Increased reuse water	AFY	81,200	89,600	8400	$1,247.14	$20	$10,643,977	0.35	$3,729,051
2031	Energy saved	kWh	Baseline	Baseline - 4,100,013	4,100,000	$0.11		$446,900	0.33	$147,706
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$35.36		$325,748	0.33	$107,664
	Increased reuse water	AFY	81,200	89,600	8400	$1,265.85	$20	$10,801,117	0.33	$3,569,910
2032	Energy saved	kWh	Baseline	Baseline - 4,100,014	4,100,000	$0.11		$446,900	0.31	$139,346
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$36.21		$333,566	0.31	$104,008
	Increased reuse	AFY	81,200	89,600	8400	$1,284.83	$20	$10,960,614	0.31	$3,417,571

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	Unit $ value - Infra. Surcharge	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
	water									
2033	Energy saved	kWh	Baseline	Baseline - 4,100,015	4,100,000	$0.11		$446,900	0.29	$131,458
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$37.07		$341,572	0.29	$100,475
	Increased reuse water	AFY	81,200	89,600	8400	$1,304.11	$20	$11,122,503	0.29	$3,271,744
2034	Energy saved	kWh	Baseline	Baseline - 4,100,016	4,100,000	$0.11		$446,900	0.28	$124,017
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$37.96		$349,770	0.28	$97,063
	Increased reuse water	AFY	81,200	89,600	8400	$1,323.67	$20	$11,286,820	0.28	$3,132,150
2035	Energy saved	kWh	Baseline	Baseline - 4,100,017	4,100,000	$0.11		$446,900	0.26	$116,997
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$38.88		$358,164	0.26	$93,766
	Increased reuse water	AFY	81,200	89,600	8400	$1,343.52	$20	$11,453,603	0.26	$2,998,522
2036	Energy saved	kWh	Baseline	Baseline -		$0.11		$446,900	0.25	$110,375

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
				4,100,018	4,100,000					
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$39.81		$366,760	0.25	$90,582
	Increased reuse water	AFY	81,200	89,600	8400	$1,363.68	$20	$11,622,887	0.25	$2,870,604
2037	Energy saved	kWh	Baseline	Baseline - 4,100,019	4,100,000	$0.11		$446,900	0.23	$104,127
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$40.76		$375,562	0.23	$87,505
	Increased reuse water	AFY	81,200	89,600	8400	$1,384.13	$20	$11,794,710	0.23	$2,748,151
2038	Energy saved	kWh	Baseline	Baseline - 4,100,020	4,100,000	$0.11		$446,900	0.22	$98,233
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$41.74		$384,576	0.22	$84,534
	Increased reuse water	AFY	81,200	89,600	8400	$1,404.89	$20	$11,969,111	0.22	$2,630,931
2039	Energy saved	kWh	Baseline	Baseline - 4,100,021	4,100,000	$0.11		$446,900	0.21	$92,673
	GHG avoided	MT	Baseline	Baseline -	9213	$42.74		$393,806	0.21	$81,663

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
				9,213						
	Increased reuse water	AFY	81,200	89,600	8400	$1,425.97	$20	$12,146,127	0.21	$2,518,718
2040	Energy saved	kWh	Baseline	Baseline - 4,100,022	4,100,000	$0.11		$446,900	0.20	$87,427
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$43.77		$403,257	0.20	$78,889
	Increased reuse water	AFY	81,200	89,600	8400	$1,447.36	$20	$12,325,799	0.20	$2,411,298
2041	Energy saved	kWh	Baseline	Baseline - 4,100,023	4,100,000	$0.11		$446,900	0.18	$82,478
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$44.82		$412,935	0.18	$76,210
	Increased reuse water	AFY	81,200	89,600	8400	$1,469.07	$20	$12,508,166	0.18	$2,308,466
2042	Energy saved	kWh	Baseline	Baseline - 4,100,024	4,100,000	$0.11		$446,900	0.17	$77,810
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$45.90		$422,845	0.17	$73,622
	Increased reuse	AFY	81,200	89,600	8400	$1,491.10	$20	$12,693,269	0.17	$2,210,027

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value (1)	Unit $ value - Infra. Surcharge	(h) Annual $ Value (1) (f) x (g)	(i) Discount Factor (1)	(j) Discounted Benefits (1) (h) x (i)
	water									
2043	Energy saved	kWh	Baseline	Baseline - 4,100,025	4,100,000	$0.11		$446,900	0.16	$73,405
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$47.00		$432,994	0.16	$71,121
	Increased reuse water	AFY	81,200	89,600	8400	$1,513.47	$20	$12,881,148	0.16	$2,115,791
2044	Energy saved	kWh	Baseline	Baseline - 4,100,026	4,100,000	$0.11		$446,900	0.15	$69,250
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$48.13		$443,386	0.15	$68,706
	Increased reuse water	AFY	81,200	89,600	8400	$1,536.17	$20	$13,071,845	0.15	$2,025,579
2045	Energy saved	kWh	Baseline	Baseline - 4,100,027	4,100,000	$0.11		$446,900	0.15	$65,331
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$49.28		$454,027	0.15	$66,372
	Increased reuse water	AFY	81,200	89,600	8400	$1,559.21	$20	$13,265,403	0.15	$1,939,219
2046	Energy saved	kWh	Baseline	Baseline -		$0.11		$446,900	0.14	$61,633

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
				4,100,028	4,100,000					
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$50.46		$464,924	0.14	$64,118
	Increased reuse water	AFY	81,200	89,600	8400	$1,582.60	$20	$13,461,864	0.14	$1,856,546
2047	Energy saved	kWh	Baseline	Baseline - 4,100,029	4,100,000	$0.11		$446,900	0.13	$58,144
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$51.67		$476,082	0.13	$61,941
	Increased reuse water	AFY	81,200	89,600	8400	$1,606.34	$20	$13,661,272	0.13	$1,777,403
2048	Energy saved	kWh	Baseline	Baseline - 4,100,030	4,100,000	$0.11		$446,900	0.12	$54,853
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$52.92		$487,508	0.12	$59,837
	Increased reuse water	AFY	81,200	89,600	8400	$1,630.44	$20	$13,863,671	0.12	$1,701,638
2049	Energy saved	kWh	Baseline	Baseline - 4,100,031	4,100,000	$0.11		$446,900	0.12	$51,748
	GHG avoided	MT	Baseline	Baseline -	9213	$54.19		$499,208	0.12	$57,805

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [1]	Unit $ value - Infra. Surcharge	Annual $ Value [1] (f) x (g)	Discount Factor [1]	Discounted Benefits [1] (h) x (i)
				9,213						
	Increased reuse water	AFY	81,200	89,600	8400	$1,654.89	$20	$14,069,106	0.12	$1,629,107
2050	Energy saved	kWh	Baseline	Baseline - 4,100,032	4,100,000	$0.11		$446,900	0.11	$48,819
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$55.49		$511,189	0.11	$55,842
	Increased reuse water	AFY	81,200	89,600	8400	$1,679.72	$20	$14,277,622	0.11	$1,559,671
2051	Energy saved	kWh	Baseline	Baseline - 4,100,033	4,100,000	$0.11		$446,900	0.10	$46,056
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$56.82		$523,457	0.10	$53,945
	Increased reuse water	AFY	81,200	89,600	8400	$1,704.91	$20	$14,489,267	0.10	$1,493,199
2052	Energy saved	kWh	Baseline	Baseline - 4,100,034	4,100,000	$0.11		$446,900	0.10	$43,449
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$58.18		$536,020	0.10	$52,113
	Increased reuse	AFY	81,200	89,600	8400	$1,730.49	$20	$14,704,086	0.10	$1,429,563

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value [(1)]	Unit $ value - Infra. Surcharge	(h) Annual $ Value [(1)] (f) x (g)	(i) Discount Factor [(1)]	(j) Discounted Benefits [(1)] (h) x (i)
	water									
2053	Energy saved	kWh	Baseline	Baseline - 4,100,035	4,100,000	$0.11		$446,900	0.09	$40,989
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$59.58		$548,885	0.09	$50,343
	Increased reuse water	AFY	81,200	89,600	8400	$1,756.44	$20	$14,922,127	0.09	$1,368,643
2054	Energy saved	kWh	Baseline	Baseline - 4,100,036	4,100,000	$0.11		$446,900	0.09	$38,669
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$61.01		$562,058	0.09	$48,633
	Increased reuse water	AFY	81,200	89,600	8400	$1,782.79	$20	$15,143,439	0.09	$1,310,322
2055	Energy saved	kWh	Baseline	Baseline - 4,100,037	4,100,000	$0.11		$446,900	0.08	$36,480
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$62.47		$575,547	0.08	$46,982
	Increased reuse water	AFY	81,200	89,600	8400	$1,809.53	$20	$15,368,071	0.08	$1,254,490
2056	Energy saved	kWh	Baseline	Baseline -		$0.11		$446,900	0.08	$34,415

Table 8-45: (PSP Table 15)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Annual Project Benefits
(2012 Dollars)

(a) Year	(b) Type of Benefit	(c) Measure of Benefit (Units)	(d) Without Project	(e) With Project	(f) Change Resulting from Project (e) – (d)	(g) Unit $ Value [(1)]	Unit $ value - Infra. Surcharge	(h) Annual $ Value [(1)] (f) x (g)	(i) Discount Factor [(1)]	(j) Discounted Benefits [(1)] (h) x (i)
				4,100,038	4,100,000					
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$63.97		$589,361	0.08	$45,386
	Increased reuse water	AFY	81,200	89,600	8400	$1,836.68	$20	$15,596,072	0.08	$1,201,039
2057	Energy saved	kWh	Baseline	Baseline - 4,100,039	4,100,000	$0.11		$446,900	0.07	$32,467
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$65.51		$603,505	0.07	$43,845
	Increased reuse water	AFY	81,200	89,600	8400	$1,864.23	$20	$15,827,493	0.07	$1,149,869
2058	Energy saved	kWh	Baseline	Baseline - 4,100,040	4,100,000	$0.11		$446,900	0.07	$30,630
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$67.08		$617,989	0.07	$42,356
	Increased reuse water	AFY	81,200	89,600	8400	$1,892.19	$20	$16,062,385	0.07	$1,100,881
2059	Energy saved	kWh	Baseline	Baseline - 4,100,041	4,100,000	$0.11		$446,900	0.06	$28,896
	GHG avoided	MT	Baseline	Baseline -	9213	$68.69		$632,821	0.06	$40,917

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Unit $ value - Infra. Surcharge	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
				9,213						
	Increased reuse water	AFY	81,200	89,600	8400	$1,920.57	$20	$16,300,801	0.06	$1,053,982
2060	Energy saved	kWh	Baseline	Baseline - 4,100,042	4,100,000	$0.11		$446,900	0.06	$27,260
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$70.34		$648,009	0.06	$39,528
	Increased reuse water	AFY	81,200	89,600	8400	$1,949.38	$20	$16,542,793	0.06	$1,009,084
2061	Energy saved	kWh	Baseline	Baseline - 4,100,043	4,100,000	$0.11		$446,900	0.06	$25,717
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$72.02		$663,561	0.06	$38,185
	Increased reuse water	AFY	81,200	89,600	8400	$1,978.62	$20	$16,788,415	0.06	$966,100
2062	Energy saved	kWh	Baseline	Baseline - 4,100,044	4,100,000	$0.11		$446,900	0.05	$24,261
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$73.75		$679,487	0.05	$36,888
	Increased reuse	AFY	81,200	89,600	8400	$2,008.30	$20	$17,037,721	0.05	$924,950

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Unit $ value - Infra. Surcharge	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
	water									
2063	Energy saved	kWh	Baseline	Baseline - 4,100,045	4,100,000	$0.11		$446,900	0.05	$22,888
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$75.52		$695,794	0.05	$35,635
	Increased reuse water	AFY	81,200	89,600	8400	$2,038.42	$20	$17,290,767	0.05	$885,554
2064	Energy saved	kWh	Baseline	Baseline - 4,100,046	4,100,000	$0.11		$446,900	0.05	$21,593
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$77.34		$712,493	0.05	$34,425
	Increased reuse water	AFY	81,200	89,600	8400	$2,069.00	$20	$17,547,608	0.05	$847,838
2065	Energy saved	kWh	Baseline	Baseline - 4,100,047	4,100,000	$0.11		$446,900	0.05	$20,370
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$79.19		$729,593	0.05	$33,256
	Increased reuse water	AFY	81,200	89,600	8400	$2,100.04	$20	$17,808,302	0.05	$811,730
2066	Energy saved	kWh	Baseline	Baseline -		$0.11		$446,900	0.04	$19,217

Table 8-45: (PSP Table 15) San Jose Creek Water Reclamation Plant East Process Optimization Project Annual Project Benefits (2012 Dollars)										
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value [(1)]	Unit $ value - Infra. Surcharge	Annual $ Value [(1)] (f) x (g)	Discount Factor [(1)]	Discounted Benefits [(1)] (h) x (i)
				4,100,048	4,100,000					
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$81.09		$747,103	0.04	$32,127
	Increased reuse water	AFY	81,200	89,600	8400	$2,131.54	$20	$18,072,907	0.04	$777,162
2067	Energy saved	kWh	Baseline	Baseline - 4,100,049	4,100,000	$0.11		$446,900	0.04	$18,130
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$83.04		$765,034	0.04	$31,035
	Increased reuse water	AFY	81,200	89,600	8400	$2,163.51	$20	$18,341,481	0.04	$744,067
2068	Energy saved	kWh	Baseline	Baseline - 4,100,050	4,100,000	$0.11		$446,900	0.04	$17,103
	GHG avoided	MT	Baseline	Baseline - 9,213	9213	$85.03		$783,395	0.04	$29,981
	Increased reuse water	AFY	81,200	89,600	8400	$2,195.96	$20	$18,614,083	0.04	$712,382
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)										**$134,428,638**
Comments:										

Table 8-46: (PSP Table 19)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2012								0	1.000	
2013	**$3,738,000**							$3,738,000	0.943	**$3,526,415**
2014	**$2,199,000**							$2,199,000	0.890	**$1,957,102**
2015	**$16,838,000**							$16,838,000	0.840	**$14,137,509**
2016	**$33,757,000**							33,757,000	0.792	**$26,738,706**
2017	**$16,814,000**			$101,000	$ 82,000			$16,997,000	0.747	**$12,701,147**
2018	**$461,000**			$101,000	$ 82,000			$644,000	0.705	**$453,995**
2019				$101,000	$ 82,000			$183,000	0.665	**$121,705**
2020				$101,000	$ 82,000			$183,000	0.627	**$114,816**
2021				$101,000	$ 82,000			$183,000	0.592	**$108,317**
2022				$101,000	$ 82,000			$183,000	0.558	**$102,186**
2023				$101,000	$ 82,000			$183,000	0.527	**$96,402**

Table 8-46: (PSP Table 19)
San Jose Creek Water Reclamation Plant East Process Optimization Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2024				$101,000	$ 82,000			$183,000	0.497	**$90,945**
2025				$101,000	$ 82,000			$183,000	0.469	**$85,798**
2026				$101,000	$ 82,000			$183,000	0.442	**$80,941**
2027				$101,000	$ 82,000			$183,000	0.417	**$76,360**
2028				$101,000	$ 82,000			$183,000	0.394	**$72,037**
2029				$101,000	$ 82,000			$183,000	0.371	**$67,960**
2030				$101,000	$ 82,000			$183,000	0.350	**$64,113**
2031				$101,000	$ 82,000			$183,000	0.331	**$60,484**
2032				$101,000	$ 82,000			$183,000	0.312	**$57,060**
2033				$101,000	$ 82,000			$183,000	0.294	**$53,830**
2034				$101,000	$ 82,000			$183,000	0.278	**$50,783**
2035				$101,000	$ 82,000			$183,000	0.262	**$47,909**
2036				$101,000	$ 82,000			$ 183,000	0.247	**$45,197**
2037				$101,000	$ 82,000			$183,000	0.233	**$42,639**

Table 8-46: (PSP Table 19) San Jose Creek Water Reclamation Plant East Process Optimization Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2038				$101,000	$ 82,000			$183,000	0.220	**$40,225**
2039				$101,000	$ 82,000			$183,000	0.207	**$37,948**
2040				$101,000	$ 82,000			$183,000	0.196	**$35,800**
2041				$101,000	$ 82,000			$183,000	0.185	**$33,774**
2042				$101,000	$ 82,000	$7,310,000		$7,493,000	0.174	**$ 1,304,607**
2043				$101,000	$ 82,000			$183,000	0.164	**$ 30,059**
2044				$101,000	$ 82,000			$183,000	0.155	**$ 28,357**
2045				$101,000	$ 82,000			$183,000	0.146	**$ 26,752**
2046				$101,000	$ 82,000			$183,000	0.138	**$ 25,238**
2047				$101,000	$ 82,000			$183,000	0.130	**$ 23,809**
2048				$101,000	$ 82,000			$183,000	0.123	**$ 22,462**
2049				$101,000	$ 82,000			$183,000	0.116	**$ 21,190**
2050				$101,000	$ 82,000			$183,000	0.109	**$ 19,991**
2051				$101,000	$ 82,000			$183,000	0.103	**$ 18,859**

Table 8-46: (PSP Table 19) San Jose Creek Water Reclamation Plant East Process Optimization Project Project Annual Costs (2012 Dollars)											
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2052				$101,000	$ 82,000			$183,000	0.097	**$ 17,792**
2053				$101,000	$ 82,000			$183,000	0.092	**$ 16,785**
2054				$101,000	$ 82,000			$183,000	0.087	**$ 15,835**
2055				$101,000	$ 82,000			$ 183,000	0.082	**$ 14,938**
2056				$101,000	$ 82,000			$183,000	0.077	**$ 14,093**
2057				$101,000	$ 82,000			$183,000	0.073	**$ 13,295**
2058				$101,000	$ 82,000			$183,000	0.069	**$ 12,542**
2059				$101,000	$ 82,000			$183,000	0.065	**$ 11,832**
2060				$101,000	$ 82,000			$183,000	0.061	**$ 11,163**
2061				$101,000	$ 82,000			$183,000	0.058	**$ 10,531**
2062				$101,000	$ 82,000			$183,000	0.054	**$ 9,935**
2063				$101,000	$ 82,000			$183,000	0.051	**$ 9,372**
2064				$101,000	$ 82,000			$183,000	0.048	**$ 8,842**

Table 8-46: (PSP Table 19) San Jose Creek Water Reclamation Plant East Process Optimization Project Project Annual Costs (2012 Dollars)											
			Annual Costs							Discounting Calculations	
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2065				$101,000	$ 82,000			$183,000	0.046	**$ 8,341**
2066				$101,000	$ 82,000			$183,000	0.043	**$ 7,869**
2067				$101,000	$ 82,000			$183,000	0.041	**$ 7,424**
2068				$101,000	$ 82,000			$183,000	0.038	**$ 7,004**
2061				$101,000	$ 82,000			$183,000	0.058	**$10,531**
2062				$101,000	$ 82,000			$183,000	0.054	**$9,935**
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$62,821,022**
Comments:										

Table 8-47: (PSP Table 16): Annual Costs of Avoided Projects (2012 Dollars)

	Costs				Discounting Calculations	
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Year	Avoided Project Description: End of lifetime replacement of plant equipment and PACs					
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance Costs	Total Costs Avoided for Individual Alternatives (b) + (C) + (d)	Discount Factor	Discounted Costs (e) x (f)
2021		$4,000,000			0.592	**$ 1,095,012**
2032		$4,000,000			0.312	**$ 576,839**
Total Present Value of Discounted Costs (Sum of column (g))						**$3,614,813**
(%) Avoided Cost Claimed by Project						**100%**
Total Present Value Discounted Avoided Project Costs Claimed by Alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)						**$3,614,813**
Comments:						

Benefits and Costs Summary

The estimated present value benefits of this Project are $138,043,451. Benefits quantified are for increasing the volume of recycled water, energy savings due to reduced power consumption, and reduced emissions of GHGs. The present value cost of this Project is $62,821,022. Therefore the benefit to cost ratio for this Project is over 2:1.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the increased volume of recycled water available for reuse and the energy savings due to reduced power consumption and associated GHG emissions benefits. These issues are listed in **Table 8-48**.

Table 8-48: Omissions, Biases, and Uncertainties, and Their Likely Impact on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Increased volume of recycled water available for reuse	U	Each year the quantities of recycled water produced and reused vary with flows into SJCWRP and recycled water demands. Inputs of domestic and industrial wastewater into SJCWRP vary over time and are dependent on sources outside of LACSD's control. The amount of recycled water used for groundwater replenishment can vary greatly each year depending on the amount and timing of rainfall runoff, maintenance activities in the spreading grounds, and other factors. Therefore, these uncertainties may affect the realized benefits on an annual basis. However, it is anticipated that implementation of the Project, will create a long-term trend over multiple years that demonstrates an increase in production and reuse of recycled water, thereby realizing the physical benefits of the Project. Additionally, LACSD has various existing recycled water users and is continuously in the process of obtaining other new users. Therefore, recycled water would and could be used for other beneficial uses, such as

Table 8-48: Omissions, Biases, and Uncertainties, and Their Likely Impact on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
		industrial and landscaping purposes. The timing of this demand is also not within LACSD's control. However, it is reasonable to assume that these uses would likely result in imported water offsets. Lastly, the Project is in 10% Design, therefore, the final location and sizing of the facilities are still being determined. However, all of the facilities (in addition to the license agreement) would be located within the existing SJCWRP site and would produce the same benefits described.
Energy savings due to reduced power consumption and associated GHG emissions reductions	U	Power consumption at the plant is directly correlated to the volume of wastewater treated and therefore will vary with the volume of wastewater treated.

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

References

Sanitation Districts of Los Angeles County, Memorandum – "Recycled Water Supply for GRIP – August 2010 Update." To: Ray Tremblay, From: Andrew Hall, August 23, 2010.

Sanitation Districts of Los Angeles County, Memorandum – “San Jose Creek WRP Process Air Compressor Efficiency Study Rl” To: Anthony Mahinda, From: Andre Schmidt, October 29, 2012).

Central Basin Municipal Water District. 2013 http://www.centralbasin.org/budget2012.html. Accessed 15 march 2013.

South Gardena Recycled Water Pipeline Project

This attachment presents the economic analysis for the South Gardena Recycled Water Project (Project). A Project overview and Project benefit summary table are followed by the following sections as outlined in the Proposal Solicitation Package: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The South Gardena Recycled Water Pipeline 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. 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).

The new pipeline will serve four customers that currently use potable water for irrigation purposes, including: Roosevelt Memorial Park Association (cemetery), Gardena High School, South Garden Park, and C Stars Nursery. The cemetery and Gardena High School currently receive potable water from the City of Los Angeles Department of Water and Power (LADWP), while South Garden Park and C-Stars Nursery receive their potable supplies from Golden State Water Company (which receives its imported supplies for this part of the service area from WBMWD. Providing recycled water to these customers will directly offset the use of imported water provided to LADWP and Golden State Water Company (via WBMWD and CBMWD) by the Metropolitan Water District of Southern California (MWD).

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 of Los Angeles (after it has been treated to secondary standards) and treats it to Title 22 and higher water quality standards for delivery to end users. Currently, WBMWD purchases approximately 33,000 AFY of secondary treated effluent from Hyperion (about 10% of total treated effluent generated at the plant).

Summary of Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-49**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-49: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$2,238,849
Monetizable Benefits	
Avoided Imported Water Supply Costs	$1,804,795
Avoided Fertilizer Costs	$93,051
Avoided Social Costs of Carbon Emissions	$42,799
Total Monetizable Benefits	$1,940,644
Qualitative Benefit or Cost	**Qualitative Indicator***
Provide social recreation or access benefits	+
Help avoid, reduce or resolve various public water resources conflicts?	+
Have other social benefits	+
Improve water quality in ways that were not quantified in Attachment 7	+
Improve the overall, long-term management of California groundwater resources	+
Reduce demand for net diversions for the regions from the Delta?	+
Provide a long-term solution in place of a short-term one?	+
Improve water supply reliability in ways not quantified in Attachment 7	++
Avoid wastewater discharge costs	+

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

"USD" = United States dollars

Non-Monetized Benefits Analysis (Section D2)

Table 8-50 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table, are provided in the narrative of qualitative benefits section after the table.

Table 8-50: (PSP Table 12) Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	No
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include: - Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	No
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events?	

No.	Question	Enter "Yes", "No" or "Neg"
	- Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	Yes
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses? - Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	

No.	Question	Enter "Yes", "No" or "Neg"
10	**Improve the overall, long-term management of California groundwater resources?**	No
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	Yes
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No[1]
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other: Avoided wastewater discharge costs**	Yes

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

The narrative below explains the "yes" answers in Table 8-50 above. Some of the benefits described below are explained in more detail and/or are physically quantified in Attachment 7.

Provide social recreation or access benefits

Preserve outdoor recreation opportunities

By switching to recycled water, customers participating in the Project will no longer be subject to watering restrictions during times of drought. Thus the cemetery, high school, and South Garden Park can continue to irrigate their landscape/turf areas regardless of drought conditions (thus remaining green during dry periods). This will improve the aesthetics and enjoyment of these areas and, in extreme cases, may avoid closures that would otherwise be necessary to prevent further turf damage (e.g., on playing fields and/or playgrounds).

Help avoid, reduce or resolve various public water resources conflicts

Help meet an existing state mandate

This Project helps to meet requirements set forth in California Senate Bill x7-7 (2009), which sets an overall goal for urban water suppliers of reducing per capita water use by 20% by December 31, 2020 (and by at least 10% by December 31, 2015). Under this legislation, recycled water does not count against an agency's per capita use calculation, and therefore essentially counts as "conserved" water. This Project also helps to meet statewide goals to increase use of recycled wastewater by at least 1 million AFY by 2020 and by at least 2 million AFY by 2030 (State Water Resources Control Board, 2009).

Have other social benefits

Have disproportionate beneficial effects on DAC

The City of Gardena is considered a DAC. This Project will help to provide a more reliable source of supply within the City of Gardena and will reduce the cost of water for irrigation for the four recycled water customers. This includes institutional customers that are funded through local taxes (see Attachment 10 for additional detail on the City of Gardena DAC).

Improve water quality in ways that were not quantified in Attachment 7

As described below, this Project will offset the use of about 120 AFY of State Water Project water. SWP water has a number of water quality constituents that affect its suitability as a drinking water source. SWP water contains relatively high levels of bromide and total organic carbon (TOC), two elements that are of particular concern to drinking water agencies. Bromide and TOC combine with chemicals used in the water treatment process to form disinfection byproducts (DBPs) such as trihalomethanes (THMs) and bromate, which pose risks to human health and are strictly regulated under the federal Safe Drinking Water Act and associated state of California regulations. Currently, there are no standards for bromide or TOC in drinking water. However, current levels of bromide and TOC are significantly higher than target levels identified by an expert panel hired by the California Urban Water Agencies. These target levels are 50 parts per billion (ppb) for bromide and 3 parts per million (ppm) for TOC. Average SWP levels are significantly higher: up to 600% above the target level for bromide and 10% above the target level for TOC (Owen et al., 1998).

Water agencies treat all water to meet stringent state and federal drinking water standards before delivering it to their customers. However, poor-quality source water makes it increasingly expensive and difficult to meet such standards. Increased levels of constituents that aid in the formation of THMs, bromate, and other DBPs of public health concern can mean more time spent monitoring finished water in the distribution system, and the need to increase the use of expensive water treatment and disinfection processes. Increased levels of these constituents may also lead to the use of increased proportions of groundwater in the blend of water supplies in order to control DBPs. Reduced imports of SWP water will reduce the need for such preventative measures and help promote better drinking water quality.

Reduce demand for net diversions from the Delta

Both LADWP and the Golden State Water Company, Southwest Region obtain imported water from MWD[21]. MWD obtains its water from two sources: the Colorado River Authority (CRA), which it owns and operates, and the SWP, with which MWD has a water supply contract through the state of California. Currently, imported water purchases account for about 52% of LADWP supplies,[22] and 42% of Golden State Water Company supplies (LADWP, 2011; Kennedy/Jenks Consultants, 2011). Golden State expects to increase reliance on imported water supplies by 2015 due to reduced groundwater pumping allocations in the Central and West Coast Groundwater Basins.

For this analysis, it is assumed that this Project will avoid the use of SWP supplies from MWD, as this is the most expensive and energy intensive source of supply for MWD to provide.

By reducing the use of imported SWP water, the proposed Project will augment in-stream flows in the Sacramento-San Joaquin River Delta (which provides the means by which the SWP delivers water from Northern California to the south) or will offset other diversions that may

[21] Golden State Water Company purchases MWD imported supplies from both WBMWD and Central Basin Municipal Water District. In the portion of the service area where the Golden State customers that are participating in this project are located, imported supplies come exclusively from WBMWD.

[22] Based on five year average of LADWP supplies for 2005 - 2010

otherwise reduce flows. Reduced demands on Delta supplies will also help reduce the overall salinity of the Delta and improve Delta habitat.

Maintaining the Delta's environmental condition is vital to maintaining and improving the viability of the Delta Region. The Delta provides drinking water to 25 million people, supports irrigation of 4.5 million acres of agriculture, and serves as home to 750 plant and animal species. The Delta's 1,600 square miles of marshes, islands, and sloughs support at least half of migratory water birds on the Pacific Flyway; 80% of California's commercial fisheries; and recreational uses including boating, fishing, and windsurfing (AECOM, 2012).

Delta resources are in a state of crisis. Fish populations, including salmon and Delta-smelt, have declined dramatically in recent years. The levee system is aging, and the vulnerability of the Delta to flooding, sea level rise, or a major earthquake has contributed to concerns about possible levee collapse. In addition, water quality problems continue, and there is little consensus on how to manage water resources through storage.

Provide a long-term solution in place of a short-term one

The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands), drought, changes in snowpack, earthquakes, environmental regulations, water rights determinations, and associated legal challenges and Court rulings. WBMWD, LADWP, and Golden State Water Company recognize the need to develop additional, local, reliable sources of water to meet current and future demands. The Project offers a drought-resistant water supply source and long-term solution that will reduce continued reliance on imported water supplies.

Improve water supply reliability in ways not quantified in Attachment 7

The reliability of a water supply refers to its ability to meet water demands on a consistent basis, even in times of drought or other constraints on source water availability. As noted above, the reliability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands), drought, earthquakes, environmental regulations, and water rights determinations. By offsetting the use of imported water from MWD, the proposed Project will help improve water supply reliability within the City of Gardena and the LADWP and Golden State Water Company Service areas.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns about climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies see for example Carson and Mitchell, 1987, CUWA, 1994, Griffen and Mjelde, 2000, Raucher et al., 2013). The results from these studies indicate that residential and industrial (i.e., urban) customers seem to value supply reliability quite highly. Stated preference studies find that water customers are willing to pay $100 to more than $500 per household per year for total reliability (i.e., a 0% probability of their water supply being interrupted in times of drought).

The challenge in using these values to determine a value of increased reliability as a result of the Project is recognizing how to reasonably interpret these survey-based household monetary values. The values noted above reflect a willingness to pay per household to ensure complete reliability (zero drought-related use restrictions in the future), whereas the Project only enhances overall reliability; it does not guarantee 100% reliability. Thus if applied directly to the number of households within the City of Gardena or the LADWP and Golden State Water Company service areas, the dollar values from the studies would overstate the reliability value provided by the Project. Because of the uncertainty involved in applying these numbers to this situation, this benefit estimate is not included in the PSP tables.

Avoid wastewater discharges

To produce recycled water with this project, WBMWD would purchase wastewater effluent from the City of Los Angeles (after it has been treated to secondary standards at the Hyperion Wastewater Treatment Facility) and treat it to Title 22 standards for delivery to end users. Without the project, 120 AFY of wastewater effluent will continue to be discharged to the Pacific Ocean from Hyperion. If the Project is implemented, it will avoid this discharge, and its associated costs. The costs associated with this discharge are not known (and are not expected to be significant). This benefit is therefore not monetized as part of this analysis.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 40-year life of the Project. These include:

- Avoided imported water supply costs
- Avoided fertilizer costs
- Reduced social costs associated with CO_2 emissions

Avoided imported water supply costs

Both LADWP and the Golden State Water Company (Southwest Region) obtain imported water from MWD. Currently, imported water purchases account for about 52% of LADWP supplies,[23] and 42% of Golden State Water Company supplies.[24] Golden State expects to increase reliance on imported water supplies by 2015 due to reduced groundwater pumping allocations in the Central and West Coast Groundwater Basins.

By expanding the use of recycled water, this Project will directly offset the use of 120 AFY of imported water provided by MWD to LADWP and Golden State Water Company (through WBMWD). Although LADWP and Golden State Water Company use a mix of imported water and local sources to supply their customers, imported water is more expensive to provide than other sources. For this analysis, imported water is therefore considered the marginal water source. Thus, reduced overall water demand due to increased use of recycled water will be used to reduce reliance on imported water supplies exclusively.

To calculate the avoided costs of imported water over time, the amount of imported water avoided each year is multiplied by the projected cost of imported water. For this analysis, it is assumed that the Project will avoid Tier 1 treated MWD water supplies because this is the primary source of water obtained by both LADWP and Golden State Water Company, and the extent of Tier 2 versus Tier 1 future usage is unknown. In 2013, the cost of Tier 1 treated water from MWD amounts to $847 per AF of water delivered ($830 in 2012 USD).

In recent years, annual MWD rate increases have averaged about 6% in nominal terms (i.e., including inflation). For this analysis, we assume that the cost of imported supplies will continue to increase at this rate through 2020 due to current and planned MWD financial commitments. After adjusting for projected annual inflation of about 2.3%[25], the cost of imported water is therefore expected to increase annually by 3.5% or more in real terms over this time period. Beginning in 2021, a 1.5% annual real increase in water rates is assumed through the end of the project life. **Appendix 8.1** provides additional documentation on the imported water cost escalation rates assumed for this analysis.

[23] LADWP UWMP, 2011, based on five year average 2005 - 2010

[24] Golden State Water Company Southwest UWMP, 2010

[25] Based on long-range Consumer Price Index (CPI) projections from the Federal Reserve Bank of Philadelphia of 2.3% per year, for 2013 through 2022.

The proposed Project will begin providing recycled water in 2016 and will avoid a total of 4,800 AF of imported water over the expected 40-year project life. Based on the assumptions described above, and applying a discount rate of 6% (per DWR's PSP Guidelines), total present value benefits associated with the avoided purchase of imported water from MWD amount to about $1,804,795.

Avoided fertilizer costs

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.[26] Thus for every acre-foot of recycled water used in lieu of potable water, the recycled water customers will avoid the use of a total of 62 lbs of fertilizer. The weighted average commercial value of this fertilizer is $0.99/lb.[27]

For the 120 AF of recycled water applied each year in lieu of imported water, recycled water customers serviced by the Project will avoid the use of 7,440 lbs of fertilizer. This will result in avoided costs of $7,365.60 annually (undiscounted).[28] Over the lifetime of the Project, total present value avoided fertilizer costs will amount to $93,051.

Reduced social costs of carbon emissions

As described in Attachment 7, reduced reliance on imported SWP water (the most expensive source of water for MWD to provide, and therefore the marginal water source) will avoid the extensive energy requirements associated with transporting water from Northern California to

[26] 2012 Water Quality from West Basin WRP Title 22 Product Water for Landscape and Industrial Water Users

[27] This represents the average weighted cost of nitrogen, potassium, and phosphorus. Source: Asano, 1981, updated to 2006 using the national fertilizer price index. Updated from 2006 to 2012 based on the CPI.

[28]. Numbers do not add exactly due to rounding.

L.A. County. This in turn will result in avoided CO_2 emissions (a GHG) associated with the production of this energy.

By avoiding 120 AFY of imported water (at full implementation), the Project will result in a net reduction in CO_2 emissions of 99 MT per year. Given the schedule for Project construction (with benefits beginning to accrue in 2016), total net CO_2 emissions reductions amount to 3,957 MT over the 40-year project life. See Attachment 7 for additional details.

To monetize this benefit, we applied the dollar value assigned to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalent (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT(updated from 2010 values using CPI), with a range of values from $4.95 to $68.33 per MT. The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions. Estimates of the portions of the net benefits occurring in the United States range from 7% to 23% of the worldwide social cost of carbon.

For this analysis, the average value of $22.53/MT was used when calculating social benefits and costs, which produces conservative estimates for the benefits and costs associated with GHG emissions. To determine total costs over the 40-year life of the project, we escalate the social cost of carbon by 2.4% per year[29], which is above the general rate of inflation. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change.

Over the 40-year life of the Project, total present value benefits associated with avoided social costs of carbon amount to $42,799.

Summary of monetized benefits

Total monetized benefits of the Project amount to $1,940,644. **Table 8-51** summarizes the annual benefits from the Project.

[29]. The United Kingdom has established an official estimate of the social cost of carbon for use in many of its project evaluations and models the growth rate of the real cost at 2.4% per year.

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2012									
2013									
2014									
2015									
2016	Imported water supply	AF	120	0	120	$913.75	$109,650	0.792	**$86,853**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.792	**$5,834**
	Social costs of CO_2 emissions	MT	118	19	99	$24.77	$2,450	0.792	**$1,941**
2017	Imported water supply	AF	120	0	120	$945.73	$113,488	0.747	**$84,805**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.747	**$5,504**
	Social costs of CO_2 emissions	MT	118	19	99	$25.37	$2,509	0.747	**$1,875**
2018	Imported water supply	AF	120	0	120	$978.83	$117,460	0.705	**$82,805**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.705	**$5,192**

Table 8-51: (PSP Table 15)
South Gardena Recycled Water Pipeline Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	Social costs of CO_2 emissions	MT	118	19	99	$25.98	$2,569	0.705	**$1,811**
2019	Imported water supply	AF	120	0	120	$1,013.09	$121,571	0.665	**$80,852**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.665	**$4,899**
	Social costs of CO_2 emissions	MT	118	19	99	$26.60	$2,631	0.665	**$1,750**
2020	Imported water supply	AF	120	0	120	$1,048.55	$125,826	0.627	**$78,945**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.627	**$4,621**
	Social costs of CO_2 emissions	MT	118	19	99	$27.24	$2,694	0.627	**$1,690**
2021	Imported water supply	AF	120	0	120	$1,064.28	$127,713	0.592	**$75,593**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.592	**$4,360**

Table 8-51: (PSP Table 15)
South Gardena Recycled Water Pipeline Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$27.89	$2,759	0.592	**$1,633**
2022	Imported water supply	AF	120	0	120	$1,080.24	$129,629	0.558	**$72,384**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.558	**$4,113**
	Social costs of CO_2 emissions	MT	118	19	99	$28.56	$2,825	0.558	**$1,577**
2023	Imported water supply	AF	120	0	120	$1,096.45	$131,573	0.527	**$69,311**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.527	**$3,880**
	Social costs of CO_2 emissions	MT	118	19	99	$29.25	$2,893	0.527	**$1,524**
2024	Imported water supply	AF	120	0	120	$1,112.89	$133,547	0.497	**$66,369**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.497	**$3,660**

Table 8-51: (PSP Table 15)
South Gardena Recycled Water Pipeline Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$29.95	$2,962	0.497	**$1,472**
2025	Imported water supply	AF	120	0	120	$1,129.59	$135,550	0.469	**$63,551**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.469	**$3,453**
	Social costs of CO_2 emissions	MT	118	19	99	$30.67	$3,033	0.469	**$1,422**
2026	Imported water supply	AF	120	0	120	$1,146.53	$137,583	0.442	**$60,853**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.442	**$3,258**
	Social costs of CO_2 emissions	MT	118	19	99	$31.40	$3,106	0.442	**$1,374**
2027	Imported water supply	AF	120	0	120	$1,163.73	$139,647	0.417	**$58,270**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.417	**$3,073**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$32.16	$3,181	0.417	**$1,327**
2028	Imported water supply	AF	120	0	120	$1,181.18	$141,742	0.394	**$55,796**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.394	**$2,899**
	Social costs of CO_2 emissions	MT	118	19	99	$32.93	$3,257	0.394	**$1,282**
2029	Imported water supply	AF	120	0	120	$1,198.90	$143,868	0.371	**$53,427**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.371	**$2,735**
	Social costs of CO_2 emissions	MT	118	19	99	$33.72	$3,335	0.371	**$1,239**
2030	Imported water supply	AF	120	0	120	$1,216.88	$146,026	0.350	**$51,159**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.350	**$2,580**

Table 8-51: (PSP Table 15)
South Gardena Recycled Water Pipeline Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$34.53	$3,415	0.350	**$1,196**
2031	Imported water supply	AF	120	0	120	$1,235.14	$148,216	0.331	**$48,987**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.331	**$2,434**
	Social costs of CO_2 emissions	MT	118	19	99	$35.36	$3,497	0.331	**$1,156**
2032	Imported water supply	AF	120	0	120	$1,253.66	$150,440	0.312	**$46,908**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.312	**$2,297**
	Social costs of CO_2 emissions	MT	118	19	99	$36.20	$3,581	0.312	**$1,117**
2033	Imported water supply	AF	120	0	120	$1,272.47	$152,696	0.294	**$44,916**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.294	**$2,167**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$37.07	$3,667	0.294	**$1,079**
2034	Imported water supply	AF	120	0	120	$1,291.56	$154,987	0.278	**$43,010**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.278	**$2,044**
	Social costs of CO_2 emissions	MT	118	19	99	$37.96	$3,755	0.278	**$1,042**
2035	Imported water supply	AF	120	0	120	$1,310.93	$157,312	0.262	**$41,184**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.262	**$1,928**
	Social costs of CO_2 emissions	MT	118	19	99	$38.87	$3,845	0.262	**$1,007**
2036	Imported water supply	AF	120	0	120	$1,330.59	$159,671	0.247	**$39,435**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.247	**$1,819**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$39.81	$3,937	0.247	**$972**
2037	Imported water supply	AF	120	0	120	$1,350.55	$162,066	0.233	**$37,761**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.233	**$1,716**
	Social costs of CO_2 emissions	MT	118	19	99	$40.76	$4,032	0.233	**$939**
2038	Imported water supply	AF	120	0	120	$1,370.81	$164,497	0.220	**$36,158**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.220	**$1,619**
	Social costs of CO_2 emissions	MT	118	19	99	$41.74	$4,129	0.220	**$908**
2039	Imported water supply	AF	120	0	120	$1,391.37	$166,965	0.207	**$34,623**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.207	**$1,527**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$42.74	$4,228	0.207	**$877**
2040	Imported water supply	AF	120	0	120	$1,412.24	$169,469	0.196	**$33,153**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.196	**$1,441**
	Social costs of CO_2 emissions	MT	118	19	99	$43.77	$4,329	0.196	**$847**
2041	Imported water supply	AF	120	0	120	$1,433.43	$172,011	0.185	**$31,746**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.185	**$1,359**
	Social costs of CO_2 emissions	MT	118	19	99	$44.82	$4,433	0.185	**$818**
2042	Imported water supply	AF	120	0	120	$1,454.93	$174,591	0.174	**$30,398**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.174	**$1,282**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$45.89	$4,539	0.174	**$790**
2043	Imported water supply	AF	120	0	120	$1,476.75	$177,210	0.164	**$29,108**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.164	**$1,210**
	Social costs of CO_2 emissions	MT	118	19	99	$47.00	$4,648	0.164	**$764**
2044	Imported water supply	AF	120	0	120	$1,498.90	$179,868	0.155	**$27,872**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.155	**$1,141**
	Social costs of CO_2 emissions	MT	118	19	99	$48.12	$4,760	0.155	**$738**
2045	Imported water supply	AF	120	0	120	$1,521.39	$182,567	0.146	**$26,689**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.146	**$1,077**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$49.28	$4,874	0.146	**$713**
2046	Imported water supply	AF	120	0	120	$1,544.21	$185,305	0.138	**$25,556**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.138	**$1,016**
	Social costs of CO_2 emissions	MT	118	19	99	$50.46	$4,991	0.138	**$688**
2047	Imported water supply	AF	120	0	120	$1,567.37	$188,085	0.130	**$24,471**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.130	**$958**
	Social costs of CO_2 emissions	MT	118	19	99	$51.67	$5,111	0.130	**$665**
2048	Imported water supply	AF	120	0	120	$1,590.88	$190,906	0.123	**$23,432**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.123	**$904**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$52.91	$5,234	0.123	**$642**
2049	Imported water supply	AF	120	0	120	$1,614.75	$193,769	0.116	**$22,437**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.116	**$853**
	Social costs of CO_2 emissions	MT	118	19	99	$54.18	$5,359	0.116	**$621**
2050	Imported water supply	AF	120	0	120	$1,638.97	$196,676	0.109	**$21,485**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.109	**$805**
	Social costs of CO_2 emissions	MT	118	19	99	$55.48	$5,488	0.109	**$599**
2051	Imported water supply	AF	120	0	120	$1,663.55	$199,626	0.103	**$20,573**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.103	**$759**

Table 8-51: (PSP Table 15) South Gardena Recycled Water Pipeline Project Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Social costs of CO_2 emissions	MT	118	19	99	$56.81	$5,620	0.103	**$579**
2052	Imported water supply	AF	120	0	120	$1,688.50	$202,621	0.097	**$19,699**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.097	**$716**
	Social costs of CO_2 emissions	MT	118	19	99	$58.18	$5,754	0.097	**$559**
2053	Imported water supply	AF	120	0	120	$1,713.83	$205,660	0.092	**$18,863**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.092	**$676**
	Social costs of CO_2 emissions	MT	118	19	99	$59.57	$5,893	0.092	**$540**
2054	Imported water supply	AF	120	0	120	$1,739.54	$208,745	0.087	**$18,062**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.087	**$637**
	Social costs of CO_2 emissions	MT	118	19	99	$61.00	$6,034	0.087	**$522**

Table 8-51: (PSP Table 15)
South Gardena Recycled Water Pipeline Project
Annual Project Benefits
(2012 Dollars)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2055	Imported water supply	AF	120	0	120	$1,765.63	$211,876	0.082	**$17,295**
	Fertilizer use	lbs	7,440	0	7,440	$0.99	$7,366	0.082	**$601**
	Social costs of CO_2 emissions	MT	118	19	99	$62.47	$6,179	0.082	**$504**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$1,940,644**
Comments:									

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Capital costs for the Project total $1,919,440. Construction and implementation costs (including construction administration and contingency costs) account for $1,580,855 (about 82%) of total capital costs. Project administration, planning, design, environmental documentation and compliance, and mitigation costs account for the remainder of the capital budget.

O&M costs associated with the Project will total $48,300 per year. This includes an estimated $1,300 in administrative costs, $31,100 in operations costs, and $6,300 in general maintenance costs. In addition, periodic replacement costs associated with the Project are expected to average about $9,600 per year.

In total, the present value capital and O&M costs associated with the Project amount to $2,238,849 over the 40-year project life. **Table 8-52** summarizes the economic project costs for the Project.

Table 8-52: (PSP Table 19)
South Gardena Recycled Water Pipeline Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2012										**$**
2013	$24,766							**$24,766**	0.943	**$23,364**
2014	$287,790							**$287,790**	0.890	**$256,132**
2015	$1,606,884							**$1,606,884**	0.840	**$1,349,171**
2016			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.792	**$38,258**
2017			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.747	**$36,093**
2018			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.705	**$34,050**
2019			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.665	**$32,122**
2020			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.627	**$30,304**
2030			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.592	**$28,589**
2031			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.558	**$26,970**
2032			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.527	**$25,444**

Table 8-52: (PSP Table 19) South Gardena Recycled Water Pipeline Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2033			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.497	**$24,004**
2034			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.469	**$22,645**
2035			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.442	**$21,363**
2036			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.417	**$20,154**
2037			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.394	**$19,013**
2038			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.371	**$17,937**
2039			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.350	**$16,922**
2040			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.331	**$15,964**
2041			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.312	**$15,060**
2042			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.294	**$14,208**
2043			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.278	**$13,403**

Table 8-52: (PSP Table 19)
South Gardena Recycled Water Pipeline Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2044			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.262	**$12,645**
2045			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.247	**$11,929**
2046			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.233	**$11,254**
2047			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.220	**$10,617**
2048			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.207	**$10,016**
2049			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.196	**$9,449**
2050			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.185	**$8,914**
2051			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.174	**$8,410**
2052			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.164	**$7,934**
2053			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.155	**$7,484**
2054			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.146	**$7,061**

Table 8-52: (PSP Table 19) South Gardena Recycled Water Pipeline Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2055			$1,300	$31,100	$6,300	$9,600		**$48,300**	0.138	**$6,661**
Total Present Value of Discounted Costs (Sum of Column (j)) **Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries**										**$2,238,849**
Comments:										

Benefits and Costs Summary

As shown in the Tables 8-50 – 8-52 above, the total present value benefits associated with the South Gardena Recycled Water Pipeline Project amount to $1,940,644 over the expected 40-year project life. The total present value cost of the Project (including capital and O&M costs) is $2,238,849.

Total monetized benefits include avoided imported water supply costs, avoided fertilizer costs, and reduced social costs associated with CO_2 emissions.

Although the monetized benefits are slightly lower than the costs of the project, there are several additional benefits that we were not able to monetize that are extremely valuable. Specifically, the proposed Project will also result in the following non-monetized benefits:

- Social recreation/access benefits by providing a source of supply that is not subject to drought-related watering restrictions. This allows recycled water customers to maintain green areas even during dry periods, which increases the aesthetics and enjoyment of these areas (and may help to avoid closures associated with turf damage in dry conditions).
- Help avoid, reduce, or resolve various public water resources conflicts by helping to meet state mandates associated with water recycling
- Improve drinking water quality due to avoided SWP supplies (resulting in reduced treatment needs)
- Reduce demand for net diversions from the Delta
- Provide a long-term solution in place of a short-term one
- Improve water supply reliability by offsetting the use of imported water with locally-generated recycled water

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with the total amount of avoided imported water supplies, reduced social costs of CO_2 emissions and avoided fertilizer costs. These issues are listed in **Table 8-53**.

Table 8-53: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Avoided imported water supply savings	U	The calculation of avoided imported water costs assumes that Metropolitan water rates will increase annually (in real terms) by 3.5% through 2020. Beyond 2020, a 1.5% real increase in water rates is assumed. These projections are based on existing and planned Metropolitan financial commitments and recent increases in Metropolitan rates. It is uncertain whether actual future rate increases will be above or below these assumed rate increases.
Reduced social costs of CO_2 emissions	U	The value of reduced CO_2 emissions is based on the mid-point estimate from existing literature. The social costs associated with carbon emissions may be higher or lower than the estimate used here.
Avoided fertilizer costs	U	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.

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

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Upper Malibu Creek Watershed Restoration Project

This attachment presents the economic analysis for the Upper Malibu Creek Project (Project). A project overview and project benefit summary table are followed by the following sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Upper Malibu Creek Watershed Restoration Project will address two channelized sections of creeks in the Upper Malibu Watershed – Medea Creek (abutting Chumash Park) and a failed channelized section of Las Virgenes Creek between Meadow Creek Lane and Lost Hills Road Bridge. To the extent possible, the Project will be similar to a successful creek restoration project in Calabasas completed in 2005 within the same watershed. As in the Calabasas project, this Project will restore and reestablish creek habitat to enhance the water quality and biological environment of the area.

The City of Agoura Hills (Agoura Hills) is the sponsor of the Medea Creek portion of the Project. The Agoura Hills proposes to naturalize an existing 450-foot concrete flood channel of Medea Creek while maintaining the segment’s flood control capabilities. Meandering along this portion of completely natural creek will be a pedestrian trail with educational elements such as storyboards describing habitat and water conservation. The trail will connect with Chumash Park, one of the City of Agoura Hills’ largest and most used parks. The City of Calabasas (Calabasas) is the sponsor of the Las Virgenes Creek portion of the Project. Calabasas proposes bank stabilization and barrier removal for the segment of Las Virgenes Creek between Meadow Creek Lane and Lost Hills Road Bridge. It will also include a trail that will connect regional trails. The primary objectives of the Project are to:

- Create approximately 4 acres of new riparian ecosystem
- Restore habitat by reconnecting mammal migration corridors and removing fish migration barriers
- Provide recreational access with trail system connectivity
- Improve water quality by increasing dissolved oxygen concentration, increasing vegetative uptake of nutrients (i.e., nitrogen and phosphorus) and reducing water temperature by adding vegetated canopy cover
- Provide education and outreach to neighboring schools and the overall community
- Maintain flood control needs and public safety.

By addressing these objectives, the Project will help the Greater Los Angeles County Region meet the following IRWM Plan goals:

- Comply with water quality regulations (including TMDLs) by improving the quality of urban runoff, stormwater and wastewater
- Maintain and enhance public infrastructure-related flood protection, water resources, and water quality
- Protect, restore, and enhance natural processes and habitats
- Increase watershed-friendly recreational space for all communities.

In addition, the Upper Malibu Creek Watershed Restoration Project will help meet several of the goals that have been documented and prioritized for Malibu Creek Watershed restoration – improving water quality, enhancing habitat restoration protection, and providing enforcement and education (Malibu Creek Watershed Executive Advisory Council, 2001). The Malibu Creek Watershed, which is approximately 81% vacant, is one of the least urbanized of the watershed management areas in Los Angeles County. The watershed drains 109 square miles of the Santa Monica Mountains and Simi Hills. The Santa Monica Mountains and Simi Hills provide a large amount of open space for the region, and so support a diverse community of flora and fauna, and provide recreational space for the region's population. Portions of the watershed are overlapped by the City of Agoura Hills and the City of Calabasas where watersheds have been channelized in an effort to reduce flood risk to the residents of these cities.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-54**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-54: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$2,868,398
Monetizable Benefits	
Increased Property Values	$1,090,379
Avoided Repair and Maintenance Costs	$1,133,481
Total Monetizable Benefits	**$2,223,860**

Physically Quantified Benefit or Cost	**Project Life Total**
Created or restored riparian habitat	4 acres
Providing recreational access	9,526 feet of trails
Qualitative Benefit or Cost	**Qualitative Indicator***
Provide education benefits	+
Provide social recreation and access benefits	+
Promote social health and safety	+
Benefit wildlife habitat	++
Improve water quality	++
Provide long-term solution in place of a short-term one	++
Reduce flood risks	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-55 shows the non-monetized benefits checklist for the project. Narrative descriptions of the benefit categories marked "Yes" in the following the table are provided in the narrative description of qualitative benefits section after the table.

Table 8-55: (PSP Table 12)
Upper Malibu Creek Watershed Restoration
Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits	
	Will the proposal	
1	**Provide education or technology benefits?**	Yes
	Examples are not limited to, but may include:	

Table 8-55: (PSP Table 12) Upper Malibu Creek Watershed Restoration Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	- Include educational features that should result in water supply, water quality, or flood damage reduction benefits?	
	- Develop, test or document a new technology for water supply, water quality, or flood damage reduction management?	
	- Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include:	
	- Provide new or improved outdoor recreation opportunities?	
	- Provide more access to open space?	
	- Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	No
	Examples are not limited to, but may include:	
	- Provide more opportunities for public involvement in water management?	
	- Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include:	
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events?	
	- Reduce risk to life from dam failure or flooding?	
	- Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	No
	Examples are not limited to, but may include:	
	- Redress or increase inequitable distribution of environmental burdens?	
	- Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits:	
	Will the proposal	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat?	

Table 8-55: (PSP Table 12) Upper Malibu Creek Watershed Restoration Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	- Contribute to an existing biological opinion or recovery plan for a listed special status species?	
	- Preserve or restore designated critical habitat of a listed species?	
	- Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include:	
	- Cause an improvement in water quality in an impaired water body or sensitive habitat?	
	- Prevent water quality degradation?	
	- Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No
	Examples are not limited to, but may include:	
	- Reduce net production of greenhouse gasses?	
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits:	
	Will the proposal	
10	**Improve the overall, long-term management of California groundwater resources?**	No
	Examples are not limited to, but may include:	
	- Reduce extraction of non-renewable groundwater?	
	- Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No
	Examples are not limited to, but may include:	
	- Reduce net energy use on a permanent basis?	
	- Increase renewable energy production?	
	- Include new buildings or modify buildings to include certified LEED features?	
	- Provide a net increase in recycling or reuse of materials?	
	- Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	No

Table 8-55: (PSP Table 12) Upper Malibu Creek Watershed Restoration Non-monetized Benefits Checklist		
No.	Question	Enter "Yes", "No" or "Neg"
	Examples are not limited to, but may include:	
	- Provide a more flexible mix of water sources?	
	- Reduce likelihood of catastrophic supply outages?	
	- Reduce supply uncertainty?	
	- Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	Yes

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

Provide education or technology benefits

Install educational story boards

The Project will include a public interface along the hiking trails that will incorporate story boards to educate visitors about water resource issues. Messages regarding the importance of habitats, watersheds, water conservation, local water use reduction programs, and water conservation practices designed to reduce local residential and commercial use of potable water will be included in the sign program. An educational component of this Project will cover similar topics and will include outreach to school staff, students, and parents, such as classroom presentations, field trips to the Upper Malibu Creek projects, and development of informational outreach materials.

Provide social recreation or access benefits

Construct hiking trails that will connect with regional trail systems

Incorporated into the Las Virgenes Creek portion of the Project will be an 8,976 foot trail that connects two Santa Monica Mountain trail systems (each of which is seven miles in length), and will be a part of the planned Las Virgenes Creek Trail. The trail at Medea Creek will be a 550 foot long trail that will meander along the restored creek segment and connect with one of the City of Agoura Hills' largest and most used parks, Chumash Park.

Promote social health and safety

Connect hiking trails with regional trail systems

Creation of a hiking trail that links to other trails in the area will expand recreation opportunities for those who live nearby, possibly leading to community health benefits. The Las Virgenes Creek portion of the Project will include an 8,976 foot trail that connects two Santa Monica Mountain trail systems, the Las Virgenes Trail and Juan Bautista Trail, and will be a part of the planned Las Virgenes Creek Trail.

Benefit wildlife or habitat in ways that were not quantified in Attachment 7

The Medea Creek portion of the Project will naturalize a concrete-lined flood control channel and create a riparian ecosystem and trail alongside this the restored creek. The Las Virgenes portion of the Project will also create riparian habitat, and will remove a fish barrier in the channel. Combined, these activities will increase wildlife migration corridor connectivity, provide four new acres of essential riparian habitat, and protect fish passage. Based on the results of a prior creek restoration project in the City of Calabasas, this Project will help provide habitats for the southern-most documented, continuous annual steelhead trout run of the West Coast. The southern steelhead trout is currently on the Federal Endangered Species List. The watershed also 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. (Farassati, 2008; CDFG, 2013)

Improve water quality in ways that were not quantified in Attachment 7

Under the State Water Quality Control Board’s Tributary Rule, this tributary system is listed for the following impairments: bacteria, trash/debris, DDT, PCB, sediment toxicity, fish passage, nutrients, benthic macro-invertebrate imbalances, sedimentation/siltation, invasive species, chloride, foam/scum, specific conductivity, sulfates and selenium.

Restoring habitat and improving water quality are the primary purposes of this project. With the removal of the creeks’ concrete lining, urban runoff will percolate into the soft bottom channel which will enhance the following natural treatment processes: filtration of pollutants such as oils and grease, sedimentation of solids where flow velocities are slow, absorption of nutrients and coliforms by the restored vegetation, and removal of metals by adhering to sediments. The native vegetation will metabolize coliforms and nutrients, reducing eutrophication which has historically led to algal blooms and low dissolved oxygen. Removing the concrete lining also reduces downstream erosion potential by slowing flow through the naturalized sections.

Provide a long-term solution in place of a short-term one

The Las Virgenes portion of this Project includes removing failing concrete structures under a bridge in the affected channel and conducting bank stabilization. If this work is not conducted, erosion and resulting sediment and debris accumulation will block fish migration and cause flooding during large storms. The short-term solution without this Project is to continue repairing the concrete structures and maintaining the channel from sediment and debris accumulation. In contrast, the proposed Project will provide a long-term (e.g., 70-90 years) solution that will avoid potential problems of bank erosion that could undermine the roadway, protect fish passage, and enhance flood control capacity without requiring frequent and continual maintenance and repairs (see Avoided Costs table.)

Reduce flood risks

The Medea Creek portion of this Project will maintain the existing flood control capacity of the existing engineered channel through a reconfiguration of the channel cross-section which will incorporate natural vegetation and riparian habitat.

The Las Virgenes portion of the Project will address a flood control problem at this location by stabilizing the bank along the channel, removing concrete structures that are currently causing sediment and debris to accumulate and clog the channel, and planting native vegetation. According to Alex Farassati, Environmental Services Manager of the City of Calabasas Public Works Department, a storm in 2005 caused flooding that carried large amounts of sediment and debris from this portion of the creek into the nearby state parks, resulting in a major water quality concern and adversely affecting macro-invertebrate communities.

Flooding has also led to bank erosion and the bank has been significantly undercut. The adjacent roadway, which is about 50 feet from the channel and links Las Virgenes Creek Road to the freeway, has not been damaged. It is anticipated that without the project, a 100-year storm would result in severe damage to the roadway and cause other major impacts, given that the roadway overlaps with a FEMA special flood hazard zone which is designated as having a 1% chance of flooding, which is equivalent to flooding during a 100-year storm event.

Monetized Benefit Analysis (Section D3)

The following two monetized benefits are expected to accrue over the expected 80 year life of the project. Note that an 80 year project life was selected as the midpoint between the anticipated life of 70 to 90 years.

- Increased property values
- Avoided repair costs

Increased property values

Because of the multiple benefits provided by the Upper Malibu Creek project, the park is expected to help increase residential property values in the Medea Creek and Las Virgenes Creek neighborhoods. A number of empirical studies have shown that the natural features and vegetative cover of green infrastructure projects can enhance an area's aesthetics, and increase adjacent property values. Estimates of the increase in property values related to these projects typically range up to seven percent (CNT 2010, EconNorthwest 2007). **Table 8-56** summarizes our estimate of increased property values from the Upper Malibu Creek Watershed Restoration project. The number of single-family houses and townhouses within 500 feet of the Medea Creek and Las Virgenes Creek restoration sites was estimated by conducting a visual count using Google Earth. It was assumed that residences that are across a major highway from the projects would not benefit in terms of increased property values. As shown in Table 8-56, an estimated 88 residences (63 near the Medea Creek portion and 25 near the Las Virgenes Creek portion) would benefit from the project.

To obtain an estimate of property values in the area, we compiled listing prices, sales prices, and estimated sales prices from Zillow.com for residential properties near Chumash Park (for the Medea Creek project) and El Encanto Drive (for the Las Virgenes Creek project). The average property values are shown in the table. Applying a 3.5% increase in property values (i.e., midway between the range of likely property value increases of zero and seven percent), we estimate that the increased property value associated with the projects for residences within 500 feet of the two locations will be approximately $1,376,578. This is likely to be a conservative value because we did not include property value increases from rental properties that are located near Las Virgenes. In addition, additional local properties that are more than 500 feet from the Project might also benefit. Assuming the Project is completed and reflected in enhanced property values in 2016, the present value of the one-time capitalized value of nearby residential properties is $1.03 million. **Table 8-57** summarizes the annual benefits from the project.

Table 8-56: Estimated Increase in Property Values Related to Upper Malibu Creek Watershed Restoration Project				
Project Location/ Type of Residence	Number of Affected Units	Mean Property Values	Average Percentage Increase in Property Values (based on 3.5% increase)	Total Increase in Property Values
Medea Creek/Houses	31	$435,250	$15,234	$472,246
Medea Creek/ Townhouses	32	$233,476	$8,172	$261,493
Las Virgenes/Houses	25	$734,673	$25,714	$642,839
Total	**88**			**$1,376,578**

Table 8-57: (PSP Table 15) Upper Malibu Creek Watershed Restoration Annual Project Benefits (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value (1)	Annual $ Value (1) (f) x (g)	Discount Factor (1)	Discounted Benefits (1) (h) x (i)
2016	enhanced residential property values	capitalized gain in $ value	0	$1,376,578	$ 1,376,578	$1,376,578	$ 1,376,578	0.792	**$ 1,090,379**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$ 1,090,379**

Avoided Repair and Maintenance Costs

The banks along Las Virgenes creek are eroding. Although the nearby roadway has not yet been undermined, this is a very real possibility. Consequently, if the proposed project restoration does not occur, it would be necessary to conduct repairs to avoid lower level slope failure. In addition, it would be necessary to conduct annual maintenance to remove an estimated 50 cubic yards per year of sediment that builds up from a downstream culvert (under Lost Hills Road Bridge near De Anza Park). The costs that will be avoided by implementing the proposed Project are estimated to be an initial cost of $1 million to repair the slope plus $20,000 per year to remove the sediment that builds up in the creek. Over the 80 year life of the project, applying a discount rate of 6%, the total present value of discounted avoided costs is $1,133,481.

Table 8-58 shows the avoided costs from the Project.

Table 8-58: (PSP Table 16)
Upper Malibu Creek Watershed Restoration
Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures

Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.

	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discounting Calculations	
					Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	(b)	(c)	(d)	(e)	(i)	(j)
2012	$0			$0	1.000	**$0**
2013	$0			$0	0.943	**$0**
2014	$0			$0	0.890	**$0**
2015	$1,000,000	$0	$20,000	$1,020,000	0.840	**$856,412**
2016		$0	$20,000	$20,000	0.792	**$15,842**
2017		$0	$20,000	$20,000	0.747	**$14,945**
2018		$0	$20,000	$20,000	0.705	**$14,099**
2019		$0	$20,000	$20,000	0.665	**$13,301**
2020		$0	$20,000	$20,000	0.627	**$12,548**
2021		$0	$20,000	$20,000	0.592	**$11,838**
2022		$0	$20,000	$20,000	0.558	**$11,168**
2023		$0	$20,000	$20,000	0.527	**$10,536**
2024		$0	$20,000	$20,000	0.497	**$9,939**
2025		$0	$20,000	$20,000	0.469	**$9,377**
2026		$0	$20,000	$20,000	0.442	**$8,846**
2027		$0	$20,000	$20,000	0.417	**$8,345**

Table 8-58: (PSP Table 16)
Upper Malibu Creek Watershed Restoration
Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures

Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.

	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discounting Calculations	
					Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	(b)	(c)	(d)	(e)	(i)	(j)
2028		$0	$20,000	$20,000	0.394	**$7,873**
2029		$0	$20,000	$20,000	0.371	**$7,427**
2030		$0	$20,000	$20,000	0.350	**$7,007**
2031		$0	$20,000	$20,000	0.331	**$6,610**
2032		$0	$20,000	$20,000	0.312	**$6,236**
2033		$0	$20,000	$20,000	0.294	**$5,883**
2034		$0	$20,000	$20,000	0.278	**$5,550**
2035		$0	$20,000	$20,000	0.262	**$5,236**
2036		$0	$20,000	$20,000	0.247	**$4,940**
2037		$0	$20,000	$20,000	0.233	**$4,660**
2038		$0	$20,000	$20,000	0.220	**$4,396**
2039		$0	$20,000	$20,000	0.207	**$4,147**
2040		$0	$20,000	$20,000	0.196	**$3,913**
2041		$0	$20,000	$20,000	0.185	**$3,691**
2042		$0	$20,000	$20,000	0.174	**$3,482**
2043		$0	$20,000	$20,000	0.164	**$3,285**

Table 8-58: (PSP Table 16)
Upper Malibu Creek Watershed Restoration
Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures

Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.

					Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	(b)	(c)	(d)	(e)	(i)	(j)
2044		$0	$20,000	$20,000	0.155	**$3,099**
2045		$0	$20,000	$20,000	0.146	**$2,924**
2046		$0	$20,000	$20,000	0.138	**$2,758**
2047		$0	$20,000	$20,000	0.130	**$2,602**
2048		$0	$20,000	$20,000	0.123	**$2,455**
2049		$0	$20,000	$20,000	0.116	**$2,316**
2050		$0	$20,000	$20,000	0.109	**$2,185**
2051		$0	$20,000	$20,000	0.103	**$2,061**
2052		$0	$20,000	$20,000	0.097	**$1,944**
2053		$0	$20,000	$20,000	0.092	**$1,834**
2054		$0	$20,000	$20,000	0.087	**$1,731**
2055		$0	$20,000	$20,000	0.082	**$1,633**
2056		$0	$20,000	$20,000	0.077	**$1,540**
2057		$0	$20,000	$20,000	0.073	**$1,453**
2058		$0	$20,000	$20,000	0.069	**$1,371**
2059		$0	$20,000	$20,000	0.065	**$1,293**

Table 8-58: (PSP Table 16) Upper Malibu Creek Watershed Restoration Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.						
					Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	(b)	(c)	(d)	(e)	(i)	(j)
2060		$0	$20,000	$20,000	0.061	$1,220
2061		$0	$20,000	$20,000	0.058	$1,151
2062		$0	$20,000	$20,000	0.054	$1,086
2063		$0	$20,000	$20,000	0.051	$1,024
2064		$0	$20,000	$20,000	0.048	$966
2065		$0	$20,000	$20,000	0.046	$912
2066		$0	$20,000	$20,000	0.043	$860
2067		$0	$20,000	$20,000	0.041	$811
2068		$0	$20,000	$20,000	0.038	$765
2069		$0	$20,000	$20,000	0.036	$722
2070		$0	$20,000	$20,000	0.034	$681
2071		$0	$20,000	$20,000	0.032	$643
2072		$0	$20,000	$20,000	0.030	$606
2073		$0	$20,000	$20,000	0.029	$572
2074		$0	$20,000	$20,000	0.027	$540
2075		$0	$20,000	$20,000	0.025	$509

Table 8-58: (PSP Table 16)
Upper Malibu Creek Watershed Restoration
Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures

Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.

					Discounting Calculations	
	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	(b)	(c)	(d)	(e)	(i)	(j)
2076		$0	$20,000	$20,000	0.024	**$480**
2077		$0	$20,000	$20,000	0.023	**$453**
2078		$0	$20,000	$20,000	0.021	**$427**
2079		$0	$20,000	$20,000	0.020	**$403**
2080		$0	$20,000	$20,000	0.019	**$380**
2081		$0	$20,000	$20,000	0.018	**$359**
2082		$0	$20,000	$20,000	0.017	**$339**
2083		$0	$20,000	$20,000	0.016	**$319**
2084		$0	$20,000	$20,000	0.015	**$301**
2085		$0	$20,000	$20,000	0.014	**$284**
2086		$0	$20,000	$20,000	0.013	**$268**
2087		$0	$20,000	$20,000	0.013	**$253**
2088		$0	$20,000	$20,000	0.012	**$239**
2089		$0	$20,000	$20,000	0.011	**$225**
2090		$0	$20,000	$20,000	0.011	**$212**
2091		$0	$20,000	$20,000	0.010	**$200**

Table 8-58: (PSP Table 16)
Upper Malibu Creek Watershed Restoration
Alternative (Avoided Project Name): Repair and Maintain Las Virgenes Creek Cement Structures

Avoided Project Description: Repair the concrete structure/channel and annually remove sediment that builds up around it. This alternative approach would NOT involve removing the failing cement structures or providing habitat restoration. It would not completely address flooding concerns.

	Avoided Capital Costs	Avoided Replacement Costs	Avoided Operations and Maintenance costs	Total Cost Avoided for Individual Alternatives (b) + (c) + (d)	Discounting Calculations	
					Discount Factor	Discounted Project Costs (h) x (i)
(a) Year	**(b)**	**(c)**	**(d)**	**(e)**	**(i)**	**(j)**
2092		$0	$20,000	$20,000	0.009	**$189**
2093		$0	$20,000	$20,000	0.009	**$178**
2094		$0	$20,000	$20,000	0.008	**$168**
Total Present Value of Discounted Costs (Sum of Column (g))						**$1,133,481**
(%) Avoided Cost Claimed by Project						**100%**
Total Present Value of Discounted Avoided Project Costs Claimed by Alternative Project (Total Present Value of Discounted Costs x % Avoided Cost Claimed by Project)						**$1,133,481**

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-59 summarizes the economic project costs for the project. Project capital costs are estimated to be $3,036,260. These costs include direct project administration; planning, design, engineering, and environmental documentation; construction; environmental compliance, mitigation, and enhancement; construction administration; development of performance measures, a monitoring plan, and financing; and a contingency. Anticipated operations and maintenance (O&M) costs include $20,000 in maintenance costs required to hire a contractor to plant, water, and maintain the new vegetation until the plants are established (i.e., over a five-year period). An additional $10,000 per year (classified as "Other" O&M costs) will be incurred over a five-year period to establish and implement educational outreach to school staff, students, and parents. The total present value of O&M costs is estimated to be $100,098. The total present value for capital costs plus O&M costs is $2,868,398.

Table 8-59: (PSP Table 19) Upper Malibu Creek Watershed Restoration Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2012	$0							**$0**	1.000	**$0**
2013	$1,012,086							**$1,012,086**	0.943	**$954,798**
2014	$2,016,674							**$2,016,674**	0.890	**$1,794,833**
2015	$7,500				$20,000		$10,000	**$37,500**	0.840	**$31,486**
2016					$20,000		$10,000	**$30,000**	0.792	**$23,763**
2017					$20,000		$10,000	**$30,000**	0.747	**$22,418**
2018					$20,000		$10,000	**$30,000**	0.705	**$21,149**
2019					$20,000		$10,000	**$30,000**	0.665	**$19,952**
2020								**$0**	0.627	**$0**
2021								**$0**	0.592	**$0**
2022								**$0**	0.558	**$0**
2023								**$0**	0.527	**$0**
2024								**$0**	0.497	**$0**
2025								**$0**	0.469	**$0**
2026								**$0**	0.442	**$0**

Table 8-59: (PSP Table 19) Upper Malibu Creek Watershed Restoration Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2027								$0	0.417	$0
2028								$0	0.394	$0
2029								$0	0.371	$0
2030								$0	0.350	$0
2031								$0	0.331	$0
2032								$0	0.312	$0
2033								$0	0.294	$0
2034								$0	0.278	$0
2035								$0	0.262	$0
2036								$0	0.247	$0
2037								$0	0.233	$0
2038								$0	0.220	$0
2039								$0	0.207	$0
2040								$0	0.196	$0
2041								$0	0.185	$0

Table 8-59: (PSP Table 19) Upper Malibu Creek Watershed Restoration Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2042								$0	0.174	$0
2043								$0	0.164	$0
2044								$0	0.155	$0
2045								$0	0.146	$0
2046								$0	0.138	$0
2047								$0	0.130	$0
2048								$0	0.123	$0
2049								$0	0.116	$0
2050								$0	0.109	$0
2051								$0	0.103	$0
2052								$0	0.097	$0
2053								$0	0.092	$0
2054								$0	0.087	$0
2055								$0	0.082	$0
2056								$0	0.077	$0

Table 8-59: (PSP Table 19) Upper Malibu Creek Watershed Restoration Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2057								$0	0.073	$0
2058								$0	0.069	$0
2059								$0	0.065	$0
2060								$0	0.061	$0
2061								$0	0.058	$0
2062								$0	0.054	$0
2063								$0	0.051	$0
2064								$0	0.048	$0
2065								$0	0.046	$0
2066								$0	0.043	$0
2067								$0	0.041	$0
2068								$0	0.038	$0
2069								$0	0.036	$0
2070								$0	0.034	$0
2071								$0	0.032	$0

Table 8-59: (PSP Table 19)
Upper Malibu Creek Watershed Restoration Project
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2072								$0	0.030	$0
2073								$0	0.029	$0
2074								$0	0.027	$0
2075								$0	0.025	$0
2076								$0	0.024	$0
2077								$0	0.023	$0
2078								$0	0.021	$0
2079								$0	0.020	$0
2080								$0	0.019	$0
2081								$0	0.018	$0
2082								$0	0.017	$0
2083								$0	0.016	$0
2084								$0	0.015	$0
2085								$0	0.014	$0
2086								$0	0.013	$0

Table 8-59: (PSP Table 19) Upper Malibu Creek Watershed Restoration Project Project Annual Costs (2012 Dollars)										
	Initial Costs from Att 4 Total Cost (row (i), column (d))	Adjusted Grant Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2087								$0	0.013	$0
2088								$0	0.012	$0
2089								$0	0.011	$0
2090								$0	0.011	$0
2091								$0	0.010	$0
2092								$0	0.009	$0
2093								$0	0.009	$0
2094								$0	0.008	$0
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										$2,868,398

Benefits and Costs Summary

The total present value for capital plus O&M costs over the 80-year project life is $2,868,398. Monetized benefits, which include property value increases and avoided repair and maintenance costs, are estimated at $2,223,860. In addition to these monetized benefits, construction of the Upper Malibu Creek Watershed Restoration Project will provide the following benefits that can be quantified but are not easily monetized: four acres of created or restored riparian habitat and 9,526 feet of trails. Finally, unquantifiable benefits are numerous, including providing education, enhancing social recreation and access, promoting social health and safety, improving habitats for flora and fauna, improving water quality, providing a long-term solution in place of a short-term one, and reducing flood risks.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with increased property values. These issues are listed in **Table 8-60**.

Table 8-60: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Increased property values	U	Because many assumptions are required to estimate this benefit, it is possible that the value could be higher or lower than estimated. For example, property value enhancements are likely to extend to properties beyond the 500-foot distance from the sites, although the extent of property value increase are likely to taper off as distance increases

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

References

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Vermont Avenue Stormwater Capture and Greenstreet Project

This attachment presents the economic analysis for the Vermont Avenue Stormwater Capture and Green Street Project (Project). A project overview and project benefit summary table are followed by the following sections as outlined in the PSP: Non-Monetized Benefits Analysis (Section D2) and Project Benefits and Costs Summary (Section D5).

Project Overview

This Project is located in the Ballona Creek watershed which drains to the Ballona Wetlands, Ballona Estuary, and Santa Monica Bay. It involves implementing a series of stormwater best management practices (BMPs) in up to 39 acres of heavily urbanized area in South Los Angeles along Vermont Avenue between Gage Avenue and Florence Avenue and on the eastern tributary side streets (see location map in Attachment 3). The City of Los Angeles will install "Green Street" vegetated facilities to manage stormwater, reduce flows, improve water quality, and enhance watershed health with a target stormwater capture of a ¾-inch, 24-hour storm. Examples of BMPs to be installed include parkway swales, tree well watering devices, and infiltration swales. This Project provides an opportunity to model and test scalable water quality and conservation measures on a major highway with tributary sub-watersheds. It will further inform the development of regional standard BMP planning by supporting the Greenways to Rivers Arterial Stormwater Systems (GRASS) program.

The Project also involves a community outreach and education component. The City of Los Angeles' Project partner, Heal the Bay, will administer a minimum of three surveys. Heal the Bay will assess the baseline knowledge of the Project area residents on topics such as bio-diversity and stormwater management, as well as community interest and support for the Project. Heal the Bay will initiate educational efforts to inform community members of water quality issues in their area through outreach events, community meetings, and classroom visits. Education to private property owners will inform them of options for decentralized BMPs that can be implemented on their property. Heal the Bay will also assess the willingness of residents to install distributed BMPs on their own property and explore BMP preferences while identifying reasons for unwillingness to participate and other barriers to implementation of BMPs.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-61**. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-61: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and O&M	$4,269,719
Monetizable Benefits	
Total Monetizable Benefits	**$0**
Physically Quantified Benefit or Cost	**Project Life Total**
Water Quality Improvements - Pollutant Load Reduction	
TSS reduction of 1,200 kg/year	30,000 kg
Total Phosphorus reduction of 3.5 kg/year	87.5 kg
Total Nitrogen reduction of 25 kg/year	625 kg
Fecal Coliform reduction of 100,000 billion colonies per year	2,500,000 billion colonies
Fecal Enterococcus reduction of 550,000 billion colonies per year	13,750,000 billion colonies
Fecal Streptococcus reduction of 110,000 billion colonies per year	2,750,000 billion colonies
Total Coliform reduction of 170,000 billion colonies per year	4,250,000 billion colonies
Copper reduction of 0.459 kg/year	11.475 kg
Lead reduction of 0.170 kg/year	4.25 kg
Zinc reduction of 3.334 kg/year	83.35 kg
Avoided Carbon Emissions (Assuming trees reach maturity after 10 years, and sequester 3,015 kg carbon/year for remaining 15 years)	45,225 kg
Qualitative Benefit or Cost	**Qualitative Indicator***
Education or Technology Benefit	++
Social Recreation or Access Benefit	++
Avoid, Reduce, or Resolve Water Resources Conflicts	++

Social Health and Safety Benefit	++
Other Social Benefits	++
Wildlife or Habitat Benefit	+
Long-term Groundwater Management Benefit	+
Long-term Solution	++
Water Reliability Benefit	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-62 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following table are provided in the narrative of qualitative benefits section after the table.

Table 8-62: (PSP Table 12)
Vermont Avenue Stormwater Capture and Green Street Project
Non-monetized Benefits Checklist

No.	Question	Enter "Yes", "No" or "Neg"
	Community/Social Benefits **Will the proposal**	
1	**Provide education or technology benefits?**	Yes
	Examples are not limited to, but may include: - Include educational features that should result in water supply, water quality, or flood damage reduction benefits? - Develop, test or document a new technology for water supply, water quality, or flood damage reduction management? - Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	Yes
	Examples are not limited to, but may include: - Provide new or improved outdoor recreation opportunities? - Provide more access to open space? - Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	Yes
	Examples are not limited to, but may include:	

Table 8-62: (PSP Table 12) Vermont Avenue Stormwater Capture and Green Street Project Non-monetized Benefits Checklist		
No.	**Question**	**Enter "Yes", "No" or "Neg"**
	- Provide more opportunities for public involvement in water management? - Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation? - Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	Yes
	Examples are not limited to, but may include: - Increase urban water supply reliability for fire-fighting and critical services following seismic events? - Reduce risk to life from dam failure or flooding? - Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	Yes
	Examples are not limited to, but may include: - Redress or increase inequitable distribution of environmental burdens? - Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits: **Will the proposal**	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat? - Contribute to an existing biological opinion or recovery plan for a listed special status species? - Preserve or restore designated critical habitat of a listed species? - Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Cause an improvement in water quality in an impaired water body or sensitive habitat? - Prevent water quality degradation? - Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	No[1]
	Examples are not limited to, but may include: - Reduce net production of greenhouse gasses?	

Table 8-62: (PSP Table 12) Vermont Avenue Stormwater Capture and Green Street Project Non-monetized Benefits Checklist		
No.	**Question**	**Enter "Yes", "No" or "Neg"**
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3 or D4?**	No
	Sustainability Benefits: **Will the proposal**	
10	**Improve the overall, long-term management of California groundwater resources?**	Yes
	Examples are not limited to, but may include: - Reduce extraction of non-renewable groundwater? - Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	No
12	**Provide a long-term solution in place of a short-term one?**	Yes
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	No
	Examples are not limited to, but may include: - Reduce net energy use on a permanent basis? - Increase renewable energy production? - Include new buildings or modify buildings to include certified LEED features? - Provide a net increase in recycling or reuse of materials? - Replace unsustainable practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	Yes
	Examples are not limited to, but may include: - Provide a more flexible mix of water sources? - Reduce likelihood of catastrophic supply outages? - Reduce supply uncertainty? - Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	No

[1] This benefit category is marked as no because it was already described as a physically quantified benefit in Attachment 7.

Narrative Description of Qualitative Benefits

Provide Education or Technology Benefits

Develop, test or document a new technology for water supply, water quality, or flood damage reduction management

One of the primary Project objectives is to assist in defining scalable stormwater improvements to water quality and conservation from BMP installations along a major highway and its tributary sub-watersheds. Specifically, results obtained from this Project will affect 893.41 miles of major streets, 645.26 miles of secondary streets, and 990.71 miles of collector streets.

The information the Project provides about capacities, benefits, and cost-effectiveness may be extended to all street cross sections in the City of Los Angeles' streets, through the development of *Green Street Standard Plans* which are currently, or will become, available for application at the regional (distributed) scale through work done on this Project. The City of Los Angeles estimates it had spent approximately $200 million in 2012 for projects intended to ensure that TMDL requirements are met. The *Green Street Standard Plans* will provide valuable information that will help the City apply this type of funding in the most effective manner possible for future projects. Over the long-term, a regional framework of resultant city standards will lead to connected, distributed projects that filter and detain runoff nearer to the source, thereby reducing peak flows downstream, and imparting regional stormwater benefits.

Other education benefits

Another primary Project objective is to educate the surrounding community regarding water quality and storm water, and encourage them so that they may demonstrate an increased public willingness to participate in voluntary onsite stormwater capture on private property. The City of Los Angeles's Project partner, Heal the Bay, will administer a minimum of three surveys in the predominant language of the community members, most likely in Spanish or English. A number of methods may be employed to distribute the surveys, including but not limited to community events, meetings with schools or community groups, and door-to-door canvassing. These surveys build on similar recent survey efforts from the Upper Los Angeles River Area watershed, and a standardized survey will be formalized as a template for collecting data on issues such as public awareness and public acceptance of projects related to stormwater and biodiversity. The results and lessons learned can be used to inform future projects with similar locations and demographics. Heal the Bay will assess the Project area residents' baseline knowledge of topics such as bio-diversity (i.e., invasive species awareness, native plant knowledge, plant host species associations, insect and avian identification, plant maintenance, water conservation) and stormwater management (i.e., understanding of their own watershed and the storm water system, what they perceive as the biggest sources of pollution, and their familiarity with stormwater BMPs), as well as community interest and support for the Project.

Then, Heal the Bay will initiate educational efforts to inform community members of water quality issues in their area through outreach events, community meetings, and classroom visits. Education directed towards private property owners will inform them of options for distributed BMPs that can be implemented on their property. Participating community members will be informed of a variety of BMP options to choose from the "BMP Toolbox," and will be educated and encouraged to perform their own installations, and (contingent on available funding) they may be provided a financial incentive or free BMP device from the toolbox to aid in doing so. Heal the Bay will also assess the willingness of residents to install distributed BMPs on their own property and will explore the local BMP planting and landscaping preferences while identifying reasons for unwillingness to participate and other barriers to implementation or maintenance of BMPs.

Raising public awareness of urban runoff and stormwater management has been demonstrated to provide support for measures that will address these problems. Public education is a recognized pollution source control measure by the EPA and the Regional Water Quality Control Board.

Provide Social Recreation or Access Benefits

Provide new or improved outdoor recreation opportunities

Vegetated parkways provide both passive recreation opportunities and improved conditions for active pedestrians and bicyclists. These parkways will reduce urban heat island effects, increase shade, and enhance the buffer between pedestrians and traffic. BMPs will be sited to avoid interference with non-motorized use. Also, paving improvements will help level paths and sidewalks to better accommodate bicycles, wheel chairs, skates, skateboards, and other modes of non-motorized transport. Motorists, bicyclists and pedestrians alike will benefit when the installed BMPs collect stormwater, thus reducing nuisance flooding on the 71st Street roadway.

Help Avoid, Reduce, or Resolve Various Water Resources Conflicts

Help meet an existing state mandate

As the proposed community education efforts are initiated, the Project will provide opportunities and resources for greater public involvement in water issues.

Storm drains that collect runoff from the Project area terminate downstream at Ballona Creek, a water body listed as impaired according to Section 303(d) of the Clean Water Act for heavy metals (dissolved copper, dissolved lead, total selenium, and dissolved zinc), organic pollutants (Chem A, chlordane, dieldrin, DDT, PCBs, PAHs, and sediment toxicity), coliform bacteria, and trash. Implementing BMPs to capture this runoff will reduce volume and pollutant loadings that would otherwise contribute to Ballona Creek's ongoing impairment. The Project will assist local agencies in avoiding monetary fines associated with TMDL violations.

Stormwater flows may be permitted through the municipal separate storm sewer system (MS4) permit issued to the County of Los Angeles, a separate Caltrans stormwater permit, a general construction stormwater permit, and a general industrial stormwater permit.

Promote Social Health and Safety

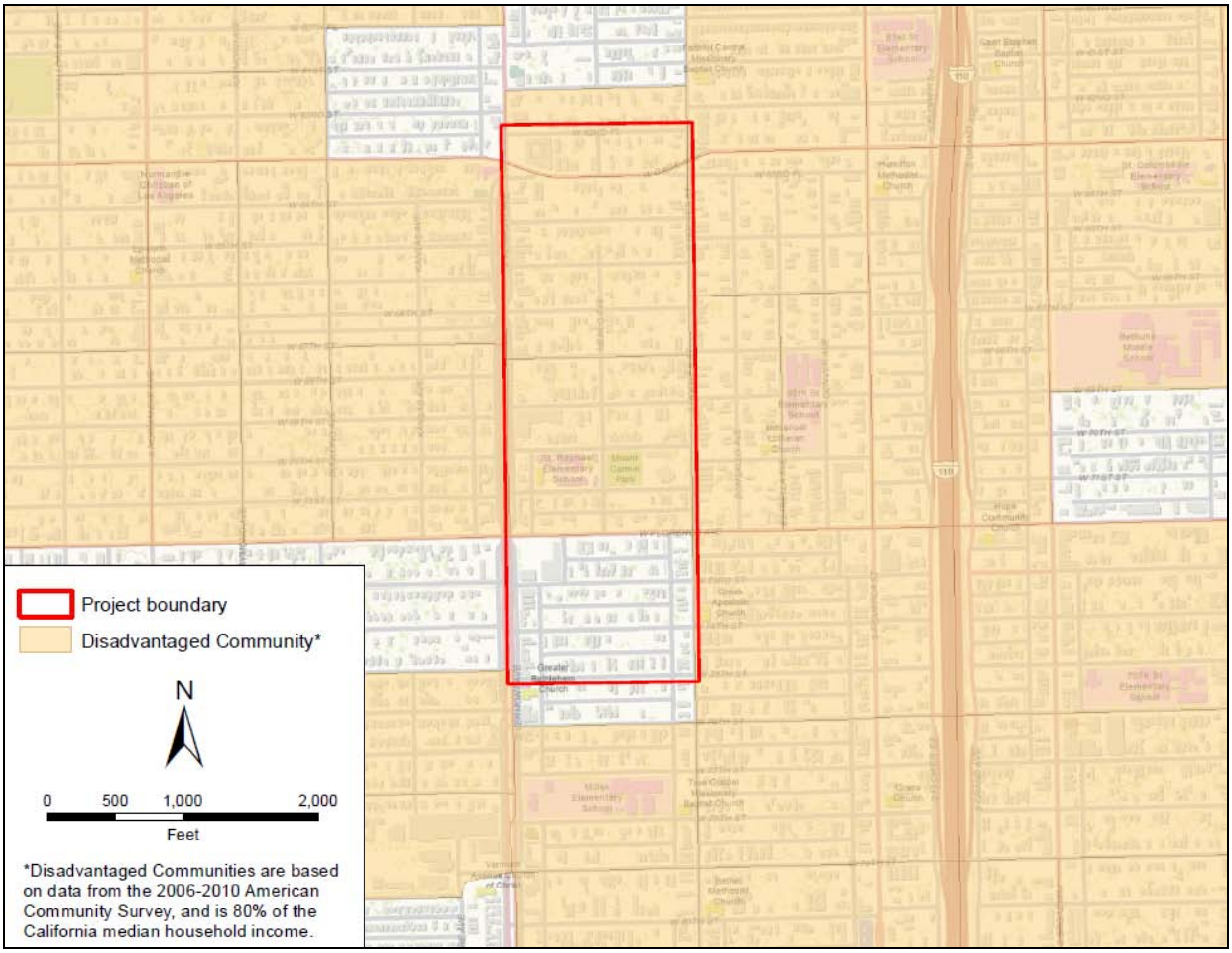
Reduce exposure to water-related hazards

Enhanced recreation opportunities may lead to community health benefits by encouraging interactive outdoor activities, such as walking, jogging and biking. In addition, carefully planned design solutions will address the potential for adverse impacts associated with standing water or anaerobic conditions in dry wells, including odors and vector control. The key to avoiding and mitigating these problems will be to ensure adequate soil infiltration rates, or providing adequate measures for sub-drainage. Pre-filtration techniques, such as biofilters or vegetated BMPs also restrict pollutants and clogging particles from reaching drywells, and help to protect groundwater resources.

Other Social Benefits

Have disproportionate beneficial effects on disadvantaged communities

This Project provides environmental enhancements and outdoor recreational opportunities in a highly urbanized area, benefitting a community designated by DWR as a Disadvantaged Community (DAC) Area. Enhanced recreation opportunities may lead to community health benefits by encouraging interactive outdoor activities, such as walking, biking, skateboarding, etc.



Benefit wildlife or habitat in ways that were not quantified in Attachment 7

Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat

Along with the direct ecosystem restoration benefits identified in Attachment 7, the Project will also reduce pollutant loadings currently impairing downstream water bodies, including the Ballona Creek, Estuary and Wetlands. These water bodies constitute habitats that contain unique plants, including Orcutt's Yellow Pincushion, a rare native plant limited to the coastal dunes of southern California. Also, the estuary provides a home for Great Blue Heron and Snowy Egret rookeries, the California Killifish, the California Least Tern, and the Belding's Savannah Sparrow. The Ballona Wetlands and the adjacent City-owned lagoons are a stop along the migratory Pacific Flyway.

At a project-level, local scale, habitat benefits will teach residents about plant and insect associations in their neighborhoods, so that they can have a deeper respect and will seek similar knowledge. The implementation of this Project will influence future regional efforts, potentially leading to cumulative physical benefits, and as small scale neighborhood projects are developed and merge into larger regional scale corridors that terminate at the large channels such as Ballona Creek and Los Angeles River. The net goal is to provide stormwater greenways as distributed recreational/habitat/parkway connections that over time will become more continuous green corridors that heighten public awareness.

Improve the overall, long-term management of California groundwater resources

Promote aquifer storage or recharge

At a project-level, local scale, groundwater benefits will not be significant, but the eventual implementation of this Project at a regional scale will recharge urban runoff and stormwater that would otherwise be discharged to local receiving water bodies. This will ultimately influence future regional planning and funding, and lead to cumulative physical benefits at the regional scale which would promote aquifer storage and recharge through the demonstration of drywells and other BMPs that capture and percolate urban runoff and stormwater.

Provide a long-term solution in place of a short-term one

The proposed approach provides, and demonstrates, a long-term sustainable approach to address issues associated with stormwater runoff and its associated adverse impacts. Without the Project, costly, single benefit, “end-of–pipe” solutions would be required to meet interim TMDLs for the current schedule, such as low flow diversions to capture and divert flows to a wastewater treatment plant, or could require (non-allowed) in-channel treatment to reach TMDL targets. This involves capital costs for pumping and pipeline connections, O&M of pumps and treatment infrastructure. Although this Project alone will not create the large-scale solution that is needed, it will chart a course towards effective regional implementation. Distributed parkway and sidewalk BMP measures applied strategically over large areas of the City could provide a continuous, alternative method to meet TMDLs without costs for pumping and treatment, and would help to meet pollutant goals upstream of 303(d) listed waters.

Improve water supply reliability in ways not quantified in Attachment 7

Reduce supply uncertainty

Although transitioning from hard-scaped surfaces to vegetated areas will require water (particularly irrigation to establish the newly installed BMPs), the Project infiltrates any available stormwater into drywells, offsetting water required for irrigation. Replacing impervious asphalt and concrete with high storage capacity materials (such as open-graded aggregate) is also proposed by the Project. In addition, the Project minimizes expanded use of imported potable water supply by relying on native vegetation as selected for their low water demands, ability to survive inundation, and on existing rainfall. If the installed BMPs ultimately capture insufficient volumes of stormwater in drywells to support the native/drought-tolerant vegetation, it is possible to limit the vegetative footprint to an area matching the capture volume of the BMP. In these cases, permeable paving, gravel, mulch, or other zero-use landscape materials can be substituted to ensure filtration is included for water quality benefit.

As a standalone Project, measureable water supply impacts on the Region are minimal. However, significant impacts may occur as similar distributed measures are employed regionally and stormwater is integrated with potable and recycled supplies for a more flexible mix of water resources. To the extent the planned plant palettes can be applied regionally through integration with City standards (see S-484, plant palette) rather than the more common, higher water use species (such as turf) for parkways, it will encourage a new use of an underutilized water supply, integrating stormwater runoff with the irrigation of green street BMPs.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Initial costs include funding to complete the various types of deliverables associated with this multi-benefit Project, including construction costs for the stormwater BMP facilities, administration of a minimum of three surveys along with other community outreach and education activities, and finalization of the Green Street Standard Plans for major highways. Initial costs will total $4,957,480.

It is anticipated that O&M costs for BMP landscaping will amount to one-half percent of the construction costs ($3,511,014) per year for the 25-year Project lifetime, totaling $438,900 (Deets, 2013a). Because the responsibility for long-term maintenance will be shared between the City, local homeowners, and other community members, and because the periodic replacement necessary over 25 years for plants and paving wear is variable, O&M costs are difficult to estimate. Therefore, these costs have been allocated evenly among the administration, operations, maintenance, and periodic replacement categories (Deets, 2013b). The present value total for the combined capital and O&M costs is $4,269,719. **Table 8-63** summarizes the economic costs for the Project.

Table 8-63: (PSP Table 19) Vermont Avenue Stormwater Capture and Green Street Project Annual Costs (2012 Dollars)										
	Initial Costs From Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Opera-tion	Maintenance	Replace-ment	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012	$11,890							$11,890	1	**$11,890**
2013	$233,315							$233,315	0.943	**$220,016**
2014	$374,135							$374,135	0.89	**$332,980**
2015	$2,181,000							$2,181,000	0.84	**$1,832,040**
2016	$1,997,026							$1,997,026	0.792	**$1,581,645**
2017	$59,650		$4,389	$4,389	$4,389	$4,389		$77,206	0.747	**$57,673**
2018	$50,232		$4,389	$4,389	$4,389	$4,389		$67,788	0.705	**$47,791**
2019	$50,232		$4,389	$4,389	$4,389	$4,389		$67,788	0.665	**$45,079**
2020			$4,389	$4,389	$4,389	$4,389		$17,556	0.627	**$11,008**
2021			$4,389	$4,389	$4,389	$4,389		$17,556	0.592	**$10,393**
2022			$4,389	$4,389	$4,389	$4,389		$17,556	0.558	**$9,796**
2023			$4,389	$4,389	$4,389	$4,389		$17,556	0.527	**$9,252**
2024			$4,389	$4,389	$4,389	$4,389		$17,556	0.497	**$8,725**
2025			$4,389	$4,389	$4,389	$4,389		$17,556	0.469	**$8,234**

Table 8-63: (PSP Table 19) Vermont Avenue Stormwater Capture and Green Street Project Annual Costs (2012 Dollars)										
	Initial Costs From Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2026			$4,389	$4,389	$4,389	$4,389		$17,556	0.442	**$7,760**
2027			$4,389	$4,389	$4,389	$4,389		$17,556	0.417	**$7,321**
2028			$4,389	$4,389	$4,389	$4,389		$17,556	0.394	**$6,917**
2029			$4,389	$4,389	$4,389	$4,389		$17,556	0.371	**$6,513**
2030			$4,389	$4,389	$4,389	$4,389		$17,556	0.35	**$6,145**
2031			$4,389	$4,389	$4,389	$4,389		$17,556	0.331	**$5,811**
2032			$4,389	$4,389	$4,389	$4,389		$17,556	0.312	**$5,477**
2033			$4,389	$4,389	$4,389	$4,389		$17,556	0.294	**$5,161**
2034			$4,389	$4,389	$4,389	$4,389		$17,556	0.278	**$4,881**
2035			$4,389	$4,389	$4,389	$4,389		$17,556	0.262	**$4,600**
2036			$4,389	$4,389	$4,389	$4,389		$17,556	0.247	**$4,336**
2037			$4,389	$4,389	$4,389	$4,389		$17,556	0.233	**$4,091**
2038			$4,389	$4,389	$4,389	$4,389		$17,556	0.22	**$3,862**
2039			$4,389	$4,389	$4,389	$4,389		$17,556	0.207	**$3,634**
2040			$4,389	$4,389	$4,389	$4,389		$17,556	0.196	**$3,441**
2041			$4,389	$4,389	$4,389	$4,389		$17,556	0.185	**$3,248**

Table 8-63: (PSP Table 19)
Vermont Avenue Stormwater Capture and Green Street
Project Annual Costs
(2012 Dollars)

	Initial Costs From Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Maintenance	Replacement	Other	Total Costs (a) +…+ (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Total Present Value of Discounted Costs (Sum of Column (j))										$4,269,719

Benefits and Costs Summary

Although this Project currently has no monetized benefits, all of the benefits typically associated with low-impact development are in effect to offset Project costs. Stormwater BMPs will capture runoff from up to 39 acres of urban environment, resolving nuisance flooding problems in local streets and reducing stormwater volume and pollutant loadings in downstream water bodies while also providing recreational and aesthetic enhancements within the community. This Project offers additional benefits by raising awareness of stormwater management issues through its community education component and by contributing to the development of a regional framework plan through refinement of standard street construction, retrofits, and improvement projects that can later be implemented City-wide. Currently, the City of Los Angeles has information applicable to local and residential green streets, but lacks data on BMP installation, pollutant removal, and on realistic capacities for major highways. This Project will serve to fill that information gap.

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis, the main uncertainties are associated with Runoff Volume Reduction and Pollutant Load Reduction. These issues are listed in **Table 8-64**.

Table 8-64: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Runoff Volume Reduction	U	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 on private property by these BMPs. Goal is capture of ¾-inch of runoff from impervious rooftops and other surfaces at private parcels, and from the right of way adjacent to BMP's (assumes a crowned roadway)
Pollutant Load Reduction	U	The number of BMPs installed will also affect this benefit. Pollutant loading calculations are estimations based on Los Angeles County land use data and other data. Actual reductions may vary due to site-specific conditions of the Project.

*Direction and magnitude of effect on net benefits:
+ = Likely to increase net benefits relative to quantified estimates.
++ = Likely to increase net benefits significantly.

– = Likely to decrease benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

References

California Regional Water Quality Control Board – Los Angeles Region, 2012. *Water Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges Within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating from the City of Long Beach.* Order No. R4-2012-0175. NPDES No. CAS004001.

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

Deets, D. (2013a, March 8). Email correspondence.

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Walnut Spreading Basin Improvements Project

This attachment presents the economic analysis for the Walnut Spreading Basin Improvements Project (Project). A project overview and project benefit-cost summary table are followed by the following sections as outlined in the Proposal Solicitation Package (PSP): Non-Monetized Benefits Analysis (Section D2), Monetized Benefit Analysis (Section D3), Flood Damage Reduction Benefit Analysis (D4), and Project Benefits and Costs Summary (Section D5).

Project Overview

The Walnut Spreading Basin Improvements Project, managed by the Los Angeles County Flood Control District (LACFCD), will increase local water supplies by 500 acre feet (AF) annually to the Main San Gabriel Groundwater Basin. The Project will remove 2 to 6 feet of fine sediments and clays to improve percolation at the 16-acre Walnut Spreading Basin. Additionally, the Project will install a pump station with two pumps to drain the facility (which will improve percolation rates) and convey water to other downstream replenishment facilities with better percolation rates. The Walnut Spreading Basin receives and conveys flows into the concrete-lined Walnut Creek Wash, which flows to the San Gabriel River and discharges to the Pacific Ocean near Long Beach.

This Project is important to secure local water supplies in a water scarce region for the long-term. Currently over 90% of regional water supplies are met by local groundwater from the Main San Gabriel Groundwater Basin (Main San Gabriel Basin Watermaster, 2011). In the face of growing demand and population it is vital to preserve or improve groundwater recharge rates into the basin. At least 22 entities, including numerous municipalities, pump from the Main San Gabriel Groundwater Basin (Main San Gabriel Basin Watermaster, 2011). This Project is one piece of a much larger strategy to improve water security in the Region.

By enhancing the ability to capture and use local water resources, the Project will avoid importing water from the Bay Delta, and provide other non-monetized benefits including improved social health and safety, and water quality benefits. Monetized benefits from the Project include avoided water import costs and reduced net carbon emissions from importing water.

Summary Project Benefits and Costs

A summary of all benefits and costs of the Project are provided in **Table 8-65**. Present value costs of this Project are far outweighed by Project benefits. Additionally, the Project provides substantive non-quantified benefits such as improved water quality and reduced demand for net diversions from the Delta. Monetized benefits and non-monetized benefits are presented in this attachment. Physical benefits that require technical justification are described in Attachment 7.

Table 8-65: Benefit-Cost Analysis Overview (present values, in 2012 USD)

	Present Value
Costs – Total Capital and O&M	$4,157,695
Monetizable Benefits	
Increased local water supply and reduced energy costs	$8,426,860
Reduced net carbon emissions	$184,372
Local pumping and treatment costs	($678,753)
Total Monetizable Benefits	**$7,932,479**
Physically Quantified Benefits	**Project Life Total**
500 acre feet local water per year	25,000 AF
1,262,500 kWh per year of conserved energy	63 million kWh
414 metric tons of avoided CO_2e emissions	20,700 metric tons
118 billion colonies of total coliform bacteria loadings reduced per day	2.2×10^{15} colonies
1.6 billion colonies of E. coli bacteria loadings reduced per day	29,200 billion colonies
0.05 pounds total copper reduced per day	913 pounds
0.03 pounds dissolved copper reduced per day	548 pounds
0.004 pounds total lead reduced per day	73 pounds
0.002 pounds dissolved lead reduced per day	37 pounds
0.01 pounds total nickel reduced per day	183 pounds
0.01 pounds dissolved nickel reduced per day	183 pounds
154 metric tons TDS per year	7,700 pounds
Qualitative Benefit or Cost	**Qualitative Indicator***
Social health and safety	+
Other social benefits	+
Improve long-term management of California groundwater resources	+
Reduce demand for net diversions from the Delta	++
Provide a long-term solution	+
Improve water supply reliability	+

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

Non-Monetized Benefits Analysis (Section D2)

Table 8-66 shows the non-monetized benefits checklist for the Project. Descriptions of the benefit categories marked "Yes" in the following the table are provided in the narrative of qualitative benefits section after the table.

Table 8-66: (PSP Table 12)
Walnut Spreading Basin Improvements
Non-monetized Benefits Checklist

No.	Question	Enter "Yes," "No" or "Neg"
	Community/Social Benefits	
	Will the proposal	
1	**Provide education or technology benefits?**	**No**
	Examples are not limited to, but may include:	
	- Include educational features that should result in water supply, water quality, or flood damage reduction benefits?	
	- Develop, test, or document a new technology for water supply, water quality, or flood damage reduction management?	
	- Provide some other education or technological benefit?	
2	**Provide social recreation or access benefits?**	**No**
	Examples are not limited to, but may include:	
	- Provide new or improved outdoor recreation opportunities?	
	- Provide more access to open space?	
	- Provide some other recreation or public access benefit?	
3	**Help avoid, reduce or resolve various public water resources conflicts?**	**No**
	Examples are not limited to, but may include:	
	- Provide more opportunities for public involvement in water management?	
	- Help avoid or resolve an existing conflict as evidenced by recurring fines or litigation?	

Table 8-66: (PSP Table 12) Walnut Spreading Basin Improvements Non-monetized Benefits Checklist		
	- Help meet an existing state mandate (e.g., water quality, water conservation, flood control)?	
4	**Promote social health and safety?**	**Yes**
	Examples are not limited to, but may include:	
	- Increase urban water supply reliability for fire-fighting and critical services following seismic events?	
	- Reduce risk to life from dam failure or flooding?	
	- Reduce exposure to water-related hazards?	
5	**Have other social benefits?**	**Yes**
	Examples are not limited to, but may include:	
	- Redress or increase inequitable distribution of environmental burdens?	
	- Have disproportionate beneficial or adverse effects on disadvantaged communities, Native Americans, or other distinct cultural groups?	
	Environmental Stewardship Benefits:	
	Will the proposal	
6	**Benefit wildlife or habitat in ways that were not quantified in Attachment 7?**	**No**
	Examples are not limited to, but may include:	
	- Cause an increase in the amount or quality of terrestrial, aquatic, riparian or wetland habitat?	
	- Contribute to an existing biological opinion or recovery plan for a listed special status species?	
	- Preserve or restore designated critical habitat of a listed species?	
	- Enhance wildlife protection or habitat?	
7	**Improve water quality in ways that were not quantified in Attachment 7?**	**No**[1]
	Examples are not limited to, but may include:	
	- Cause an improvement in water quality in an impaired water body or sensitive habitat?	
	- Prevent water quality degradation?	
	- Cause some other improvement in water quality?	
8	**Reduce net emissions in ways that were not quantified in Attachment 7?**	**No**[1]
	Examples are not limited to, but may include:	
	- Reduce net production of greenhouse gasses?	
	- Reduce net emissions of other harmful chemicals into the air or water?	
9	**Provide other environmental stewardship benefits, other than those claimed in Sections D1, D3, or D4?**	**No**

Table 8-66: (PSP Table 12) Walnut Spreading Basin Improvements Non-monetized Benefits Checklist		
	Sustainability Benefits:	
	Will the proposal	
10	**Improve the overall, long-term management of California groundwater resources?**	**Yes**
	Examples are not limited to, but may include:	
	- Reduce extraction of non-renewable groundwater?	
	- Promote aquifer storage or recharge?	
11	**Reduce demand for net diversions for the regions from the Delta?**	**Yes**
12	**Provide a long-term solution in place of a short-term one?**	**Yes**
13	**Promote energy savings or replace fossil fuel based energy sources with renewable energy and resources?**	**No**[1]
	Examples are not limited to, but may include:	
	- Reduce net energy use on a permanent basis?	
	- Increase renewable energy production?	
	- Include new buildings or modify buildings to include certified LEED features?	
	- Provide a net increase in recycling or reuse of materials?	
	- Replace unsustainable land or water management practices with recognized sustainable practices?	
14	**Improve water supply reliability in ways not quantified in Attachment 7?**	**Yes**
	Examples are not limited to, but may include:	
	- Provide a more flexible mix of water sources?	
	- Reduce likelihood of catastrophic supply outages?	
	- Reduce supply uncertainty?	
	- Reduce supply variability?	
15	**Other (If the above listed categories do not apply, provide non-monetized benefit description)?**	**N/A**

[1] This benefit category is marked as "no" because it is a quantified benefit.

Narrative Description of Qualitative Benefits

Promote social health or safety

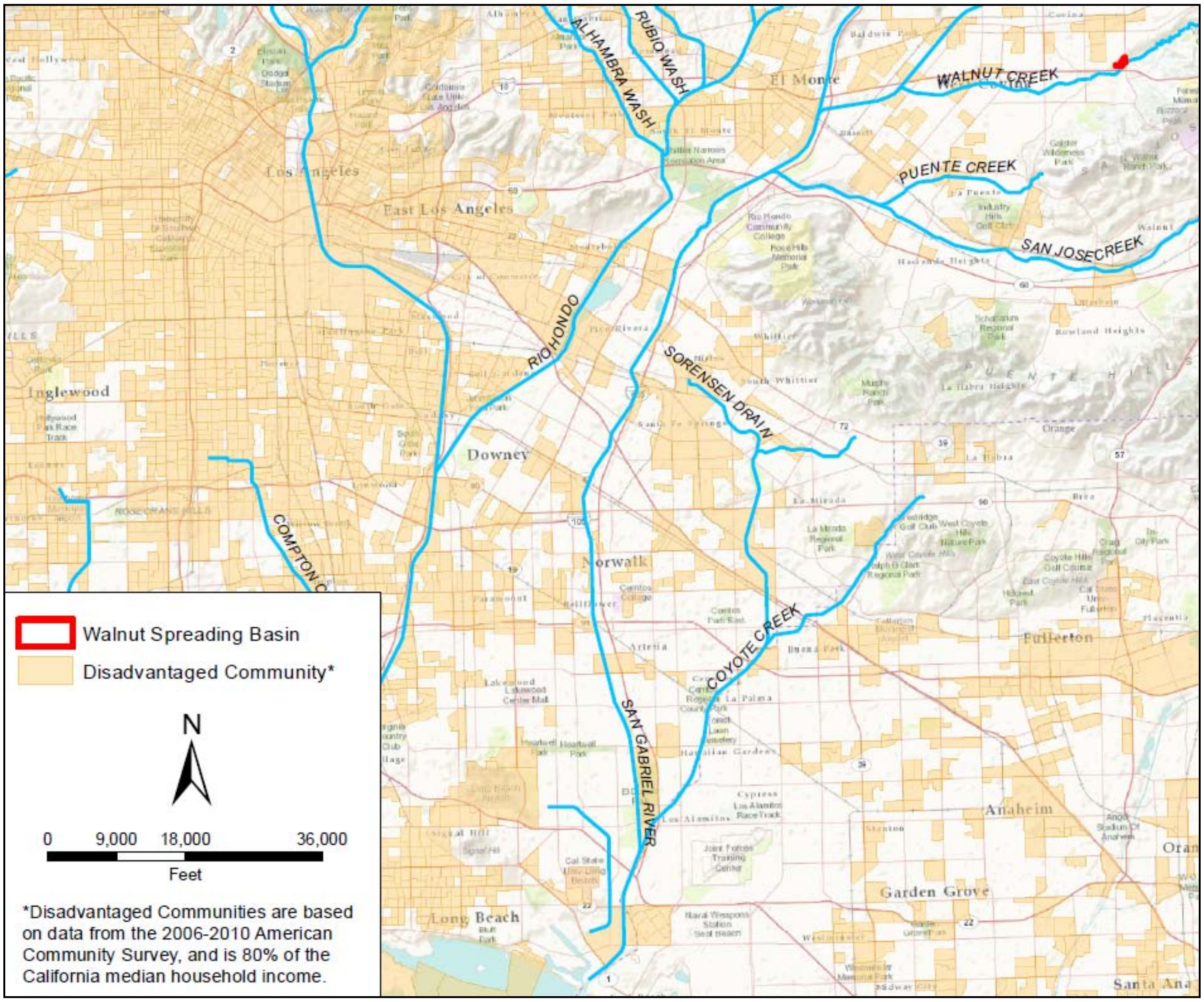
Reduce localized flooding risk

The Project provides flood risk mitigation, a benefit to overall social health and safety. As a concrete-lined channelized wash, the Walnut Creek Wash does not manage flood water through natural percolation. The Project will reduce flood risk along the Walnut Creek Wash in two ways. First, the Project will improve percolation rates through sediment removal and improved drainage of storm water. Second, the new pumps will allow LACFCD to pump water from the Walnut Spreading Basin prior to large storm events, reducing in-stream flow and reducing flood risk. These two improvements will reduce the potential for flood damage to downstream communities.

Other social benefits

In the absence of this Project, untreated water would flow through the San Gabriel River and outlet to the Pacific Ocean near Long Beach. While this Project does not claim to benefit disadvantaged communities (DACs) directly, this Project will provide some benefit to the El Monte DAC and other DAC communities located downstream from the Project site through decreasing non-point source pollutant loadings to these water bodies.

Figure 8-3: Disadvantaged Communities downstream of Walnut Spreading Basin



Improve the overall, long-term management of California groundwater resources

Increase groundwater supply available

Local groundwater supply is a key resource that has historically been utilized to support approximately 90% of the water demand in the Main San Gabriel Groundwater Basin region (Main San Gabriel Basin Watermaster, 2011). In the face of growing demand and population it is vital to preserve or improve groundwater water recharge rates into the basin. This Project will increase groundwater recharge at the Walnut Spreading Basin, replenish the Main San Gabriel Groundwater Basin, and increase local groundwater supply while reducing dependence on imported water into the future. This Project is one piece of a much larger plan to improve water security in the region.

Reduce demand for net diversions from the Delta

By reducing the use of imported State Water Project (SWP) water, the Walnut Spreading Basin Improvements Project will augment in-stream flows in the Bay-Delta or will offset other diversions that may otherwise reduce flows. Reduced demands on Delta supplies also will help reduce the overall salinity of the Delta and improve Delta habitat.

Maintaining the Delta's environmental condition is vital to maintaining and improving the viability of the region. The Delta provides drinking water to 25 million people, supports thousands of industries and irrigation of 750,000 acres of agriculture, and serves as home to hundreds of plant, animal, and fish species – some of which are listed as threatened or endangered. The Delta's 1,600 square miles of marshes, islands, and sloughs support at least half of migratory water birds on the Pacific Flyway; 80% of California's commercial fisheries; and recreational uses including boating, fishing, and windsurfing.

Delta resources are in a state of crisis. Fish populations, including salmon and Delta-smelt, have declined dramatically in recent years. The levee system is aging, and vulnerability of the Delta to flooding, sea level rise, or a major earthquake has contributed to concerns about possible levee collapse. In addition, water quality problems continue, and there is little consensus on how to manage water resources through storage.

Accordingly, by reducing reliance of SWP waters, this Project reduces extractions of water from the Bay-Delta system and helps preserve this vital resource. In addition, by reducing demand for Bay-Delta extractions, this Project may help free up some SWP water for other potential users.

Provide a long-term solution

As discussed in the section above on improving long-term management of California's groundwater resources, and further discussed below regarding increased water supply reliability, this Project helps to address growing demands on local water resources. The increased reliance on local resources accomplished through this 50-year Project is one piece of a much larger plan to improve long-term water security in the region.

Improve water supply reliability

The availability of imported water is subject to a number of natural and human forces, including increased population growth (and accompanying increased demands), drought, changes in snowpack and earthquakes, environmental regulations, and water rights determinations with associated legal challenges and court rulings. Increasing locally available groundwater helps to reduce dependence on imported water and provide a long-term solution. The Walnut Spreading Basin Improvements Project will also enhance reliability by offsetting the use of imported water. It will improve the region's ability to meet water demands on a consistent basis even in times of drought or other constraints on source water availability.

Although interest in water supply reliability is increasing (e.g., due to increasing water demands and concerns over climate-related events), only a few studies have directly attempted to quantify its value (i.e., through nonmarket valuation studies; see for example Carson and Mitchell, 1987, CUWA, 1994, Griffen and Mjelde, 2000, Raucher et al., 2013). Due to the uncertainty involved, this benefit estimate is not included in the monetized benefits tables.

Monetized Benefit Analysis (Section D3)

Several monetized benefits are expected to accrue over the expected 50-year life of the Project. The benefits primarily include:

- Increased local groundwater recharge, reduced water imports, and energy savings
- Reduced net emissions from the import of water

Increase local groundwater recharge, reduce water imports, and promote energy savings

Local groundwater supply is a key resource that has historically been utilized to support over 90% of the water demand in the Main San Gabriel Groundwater Basin region (Main San Gabriel Basin Watermaster, 2011). This Project will increase groundwater recharge at the Walnut Spreading Basin, replenish the Main San Gabriel Groundwater Basin, and increase local groundwater supply while reducing dependence on imported water.

This Project increases groundwater recharge and local groundwater supplies by 500 AFY beginning in 2015. Several benefits are monetized by avoiding water imports; primarily, the avoided cost of importing water, which inherently includes energy savings associated with no longer needing to transport the water across a considerable distance and over elevations. These two benefits are monetized using a single value, the value of importing a single AF of treated Tier 1 water.

Over the 50 year effective life of the Project, the Project will provide 25,000 AF of groundwater resources to the region. This added resource supports significant monetized benefits. As is evident in Table 8-67, this Project supports a present value benefit of $8,426,860. However, there are several costs associated with increased local water supply. Primarily, there are the costs associated with pumping the recharged groundwater from the aquifer at the point of extraction. In this case, that cost is $96 per AF of local groundwater (2012 USD), for a total of

$673,344 in present value terms, over the Project lifetime. Additionally, the water will need to be treated. The marginal cost of treatment associated with using the recharged groundwater is $1.97 per AF (2012 USD), for a total of $5,409 in present value (Metropolitan, 2007). Total present value of these pumping and treatment costs is $678,753.

It is important to note that the value of imported water is expected to increase above the rate of inflation as water demand increases. This increased cost of importing a single AF of treated water is reflected in Table 8-67. Additional information on this can be found in **Appendix 8-1**.

Reduced net carbon emissions

Reduced reliance on imported water will avoid the extensive energy requirements associated with transporting water from the Bay Delta. This in turn will result in avoided greenhouse gas (GHG) emissions associated with the production of this energy.

To calculate the avoided carbon dioxide equivalent (CO_2e) emissions associated with the Project, we multiply the amount of energy required to treat and convey water by the average carbon emissions rate associated with energy production in California. As calculated in Attachment 7, energy required to pump groundwater in the Main San Gabriel Basin is estimated at 475 kWh/AF (Metropolitan 2007). 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 (MWD, 2007). The average carbon emissions rate associated with energy production in California is 0.724 pounds/kWh. These calculations provide an annual net reduction in CO_2 emissions resulting from the Project of 414 metric tons (MT). The total net CO_2 emissions reductions amount to 20,700 MT over the 50-year Project life.

To monetize this benefit, we apply a dollar value to greenhouse gas (GHG) emissions, measured in carbon dioxide equivalent (CO_2e). The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present (IPCC, 2007). In February 2010, the U.S. Government's Interagency Working Group on Social Cost of Carbon issued guidance (Interagency Working Group, 2010) on recommend values for the social cost of carbon for use in regulatory benefit-cost analysis. The recommended mean estimate of the social cost of reducing one metric ton (MT) of CO_2 in 2012 is $22.53/MT (updated from 2010 values using CPI). The recommended mean estimate of the social cost of carbon reflects the worldwide net benefits of reducing CO_2 emissions.

The mean value of $22.53/MT to calculate social benefits and costs produces conservative estimates for the benefits and costs associated with greenhouse gas emissions. To determine total costs over the 50-year Project period, we escalate the social cost of carbon by 2.4% per year. The social cost of carbon will increase in future years because CO_2 will produce larger incremental damages as physical and economic systems become more stressed in responding to greater climate change. The total present value costs over the 50-year Project period are listed in **Table 8-67**. Over the Project life, total present value benefits associated with avoided social costs of carbon amount to $184,372.

Table 8-67 summarizes the monetized benefits of the Project from increased local groundwater supplies (i.e., offsetting imported water) and benefits gained by reducing emissions associated with importing water.

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2012	Increased local water supply	Acre Feet				$882.86	$0	1.000	**$0**
	CO_2 emissions reduction	Metric Tons				$24.19	$0	1.000	**$0**
	Pumping costs	Acre Feet				$96.00	$0	1.000	**$0**
	Treatment costs	Acre Feet				1.97	$0	1.000	**$0**
2013	Increased local water supply	Acre Feet				$882.86	$0	0.943	**$0**
	CO_2 emissions reduction	Metric Tons				$24.19	$0	0.943	**$0**
	Pumping costs	Acre Feet				$96.00	$0	0.943	**$0**
	Treatment costs	Acre Feet				1.97	$0	0.943	**$0**
2014	Increased local water supply	Acre Feet				$882.86	$0	0.890	**$0**
	CO_2 emissions reduction	Metric Tons				$24.19	$0	0.890	**$0**
	Pumping costs	Acre Feet				$96.00	$0	0.890	**$0**
	Treatment costs	Acre Feet				1.97	$0	0.890	**$0**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2015	Increased local water supply	Acre Feet	0	500	500	$882.86	$441,428	0.840	**$370,631**
	CO_2 emissions reduction	Metric Tons	492	78	414	$24.19	$10,015	0.840	**$8,409**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.840	**($40,302)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.840	**($827)**
2016	Increased local water supply	Acre Feet	0	500	500	$913.75	$456,877	0.792	**$361,890**
	CO_2 emissions reduction	Metric Tons	492	78	414	$24.77	$10,256	0.792	**$8,123**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.792	**($38,020)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.792	**($780)**
2017	Increased local water supply	Acre Feet	0	500	500	$945.74	$472,868	0.747	**$353,355**
	CO_2 emissions reduction	Metric Tons	492	78	414	$25.37	$10,502	0.747	**$7,848**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.747	**($35,868)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.747	**($736)**
2018	Increased local water	Acre Feet	0	500	500	$978.84	$489,419	0.705	**$345,021**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	supply								
	CO_2 emissions reduction	Metric Tons	492	78	414	$25.98	$10,754	0.705	**$7,581**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.705	**($33,838)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.705	**($694)**
2019	Increased local water supply	Acre Feet	0	500	500	$1,013.10	$506,548	0.665	**$336,883**
	CO_2 emissions reduction	Metric Tons	492	78	414	$26.60	$11,012	0.665	**$7,324**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.665	**($31,923)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.665	**($655)**
2020	Increased local water supply	Acre Feet	0	500	500	$1,048.55	$524,277	0.627	**$328,938**
	CO_2 emissions reduction	Metric Tons	492	78	414	$27.24	$11,276	0.627	**$7,075**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.627	**($30,116)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.627	**($618)**
2021	Increased local water supply	Acre Feet	0	500	500	$1,064.28	$532,142	0.592	**$314,974**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	CO_2 emissions reduction	Metric Tons	492	78	414	$27.89	$11,547	0.592	**$6,835**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.592	**($28,411)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.592	**($583)**
2022	Increased local water supply	Acre Feet	0	500	500	$1,080.25	$540,124	0.558	**$301,602**
	CO_2 emissions reduction	Metric Tons	492	78	414	$28.56	$11,824	0.558	**$6,602**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.558	**($26,803)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.558	**($550)**
2023	Increased local water supply	Acre Feet	0	500	500	$1,096.45	$548,226	0.527	**$288,798**
	CO_2 emissions reduction	Metric Tons	492	78	414	$29.25	$12,108	0.527	**$6,378**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.527	**($25,286)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.527	**($519)**
2024	Increased local water supply	Acre Feet	0	500	500	$1,112.90	$556,449	0.497	**$276,538**
	CO_2 emissions reduction	Metric	492	78	414	$29.95	$12,398	0.497	**$6,162**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
		Tons							
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.497	**($23,855)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.497	**($490)**
2025	Increased local water supply	Acre Feet	0	500	500	$1,129.59	$564,796	0.469	**$264,798**
	CO_2 emissions reduction	Metric Tons	492	78	414	$30.67	$12,696	0.469	**$5,952**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.469	**($22,504)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.469	**($462)**
2026	Increased local water supply	Acre Feet	0	500	500	$1,146.54	$573,268	0.442	**$253,557**
	CO_2 emissions reduction	Metric Tons	492	78	414	$31.40	$13,001	0.442	**$5,750**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.442	**($21,230)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.442	**($436)**
2027	Increased local water supply	Acre Feet	0	500	500	$1,163.73	$581,867	0.417	**$242,793**
	CO_2 emissions reduction	Metric Tons	492	78	414	$32.16	$13,313	0.417	**$5,555**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.417	**($20,029)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.417	**($411)**
2028	Increased local water supply	Acre Feet	0	500	500	$1,181.19	$590,595	0.394	**$232,485**
	CO_2 emissions reduction	Metric Tons	492	78	414	$32.93	$13,632	0.394	**$5,366**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.394	**($18,895)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.394	**($388)**
2029	Increased local water supply	Acre Feet	0	500	500	$1,198.91	$599,454	0.371	**$222,616**
	CO_2 emissions reduction	Metric Tons	492	78	414	$33.72	$13,959	0.371	**$5,184**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.371	**($17,825)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.371	**($366)**
2030	Increased local water supply	Acre Feet	0	500	500	$1,216.89	$608,445	0.350	**$213,165**
	CO_2 emissions reduction	Metric Tons	492	78	414	$34.53	$14,294	0.350	**$5,008**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.350	**($16,817)**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.350	**($345)**
2031	Increased local water supply	Acre Feet	0	500	500	$1,235.14	$617,572	0.331	**$204,116**
	CO_2 emissions reduction	Metric Tons	492	78	414	$35.36	$14,637	0.331	**$4,838**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.331	**($15,865)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.331	**($326)**
2032	Increased local water supply	Acre Feet	0	500	500	$1,253.67	$626,836	0.312	**$195,450**
	CO_2 emissions reduction	Metric Tons	492	78	414	$36.20	$14,989	0.312	**$4,674**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.312	**($14,967)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.312	**($307)**
2033	Increased local water supply	Acre Feet	0	500	500	$1,272.48	$636,238	0.294	**$187,153**
	CO_2 emissions reduction	Metric Tons	492	78	414	$37.07	$15,348	0.294	**$4,515**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.294	**($14,119)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.294	**($290)**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2034	Increased local water supply	Acre Feet	0	500	500	$1,291.56	$645,782	0.278	**$179,208**
	CO_2 emissions reduction	Metric Tons	492	78	414	$37.96	$15,717	0.278	**$4,361**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.278	**($13,320)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.278	**($273)**
2035	Increased local water supply	Acre Feet	0	500	500	$1,310.94	$655,468	0.262	**$171,600**
	CO_2 emissions reduction	Metric Tons	492	78	414	$38.87	$16,094	0.262	**$4,213**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.262	**($12,566)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.262	**($258)**
2036	Increased local water supply	Acre Feet	0	500	500	$1,330.60	$665,300	0.247	**$164,315**
	CO_2 emissions reduction	Metric Tons	492	78	414	$39.81	$16,480	0.247	**$4,070**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.247	**($11,855)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.247	**($243)**
2037	Increased local water	Acre Feet	0	500	500	$1,350.56	$675,280	0.233	**$157,339**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	supply								
	CO_2 emissions reduction	Metric Tons	492	78	414	$40.76	$16,876	0.233	**$3,932**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.233	**($11,184)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.233	**($230)**
2038	Increased local water supply	Acre Feet	0	500	500	$1,370.82	$685,409	0.220	**$150,660**
	CO_2 emissions reduction	Metric Tons	492	78	414	$41.74	$17,281	0.220	**$3,798**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.220	**($10,551)**
	Treatment costs	Acre Feet	0	500	(500)	$1.97	($985)	0.220	**($217)**
2039	Increased local water supply	Acre Feet	0	500	500	$1,391.38	$695,690	0.207	**$144,264**
	CO_2 emissions reduction	Metric Tons	492	78	414	$42.74	$17,695	0.207	**$3,669**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.207	**($9,954)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.207	**($204)**
2040	Increased local water supply	Acre Feet	0	500	500	$1,412.25	$706,126	0.196	**$138,139**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	CO_2 emissions reduction	Metric Tons	492	78	414	$43.77	$18,120	0.196	**$3,545**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.196	**($9,390)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.196	**($193)**
2041	Increased local water supply	Acre Feet	0	500	500	$1,433.44	$716,718	0.185	**$132,275**
	CO_2 emissions reduction	Metric Tons	492	78	414	$44.82	$18,555	0.185	**$3,424**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.185	**($8,859)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.185	**($182)**
2042	Increased local water supply	Acre Feet	0	500	500	$1,454.94	$727,468	0.174	**$126,660**
	CO_2 emissions reduction	Metric Tons	492	78	414	$45.89	$19,000	0.174	**$3,308**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.174	**($8,357)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.174	**($171)**
2043	Increased local water supply	Acre Feet	0	500	500	$1,476.76	$738,380	0.164	**$121,283**
	CO_2 emissions reduction	Metric	492	78	414	$47.00	$19,456	0.164	**$3,196**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
		Tons							
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.164	**($7,884)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.164	**($162)**
2044	Increased local water supply	Acre Feet	0	500	500	$1,498.91	$749,456	0.155	**$116,134**
	CO_2 emissions reduction	Metric Tons	492	78	414	$48.12	$19,923	0.155	**$3,087**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.155	**($7,438)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.155	**($153)**
2045	Increased local water supply	Acre Feet	0	500	500	$1,521.40	$760,698	0.146	**$111,204**
	CO_2 emissions reduction	Metric Tons	492	78	414	$49.28	$20,401	0.146	**$2,982**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.146	**($7,017)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.146	**($144)**
2046	Increased local water supply	Acre Feet	0	500	500	$1,544.22	$772,108	0.138	**$106,483**
	CO_2 emissions reduction	Metric Tons	492	78	414	$50.46	$20,891	0.138	**$2,881**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.138	**($6,620)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.138	**($136)**
2047	Increased local water supply	Acre Feet	0	500	500	$1,567.38	$783,690	0.130	**$101,962**
	CO_2 emissions reduction	Metric Tons	492	78	414	$51.67	$21,392	0.130	**$2,783**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.130	**($6,245)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.130	**($128)**
2048	Increased local water supply	Acre Feet	0	500	500	$1,590.89	$795,445	0.123	**$97,634**
	CO_2 emissions reduction	Metric Tons	492	78	414	$52.91	$21,906	0.123	**$2,689**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.123	**($5,892)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.123	**($121)**
2049	Increased local water supply	Acre Feet	0	500	500	$1,614.75	$807,377	0.116	**$93,489**
	CO_2 emissions reduction	Metric Tons	492	78	414	$54.18	$22,432	0.116	**$2,597**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.116	**($5,558)**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	Treatment costs		0	500	(500)	$1.97	($985)	0.116	**($114)**
2050	Increased local water supply	Acre Feet	0	500	500	$1,638.98	$819,488	0.109	**$89,520**
	CO_2 emissions reduction	Metric Tons	492	78	414	$55.48	$22,970	0.109	**$2,509**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.109	**($5,243)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.109	**($108)**
2051	Increased local water supply	Acre Feet	0	500	500	$1,663.56	$831,780	0.103	**$85,720**
	CO_2 emissions reduction	Metric Tons	492	78	414	$56.81	$23,521	0.103	**$2,424**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.103	**($4,947)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.103	**($102)**
2052	Increased local water supply	Acre Feet	0	500	500	$1,688.51	$844,257	0.097	**$82,080**
	CO_2 emissions reduction	Metric Tons	492	78	414	$58.18	$24,086	0.097	**$2,342**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.097	**($4,667)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.097	**($96)**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
2053	Increased local water supply	Acre Feet	0	500	500	$1,713.84	$856,920	0.092	**$78,596**
	CO_2 emissions reduction	Metric Tons	492	78	414	$59.57	$24,664	0.092	**$2,262**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.092	**($4,403)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.092	**($90)**
2054	Increased local water supply	Acre Feet	0	500	500	$1,739.55	$869,774	0.087	**$75,259**
	CO_2 emissions reduction	Metric Tons	492	78	414	$61.00	$25,256	0.087	**$2,185**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.087	**($4,153)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.087	**($85)**
2055	Increased local water supply	Acre Feet	0	500	500	$1,765.64	$882,821	0.082	**$72,064**
	CO_2 emissions reduction	Metric Tons	492	78	414	$62.47	$25,862	0.082	**$2,111**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.082	**($3,918)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.082	**($80)**
2056	Increased local water	Acre Feet	0	500	500	$1,792.13	$896,063	0.077	**$69,005**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
	supply								
	CO_2 emissions reduction	Metric Tons	492	78	414	$63.97	$26,483	0.077	**$2,039**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.077	**($3,696)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.077	**($76)**
2057	Increased local water supply	Acre Feet	0	500	500	$1,819.01	$909,504	0.073	**$66,076**
	CO_2 emissions reduction	Metric Tons	492	78	414	$65.50	$27,118	0.073	**$1,970**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.073	**($3,487)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.073	**($72)**
2058	Increased local water supply	Acre Feet	0	500	500	$1,846.29	$923,147	0.069	**$63,270**
	CO_2 emissions reduction	Metric Tons	492	78	414	$67.07	$27,769	0.069	**$1,903**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.069	**($3,290)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.069	**($68)**
2059	Increased local water supply	Acre Feet	0	500	500	$1,873.99	$936,994	0.065	**$60,584**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit $ Value	Annual $ Value (f) x (g)	Discount Factor	Discounted Benefits (h) x (i)
	CO_2 emissions reduction	Metric Tons	492	78	414	$68.68	$28,435	0.065	**$1,839**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.065	**($3,104)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.065	**($64)**
2060	Increased local water supply	Acre Feet	0	500	500	$1,902.10	$951,049	0.061	**$58,012**
	CO_2 emissions reduction	Metric Tons	492	78	414	$70.33	$29,118	0.061	**$1,776**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.061	**($2,928)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.061	**($60)**
2061	Increased local water supply	Acre Feet	0	500	500	$1,930.63	$965,315	0.058	**$55,550**
	CO_2 emissions reduction	Metric Tons	492	78	414	$72.02	$29,817	0.058	**$1,716**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.058	**($2,762)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.058	**($57)**
2062	Increased local water supply	Acre Feet	0	500	500	$1,959.59	$979,794	0.054	**$53,191**
	CO_2 emissions reduction	Metric	492	78	414	$73.75	$30,532	0.054	**$1,658**

Table 8-67: (PSP Table 15) Walnut Spreading Basin Improvements Avoided Annual Costs (2012 Dollars)									
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
Year	**Type of Benefit**	**Measure of Benefit (Units)**	**Without Project**	**With Project**	**Change Resulting from Project (e) – (d)**	**Unit $ Value**	**Annual $ Value (f) x (g)**	**Discount Factor**	**Discounted Benefits (h) x (i)**
		Tons							
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.054	**($2,606)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.054	**($53)**
2063	Increased local water supply	Acre Feet	0	500	500	$1,988.98	$994,491	0.051	**$50,933**
	CO_2 emissions reduction	Metric Tons	492	78	414	$75.52	$31,265	0.051	**$1,601**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.051	**($2,458)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.051	**($50)**
2064	Increased local water supply	Acre Feet	0	500	500	$2,018.82	$1,009,409	0.048	**$48,771**
	CO_2 emissions reduction	Metric Tons	492	78	414	$77.33	$32,015	0.048	**$1,547**
	Pumping costs	Acre Feet	0	500	(500)	$96.00	($48,000)	0.048	**($2,319)**
	Treatment costs		0	500	(500)	$1.97	($985)	0.048	**($48)**
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									**$7,932,479**

Flood Damage Reduction Benefit Analysis (Section D4)

Quantifiable flood damage reduction benefits are not available for this Project.

Project Benefits and Costs Summary (Section D5)

Project Economic Costs

Table 8-68 summarizes the economic project costs for the Project. As is evident in the table, initial capital costs of $2,886,113 will accrue through 2014. Beginning in 2015, annual operations and maintenance (O&M) costs of $71,810 begin. Annual O&M costs include administration, operational costs associated with operating the two pumps, and "other" costs for upkeep of the two pumps and regular removal of some sediment and vegetation around the pumps. Periodic maintenance costs of $160,000 will be incurred every 10 years to clean out the basin and remove silts. This process will maintain the optimal percolation rate. Additionally, every 10 years the two pumps will need to be replaced for a total cost of $400,000. Therefore, the present value costs for the full lifetime of the Project total $4,128,896. It should be underscored that present value benefits of the Project far exceed present value costs.

Table 8-68: (PSP Table 19)
Walnut Spreading Basin Improvements
Project Annual Costs
(2012 Dollars)

	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs (a)+… (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**
2012										
2013	$303,023							**$303,023**	0.943	**$285,871**
2014	$2,583,090							**$2,583,090**	0.890	**$2,298,941**
2015			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.840	**$60,293**
2016			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.792	**$56,880**
2017			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.747	**$53,661**
2018			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.705	**$50,623**
2019			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.665	**$47,758**
2020			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.627	**$45,054**
2021			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.592	**$42,504**
2022			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.558	**$40,098**
2023			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.527	**$37,829**
2024			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.497	**$35,687**
2025			$10,000	$35,000	$170,000	$400,000	$16,810	**$631,810**	0.469	**$296,217**

Table 8-68: (PSP Table 19) Walnut Spreading Basin Improvements Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs (a)+… (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2026			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.442	**$31,762**
2027			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.417	**$29,964**
2028			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.394	**$28,268**
2029			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.371	**$26,668**
2030			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.350	**$25,158**
2031			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.331	**$23,734**
2032			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.312	**$22,391**
2033			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.294	**$21,123**
2034			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.278	**$19,928**
2035			$10,000	$35,000	$170,000	$400,000	$16,810	**$631,810**	0.262	**$165,406**
2036			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.247	**$17,736**
2037			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.233	**$16,732**
2038			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.220	**$15,785**
2039			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.207	**$14,891**
2040			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.196	**$14,048**
2041			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.185	**$13,253**

Table 8-68: (PSP Table 19) Walnut Spreading Basin Improvements Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs (a)+… (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2042			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.174	**$12,503**
2043			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.164	**$11,795**
2044			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.155	**$11,127**
2045			$10,000	$35,000	$170,000	$400,000	$16,810	**$631,810**	0.146	**$92,362**
2046			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.138	**$9,903**
2047			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.130	**$9,343**
2048			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.123	**$8,814**
2049			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.116	**$8,315**
2050			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.109	**$7,844**
2051			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.103	**$7,400**
2052			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.097	**$6,982**
2053			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.092	**$6,586**
2054			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.087	**$6,214**
2055			$10,000	$35,000	$170,000	$400,000	$16,810	**$631,810**	0.082	**$51,574**
2056			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.077	**$5,530**
2057			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.073	**$5,217**

Table 8-68: (PSP Table 19) Walnut Spreading Basin Improvements Project Annual Costs (2012 Dollars)										
	Initial Costs from Att. 4 Total Cost (row (i), column (d))	Adjusted Grand Total Cost	Annual Costs						Discounting Calculations	
			Admin	Operation	Mainten-ance	Replace-ment	Other	Total Costs (a)+… (g)	Discount Factor (Capital) Present Value Coeff (O&M)	Discounted Project Costs (h) x (i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2058			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.069	**$4,922**
2059			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.065	**$4,643**
2060			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.061	**$4,380**
2061			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.058	**$4,132**
2062			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.054	**$3,898**
2063			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.051	**$3,678**
2064			$10,000	$35,000	$10,000		$16,810	**$71,810**	0.048	**$3,470**
Total Present Value of Discounted Costs (Sum of Column (j)) Transfer to Table 8-1, column (c), Proposal Benefits and Costs Summaries										**$4,128,896**

Benefits and Costs Summary

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In this analysis the main uncertainties are associated with the future cost of importing water, the percolation and recharge rates of the Walnut Spreading Basin Improvements Project and the frequency of periodic maintenance and component replacement. These issues are listed in **Table 8-69**.

Table 8-69: Omissions, Biases, and Uncertainties, and Their Effect on the Project

Benefit or Cost Category	Likely Impact on Net Benefits*	Comment
Future cost of importing water	+	This analysis assumes that the cost of importing an acre foot of water will increase in real terms over time (see the appendix). Given the anticipated population growth regionally, potential climate change impacts on supply and demand, the demand for water and price of importing will continue to increase, but it is not known by how much. Conservative real price escalation rates are used in this analysis.
Recharge rates of the Walnut Spreading Basin	U	The Los Angeles County Flood Control District has conducted multiple technical studies to evaluate the Walnut Creek Spreading Basin and predict enhanced percolation rates. Nevertheless, these percolation and recharge rates are not guaranteed. Drought or deluge conditions could increase or decrease anticipated recharge rates, for example.
Frequency of periodic replacement and maintenance	U	The two pumps at the Walnut Spreading Basin will need to be replaced over time. If the pumps' lifetime is longer or shorter than expected, periodic maintenance costs could change. Similarly, the schedule of periodic basin cleanout could vary depending on percolation rates at the site. Changes in the schedule would result in changes to the Project's costs.

*Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.

++ = Likely to increase net benefits significantly.

– = Likely to decrease benefits.
– – = Likely to decrease net benefits significantly.
U = Uncertain, could be + or –.

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