Attachment 2

San Diego Integrated Regional Water Management

2015 IRWM Implementation Grant Proposal

Project Justification

Attachment 2 consists of the following items:

- ✓ **Project Justification.** This attachment includes a summary of the proposed projects, along with a technical justification of each project, which describes how each project can achieve the claimed level of benefits, explains how the benefits will be attained through the least cost alternative, and identifies a plan to monitor project performance.

Table of Contents

Introduction....1
Project Summary....1
Regional Map....2
Grant Administration....4
Conservation Program....5
Project 1: Regional Drought Resiliency Program....5
Project 2: Conservation Home Makeover in the Chollas Creek Watershed....23
Project 3: San Diego Water Conservation Program....35
Project 4: Ms. Smarty-Plants Grows Water-Wise Schools....49
Rural Water Infrastructure Program....62
Project 5: Rural Disadvantaged Community Partnership Project – Phase III....62
Water Reuse Program....80
Project 6: Integrated Water Resource Solutions for the Carlsbad Watershed....80
Project 7: UCSD Water Conservation and Watershed Protection....96
Project 8: Escondido Advanced Water Treatment for Agriculture....109
Project 9: Padre Dam Advanced Water Treatment – Phase IA Expansion....124
Project 10: Safari Park Drought Response and Outreach....136
Water Quality and Habitat Program....148
Project 11: San Diego River Healthy Headwaters Restoration....148
Project 12: Sweetwater Reservoir Wetlands Habitat Recovery....161
Project 13: Hodges Reservoir Natural Treatment System....173

Introduction

This *2015 IRWM Implementation Grant Proposal* (Proposal) contains thirteen high-priority projects that were evaluated and selected by a subcommittee (the Project Selection Workgroup) of the Region's primary stakeholder body, the Regional Advisory Committee (RAC). The Project Selection Workgroup carefully evaluated each project to determine its potential to provide multiple benefits to the San Diego Integrated Regional Water Management (IRWM) Region. It also evaluated each project's readiness to proceed, previously completed work, and viability.

This attachment contains a summary of the proposed projects, the estimated physical benefits of the projects, justifies how the projects are technically feasible, describes how the projects can achieve the level of claimed benefits, and explains whether the benefits will be attained through the least cost alternative.

Project Summary

Table 2-1 includes information about how each of the thirteen projects included in the Proposal meet applicable IRWM Program Elements stipulated in Table 4 of the *2015 Proposal Solicitation Package (2015 PSP)*.

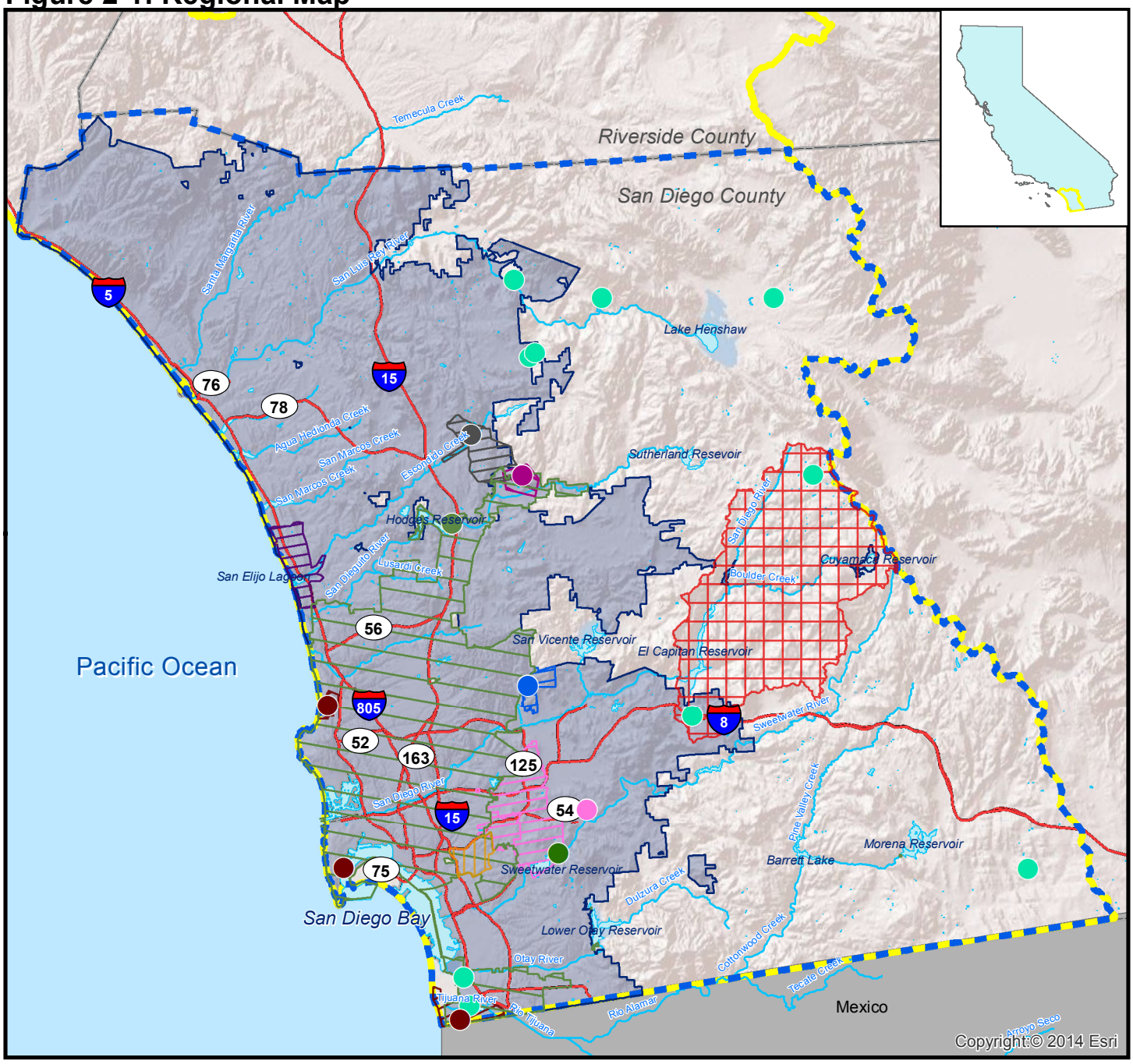
Table 2-1: *2015 IRWM Implementation Grant Proposal* Summary Table

		1: Regional Drought Resiliency Program	2: Conservation Home Makeover in the Chollas Creek Watershed	3: San Diego Water Conservation Program	4: Ms. Smarty-Plants Grows Water-Wise Schools	5: Rural Disadvantaged Community Partnership Project – Phase III	6: Integrated Water Resource Solutions in the Carlsbad Watershed	7: UCSD Water Conservation and Watershed Protection	8: Escondido Advanced Water Treatment for Agriculture	9: Padre Dam Advanced Water Treatment – Phase 1A Expansion	10: Safari Park Drought Response and Outreach	11: San Diego River Healthy Headwaters Restoration	12: Sweetwater Reservoir Wetlands Habitat Recovery	13: Hodges Reservoir Natural Treatment System
IRWM Project Element														
IR.1	Water supply reliability, water conservation, and water use efficiency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
IR.2	Stormwater capture, storage, clean-up, treatment, and management		✓			✓	✓	✓			✓	✓	✓	✓
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands							✓				✓	✓	
IR.4	Non-point source pollution reduction, management, and monitoring						✓	✓						
IR.5	Groundwater recharge and management projects													
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users					✓	✓		✓	✓	✓			
IR.7	Water banking, exchange, reclamation, and improvement of water quality					✓	✓	✓	✓	✓	✓	✓	✓	✓
IR.8	Planning and implementation of multipurpose flood management programs						✓	✓				✓	✓	
IR.9	Watershed protection and management	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓
IR.10	Drinking water treatment and distribution					✓								
IR.11	Ecosystem and fisheries restoration and protection	✓	✓	✓	✓		✓					✓	✓	✓

Regional Map

Figure 2-1 includes the San Diego IRWM regional boundary and a marker identifying the location of each project contained in this Proposal. **Figures 2-2** through **2-31** provided below include the project maps as required by the California Department of Water Resources (DWR) in the *2015 PSP* along with additional project-specific maps that provide back-up and supporting information for the benefits claimed herein.

Figure 2-1: Regional Map



Legend

- San Diego IRWM Region
- Funding Area Boundary
- Freeway
- Waterbody
- County
- 1 Regional Drought Resiliency Program
- 2 Conservation Home Makeover in the Chollas Creek Watershed
- 3 San Diego Water Conservation Program
- 4 Ms. Smarty-Plants Grows Water-Wise Schools
- 5 Rural Disadvantaged Community Partnership Project - Phase III (Note: 10 project sites)
- 6 Integrated Water Resources Solutions for the Carlsbad Watershed
- 7 UCSD Water Conservation and Watershed Protection (Note: 3 project sites)
- 8 Escondido Advanced Water Treatment for Agriculture
- 9 Padre Dam Advanced Water Treatment - Phase IA Expansion
- 10 Safari Park Drought Response and Outreach
- 11 San Diego River Healthy Headwaters Restoration
- 12 Sweetwater Reservoir Wetlands Habitat Recovery
- 13 Hodges Reservoir Natural Treatment System

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Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
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Grant Administration

Grant Administrator: San Diego County Water Authority (SDCWA)
Partners: Local Project Sponsors – Padre Dam Municipal Water District, Zoological Society of San Diego, City of Escondido, San Elijo Joint Powers Authority, University of California San Diego, Groundwork San Diego, City of San Diego, SDCWA, The Water Conservation Garden, Rural Community Assistance Corporation, USDA Forest Service, and Sweetwater Authority

Project Summary

SDCWA will administer this grant on behalf of the San Diego IRWM Region project sponsors, coordinate with DWR, and ensure grant contract requirements are met.

Project Description

SDCWA is the grant applicant for the *2015 IRWM Implementation Grant Proposal*, and will be responsible for contracting with California Department of Water Resource (DWR), contracting with project proponents (referred to here as "local project sponsors" or "LPS"), submitting all invoices, progress reports, and deliverables to the DWR on behalf of LPS, ensuring compliance with all grant requirements, and coordinating with DWR and LPS.

Project Physical Benefits

The benefits of having a regional grant administrator include: knowledgeable grant administration staff, efficient review and feedback on invoices and progress reports, regional labor compliance contracting, and a regional "voice" for LPS during communications with DWR. No formal benefits analysis has been conducted for Grant Administration.

Conservation Program

Project 1: Regional Drought Resiliency Program

Local Project Sponsor: San Diego County Water Authority (SDCWA)
Partner: California Department of Corrections and Rehabilitation (CDCR), Otay Water District, and Mission Resources Conservation District (MRCD)

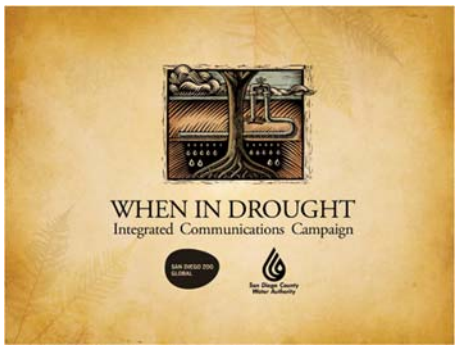
Project Summary

The program expands efforts to retrofit correctional facilities with water-saving devices, implement a sustainable landscapes program, and outreach to property owners on reducing water demands.

Project Maps

Figure 2-2 shows the *Regional Drought Resiliency Program* project area, the service areas of the project sponsor, the project facilities and the project's relation to groundwater basins and surface water, disadvantaged communities (DACs) and proposed monitoring locations.

Pre- and Post-turf conversion landscaping



Drought and water conservation outreach from SDCWA and its partners

Project Description

SDCWA will expand current water conservation and sustainability programs to continue its efforts to reduce water use and improve water awareness in the community. The *Regional Drought Resiliency Program* project will conduct a correctional facility retrofit project to reduce water use in prisons, expand the existing turf replacement program and upgrade it to a sustainability program, continue efforts to improve agricultural irrigation efficiencies, and continue education and outreach programs that empower and enable individuals to implement changes in their personal lives to reduce water use. This project will conserve a total of 1,809 acre-feet per year (AFY) potable water (14,510 acre-feet [AF] over the project life) and help SDCWA and the Region meet its water conservation goals and reduce water use during drought. This project consists of six components:

Component 1: Correctional Facility Retrofit Project: In collaboration with CDCR and Otay Water District, this project provides financial incentives for the direct installation of water efficiency hardware upgrades at Donovan Correctional Facility (DCF), a 780-acre state prison facility located in unincorporated southern San Diego County, California. This project will purchase 600 electronic faucet controllers, 265 aerators, 44 faucet flow reducers, 188 low-flow showerheads with timers, 26 commercial toilets, 4 urinal flush valves, and 267 high-efficiency toilets and 23 urinals for public and employee areas at DCF to produce immediate water and embedded energy savings. The project is modeled after a successful pilot phase at the Bailey and Vista detention facilities that together reduced water use by more than 348 AFY.

Component 2: Electrical Conductivity (EC) Mapping and Soil Moisture Sensor Systems Project: The project will develop and use EC maps to install 200 soil moisture sensor systems that would enable approximately 100 farmers in SDCWA's service area to switch from using a calendar to using precise irrigation management resources to make irrigation decisions.

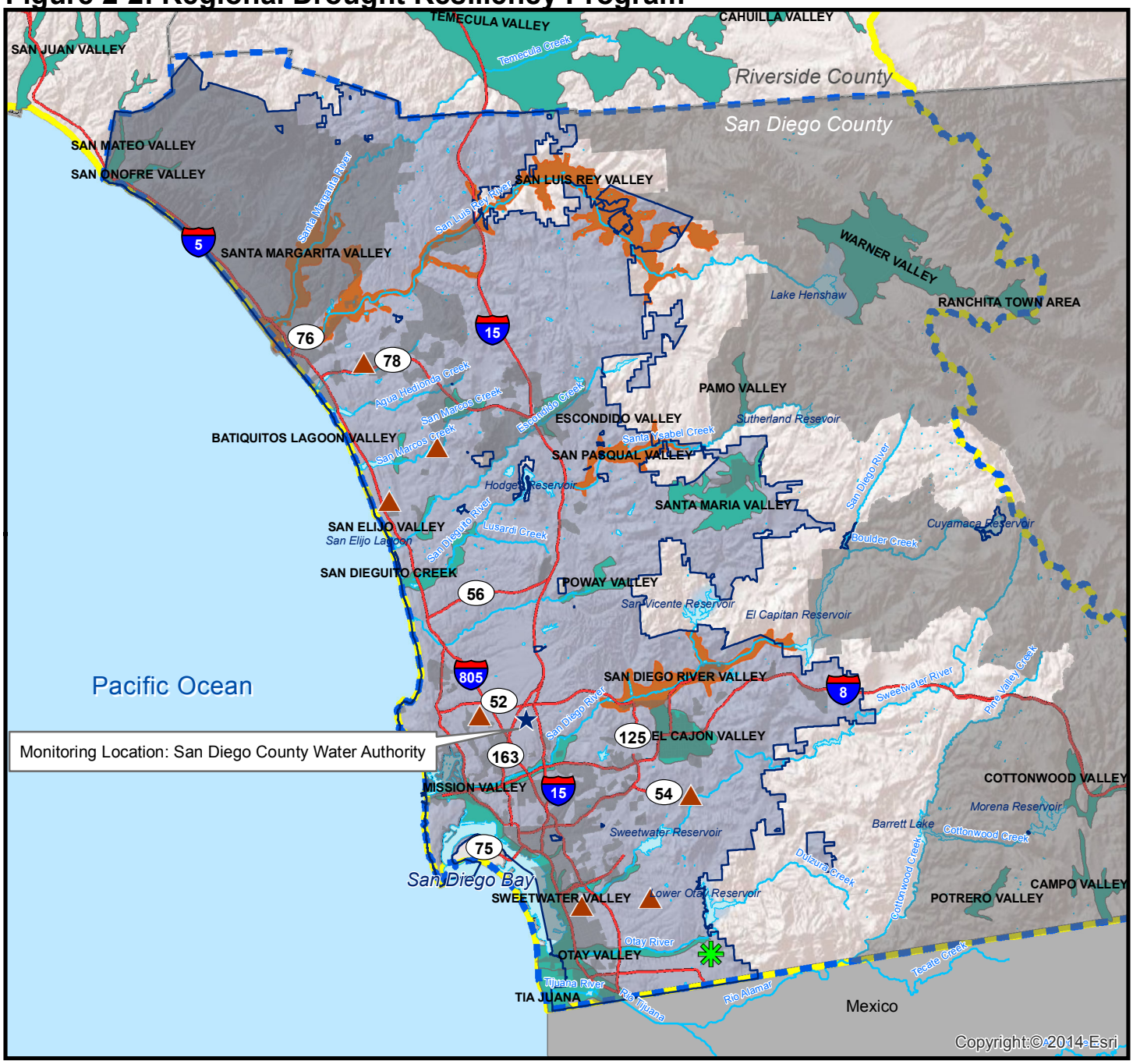
Component 3: WaterSmart Field Services Program: This program (aka WaterSmart Checkup) will be expanded to continue to reduce water waste and increase water-use efficiencies through water surveys and landscape audits. Participation in this program will be open to all users, but will target mid- to heavy water users across all markets. Field services provide water use data, savings recommendations, and resources to assist in reducing water use to participants. Approximately 8,300 field services will be provided.

Component 4: Sustainable Landscapes Program: This program will promote outdoor water use efficiency in all sectors by expanding existing financial incentives to replace an additional 1,270,588 square feet (sq ft) of existing turf with water-wise landscaping and upgrade overhead sprinkler irrigation systems to high-efficiency irrigation systems. Due to changing regulatory and drought conditions, SDCWA may also add components to the existing turf rebate program to achieve multiple benefits from more sustainable landscape practices.

Component 5: WaterSmart Landscape Makeover Program: This program will provide homeowners with the education and skills necessary for successful conversion of turf into a WaterSmart landscape. A four-class series will provide an opportunity for hands-on learning necessary for a successful landscape retrofit, and will result in a landscape design ready for implementation. This series will be conducted five times and participants will commit to converting a minimum of 400 sq ft of turf, with an average conversion of 1,000 sq ft. Additional 3-hour workshops and online eLearning modules will also be developed that will be self-paced and available 24/7.

Component 6: Drought Outreach and Education: This program will communicate water-efficient practices and ensure compliance with local water use restrictions and state-mandated reductions; use media and community partners to leverage grant and operating funds and to increase the reach of conservation messaging; inform the public of programs that provide water-efficient landscape education and incentives; provide outreach to Hispanic, Pan-Asian, and other minority communities with appropriate native language advertising and community events; offer programs for K-12 students, community leaders, and other key audiences to establish a life-long conservation ethic; and conduct research to track changes in attitudes and monitor effectiveness.

Figure 2-2: Regional Drought Resiliency Program



Coordinates: 32.8255, -117.13116

Legend

- San Diego IRWM Region
- Funding Area Boundary
- Freeway
- Waterbody
- County
- Disadvantaged Community Area (DAC)*
- Medium Priority Groundwater Basin
- Very Low Priority Groundwater Basins
- Benefit Area: 1 Regional Drought Resiliency Program (corresponds to SDCWA service area)
- R.J. Donovan Correctional Facility
- Landscape Workshops
- Monitoring Location

0 4.75 9.5 19

Miles

N

*Note: DAC as determined by census tract and block group data for the year 2013, from the American Community Survey 2009-2013 5-year results. DAC determined based on definition of median household incomes below 80% of the statewide MHI or $48,875.

Sources: U.S. Census 2013 ACS 5-year estimates; San Diego Association of Governments (SANDAG) - GIS Data Warehouse
Document Path: N:\Projects GIS\0188-003 SDIRWM Plan Update\Prop84_Rnd4\MXD\Project maps\2-2_SDCWAProject28072015.mxd

Project Physical Benefits

This project has two quantified benefits: Water Supply and Habitat Improved. These benefits are presented in **Table 2-3** and **Table 2-4**, below. The primary benefit is Water Supply (1,809 AFY), achieved through water conservation from turf conversions, hardware upgrades, irrigation efficiencies, and individual implementation of field services recommendations. The secondary benefit is Habitat Improved (18.7 acres), achieved through turf conversions to water-wise and native landscaping.

For the primary benefit (Water Supply), the baseline value was calculated as the baseline water use for each component that contributed toward water conservation (Components 1, 2, 3, and 4). The baseline calculations are explained here, and summarized in **Table 2-2**, below.

- For Component 1, the baseline value was water use at Donovan Correctional Facility (DCF), which was reported as 635 AF in 2012.[1] The anticipated useful life of the DCF upgrades is 10 years.
- Component 2's baseline was calculated as the average water demand for agricultural land multiplied by the total agricultural lands that would participate in the Soil Moisture Sensor program. MRCD will implement this component over approximately 900 acres.[2] The City of Escondido's *Easterly Recycled Water Main Preliminary Design Report* states that agricultural water use in northern San Diego County is approximately 5 AFY per acre.[3] Applying this demand to the total 900 acres participating in this program yields a baseline of 4,500 AFY. The anticipated useful life of the soil moisture sensors is 10 years.
- Component 3 will complete a total of 7,927 field services at residences, 166 field services at large residential properties, and 209 field services at Commercial, Industrial, and Institutional (CII) sites. For both the residential and large property water use, an average water use per residence was calculated. The Equinox Center reports that SDCWA's Fiscal Year (FY) 2014 water use was 92 gallons per capita per day (GPCD).[4] The Equinox Center's data was used, rather than the "r-gpcd" values being reported to the State Water Resources Control Board under the emergency regulations, because the FY2014 data is considered as a reasonable median sans extraordinary conservation measures. Assuming 4 persons per household yields a baseline of 0.4 AFY per household. This was then applied to the total number of field services provided to residential and large residential customers (8,890 field services), for baseline water use of 3,671 AFY. CII baseline water use was calculated by determining the average number of employees per business, based on U.S. Census estimates for 2013. Within the County of San Diego, there are 78,379 businesses, and an employed population of 1,181,133 people, for an average of 15.1 people per business.[5] Again applying this to SDCWA's GPCD (92 gal/day) and the number of CII field services (209), yields a baseline water use of 324.6 AFY for CII customers. Together, the baselines water use for customers receiving field services is 3,996 AFY. The anticipated useful life of the field services measures is 5 years.
- Component 4's baseline is water use for residences participating in the program. Assuming that an average of 1,000 sq ft are converted per participant, 1,271 homes would participate. Assuming 4 persons per household, multiplied by 92 GPCD, baseline water use for Component 4 is 525 AFY. The anticipated useful life of the turf conversions is 13 years, based on length of average homeownership estimated by U.S. Department of Housing and Urban Development[6] (HUD) and assuming that new homeowners may not be inclined to maintain water-wise landscaping.

In total, the baseline water use for the *Regional Drought Resiliency Program* is 9,655 AFY. Note that some differences may occur due to rounding.

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[1] CDCR. 2013. *Level II Infill Correctional Facilities Project Draft Environmental Impact Report, Volume 2: Site-Specific Evaluation of Level II Infill Correctional Facilities at R.J. Donovan Correctional Facility*. June.
[2] Pers. Comm. Lori Swanson, Water Resources Specialist, San Diego County Water Authority. 23 July 2015.
[3] City of Escondido. 2012. Easterly Recycled Water Main Extension Preliminary Design Report. August 2012.
[4] Equinox Center. 2015. *H2Overview Series: San Diego County Residential Water Use Trends*. February.
[5] U.S. Census. State & County Quick Facts – San Diego County, California. Website. Accessed 23 July 2015. Available: http://quickfacts.census.gov/qfd/states/06/06073.html
[6] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

Table 2-2: Baseline Calculations for Water Use for *Regional Drought Resiliency Program*

Component	Assumptions for Baseline	Baseline Water Use	Benefit Accrual	Project Life
1. Correctional Facility	635 AFY water use at DCF	635 AFY	81 AFY	10 yr
2. EC Mapping	Agricultural water demand = 5 AFY/acre; Project installs sensors over 900 acres	4,500 AFY	800 AFY	10 yr
3. Field Services		3,995 AFY	795 AFY	5 yr
3.1 Residential – Indoor	*3,128 field services; 92 GPCD; 4 persons/household; converted to AFY*	*1,292 AFY*	*44 AFY*	*5 yr*
3.2 Residential – Landscape	*501 field services; 92 GPCD; 4 persons/household; converted to AFY*	*207 AFY*	*12 AFY*	*5 yr*
3.3 Residential – Indoor and Outdoor	*4,298 field services; 92 GPCD; 4 persons/household; converted to AFY*	*1,775 AFY*	*163 AFY*	*5 yr*
3.4 CII	*209 field services; 92 GPCD; 15.1 persons per business; converted to AFY*	*325 AFY*	*56 AFY*	*5 yr*
3.5 Full Audit	*962.8 field services; 92 GPCD; 4 persons/household; converted to AFY*	*398 AFY*	*520 AFY*	*5 yr*
4. Sustainable Landscapes	1,270,588 sq ft converted; 1,000 sq ft per house; 92 GPCD; 4 persons/household; converted to AFY	525 AFY	133 AFY	13 yr
Total Baseline		**9,655 AFY**	**1,809 AFY**	

The value of the water supply benefit for the DCF component (81 AFY) was from CDCR's *Water Systems Efficiency and Conservation Feasibility Study: R.J. Donovan Correctional Facility*. The value of the water supply benefit for the EC Mapping component (800 AFY) was from Rancho California Water District's (RCWD's) *Enhanced Agricultural Irrigation Efficiency Program*. The value of the water supply benefit for the Field Services component (795 AFY) was from the *Alliance for Water Efficiency Conservation Tracking Tool*. The value of the water supply benefit for the Sustainable Landscapes component (133 AFY) is based on information from the California Urban Water Conservation Council (CUWCC) on turf conversions. Annual benefit is anticipated vary over the course of the project life (see **Table 2-3**), with the maximum annual reduction in potable water use being 1,809 AFY in years 2019 and 2020. Over the course of the project life, total water savings from conservation is anticipated to be 14,494 AF.

Table 2-3: Primary Physical Benefit – Water Supply
Regional Drought Resiliency Program

Project Name: Regional Drought Resiliency Program
Type of Benefit Claimed: Water Supply – Conservation from hardware, turf conversion, irrigation efficiency, field services
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project: Variable 5-13 Years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2016	9,655 AFY	9,159 AFY	496 AFY
2017	9,655 AFY	8,582 AFY	1,073 AFY
2018	9,655 AFY	8,078 AFY	1,577 AFY
2019	9,655 AFY	7,846 AFY	1,809 AFY
2020	9,655 AFY	7,846 AFY	1,809 AFY
2021	9,655 AFY	8,045 AFY	1,610 AFY
2022	9,655 AFY	8,244 AFY	1,411 AFY
2023	9,655 AFY	8,443 AFY	1,212 AFY
2024	9,655 AFY	8,642 AFY	1,013 AFY
2025	9,655 AFY	8,642 AFY	1,013 AFY
2026	9,655 AFY	8,914 AFY	741 AFY
2027	9,655 AFY	9,259 AFY	397 AFY
2028	9,655 AFY	9,523 AFY	133 AFY
2029	9,655 AFY	9,556 AFY	99 AFY
2030	9,655 AFY	9,589 AFY	66 AFY
2031	9,655 AFY	9,622 AFY	33 AFY

Comments: This project has an expected life ranging between 5 and 13 years, depending on the component. Component 1's 10-year project life is based on assumptions used for the Baily Correctional Facility Retrofit project, funded through a Prop 84-Drought IRWM grant, which installed similar water-saving features at a correctional facility. Turf conversions completed under Component 4 are anticipated to last 13 years based on HUD estimates of typical homeownership duration. Although homeownership duration could be a reasonable project life for Component 3, SDCWA does not offer on-going support to field services program participants, and project life has been modified to a conservative 5 years. This project life is consistent with the "Useful Life" reported in the AWE Conservation Tracking Tool. Benefits were phased in for each component, based on the project schedule (see *Attachment 5 Schedule*), and phased out in a similar manner. Benefits were assumed to begin accruing immediately upon completion for the Donovan facility (completed in October 2016, full benefits realized starting 2017), and immediately upon completion of services, conversions, and sensor installations at each individual site for the Components 2, 3, and 4. For the latter components, implementation was assumed to occur at a constant rate: Sensor installation phases in by 33% per year 2016-2018, field services by 25% per year 2016-2019, and turf conversions by 25% per year 2016-2019). Benefits are phased out in the same way at the end of their useful life.

Sources: WMI. 2006. *Water Systems Efficiency and Conservation Feasibility Study: R.J. Donovan Correctional Facility.*

Rancho California Water District. 2014. *Enhanced Agricultural Irrigation Efficiency Program*. December 31.

CUWCC. 2015. *Turf Removal & Replacement: Lessons Learned*. March.

Alliance for Water Efficiency Conservation Tracking Tool, available with subscription: http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx.

A&N Technical Services, Inc. 2011. *Mini-Audit Program Evaluation Prepared for the San Diego County Water Authority*. June.

The secondary benefit of this project is Habitat Improved achieved through conversion from turf monoculture to diverse WaterSmart landscaping. The baseline for this secondary benefit was calculated as the geographic area that currently provides wildlife habitat within SDCWA's service area. Habitat was defined as Landscape Open Space, Open Space Park or Preserve, or Undevelopable Natural Area in land use data from San Diego Association of Governments (SANDAG).[7] This analysis found 22% of the project area, or 277,011 acres, qualified as existing habitat. Baseline habitat also included areas that have been, or are committed to be, converted through SDCWA's existing turf replacement rebate program, which has committed to funding 282,176 sq ft (6.5 acres) to date via Prop 84-Round 2 and Prop 84-Drought IRWM grants. The value of the habitat accrual (18.7 acres) was calculated based on the City of San Diego's estimate of 64% plant coverage for participating residential properties in their existing turf rebate program. This estimate is used because it is local data and assumes that on average, customers throughout SDCWA's service area will convert turf in a similar manner as those within the City of San Diego. Note that this is considered a conservative estimate, because the City of San Diego does not have a minimum vegetation cover requirement and issues rebates for backyard conversions which may have more hardscapes (e.g., patios), compared to SDCWA's rebate program which requires a minimum 50% vegetation cover and limits rebates to landscaping visible from the street. Assuming the same proportion of habitat accrual in Rounds 2, 3 and 4 of the IRWM grant program, total "without project" habitat area is therefore 277,015 acres. The useful project life is considered 13 years for the turf conversions, based on length of average homeownership estimated by HUD.[8]

Table 2-4: Secondary Physical Benefit – Habitat Improved
Regional Drought Resiliency Program

Project Name: Regional Drought Resiliency Program
Type of Benefit Claimed: Habitat Improved – Water-wise and native plantings
Units of the Benefit Claimed: Acres
Anticipated Useful Life of Project: 13 years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2016	277,015 acres	277,020 acres	4.7 acres
2017	277,015 acres	277,024 acres	9.3 acres
2018	277,015 acres	277,029 acres	14.0 acres
2019-2028	277,015 acres	277,034 acres	18.7 acres
2029	277,015 acres	277,029 acres	14.0 acres
2030	277,015 acres	277,024 acres	9.3 acres
2031	277,015 acres	277,020 acres	4.7 acres

Comments: This project has an anticipated project life of 13 years, based on HUD estimates of typical homeownership duration. Benefits are assumed to begin accruing immediately following each turf conversion. An equal number of landscapes are assumed to be converted each year of the four-year implementation period, and each landscape assumed to provide equal benefits. Benefits are anticipated to phase in at 25% per year. The annual benefit will remain the same for 2019-2028 at 100% and then phase back out (as properties change hands and water-wise landscapes may be replanted or removed).

Sources: Equinox Center. 2015. *H2Overview Series: San Diego County Residential Water Use Trends*. February.
CUWCC. 2015. *Turf Removal & Replacement: Lessons Learned.* March.

[7] San Diego Association of Governments (SANDAG). SanGIS Data Warehouse – Landuse_Current. Available for download through the Regional GIS Data Warehouse, which can be accessed here: http://www.sandag.org/index.asp?subclassid=100&fuseaction=home.subclasshome

[8] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

Technical Analysis of Physical Benefits Claimed

Project Need and Conditions

With California experiencing extreme drought conditions, the need to immediately reduce water use is paramount. This comprehensive *Regional Drought Resiliency Program* responds to the State's mandatory water use restrictions. SDCWA, the Region's wholesale water agency, imported approximately 76% of its water supplies from the State Water Project (SWP) and the Colorado River in 2014.[9] SWP supplies from the Bay-Delta have been restricted since 2006 due to drought and environmental regulations, while the delivery of Colorado River water may be subject to limitations in the future. Recent drought has limited the Region's ability to acquire extra Colorado River supplies (beyond its allocation) to make up the reductions from SWP. For 2015, SWP deliveries have been reduced to 20% of allocations,[10] during a time when local supplies are stretched thin and demand for imported water is increasing. On April 1, 2015, Governor Brown's executive order imposed mandatory statewide water restrictions to reduce water use by 25%. SDCWA's member agencies must reduce water use from 12%-36%, depending on the agency.[11] This suite of proposed projects will help the Region meet the Governor's water use reduction target, as well as potential future water conservation targets or objectives.

According to SDCWA's *2010 Urban Water Management Plan*, 9% of water use by its customers was for agricultural uses, projected to be 30,358 AF in 2015. Agricultural water use within SDCWA's service area is concentrated mainly in the North County, and includes member agencies such as the Rainbow, Valley Center, Ramona, and Yuima Municipal Water Districts, the Fallbrook Public Utility District, and the City of Escondido. The primary crops grown for local, national, and international markets are avocados, citrus, cut flowers, and nursery products. Agricultural water demand has decreased substantially in that last decade due to SWP cutbacks (specifically targeted to farmers in 2008) and resultant tree stumping and plant stock reduction.[12] To maintain the region's $1.68 billion agricultural industry (2011 annual crop value within San Diego County[13]), tools must be made available to farmers to support efficient water use.

According to SDCWA's *2010 Urban Water Management Plan*, residential use was 56% of total demand, projected to be 360,346 AF in 2015 (61% of projected Municipal and Industrial demand). Outdoor water use comprises up to 60% of total residential use.[14] Water use efficiency and water conservation is a key component of SDCWA's water demand management strategy, and conservation is one of the most cost-effective and environmentally-friendly ways to reduce regional water demands. This project would expand existing conservation and efficiency programs, which have already been proven to be successful. Demand for SDCWA's existing turf rebate program is so high that funds have already been exhausted, as have funds for other turf rebate programs residents in SDCWA's service area may have qualified for, such as Metropolitan Water District of Southern California's Water$mart turf rebate program.[15] Component 4 would help meet the need and demand for additional turf conversion incentives.

The DCF, which is operated by CDCR, was opened in 1987 with a mission to provide housing for inmates classified as medium-high custody. Currently, there are approximately 3,200 inmates detained and approximately 1,700 support staff. An expansion that is currently underway will increase these numbers to approximately 4,000 inmates and 2,000 staff by February 2016. The DCF is the largest customer of the Otay Water District and offers a correspondingly large opportunity for water efficiency improvements. At the DCF, onsite research showed that 55% of the facility's water use was from excessive flushing of inmate bathrooms. Previously, Otay Water District partnered with CDCR to install valves (electronic bathroom controls) to limit the number of daily flushes at DCF,

[9] SDCWA. Increasing San Diego County's Water Supply Reliability through Supply Diversification. Available: http://www.sdcwa.org/sites/default/files/images/piechart.jpg
[10] California Department of Water Resources. 2015. Notice to State Water Project Contractors – 2015 State Water Project Allocation Increase – 20 Percent. March 2.
[11] State Water Resources Control Board. 2015. Final Urban Water Supplier Conservation Tiers. May. Available: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/docs/supplier_tiers.pdf
[12] SDCWA. 2011. *2010 Urban Water Management Plan*. June.
[13] San Diego RWMG and RAC. 2013. *2013 San Diego IRWM Plan*.
[14] SDCWA. 2011. *2010 Urban Water Management Plan*. June.
[15] WaterSmart. San Diego County Water Authority Turf Replacement Program. Website. Accessed 23 July 2015. Available: http://turfreplacement.watersmartsd.org/

as toilets were flushed an average of 18 times per day. The valves reduced flushing to 12 times per day.[16] However, additional opportunities exist to conserve water at the DCF. SDCWA partnered with CDCR and Otay Water District, via a Prop 84-Drought IRWM grant, to retrofit the Bailey Facility, and found that installing 64 controlled flush toilets saved 1,615,260 gal/yr.[17]

While SDCWA has an aggressive drought awareness campaign in place ("When in Drought"), with messaging available over radio, billboards, signs, websites, and other media, most of this messaging is available in English only. As described in the *2013 San Diego Integrated Regional Water Management Plan (2013 IRWM Plan)*, the population of the region is highly diverse, with less than 50% of San Diego County identifying as "white". Approximately 37% of adults in the Region speak a language other than English as the primary language in the home. Approximately 16% of the population speak English less than "very well".[18] There is a clear need for translation of outreach materials and campaigns into other languages and targeted towards minority communities, in order to realize a "water conservation ethic" across all of the Region's population.

Billboard advertisement on University Ave. promotes watering your landscape no more than two days a week and letting your lawn get a tan.

Billboard Advertisement on Broadway promotes shorter showers.

SDCWA's "When in Drought" advertising campaign (http://www.sdcwa.org/whenindrought)

[16] Otay Water District. 2010. From Report to Reality; One Agency's Delayed Success Story. Presented at the WaterSmart Innovations Conference and Exposition. 6 October. Presented by Rhianna Pensa, Water Conservation Specialist. Pp.13-14
[17] Otay Water District. 2010. From Report to Reality; One Agency's Delayed Success Story. Presented at the WaterSmart Innovations Conference and Exposition. 6 October. Presented by Rhianna Pensa, Water Conservation Specialist. Pg. 19.
[18] San Diego RWMG and RAC. 2013. *2013 San Diego Integrated Regional Water Management Plan*. September.

San Diego County is also one of the most highly biodiverse areas of the country, with more endangered, threatened, and rare species than any other comparable area in the nation.[19] Habitat improvements realized through conversion from turf monoculture to native and water-wise polyculture landscaping could provide habitat for numerous species residing within, or with potential to reside within, the project area. A California Natural Diversity Database (CNDDB) query for the project area had 222 species (130 plants and 92 animals) recorded as existing or with the potential to exist within SDCWA's service area (animal species are listed in **Table 2-5**).[20] Habitat improvements from Component 4 could help to support populations of these species.

Table 2-5: Species Listed in CNDDB Within or Near the Project Area

Animals		
Federal- or State-Listed Threatened, Endangered, or Candidate Species		
Arroyo Toad	Least Bell's Vireo	Stephens' Kangaroo Rat
Bank Swallow	Lesser Long-Nosed Bat	Swainson's Hawk
Belding's Savannah Sparrow	Light-Footed Clapper Rail	Tidewater Goby
California Black Rail	Pacific Pocket Mouse	Townsend's Big-Eared Bat
California Least Tern	Quino Checkerspot Butterfly	Vernal Pool Fairy Shrimp
Coastal California Gnatcatcher	Riverside Fairy Shrimp	Western Snowy Plover
Green Turtle	San Diego Fairy Shrimp	Western Yellow-Billed Cuckoo
Hermes Copper Butterfly	Southern Steelhead - Southern California Dps	Southwestern Willow Flycatcher
Non-Listed Species		
American Badger	Grasshopper Sparrow	Senile Tiger Beetle
American Peregrine Falcon	Hoary Bat	Silver-Haired Bat
Arroyo Chub	Jacumba Pocket Mouse	Silvery Legless Lizard
Bell's Sage Sparrow	Least Bittern	South Coast Garter Snake
Big Free-Tailed Bat	Los Angeles Pocket Mouse	Spotted Bat
Black-Crowned Night Heron	Mesa Shoulderband	Thorne's Hairstreak
Burrowing Owl	Mexican Long-Tongued Bat	Tricolored Blackbird
California Brown Pelican	Northern Harrier	Two-Striped Garter Snake
California Horned Lark	Orangethroat Whiptail	Wandering (=Saltmarsh) Skipper
California Mellitid Bee	Osprey	Western Beach Tiger Beetle
Coast Horned Lizard	Pallid Bat	Western Mastiff Bat
Coast Patch-Nosed Snake	Pocketed Free-Tailed Bat	Western Pond Turtle
Coast Range Newt	Prairie Falcon	Western Red Bat
Coastal Cactus Wren	Red-Diamond Rattlesnake	Western Small-Footed Myotis
Coastal Whiptail	Rosy Boa	Western Spadefoot
Cooper's Hawk	San Bernardino Ringneck Snake	Western Tidal-Flat Tiger Beetle
Coronado Island Skink	San Diego Banded Gecko	Western Yellow Bat
Double-Crested Cormorant	San Diego Black-Tailed Jackrabbit	White-Faced Ibis
Dulzura Pocket Mouse	San Diego Desert Woodrat	White-Tailed Kite
Ferruginous Hawk	San Diego Ringneck Snake	Yellow Warbler
Globose Dune Beetle	Sandy Beach Tiger Beetle	Yellow-Breasted Chat
Mimic Tryonia (=California Brackishwater Snail)	Monarch - California Overwintering Population	Northwestern San Diego Pocket Mouse
Southern California Rufous-Crowned Sparrow	Golden Eagle	

Source: California Natural Diversity Database (CNDDB). RareFind 5 database query within Project Area (21 July 2015).

[19] San Diego RWMG and RAC. 2013. *2013 San Diego Integrated Regional Water Management Plan*. September.
[20] California Natural Diversity Database. Rarefind 5. Database query within Project Area. Accessed 21 July 2015. Available with subscription: https://map.dfg.ca.gov/rarefind/view/RareFind.aspx

Without-Project Conditions

This project would conserve a total of 14,494 AF over the entire project life, or 1,809 AFY when all project components are fully implemented. These water savings reduce overall water demand in the Region, which is heavily reliant on imported water. Without this project, SDCWA and its member agencies would need to find other ways to meet the State's mandatory use reductions, which may be less cost-effective or take longer to implement if such efforts were starting from scratch, instead of expanding existing programs. If conservation mandates couldn't be met, SDCWA and its member agencies might also need to either purchase additional imported water supplies (via transfers or other means), mine groundwater supplies (which are limited in San Diego), or expand desalination and recycled water programs to meet demands.

Without the *Regional Drought Resiliency Program* project, a CDCR DCF facility would not receive water efficiency upgrades and potable water would continue to be wasted through inefficient fixtures and behaviors such as excessive toilet flushing. EC mapping and soil moisture sensor installations would not occur, and agricultural irrigation would continue to be more inefficient than necessary. Growers may continue to lack the knowledge to maximize crop and irrigation management efficiency, which could mean additional tree stumping or crop reduction to minimize costs and/or meet conservation mandates. This could have a significant impact on the County's agricultural industry, which is the 18th largest in the country.[21]

Without the WaterSmart Field Services Program, residents who would have participated in the program would not receive irrigation check-ups, landscape audits, water consumption data, site-specific water savings recommendations, or program and incentive information. These customers may not be aware of opportunities to receive assistance to implement water saving features on their property, or may improperly install features, which means conservation targets may not be met region-wide.

The Sustainable Landscapes Program's turf rebates would need to be funded from another source in order to continue providing incentives for customers to replace water intensive turf with water-wise landscaping. Given high demand for turf conversion rebates (SDCWA, City of San Diego, and MWD have all exhausted existing rebate funds),[22,23,24] customers are less likely to be able to obtain financial assistance and may not be able to afford to implement conversions. Although DWR is implementing a turf rebate program in the near future, only $12 million is available for "Non-Targeted California Counties", which includes all counties outside the San Joaquin Valley, and is likely to be highly competitive.[25] It is unlikely that a substantial amount of these funds would be distributed for turf conversion in San Diego. High water demands for turf irrigation would continue, or if water cuts are implemented and existing turf allowed to die, property values could decrease as a result of diminished curb appeal. Further, if turf remains intact or simply allowed to die, as could happen without this project, the additional habitat provided by conversion from turf to water-wise and native landscaping would not be realized, and there would be less habitat overall for native species.

The benefits of this project are enhanced by the education and outreach components, and workshops designed to increase the success of implemented water conservation measures. While extensive outreach is already underway in the Region, it fails to adequately reach minority populations, who would benefit from additional outreach and education in languages other than English and using methods targeted to their communities. Without expanding and improving outreach to these communities and the Region as a whole, the full benefits of existing water conservation efforts may not be realized.

Methods Used to Estimate the Physical Benefits

Calculations for each of the two physical benefits of this project (Water Supply and Habitat Improved) are provided below. Note that these calculations show the annual benefits anticipated when the project is completed and 100% of the benefits are realized annually. Some differences may occur due to rounding.

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[21] San Diego RWMG and RAC. 2013. *2013 San Diego IRWM Plan*.
[22] WaterSmart. San Diego County Water Authority Turf Replacement Program. Website. Accessed 23 July 2015. Available: http://turfreplacement.watersmartsd.org/
[23] City of San Diego. Rebate Programs. Website. Accessed 20 July 2015. Available: http://www.sandiego.gov/water/conservation/rebates/index.shtml
[24] SoCal Water$mart. Turf Removal Program Update. Website. Accessed 20 July 2015. Available: http://socalwatersmart.com/?page_id=2967
[25] California Department of Water Resources. *California 2015 Turf Replacement Initiative – Guidelines*.

Primary Benefit – Water Supply

The primary benefit of this project is water supply that is achieved through conservation. This project will conserve a total of 1,809 AFY from Components 1, 2, 3, and 4.

Component 1 will conserve 80.9 AFY at the Donovan Correctional Facility (DCF). A *Water Systems Efficiency and Conservation Feasibility Study* for DCF was completed in 2006 by Water Management, Inc. for Otay Water District and SDCWA, which evaluated the existing water uses at the facility, the water uses of each type of fixture at the facility based on the manner and frequency of use and the fixture's flow rates, and made recommendations for hardware changes that could conserve water. The Feasibility Study also determined the savings potentials of the recommended changes. Using these values, the savings per fixture were calculated, as shown in **Table 2-6**.

Table 2-6: Water Savings of Hardware Improvements at Donovan Correctional Facility

Fixture	Recommended Quantity*	Total Gallons/Year Water Savings*	Gallons/Year Savings per Fixture
Electronic Shower Controls	176	13,094,010	74,398
Electronic Faucet Controls	500	5,840,000	11,680
Replace Commercial Toilets	26	1,790,592	68,869
Replace Urinal Flush Valves	4	156,160	39,040
Faucet Flow Reducers	44	78,022	1,773
Replace Common Area Toilets	267	2,797,729	10,478
Replace Common Area Urinals	23	468,096	20,352
Faucet Aerators	265	68,270	258

Source: Otay Water District and San Diego County Water Authority. 2006. *Water Systems Efficiency and Conservation Feasibility Study: R.J. Donovan Correctional Facility.*

*As reported in the Feasibility Study. Note that these values may have changed as this project was developed.

These values were then applied to the number of each type of fixture installed as part of this project to calculate the total savings associated with Component 1. As described in *Attachment 3 Work Plan*, this component will install 188 electronic shower controls, 600 electronic faucet controls, 26 commercial toilets, 4 urinal flush valves, 44 faucet flow reducers, 265 faucet aerators, and will replace 267 common area toilets and 23 common area urinals. This component would save 26,353,652 gallons, or 80.9 AFY, as shown in **Table 2-7**.

$$Number\ of\ Fixtures * \frac{Water\ Savings}{Fixture} = Water\ Savings\ from\ Fixture\ Upgrades$$

Table 2-7: Water Savings Calculations for Component 1 Hardware Upgrades

Fixture	Number Installed	Savings Per Fixture (gal/yr)	Total Savings (gal/yr)	Total Savings (AFY)
Electronic Shower Controls	188	74,398	13,986,783	42.9
Electronic Faucet Controls	600	11,680	7,008,000	21.5
Replace Commercial Toilets	26	68,869	1,790,592	5.5
Replace Urinal Flush Valves	4	39,040	156,160	0.5
Faucet Flow Reducers	44	1,773	78,022	0.2
Replace Common Area Toilets	267	10,478	2,797,729	8.6
Replace Common Area Urinals	23	20,352	468,096	1.4
Faucet Aerators	265	258	68,270	0.2
Total Savings for Component 1			**26,353,652**	**80.9**

Component 2 would install moisture sensors for agricultural irrigation systems to reduce unnecessary irrigation on large areas or farm and cropland. Rancho California Water District (RCWD) implemented a similar program in Temecula and Murrieta, and found that soil moisture sensors saved 5.4 AFY per device installed (a total of 24 devices, 130 AFY reported savings).[26] In consultation with MRCD, these savings have been conservatively revised down to 4 AFY per device, to due to potential differences in soil types and conditions between RCWD's project and this project.[27] This component will install a total of 200 sensors, for a savings of 800 AFY.

$$\frac{Water\ Savings}{Sensor} * Number\ of\ Sensors = Water\ Saved\ by\ Sensors$$

$$4\frac{AFY}{Sensor} * 200\ Sensors = \mathbf{800\ AFY}$$

Component 3 will conserve a total of 795.5 AFY. Each type of field service is anticipated to provide different levels of water savings. Residential field services provide between 0.01 and 0.04 AFY savings per service provided[28], CII field services will save 0.27 AFY per service[29], and full audits would conserve 0.54 AFY per acre that is audited.[30] Based on SDCWA's existing field services program, an average of 5.8 acres is evaluated for each full audit[31], and 166 full audits will be completed as part of this project, for a total area of 962.8 acres audited. Note that while some full audits will be conducted for residential sites, these field services are categorized as "full audits" and not "residential", due to the large size of the properties. These savings were multiplied times the number of services provided, or the total acres audited. **Table 2-8** shows the total savings associated with each type of field service.

Table 2-8: Water Conservation for Field Services

Field Service	Number of Services	Savings per Service (AFY)	Total Water Conservation (AFY)
Residential	7,927	-	219.1
Indoor Only	*3,128*	*0.01*	*43.8*
Landscape Only	*501*	*0.02*	*1.0*
Indoor & Landscape	*4,298*	*0.04*	*163.3*
CII Irrigation Check-Up	209	0.27	56.4
Full Audit	166 (963 acres)	0.54 per acre	519.9
Total Savings for Component 3			**795.5**

[26] Rancho California Water District. 2014. Enhanced Agricultural Irrigation Efficiency Program. December 31.
[27] Pers. Comm. Lori Swanson. Water Resources Specialist, San Diego County Water Authority. 23 July 2015.
[28] Alliance for Water Efficiency Conservation Tracking Tool, available with subscription: http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx. These values were vetted through California Urban Water Agencies (CUWA) Water Use Efficiency. Note that the savings for "landscape only" was not provided from this tool, but was vetted through CUWA and is considered reasonable.
[29] A&N Technical Services, Inc. 2011. *Mini-Audit Program Evaluation Prepared for the San Diego County Water Authority*. June.
[30] Alliance for Water Efficiency Conservation Tracking Tool, available with subscription: http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx.
[31] Pers. Comm. Kelly Mooney. Water Resources Specialist, San Diego County Water Authority. 23 July 2015.

Component 4 will provide financial incentives to convert 1,270,588 sq ft of turf to water-wise, sustainable landscapes. Published data from California Urban Water Conservation Council (CUWCC) shows that conversion from turf to water-wise landscaping saves 34 gallons of water per square foot.[32] For Component 4, this is a total savings of 43,199,992 gallons per year, or 133 AFY.

$$Area\ Converted * \frac{Water\ Savings}{Area} = Total\ Water\ Savings$$

$$1{,}270{,}588\ sq\ ft * 34 \frac{gal}{sq\ ft * yr} = 43{,}199{,}992\ \frac{gal}{yr} * \frac{1\ AF}{325{,}851\ gal} = \mathbf{133\ AFY}$$

Together, Components 1, 2, 3, and 4 would conserve 1,809 AFY. This is a conservative estimate of the conservation savings that will result from the *Regional Drought Resiliency Program*, as it does not include the water use reductions that are anticipated from participants in the outreach and education programs that will be implemented as part of Component 6, nor does it include potential water savings from residents who may attend a WaterSmart Landscape Makeover Program course and implement landscape makeovers without applying for a turf rebate available under Component 4.

Secondary Benefit - Habitat Improved

The secondary benefit of this project is habitat improved from conversion from turf monoculture to water-smart landscaping. A study by Andrea D. Haller found that "SmartScape" landscaping (similar in nature to SDCWA's WaterSmart Sustainable Landscapes) provided improved habitat for bird species.[33] Native plant gardens generally provide a more diverse mix of evergreen and flowering trees, shrubs, succulents and grasses, offering birds a wide range of textures and vertical variation for shelter and nesting opportunities. Additionally, varied food resources are provided, such as nectar, seeds, and the insects that will be attracted. Bird species that were observed in a similar, water-wise landscape analyzed in the Haller study included Red-tailed Hawk, Bushtits, Black Phoebe, Anna's Hummingbird, Ravens, Lesser Goldfinches, Mourning Doves, House Finches, House Sparrows, and Tree Swallows.[34]

SDCWA's existing turf replacement rebate program requires a minimum 50% vegetation cover, and areas eligible for rebates for residences must be visible from the street. The City of San Diego's similar turf rebate program has found an average of 64% of the area converted from turf is vegetation cover. This analysis assumed that only the area with vegetation cover would provide habitat improvement benefits. Although the City of San Diego does not have a minimum vegetation cover requirement, and its turf rebates can be used for conversions in backyards and areas not visible from the street, this more conservative value is used to calculate habitat benefits for SDCWA's Sustainable Landscapes Program because it is based on actual local data. This project will fund conversion of 1,270,588 sq ft of turf, providing 813,176 sq ft of additional habitat, or 18.7 acres.

$$Area\ Converted * Habitat\ Factor = Total\ Habitat$$

$$1{,}270{,}588\ sq\ ft\ converted * \frac{0.64\ sq\ ft\ habitat}{1\ sq\ ft\ converted} = 813{,}176\ sq\ ft\ habitat * \frac{1\ ac}{43{,}560\ sq\ ft} = \mathbf{18.7\ ac\ habitat}$$

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

The quantified physical benefits are directly realized through implementation of Components 1, 2, 3, and 4, and supported through implementation of Components 5 and 6. Implementation of these components would not require any additional facilities, polices, or actions beyond those contained within the Work Plan (see *Attachment 3 Work Plan*) in order to realize the benefits described above. This project continues and expands existing water conservation programs that have proven successful in the past, and will generally be able to continue within the existing policies and utilize existing facilities.

[32] CUWCC. 2015. Turf Removal & Replacement: Lessons Learned. March.
[33] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.
[34] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.

The physical benefits of the Sustainable Landscapes Program and associated Landscape Workshops components of the project require participants to complete their individual turf replacement projects. Rebates are not issued until projects are complete, so no other facilities, policies, or actions would be required to obtain the physical benefits described here. Similarly, the benefits associated with hardware upgrades at the DCF and the irrigation hardware upgrades for agricultural users would need to be installed to obtain the water savings benefits associated with those components. All required hardware upgrades at the DCF and for soil moisture sensors would be installed as part of this project. The water savings from Component 2 would require that agriculture customers utilize the sensor data to inform irrigation decision making, but given the training they will receive, the cost of water, and potential future and/or additional water supply restrictions, it is highly likely that these users would quickly adapt their irrigation practices to the data the sensors provide.

Potential Adverse Physical Effects of the Project and Mitigation

There are no anticipated sustained adverse physical effects from this project. There may be temporary effects associated with turf replacement, such as noise, air quality, or odors from equipment required for removing, hauling, and disposal of turf; however these effects are anticipated to be minor and temporary in nature. Similar localized impacts may be felt during sensor installations, but would also be minor and temporary in nature.

Long-Term Drought Preparedness

This project would effectively increase long-term drought preparedness by reducing potable water demand in the project area through four methods identified in Table 1 of the *2015 Guidelines*: 1) conservation, 2) improved landscape irrigation efficiencies, 3) improved agricultural irrigation efficiencies, and 4) long-term reduction of water use. Conservation is achieved through installation of low-water use fixtures and controlled water use hardware at DCF, conversion of turf to WaterSmart landscaping, improving irrigation efficiencies for both turf conversion participants and agricultural users, and affecting behavioral changes through outreach and education, and individual water use assessments and recommendations tailored to each site. Irrigation efficiencies will be implemented for both urban and agricultural users, and field services will provide recommendations to improve irrigation efficiencies at residential and CII sites. Efficient irrigation systems, such as drip or micro-spray irrigation, is required for landscape conversions subsidized through the Sustainable Landscapes Program, while installation of soil moisture sensors for agricultural users will improve agricultural irrigation efficiencies by allowing farmers to irrigate only as much and as often as necessary, rather than using a set schedule that does not account for actual water needs.

In conjunction with the Field Services and Outreach components, this project will result in long-term reduction of water use by creating sustainable, and easy, ways to conserve water. To maintain water savings benefits from turf conversions, WaterSmart landscaping would simply need to remain in place. Some maintenance would be required for the soil moisture sensors, but once installed, it is unlikely that farmers accustomed to irrigating only enough to meet crop needs would be likely to convert back to irrigating by the calendar. Further, Components 3 and 6 will foster behavioral changes in the community to reduce water use. Once a behavior becomes a habit, it is likely to continue, and helps to foster a culture of water-wise behavior beyond those individuals directly receiving education and outreach efforts.

This project would indirectly provide drought preparedness through indirect groundwater resource protection. Irrigation efficiencies, both urban and agricultural, will reduce runoff, thereby reducing the amount of pollution conveyed to local waterways and stormwater systems. This helps to reduce pollution reaching groundwater resource, helping to protect these resources for current and future use. Because this project will be implemented throughout SDCWA's service area, indirect groundwater protection would be provided to any one of 18 groundwater basins within the San Diego IRWM Region (see **Figure 2-2**, above).

Direct Water-Related Benefit to DACs

As described in *Attachment 7 Disadvantaged Communities*, an analysis was conducted to determine how much of each project area, by geography or population, was classified as a DAC. SDCWA's service area is 28% DAC by population (see **Table 7-1**). SDCWA's programs will be available to eligible customers within its service area, including DACs, and participation in these programs will directly address two urban DAC needs, and indirectly address another three. The primary direct benefit to urban DACs is funding for water conservation provided by the rebate program. Financial assistance will be provided to implement conservation programs that DAC residents may not otherwise be able to afford. Without this financial assistance, DAC residents may not be able to participate in conservation programs, and consequently would not be able to realize the other benefits associated with implementing conservation efforts. A second urban DAC need is met through direct DAC outreach. Although the outreach to be completed under Component 6 does not explicitly state that it will target DACs, but as it does target minority populations, and will prepare outreach materials in these communities' native languages. DACs are likely to be the primary recipients of such efforts. There has been a demonstrated lack of information about the need to conserve water that is both easily available and in languages by those who live in DACs. Most of the conservation and drought messaging that has occurred to-date during the current drought has been in English, with some in Spanish. This only captures a portion of the Region's residents, and may reflect a substantial outreach gap when considering DACs with a higher concentration of non-English-speaking residents than non-DACs.

Project Performance Monitoring Plan

Benefits will begin accruing as soon as water saving hardware is installed, turf is converted, and individuals begin implementing the recommendations of their field services evaluations. For this reason, interim targets will be based on the number of soil moisture sensors installed, the number and types of field services provided, and the total area of turf converted (based on rebates given out and/or rebate applications approved). Water savings for Component 1 are anticipated to begin accruing immediately following installation of all water savings hardware, and 100% benefits realized immediately following completion of the project. **Table 2-9** presents interim targets, along with annual benefits once 100% of each component is implemented. Note that these methods may change, pending development of the Project Performance Monitoring Plan under Task 9 of the Work Plan (see *Attachment 3 Work Plan*), and are presented as one option for measuring progress towards achieving the claimed benefits. Measurable targets for each benefit are also presented in the table.

SDCWA is the Region's water wholesaler and does not have direct metering data for individuals who participate in this project. SDCWA will complete pre- and post-site surveys where appropriate to quantify the annual amount of potable water saved as a result of this project. These surveys may involve coordination with SDCWA's member agencies (water retailers) to obtain water metering data, or may be included as a condition of program participation. Because household compositions or site circumstances can change over time, SDCWA or its project partners will follow up with residents, agricultural users, or CII customers whose water metering data or surveys show unusual or unanticipated changes in water use, in order to determine if these changes are beyond the influence or control of the project and how to address these differences when monitoring project performance.

Table 2-9: Project Monitoring for *Regional Drought Resiliency Program*

Proposed Physical Benefits	Measurement Tools and Methods	Targets	
		Interim Target	Total
Water Supply	For Donovan Correctional Facility – SDCWA will coordinate with Otay Water District to obtain and analyze water metering data for DCF. Metering data from the 12 months before hardware installations will be used to establish a baseline, while metering data collected after installation will be used to measure progress.	80.9 AFY	80.9 AFY
	For EC Mapping and Soil Moisture Sensor Systems – SDCWA will coordinate with MRCD to collect pre- and post-installation water use data for participating agricultural users. These data may be collected directly from program participants or may be obtained from water metering data acquired from the appropriate water retailers. Metering or water billing data from the 12 months before sensor system installation will be used to establish a baselines, while metering data or billing data collected after installation will be used to measure progress.	4 AFY/sensor	800 AFY
	For WaterSmart Field Services – SDCWA will coordinate with water retailers to obtain and analyze water metering data for participating properties. Metering data for the 12 months before field services are administered will be used to establish a baseline, while metering data collected after field services will be used to measure progress. SDCWA staff will encourage participants to indicate which recommendations were implemented to better track the success of the program and effectiveness of program recommendations.	Indoor Residential: 0.01 AFY Landscape Residential: 0.02 AFY Indoor & Landscape Residential: 0.04 AFY CII: 0.27 AFY Full Audit: 0.54 AFY/acre	7,955 AFY
	For Sustainable Landscapes – SDCWA will coordinate with water retailers to obtain and analyze water metering data for participating properties. Metering data for the 12 months before turf conversion will be used to establish a baseline, while metering data collected after field services project completion will be used to measure progress. Program participants may be asked to provide water meter data as a condition of participation.	Average 34 gal/ sq ft per year	132.6 AFY
Habitat Improved	For Sustainable Landscapes – SDCWA will file copies of before and after conversion photos, along with rebate forms documenting total vegetation cover. Staff will either request periodic updates from participants to provide photos showing long-term maintenance of vegetation, or will conduct site visit to visually confirm vegetation maintenance. Some combination of these two methods may be used, and may be required as a condition of participation.	Average 640 sq ft per turf conversion	18.7 acres

Cost Effectiveness Analysis

The *Regional Drought Resiliency Program* project will achieve two quantifiable physical benefits described in detail in the sections above, and summarized in **Table 2-3** and **2-4**. During project development, alternatives to the preferred project included in this application were considered and, ultimately, rejected. **Table 2-10** provides a cost effectiveness analysis consistent with Table 7 of the *2015 PSP*.

Table 2-10: Cost Effective Analysis for *Regional Drought Resiliency Program*

Cost Effective Analysis	
Question 1 Physical Benefits Summary	*Types of benefits provided as shown in Table 2-3 and 2-4.* Benefit 1: Water Supply – 1,809 AFY potable water conserved Benefit 2: Habitat Improved – 18.7 acres habitat created
Question 2 Alternatives Considered	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* No.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs. No program-wide alternatives were considered. No information on specific costs for alternatives was included in the source documentation and/or completed work cited in this Proposal. *Component 1:* DCF considered a number of different types of water saving hardware, and preliminary analysis presented four options for water savings. Subsequent evaluation determined that the recommended ICON system was preferred due to price and water savings, and was the only option fully developed. *Component 2:* This component is based on a successful pilot program implemented by RCWD. It builds on the lessons learned under that project, and the EC mapping completed as part of this component will help determine the exact location and details for installation of the soil moisture systems. *Component 3:* This component expands the existing field services program already being implemented by SDCWA. As the program continues, it has been adjusted to improve the efficiency and efficacy of the program, and no alternatives were necessary to consider. *Component 4:* This component expands the existing turf rebate program into a Sustainable Landscapes Program. It builds on the success of the existing program, which has proven extremely popular in the Region, even with relatively low rebates compared to similar programs. Because this component expands an existing program, no alternatives were considered. *Component 5:* This component expands and improves an existing WaterSmart Landscape Makeover Program, and is designed to support and improve the success of the landscape conversions implemented under Component 4. Because it expands an existing successful program, no alternatives were considered. *Component 6:* This component expands and improves SDCWA's existing drought outreach and education campaign to reach additional communities in the Region, particularly minority communities who would benefit from messaging translated into other languages and targeted to these communities. No alternatives were considered because this is a logical extension of SDCWA's existing outreach and education efforts.
Question 3 Preferred Alternative	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* There is no identified least cost alternative. This project expands and improves on existing programs, and is anticipated to provide substantial water savings, habitat benefits, and other non-quantified benefits. Each component was designed to be successful and support a long-term water conservation ethic. These programs have proven to be successful in the past, at a low cost for the level of benefit.

Project 2: Conservation Home Makeover in the Chollas Creek Watershed

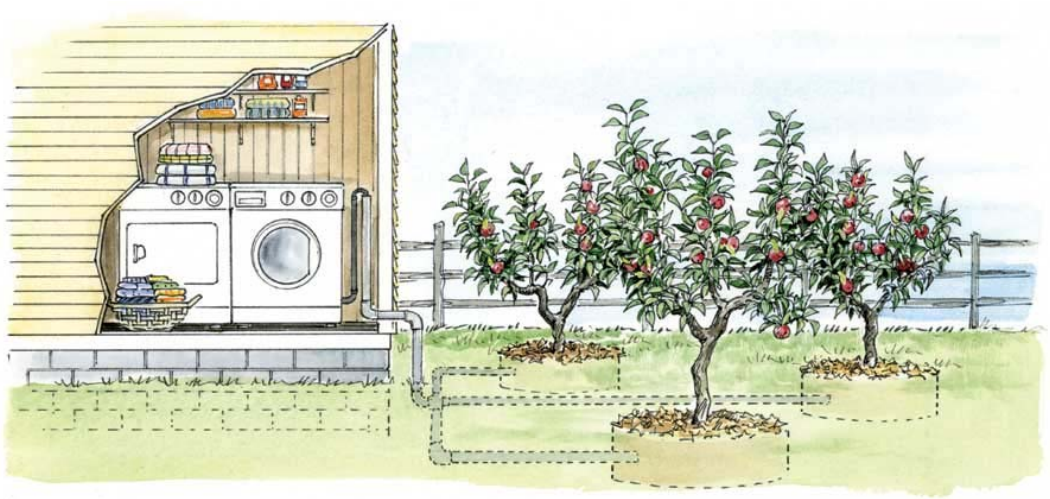
Local Project Sponsor: Groundwork San Diego
Partners: U.S. Green Building Council-San Diego (USGBC), San Diego Sustainable Living Institute (SDSLI), San Diego Unified School District (SDUSD), and Encanto Neighborhoods Community Planning Group (ENCPG)

Project Summary

The project will install stormwater capture, greywater, and landscape upgrades in low-income homes in the Encanto neighborhood to reduce potable water demands.

Project Map

Figure 2-3 shows the *Conservation Home Makeover in the Chollas Creek Watershed* project area, the service areas of the project sponsor, the project facilities and the project's relation to groundwater basins and surface water, disadvantaged communities (DAC), and proposed monitoring locations.



Proposed Laundry-to-Landscape greywater installations will provide sustainable healthy food production for local families

Rainbarrel installations

Neighborhood volunteers installing water-wise landscaping

Project Description

The *Conservation Home Makeover in the Chollas Creek Watershed* project will build drought, pollution, food security, and climate change response/resiliency in southeastern San Diego through a combination of conservation home makeovers and an outreach/engagement campaign directed at youth and families. The project will install stormwater capture, greywater, and landscape upgrades in 50 low-income homes in the Encanto neighborhood. It will mitigate the impact of drought through water conservation installations, water capture, and greywater reuse for food production and landscaping. The project will address the interlocking challenges of water, food, and energy in the Encanto neighborhood, a DAC, under the overarching crisis of water supply reliability.

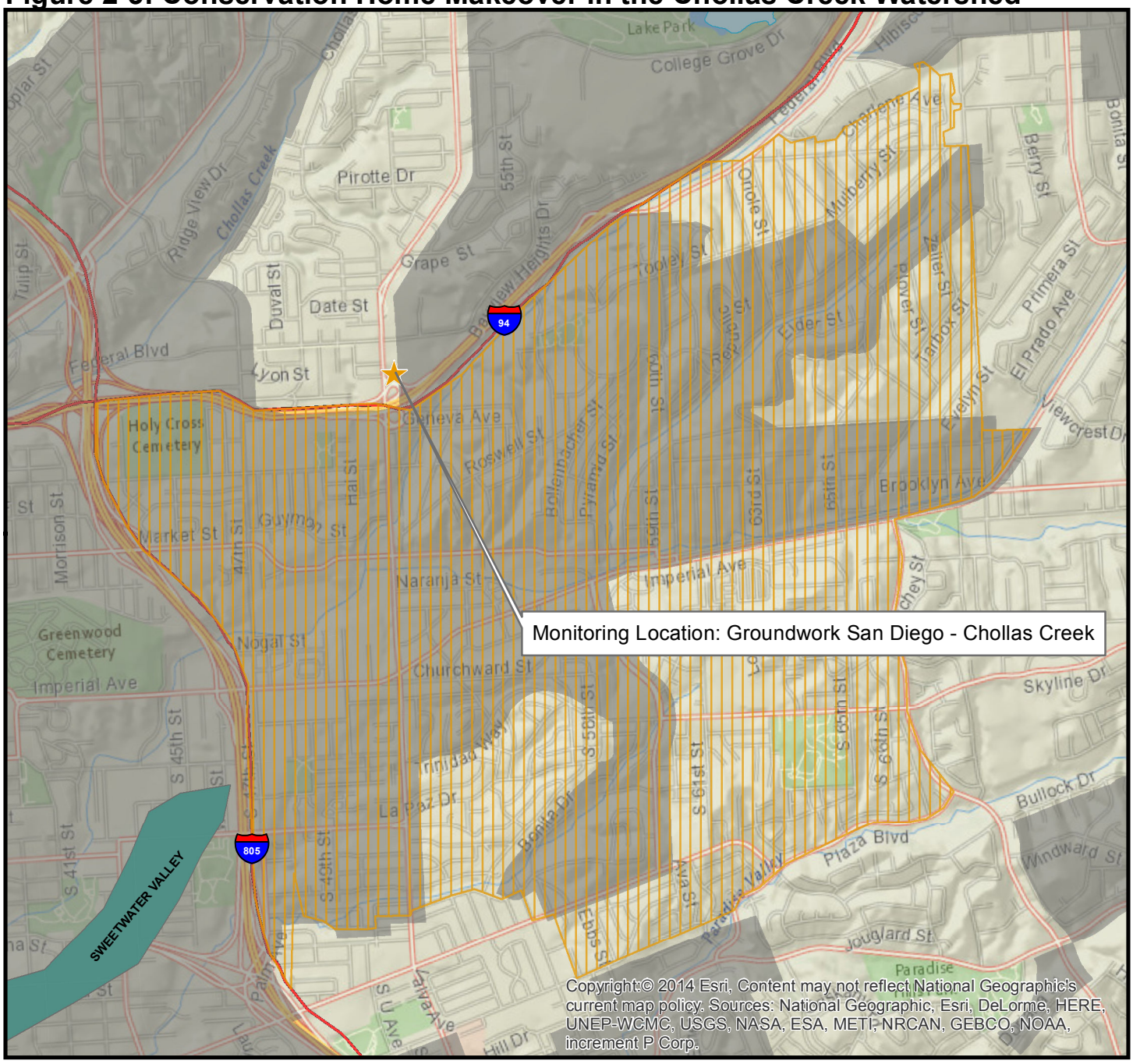
Direct marketing to families will occur through neighborhood presentations, media, and door-to-door canvassing conducted by ENCPG and other project partners. It will be reinforced by a school-based effort targeting student conservation awareness and action at home, including training Groundwork's High School Green Team to assist in residential installations. Approximately 800 students from Encanto schools (Millennial Tech Middle School, Gompers Preparatory Academy, Horton, and Chollas Mead) will be instructed in about water conservation education, and knowledge and interest gains will be measured with pre- and post-tests. Age-appropriate water audit instruments will be used by students to assess their home water consumption, and students will assist in the marketing of the residential makeover activities. Older students will be trained in conservation installation and be invited to assist professional installers.

Groundwork and its partners will use data collected from this project, and the lessons learned, to expand future conservation home makeovers to reach additional neighborhoods. Outcomes and metrics from this project will be used for future advocacy for new governmental policies supporting and incentivizing low income families to participate in conservation. In addition to helping meet the region's water conservation and climate resiliency goals, and creating habitat for native species, families will reap the personal benefits of lower water bills, enhanced tree canopy shade, and wildlife-friendly drought tolerant landscapes (in what are currently concrete/asphalt dominant streets). Cultivation of pesticide-free fruit trees will also contribute to healthy food options and reduced food costs in these underinvested DACs characterized as "food deserts". The ongoing training of Green Team students will further contribute to lasting behavioral change and promote academic interest in environmental health and science. Project partners will deliver a menu of conservation goods and services to 50 owner-occupied Encanto homes, tailored to each residence based on a home water audit and resident landscape design-input.

USGBC will utilize software models and analytics to evaluate the siting, costs, and water benefits of the project with an eye to future project scalability throughout the Encanto neighborhood. Geographic information system (GIS) scenario planning will be integrated with flow path modeling to calculate project outcomes related to stormwater diversion/capture, soil types, and vegetative coverage. Flow estimates will guide future project expansion into neighborhoods, as well as integration with Groundwork's drought response initiatives related to larger institutional BMPs in the Encanto area that are implemented by organizations such as CalTrans, City of San Diego, and SDUSD. USGBC will track and report on all project metrics and large scale impacts/implications, and will identify preferred rating systems/labels for comparing home outcomes.

SDSLI provides conservation training and installations throughout the region. For this project, they will install "laundry-to-landscape" gray water systems, water-saving devices (toilets, faucets), rain gardens and rainbarrels within the 50 Encanto homes. SDSLI will design and install drought tolerant and edible gardens within the re-landscaped areas, and also provide training to participating homeowners for the installations.

Figure 2-3: Conservation Home Makeover in the Chollas Creek Watershed



Coordinates: 32.71726, -117.08834

Legend

- Freeway
- Waterbody
- DAC Area*
- Very Low Priority Groundwater Basins
- Benefit Area: 2 Conservation Home Makeover in the Chollas Creek Watershed
- Monitoring Location

0 0.25 0.5 1

Miles

N

*Note: DAC as determined by census tract and block group data for the year 2013, from the American Community Survey 2009-2013 5-year results. DAC determined based on definition of median household incomes below 80% of the statewide MHI or $48,875.

Sources: U.S. Census 2013 ACS 5-year estimates; San Diego Association of Governments (SANDAG) - GIS Data Warehouse
Document Path: N:\Projects GIS\0188-003 SDIRWM Plan Update\Prop84_Rnd4\MXD\Project maps\2-3_GroundworksProject28072015.mxd

Project Physical Benefits

The *Conservation Home Makeover in the Chollas Creek Watershed* project will provide multiple benefits, two of which have been quantified and are presented in **Tables 2-11** and **2-12**. The two quantified physical benefits are Water Supply (achieved through conservation and reuse) and Habitat Improved (from turf conversion to water-wise and native landscaping).

For the primary benefit (Water Supply), the baseline value was calculated using fiscal year (FY) 2014 water demands provided by the City of San Diego Public Utilities Department for residents in the City (137 gallons per capita per day or GPCD)[35], assuming an average of 4 persons per household and 50 households, which equals 30.7 AFY. The useful project life is considered 13 years for the turf conversions, rainbarrels, and greywater systems, based on length of average homeownership estimated by U.S. Department of Housing and Urban Development[36] (HUD) and assuming that new homeowners may not be inclined to maintain the rainbarrels and/or water-wise landscaping. Note, however, that this is a conservative assumption because incoming homeowners may choose to continue using all conservation tools available. The benefit accrual (8.5 AFY) is based on information from the California Urban Water Conservation Council (CUWCC) on turf conversions, and from U.S. Environmental Protection Agency (EPA) and Energy Star on greywater supplies (via clothes washers). Over the project life, the *Conservation Home Makeover in the Chollas Creek Watershed* is anticipated to reduce potable demand by a total of 110.5 AF from 2017 to 2031.

Table 2-11: Primary Physical Benefit – Water Supply
Conservation Home Makeover in the Chollas Creek Watershed

Project Name: Conservation Home Makeover in the Chollas Creek Watershed
Type of Benefit Claimed: Water Supply – Conservation from turf conversions, greywater, and rainbarrels
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project: 13 years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2017	30.7 AFY	27.9 AFY	-2.8 AFY
2018	30.7 AFY	25.1 AFY	-5.6 AFY
2019-2029	30.7 AFY	22.2 AFY	-8.5 AFY
2030	30.7 AFY	25.1 AFY	-5.6 AFY
2031	30.7 AFY	27.9 AFY	-2.8 AFY

Comments: This project has an expected project life of 13 years, based on HUD estimates of typical homeownership duration. Benefits are assumed to begin accruing immediately following each home makeover. An equal number of houses are assumed to be converted each year of the four years scheduled for installation, and each house assumed to provide equal benefits. Benefits are therefore expected to phase in at 33% per year between 2017-2019. The annual benefit will remain the same for 2019-2030. Benefits will phase out in a manner consistent with how they were phased in.

Sources: Equinox Center. 2015. *H2Overview Series: San Diego County Residential Water Use Trends*. February.

CUWCC. 2015. *Turf Removal & Replacement: Lessons Learned*. March.

U.S. EPA. 2015. WaterSense – Indoor Water Use in the U.S. http://www.epa.gov/WaterSense/pubs/indoor.html

Energy Star. 2015. Certified Products – Clothes Washers. https://www.energystar.gov/products/certified-products/detail/clothes-washers

[35] Pers. Comm. Dianne Modelo, Senior Management Analyst, City of San Diego. E-mail. August 3, 2015.
[36] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

The baseline for the secondary benefit (Habitat Improvedt) was determined using a GIS analysis of the project area. Land uses that currently support wildlife habitat include Landscape Open Space, Open Space Park or Preserve, and Undevelopable Natural Areas, as mapped using data from San Diego Association of Governments (SANDAG).[37] This analysis found that 5%, or 192 acres, of the project area currently supports wildlife habitat. The same useful life estimate, 13 years, was used for this secondary benefit based on length of average homeownership from HUD.[38] The benefit accrual (0.7 acres) is based on the 2012 study, *SmartScape Design Provides Improved Avian Habitat* and the City of San Diego's vegetation cover data from their existing turf conversion rebate program.

Table 2-12: Secondary Physical Benefit – Habitat Improved
Conservation Home Makeover in the Chollas Creek Watershed

Project Name: Conservation Home Makeover in the Chollas Creek Watershed
Type of Benefit Claimed: Habitat Improved – Water-wise plantings
Units of the Benefit Claimed: Acres
Anticipated Useful Life of Project: 13 years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2017	192 acres	192.2 acres	0.2 acres
2018	192 acres	192.5 acres	0.5 acres
2019-2029	192 acres	192.7 acres	0.7 acres
2030	192 acres	192.5 acres	0.5 acres
2031	192 acres	192.2 acres	0.2 acres

Comments: This project has an expected project life of 13 years, based on HUD estimates of typical homeownership duration. Benefits are assumed to begin accruing immediately following each home makeover. An equal number of houses are assumed to be converted each year of the four years scheduled for installation, and each house assumed to provide equal benefits. Benefits are therefore expected to phase in at 33% per year. The annual benefit will remain the same for 2019-2029. Benefits will phase out in a manner consistent with how they were phased in.

Sources: San Diego Association of Governments (SANDAG). *SanGIS Data Warehouse – Landuse_Current*. Available for download through the Regional GIS Data Warehouse. Accessed: July 21, 2015.

Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.

In addition to the quantified benefits, the project would provide additional water conservation through behavioral changes inspired by the project's outreach and education components, and through changing out of older home fixtures to water efficient fixtures. Reduced water use for irrigation, combined with onsite retention of stormwater, will also reduce urban runoff and provide water quality benefits to local waterways and the San Diego Bay. These water quality benefits are anticipated to include reduced total suspended solids, total dissolved solids, and nutrients. Further, the inclusion of fruit trees in the plant palette provides healthy food options for families in an area notorious for a lack of access to fresh, local, and healthy foods. This provides for public health protection, reducing direct costs to the community. Because this project will reduce potable water demands, participants' water bills will be lowered, helping to reduce costs for residents of this DAC. Reduced water demand also provides for drought preparedness, helps the City of San Diego meet State-mandated water reduction targets and 20x2020 targets, and reduces regional energy demands (and associated greenhouse gas [GHG] emissions). This project also acts as a pilot program for future expansion of conservation home makeovers to other communities, and will lay the groundwork for revitalizing DACs in San Diego, as well as be a model for sustainable urban design.

[37] San Diego Association of Governments (SANDAG). *SanGIS Data Warehouse – Landuse_Current*. Available for download through the Regional GIS Data Warehouse. Accessed: July 21, 2015.
[38] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

Technical Analysis of Physical Benefits Claimed

Project Need and Conditions

This project will serve a DAC in southeastern San Diego. DACs often lack the technical and financial capacity to implement projects, may face additional water quality issues, and are disproportionately impacted by water rate increases or fees compared to non-DAC areas. The State, and San Diego IRWM Region, are suffering from one of the worst droughts in recent history, making water conservation both a priority and a necessity. The Region is heavily reliant on water imported from the State Water Project (SWP) and the Colorado River, but has seen these supplies restricted as a result of the drought – a time when scant local rainfall has increased demand for imported water. In addition, the State has instituted mandatory water use restrictions on cities and agencies. The Encanto neighborhood is within the service area of the City of San Diego, which must reduce its water use by 16% city-wide. The City is urging residents to reduce outdoor irrigation as the easiest and fastest way to reduce water use.[39]

Rain barrel installed by SDSLI in a DAC home

According to the California Homebuilding Foundation, water conservation in older homes (versus newer homes or in other sectors) represent one of the most effective water savings strategies available to California.[40] This project targets Encanto, where approximately 93% of single family homes were constructed prior to 1990.[41] While the City of San Diego offers a spectrum of residential conservation rebates (turf removal, rotating sprinklers, rain barrels, soil sensors, high efficiency toilets), low income communities are underrepresented in such rebate programs and in regional conservation efforts generally as a result of both limited capacity (on the part of the DAC residents) and outreach efforts that cater to the general population and may not be designed in an effective manner for DACs.

Groundwork's education and outreach activities reach students in DACs

As reported in the *Chollas Creek Comprehensive Load Reduction Plan*[42] and the *2013 IRWM Plan*, urbanization and high density along Chollas Creek have resulted in land uses dominated by roadways, freeways, and transportation infrastructure. This dense urbanization has resulted in high runoff volume, increased pollutant loading to the watershed, and related vehicular air and water pollution. The project's home landscape makeovers will capture runoff from properties and improve air quality by planting trees.

The high level of dense urbanization in Chollas Creek Watershed has also resulted in reduced habitat and habitat quality for native species, including birds, reptiles, and small mammals. The County of San Diego is one of the most biodiverse areas in the country, with over 200 species listed as endangered, threatened, rare, or are candidates for listing.[43] A California Natural Diversity Database (CNDDB) query within the project area yields a total of 10 native species that could be present within the Encanto neighborhood. The results of this search show that even in a relatively small project area, a number of species of value could be present if habitat were available. Installing trees, along with native and water-wise vegetation,

[39] City of San Diego. Drought Information and Resources – Drought Alert: Mandatory Water Use Restrictions. Website. Accessed 17 July 2015. Available: http://www.sandiego.gov/water/conservation/drought/prohibitions.shtml
[40] California Homebuilding Foundation. 2010. Water Use in the California Residential Home. January.
[41] City-Data. San Diego, CA. Search performed for "Year house built" and Encanto neighborhood was selected. Website. Accessed 29 July 2015. Available: http://www.city-data.com/city/San-Diego-California.html
[42] City of San Diego, et al. 2012. Chollas Watershed Comprehensive Load Reduction Plan. July 20.
[43] U.S. Fish and Wildlife Service and California Department of Fish and Wildlife. 1998. San Diego County Multiple Species Conservation Plan EIR/EIS.

would provide habitat and food sources not currently available due to a combination of urbanization and the predominance of turf as preferred landcover.

According to the Shriver Center on Poverty Law, and based on testimony of Robert Greenstein of the Center on Budget and Policy Priorities, the effects of climate change (extreme weather, drought, pollution, and airborne toxins) will hit low income communities first and hardest.[44],[45] The low-lying communities in the Chollas Creek Watershed will suffer disproportionately from sea level rise, storm surges, and inundations. DAC residents will also suffer disproportionately from water price increases and unavailability, due to a lesser ability to pay as water prices increase. DACs must understand, prepare for, and be empowered to mitigate climate change.

As described in the *2013 IRWM Plan*, food security also plagues urban DACs in the Region. According to a recent study of Southeastern San Diego, few healthy food options exist there, resulting in a "food swamp" where there is high exposure to unhealthy food choices.[46] Such environments have been found to result in impacts to community health. However, where fresh produce is accessible, such as near homes, schools, and work places, healthy habits are more common, and bringing healthy options to food swamps can improve public health. This project will support healthy food availability by planting fruit trees during re-landscaping efforts at DAC homes.

Without-Project Conditions

Without the *Conservation Home Makeover in the Chollas Creek Watershed* project, 50 low income single family residences would not receive home conversions to low water use/stormwater capture/carbon sequestration/food production model dwellings. These residences would continue to use existing water volumes, which total 137 gallons per person per day of potable water in the City of San Diego.[47] For an average four-person household, this is equivalent to approximately 0.6 AFY. Continuation of existing water use would impact the Region's available potable water supplies and the individual families' water costs. Without this project, the participating households would continue to use approximately 30.7 AFY and would fail to conserve 8.5 AFY potable water, based on the assumption that there would remain limited capacity to implement typical water conservation efforts in the Encanto community. If water costs increase as a result of the drought or climate change, these families will be adversely affected in a disproportionate level compared to non-DAC families. Water conservation education would not be received by the 800 students and their families in the project area. With a lack of education, these DAC residents would continue to feel the impacts of the drought and climate change, and would not be able to build technical capacity to help implement similar changes on their own.

Further, without this project, landscape makeovers would not be completed. Landscaping at these homes would remain turf, and continue to be marginally, if at all, useable as habitat for native species and birds. Stormwater would continue to runoff from properties (both because of the lack of rainbarrels to capture water, and the lack of landscaping features to retain runoff on-site), continuing to convey pollutants to local waterways. Other efforts to increase access to healthy food choices may be implemented, but are unlikely to plant fruit trees directly in people's yards, where it is the easiest to access, thereby making it the most likely fresh and healthy food source to be utilized by individual families.

Methods Used to Estimate the Physical Benefits

The calculations for each of the two quantified physical benefits are provided below. Note that these calculations show the annual benefits anticipated when the project is complete and 100% of the benefits are realized annually. Some differences may occur due to rounding.

Primary Benefit - Water Supply

The primary benefit of this project is potable Water Supply savings achieved through conservation and reuse. This project will conserve 8.5 AFY of potable water. These savings are realized through reduced water demand from

[44] Shriver Center on Poverty Law. 2009. The Shriver Brief: Climate Change's Unique Impact on Low-Income Communities. August 18.
[45] Robert Greenstein, Executive Director, Center on Budget and Policy Priorities. 2009. Testimony to the House Committee on Energy and Commerce. April 23.
[46] SDSU. 2014. Southeastern San Diego's Food Landscape. April. Available: http://geography.sdsu.edu/Research/Projects/FEP/Docs/Report.pdf
[47] Pers. Comm. Dianne Modelo, Senior Management Analyst, City of San Diego. E-mail. August 3, 2015.

1) landscape makeovers, 2) rainwater collection through installation of rainbarrels, and 3) water reuse through installation of greywater systems.

The water savings from the landscape makeovers would be achieved through turf replacement with water-wise landscaping and efficient irrigation. Note that these saving are pure conservation savings (via the residence's potable water meter), and do not include the greywater to be used for irrigation of the new landscaping. An average turf area for a single family home in Encanto is estimated as 1,000 sq. ft., based on lot sizes of 1/5 acre, average single-family home size of 1,500 sq. ft., and some assumed minor hardscaping that would remain in place, such as driveways. Under the proposed project, landscaping will include a minimum of 4 fruit trees, with the rest planted with water-wise landscaping. Although fruit trees require more water than water-wise plants, this analysis assumes that additional fruit tree water demands would be served by the greywater system and that the efficient (drip) irrigation installed to serve the water-wise plants would adequate to serve the full area of removed turf. Annual water savings were estimated at approximately 34 gallons per square foot[48] or 68,000 gallons per house per year. Once all 50 houses complete their landscape makeovers, savings are anticipated to be 1,700,000 gallons per year or 5.2 AFY.

$$\frac{Water\ Savings}{Area} * \frac{Area\ Converted}{House} * Number\ of\ Houses = Water\ Saved\ from\ Landscape\ Makeovers$$

$$34\frac{gal}{sq\ ft * yr} * 1{,}000\ \frac{sq\ ft}{house} = 68{,}000\frac{gal}{house} * 50\ houses = 1{,}700{,}000\frac{gal}{yr} * \frac{1AF}{325{,}851\ gal} = \mathbf{5.2\ AFY}$$

The rainbarrels would collect all water that falls on the roof of each participating house. The roof size of the average house in the Encanto neighborhood was estimated as 50 ft x 30 ft, or 1,500 sq. ft. (roughly equivalent to the footprint of an average single-family home[49]). Average rainfall in the City of San Diego is 10 inches[50], resulting in an average annual collection by the rainbarrels of 1,250 cubic-feet per house. For all 50 houses in this project, an estimated 62,500 cubic feet per year or 467,533 gallons per year (1.4 AFY) can be collected and routed to landscaped areas to offset potable demand.

$$\frac{Roof\ Area}{House} * Annual\ Rainfall * Number\ of\ Houses = \ Amount\ of\ Rainwater\ Collected\ for\ Reuse$$

$$1{,}500\frac{sq\ ft}{house} * 10\frac{in}{yr} * \frac{1\ ft}{12\ in} * \frac{7.48\ gallons}{1\ cu\ ft} * 50\ houses = 461{,}992\ \frac{gal}{yr} * \frac{1AF}{325{,}851\ gal} = \mathbf{1.4\ AFY}$$

The greywater systems will reuse greywater from washing machines to irrigate on-site landscaping. The U.S. EPA Energy Star program estimates that an average household runs their washing machine 300 times a year[51] and each load uses approximately 27 – 54 gallons of water for traditional front-loading models[52] (the type generally found in DACs). The project will install greywater systems in 50 houses, thereby diverting greywater to the fruit trees at an average 40.5 gallons per load, for a total savings of 12,150 gallons per year per hour or 607,500 gallons per year (1.9 AFY) in total once all 50 systems are installed.

$$\frac{Annual\ Loads}{House} * \frac{Water}{Load} * Number\ of\ Houses = Greywater\ Available\ for\ Reuse\ per\ Year$$

$$300\frac{loads}{house * yr} * 40.5\frac{gal}{load} * 50\ houses = 607{,}500\frac{gal}{yr} * \frac{1AF}{325{,}851\ gal} = \mathbf{1.9\ AFY}$$

[48] CUWCC. 2015. *Turf Removal & Replacement: Lessons Learned*. March.
[49] Per data available for Encanto neighborhood on www.realtor.com, the average home price is $265,056, and price per square foot is $170, making the average home size 1,559 square feet. Accessed 29 July 2015. Available: http://www.realtor.com/local/Encanto_San-Diego_CA/home-prices
[50] City of San Diego. 2011. *2010 Urban Water Management Plan*.
[51] U.S. EPA. 2015. WaterSense – Indoor Water Use in the U.S. http://www.epa.gov/WaterSense/pubs/indoor.html
[52] Energy Star. 2015. Certified Products – Clothes Washers. https://www.energystar.gov/products/certified-products/detail/clothes-washers

Total water savings benefits from this project is the sum of the benefits realized by each of these three components, or **8.5 AFY**.

Secondary Benefit - Habitat Improved

The secondary benefit of this project is Habitat Improved, which is achieved through the landscape makeovers that will convert landscaping from turf to water-wise and native vegetation. As described above, the estimated average lot size in the Encanto neighborhood is 1/5 acre, of which 1,000 sq. ft. is turf. This project will complete landscape makeovers at 50 houses, resulting in a total conversion of 1.1 acres to water-wise and native vegetation.

Water-wise and native vegetation have been shown to increase the number of bird species present compared to the same area when landscaped with turf.[53] Native plat gardens generally provide a more diverse mix of evergreen and flowering trees, shrubs, succulents and grasses, offering birds a wide range of textures and vertical variation for shelter and nesting opportunities. Additionally, varied food resources are provided, such as nectar, seeds, and the insects that will be attracted. Bird species that were observed in a similar, water-wise landscape analyzed in the Haller study included Red-tailed Hawk, Bushtits, Black Phoebe, Anna's Hummingbird, Raves, Lesser Goldfinches, Mourning Doves, House Finches, House Sparrows, and Tree Swallows. The presence of trees was also found to be beneficial to attracting bird species, as canopies can provide habitat for nesting, roosting, and protection.[54] While all of the converted landscape would provide habitat improvement, for consistency with similar projects in this Proposal, it is assumed that 64% of the converted area would be plant cover (and counted as habitat) based on the City of San Diego's existing turf replacement program.

$$\left(50\ homes * 1{,}000 \frac{sq\ ft}{home}\right) * \frac{1\ acre}{43{,}560\ sq\ ft} * 64\% = \mathbf{0.7\ acres}$$

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

This project would install new landscaping and irrigation, greywater systems, and rainbarrels at 50 residences in the Encanto neighborhood. It would replace existing turf areas with plant water-wise landscaping and fruit trees. Finally, it would install water-wise fixtures such as showerheads, faucets, or toilets within the homes. Greywater systems will be installed compliant with the existing Chapter 16A Nonpotable Water Reuse Systems of the California Plumbing Code. No additional facilities, policies, or actions are required to realize the benefits provided by the project.

Potential Adverse Physical Effects of the Project and Mitigation

There are no anticipated adverse physical effects from this project. There may be temporary effects associated with turf/landscape replacement such as hauling and disposal of removed turf or emissions and noise from landscaping equipment; however, these effects are anticipated to be minor and temporary in nature. Other potential impacts could include impacts associated with disposal of inefficient fixtures in local landfills, although existing disposal facilities have sufficient capacity to accommodate these small items. The greywater systems installed as part of this project would be installed compliant with the California Plumbing Code, and would not create an adverse physical effect.

Long-Term Drought Preparedness

This project would effectively increase long-term drought preparedness in the project area by reducing potable water demands through five methods identified in Table 1 of the *2015 Guidelines*. These methods are: 1) conservation, 2) reuse, 3) improved irrigation efficiencies, 4) long-term reduction of water use, and 5) creating a new water supply for participating households. Conservation would be achieved through conversion of turf to water-wise landscaping, changing out fixtures to water-saving devices, and outreach/education that encourages and enables individuals to reduce water use. The greywater systems provide an easy, on-site water reuse mechanism, reducing potable water demands, without connecting to the City's recycled water distribution system. As part of the landscape makeovers, efficient irrigation will be installed, helping to reduce overall water use and

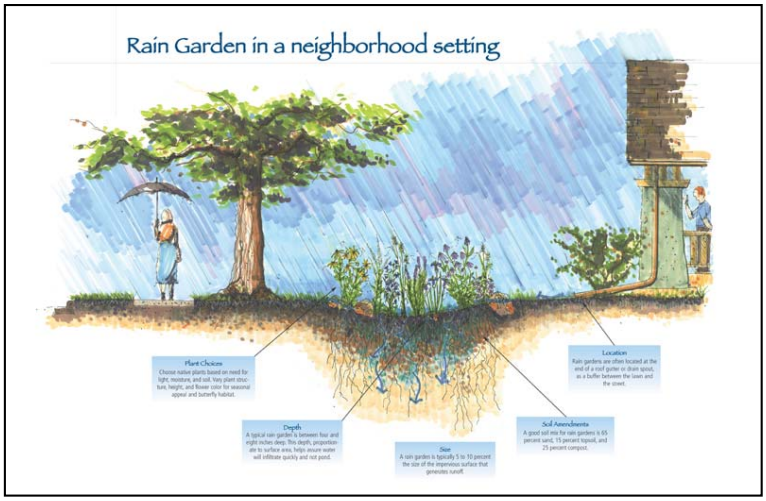
[53] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.
[54] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.

providing drought preparedness. The rainbarrels will collect rainwater that would otherwise become urban runoff. This urban runoff enters local, polluted, waterways, include Chollas Creek, and the City's stormwater system, and is not utilized as a water supply, as these systems discharge to San Diego Bay. Installation of rainbarrels would create a new water supply because it would utilize water that is otherwise uncaptured and unused.

Combined, these efforts result in long-term reduction of water use by creating sustainable, and easy, ways to reduce water use. Fixtures, rainbarrels, and greywater systems would only require standard maintenance to continue to provide drought preparedness benefits in the long-term, while the landscape conversions would simply need to remain in place (e.g., not converted back to turf) to continue to provide water savings benefits. Water-saving benefits associated with outreach and education would also be long-term because it would encourage and support behavioral changes, and could even encourage additional long-term benefits by helping to foster a culture of water-saving behaviors in the community beyond those individuals who directly receive the education and outreach.

The project also lays the groundwork for scaling up the project to implement conservation home makeovers throughout the neighborhood, and could be used as the basis for other larger scale conversions.

Although the groundwater basin in the watershed is not currently utilized in the watershed, it may be used as a resource in the future. Stormwater detention, and reduced urban runoff from this project would help reduce pollution reaching groundwater resources, protecting these resources for future use. Further, while not a direct drought preparedness benefit of this project, if the results of this project were used to develop a similar project in another area that did overlie a groundwater basin utilized for water supply, that basin would benefit from the lessons learned from this project.



Water collection and on-site stormwater detention

Direct Water-Related Benefit to DACs

The *Conservation Home Makeover in the Chollas Creek Watershed* project specifically targets residences in the Encanto neighborhood of the City of San Diego. This neighborhood is located between Hwy. 805 to the west, Hwy. 94 to the north, Hwy. 125 to the east, and Division and Plaza streets to the south. As shown in **Figure 2-3** (above) and in **Table 7-1** (see *Attachment 7 Disadvantaged Communities*), this area is 64% DAC by area as defined in the 2015 Guidelines. As shown in **Table 7-2** (*Attachment 7 Disadvantaged Communities*), this project will directly address seven urban DAC needs: Community Development, Funding, Flooding/Impervious Surfaces, San Diego Bay Pollution, Food Security/Irrigation Costs, Technical Capacity, and DAC Outreach.

Installation of greywater systems through this project will help address food security and irrigation costs by diverting greywater from the sewer system for use in irrigation of fruit trees to be planted at each residence. The project will reduce runoff from residences, protecting against flooding. Landscape makeovers will also help to reduce impervious surfaces and increase on-site stormwater retention. Along with the rainbarrel installations, landscape makeovers will reduce pollution reaching San Diego Bay. The project will build technical capacity by providing technical training to project participants, which will teach proper system maintenance, support community development and job skills, and provide outreach to DACs. The project will provide funding to help to offset the costs of installing greywater systems, water-wise fixtures, rainbarrels, and implement landscape makeovers. Data collected from the project will be used to support future expansion of conservation home makeovers, and to secure funding for such expansion through other grant programs, which helps to address the funding shortage issue that so often plagues urban DAC projects in the Region. This project will help to foster community development by enlisting community members to assist with implementing the home makeovers, provide training for system maintenance, and help to create a model community for water conservation and

healthy foods. Together these will help to foster a sense a community pride, and build technical capacity in the neighborhood. Project participation relies heavily on outreach that will be conducted to inform residents of the importance and value of water conservation and reuse, and the role this project can play in this. Because outreach is key to participation, it will be specifically targeted to the Encanto neighborhood.

Project Performance Monitoring Plan

Benefits will begin accruing as soon as the conservation makeover is completed. For this reason, interim targets would be based on the number of homes that have been completed **Table 2-13**, below, describes the methods that will be used to measure the quantified benefits of this project and described in the sections above. Measurable targets for each benefit are also presented in the table.

Groundwork is not a water supply agency, and is therefore unable to use metering data to evaluate progress towards achieving the primary benefit of water savings. Therefore, progress towards this benefit will rely on self-reporting from the project participants, and will be built into their participation agreements. Groundwork staff will visit participating homes following completion of the home makeovers as part of their work plan. As part of these visit, Groundwork staff will strengthen relationships with participants and remind them that they will be subject to annual visits as part of Groundwork's project monitoring conducted to meet the conditions of this grant.

Table 2-13: Project Monitoring for *Conservation Home Makeover in the Chollas Creek Watershed*

Proposed Physical Benefits	Measurement Tools and Methods	Targets	
		Per house	Total (50 houses)
Water Supply	As part of their participation agreements, homeowners will commit to submitting water bills to Groundwork Staff, who will compile water use data to show total water savings At the time of the agreement, homeowners will provide copies of their water bills for the 12 months prior to conversion to act as a baseline. If these bills are not available to establish a baseline, an average water use value will be applied as calculated above.	0.44 AFY water use, for a reduction of 0.17 AFY water use from current demand	22 AFY total water use, for a total reduction of 8.5 AFY from current demand
Habitat Improved	Groundwork staff will visit participant homes to verify landscaping remains in place and has not been converted back to turf or otherwise removed. Landscaped area will be measured during design of the landscaping plan, and these data will be retained by Groundwork staff to assist during project monitoring. Should any changes to landscaping be made by homeowners, Groundwork staff will re-calculate the total area landscaped with water-wise and native vegetation.	1,000 sq ft/house converted from turf, with average 64% vegetation cover (640 sq ft of habitat per house)	1.1 acres total, averaging 64% vegetation cover (0.7 acres of habitat total)

Cost Effectiveness Analysis

The Conservation Home Makeover in the Chollas Creek Watershed project will achieve two quantifiable physical benefits described in detail in the sections above, and summarized in **Table 2-11 and 2-12**. During project development, alternatives to the preferred project included in this application were considered and, ultimately, rejected. **Table 2-14** provides a cost effectiveness analysis consistent with Table 7 of the *2015 PSP*.

Table 2-14: Cost Effective Analysis for *Conservation Home Makeover in the Chollas Creek Watershed*

Cost Effective Analysis	
Question 1 Physical Benefits Summary	*Types of benefits provided as shown in Table 2-11 and 2-12.* Benefit 1: Water Supply – 8.5 AFY potable water savings Benefit 2: Habitat Improved – 1.1 acres habitat created
Question 2 Alternatives Considered	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* No
	If no, why? If yes, list the methods (including the proposed project) and estimated costs. No alternatives were considered for this project. While other projects could potentially be implemented that would achieve similar levels of water savings and habitat protection, this project goes beyond the two quantified benefits and addresses larger community needs, including food security, that are less likely to be achieved through alternative projects that provide benefits solely equivalent to the two quantified benefits for this project. Groundwork has a long history of working within the targeted community, and their experience and relationships with the community lead to development of this project specifically to meet their needs – because this project was tailored to the known needs and based in a deep understanding of the community, no viable alternatives were considered. Cost effectiveness of materials will be evaluated prior to purchase to ensure the project stays within budget.
Question 3 Preferred Alternative	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* There is no identified least cost alternative. It is the preferred alternative because it provides water savings and habitat improvement benefits (the two quantified benefits) but also a host of other, non-quantified, benefits, that address needs specific to this DAC. These other benefits include food security, improved public health through access to healthy food options and reduced exposure to pollutants, water quality protection in the watershed from reduced urban runoff, drought preparedness, cost savings (particularly important in DACs), and outreach and education specifically designed for the community, making it more effective for promoting behavioral changes that would result in fostering a water-wise community ethic.

Project 3: San Diego Water Conservation Program

Local Project Sponsor: City of San Diego
Partners: Water Conservation Garden (The Garden) and San Diego Sustainable Living Institute (SDSLI)

Project Summary

The project will achieve water conservation by expanding City of San Diego's successful turf replacement rebate program and implementing greywater system rebate pilot program.

Project Maps

Figure 2-4 shows the *San Diego Water Conservation Program* project area, the service areas of the project sponsor, the project facilities and the project's relation to groundwater basins and surface water, disadvantaged communities (DAC) and proposed monitoring locations.

The City of San Diego's existing turf rebate program has proven popular and is supported by community outreach

Project Description

The City of San Diego (City) will continue its existing incentive program for water-wise landscaping, develop and implement a pilot program for greywater system incentives, and partner with The Garden and SDSLI to provide a variety of related water conservation education and training courses that will result in conservation of 481 AFY of potable water. These efforts will help the City meet its water conservation goals, reduce water use in a time of drought, move the city to more sustainable water use practices, and engage and educate the public while providing the tools to successfully implement water conservation projects at home.

Landscape irrigation represents up to 50% or more of the total water consumed by single family residences in San Diego.[55] As such, the City foresees great potential for water savings in outdoor irrigation at single family residences. This project will fund additional rebates for the City of San Diego's existing turf replacement rebate program, which was awarded Prop 84-Round 2 funding to develop and implement the program. Since its inception, the turf rebate program has been overwhelmingly popular, to the extent that available funds were exhausted in FY 2014-15. Applications for additional funds from fiscal year (FY) 2015-16 were accepted starting July 1, 2015, and were exhausted within the same day that the rebate application period opened. Expansion of this proven, successful program is needed to meet the high demand for landscape and irrigation conversion incentives by City customers. All of the program development for the turf rebate component is already in place. The turf replacement rebates provide a cash back incentive per square foot (sq ft) for conversion from turf to water-wise landscaping, and requires installation of efficient irrigation systems (such as drip irrigation). To-date, the existing turf rebate program has funded conversion of approximately 844,518 sq ft of turf. This program expansion will convert an additional 440,000 sq ft of turf to water-wise landscaping, resulting in a total water savings of 45.9 acre-feet per year (AFY) and creation of 6.5 acres habitat for native species.

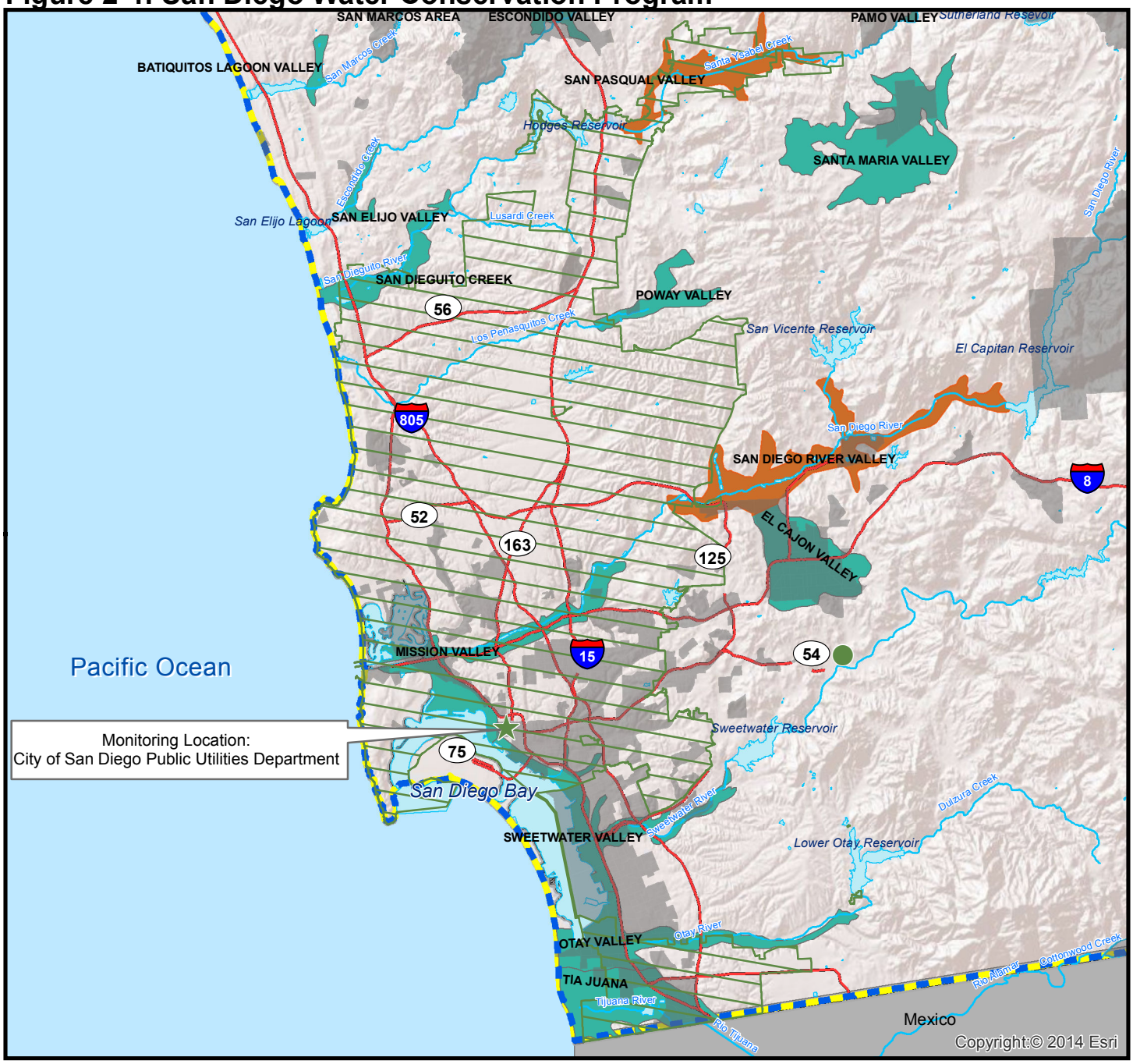
As drought conditions continue to challenge the region, the City will also develop a new rebate program for greywater systems as another incentive to encourage customers to conserve water. The greywater rebate pilot program will develop guidance for providing rebates to participants who install greywater systems in their homes to capture and safely reuse greywater from laundry machines or other sources. This guidance will include the process for applying for rebates, the rules homeowners must follow to qualify for rebates, eligible types of greywater systems, and provide information on how to safely install greywater systems in homes. This component also includes program administration and funds for the rebates themselves. This program is anticipated to offer 1,000 rebates, valued at $200 per rebate, and will result in water savings of 28.9 AFY.

Complementing these conservation efforts will be workshops and outreach regarding water-wise landscaping, irrigation efficiency, greywater systems, and water conservation. The Garden will add a new exhibit that showcases cutting-edge irrigation technologies that can contribute to reducing overall water use, which will reach an estimated 50,000 visitors per year. It will also provide outreach consisting of ten to twenty presentations over a two-year period at community venues such as churches, community events, schools, community organizations, and social clubs with a special emphasis on reaching DACs. Several workshops, classes, and tours will be offered at The Garden focusing on topics such as landscape design, water-wise veggie gardens, and efficient irrigation methods utilizing the new irrigation exhibit.

In addition to the outreach conducted by The Garden, SDSLI will conduct water reuse workshops for the public that will include monthly hands-on training for greywater installation ("Laundry to Landscape") and workshops on rainwater harvesting five times a year. The greywater and other outdoor water conservation seminars will educate the public on how to properly install, maintain, and use these tools to reduce outdoor water use. SDSLI will also provide monthly Water Conservation Talks related to rainwater, groundwater, and landscape design as well as offer quarterly water harvesting neighborhood tours.

[55] City of San Diego. Drought Information and Resources – Drought Alert: Mandatory Water Use Restrictions. Website. Accessed 17 July 2015. Available: http://www.sandiego.gov/water/conservation/drought/prohibitions.shtml

Figure 2-4: San Diego Water Conservation Program



Coordinates: 32.715, -117.1625

0 2.75 5.5 11
Miles

N

Legend

- San Diego IRWM Region
- Funding Area Boundary
- Freeway
- Waterbody
- County
- DAC Area*
- Medium Priority Groundwater Basin
- Very Low Priority Groundwater Basins
- Benefit Area: 3 San Diego Water Conservation Program (corresponds to City of San Diego)
- Monitoring Location
- The Water Conservation Garden

*Note: DAC as determined by census tract and block group data for the year 2013, from the American Community Survey 2009-2013 5-year results. DAC determined based on definition of median household incomes below 80% of the statewide MHI or $48,875.

Sources: U.S. Census 2013 ACS 5-year estimates; San Diego Association of Governments (SANDAG) - GIS Data Warehouse
Document Path: N:\Projects GIS\0188-003 SDIRWM Plan Update\Prop84_Rnd4\MXD\Project maps\2-4_CityofSDProject29072015.mxd

Project Physical Benefits

This project will provide two quantified physical benefits, Water Supply and Habitat Improved, as presented in **Table 2-15** and **Table 2-16** below. The primary benefit is 74.8 AFY Water Supply, achieved through water conservation from turf conversions and greywater reuse. The secondary benefit is 6.5 acres Habitat Improved, achieved through turf conversions to water-wise and native landscaping.

For the primary benefit (Water Supply), the baseline value was calculated using the FY2014 water demands provided by City of San Diego Public Utilities Department for residents in the City (137 gal/person/day [GPCD])[56] and assumed an average of 4 persons per household. This value was used, rather than the "r-gpcd" values being reported to the State Water Resources Control Board under the emergency regulations, because the FY2014 data is considered as a reasonable median sans extraordinary conservation measures. The useful project life is considered 13 years for the turf conversions and greywater systems, based on length of average homeownership estimated by U.S. Department of Housing and Urban Development[57] (HUD) and assuming that new homeowners may not be inclined to maintain the greywater and/or water-wise landscaping. Note, however, that this is a conservative assumption because incoming homeowners may choose to continue using all conservation tools available. The value of the conservation benefit (45.9 AFY) was calculated assuming an average turf conversion of 1,000 square feet per household, for a total of 440 participating households. The value of the greywater reuse benefit (28.8 AFY) was calculated assuming participation by 1,000 households. This number may change as the rebate program guidelines are refined. Total participation in the two rebate programs could be up to 1,440 households; however, this is also a conservative estimate because some of those households may opt to participate in both rebate programs. The benefit accrual (8.5 AFY) is based on information from the California Urban Water Conservation Council (CUWCC) on turf conversions, and from U.S. Environmental Protection Agency (EPA) and Energy Star on greywater supplies (via clothes washers). The cumulative change resulting from the project is 971 AF from 2016 to 2030.

[56] Pers. Comm. Dianne Modelo, Senior Management Analyst, City of San Diego. E-mail. August 3, 2015.
[57] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

Table 2-15: Primary Physical Benefit – Water Supply
San Diego Water Conservation Program

Project Name: San Diego Water Conservation Program **Type of Benefit Claimed:** Water Supply – Conservation from turf conversion and greywater **Units of the Benefit Claimed:** AFY **Anticipated Useful Life of Project:** 13 years			
(a)	**(b)**	**(c)**	**(d)**
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2016	884 AFY	859 AFY	-24.7 AFY
2017	884 AFY	835 AFY	-49.4 AFY
2018-2028	884 AFY	809 AFY	-74.8 AFY
2029	884 AFY	835 AFY	-49.4 AFY
2030	884 AFY	859 AFY	-24.7 AFY
Comments: This project has an expected project life of 13 years for both the turf conversions and the greywater systems, based on HUD estimates of typical homeownership duration. Benefits are assumed to begin accruing immediately following each conversion or system installation. Rebates are assumed to be distributed at a constant rate during the three-year implementation period. Based on the project schedule, benefits are anticipated to phase in by 33% per year between 2016-2018. Benefits remain constant from 2018-2086, and then are phased out at the end of the project life in a manner consistent with how they were phased in. Sources: Pers. Comm. Dianne Modelo, Senior Management Analyst, City of San Diego. 3 August 2015. CUWCC. 2015. *Turf Removal & Replacement: Lessons Learned*. March. U.S. EPA. 2015. WaterSense – Indoor Water Use in the U.S. http://www.epa.gov/WaterSense/pubs/indoor.html Energy Star. 2015. Certified Products – Clothes Washers. https://www.energystar.gov/products/certified-products/detail/clothes-washers			

The baseline for the secondary benefit (Habitat Improved) was calculated as the geographic area that currently provides wildlife habitat within the City. Habitat was defined as Landscape Open Space, Open Space Park or Preserve, or Undevelopable Natural Area in land use data from San Diego Association of Governments (SANDAG).[58] This analysis found 32% of the project area could be classified as habitat, or 87,808 acres. Baseline habitat also included areas converted from turf through the City's existing turf replacement rebate program, which has funded an estimated 844,518 (19.4 acres). Total "without project" habitat area is therefore 87,827 acres. The useful project life is considered 13 years for the turf conversions, based on length of average homeownership estimated by HUD[59]. The value of the habitat accrual (6.5 acres) was calculated based on the City's estimate of 64% plant coverage for participating residential properties in the existing turf rebate program.

[58] San Diego Association of Governments (SANDAG). SanGIS Data Warehouse – Landuse_Current. Available for download through the Regional GIS Data Warehouse, which can be accessed here: http://www.sandag.org/index.asp?subclassid=100&fuseaction=home.subclasshome

[59] U.S. Department of Housing and Urban Development. 2004. *The Sustainability of Homeownership: Factors Affecting the Duration of Homeownership and Rental Spells*. Note: Typical homeownership duration for whites, African Americans, and Hispanics is estimated to be: 16.1, 9.5, and 12.5 years, respectively; 13 years is the average.

Table 2-16: Secondary Physical Benefit – Habitat Improved
San Diego Water Conservation Program

Project Name: San Diego Water Conservation Program **Type of Benefit Claimed:** Habitat Improved – Water-wise and native plantings **Units of the Benefit Claimed:** Acres **Anticipated Useful Life of Project:** 13 years			
(a)	**(b)**	**(c)**	**(d)**
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2016	87,827 acres	87,830 acres	2.1 acres
2017	87,827 acres	87,832 acres	4.3 acres
2018-2028	87,827 acres	87,834 acres	6.5 acres
2029	87,827 acres	87,832 acres	4.3 acres
2030	87,827 acres	87,830 acres	2.1 acres
Comments: Only the turf conversion component would contribute to this benefit. Project life for this component is 13 years, based on HUD estimates of typical homeownership duration. Benefits are phased in consistent with the project schedule, at a constant rate across the three-year implementation period, with 33% of the benefit realized each year. Benefits remain constant from 2018-2028, and have been consolidated for these years. Baseline conditions include the area of habitat that currently exists within the City of San Diego, including habitat created through implementation of the City's existing turf rebate program. Sources: San Diego Association of Governments (SANDAG). *SanGIS Data Warehouse – Landuse_Current*. Available for download through the Regional GIS Data Warehouse. Accessed: July 21, 2015. Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.			

In addition to the two quantified physical benefits, this project would provide additional benefits related to water quality protection through reduced urban runoff from improved irrigation efficiencies (primarily reduction in total suspended solids, total dissolved solids [TDS], and nutrients), direct water cost savings to participants, reduced costs and energy use by the Region to import potable water supplies to meet local demands, progress towards meeting State-mandated water conservation goals (emergency regulations and 20x2020 conservation goals), and reduced green waste and associated impacts from hauling of green waste.

Technical Analysis of Physical Benefits Claimed

Project Need and Conditions

As drought conditions continue to challenge the State and the Region, water agencies and cities are seeking to find ways to encourage water conservation. These efforts are necessary to conserve supplies for critical needs, protect against water right curtailments, and to help meet mandatory water use restrictions and targets. As part of the Governor's Drought Declaration (January 17, 2014), subsequent executive orders (April 25, 2014 order to speed up drought response actions; December 22, 2014 order extending previous order; and April 1, 2015 order mandating 25% reduction in potable water usage through February 2016)[60], and adoption of emergency conservation regulations, the SWRCB issued mandatory water use cutbacks to each public water supplier in the state. The City has been directed to reduce overall water use by 16%.[61] In FY 2014, residents within the City

[60] California Department of Water Resources. Governor's Drought Declaration. Website: http://www.water.ca.gov/waterconditions/declaration.cfm

[61] City of San Diego. Drought Information and Resources – Drought Alert: Mandatory Water Use Restrictions. Website. Accessed 17 July 2015. Available: http://www.sandiego.gov/water/conservation/drought/prohibitions.shtml

averaged 137 GPCD.[62] With an estimated 2014 population of 1,355,896,[63] the City's water use was approximately 208,075 AFY.

In addition to meeting mandatory use reduction targets, the City is working to reduce its dependence on imported water. The City of San Diego's water supply mix is: 84% imported water via San Diego County Water Authority; 12% local surface water; 4% recycled water; and a negligible amount of groundwater.[64] As noted in the *2013 IRWM Plan*, the Region is heavily dependent on water imported from the State Water Project (SWP) and Colorado River. This dependence on imported supplies has reduced the reliability of water supplies, particularly in times of drought when these supplies may be restricted. Current SWP allocations have been restricted to 20% for this year, while last year they were a mere 5%.[65,66] Water conservation has been identified as a strategy to reduce reliance on imported water, and help improve supply reliability by conserving water for critical needs. The existing turf replacement rebate program has proven hugely successful in the City, and high demand has exhausted available rebate funds.[67] Additional funding for rebates would allow the City to expand its turf rebate program to meet demand.

As the drought continues, San Diegans have been further seeking innovative ways to reduce their individual water use. One such opportunity is the installation of greywater systems that reuse water from the home, such as washing machines, for outdoor irrigation. Installation of greywater systems may be intimidating to the average homeowner, and a rebate program could be used to incentivize widespread installation of greywater systems, especially when combined with an education and outreach program to help residents understand the benefits of greywater and how to properly install and maintain their systems.

In addition to reducing potable water demands, greywater reuse would offset loading to the sewer system. Wastewater from the region is conveyed to and treated at the City's Point Loma Wastewater Treatment Plant (WWTP) prior to discharge to the Pacific Ocean through the Point Loma Ocean Outfall. While the Point Loma WWTP currently uses primary treatment and operates under a waiver, it is anticipated that in the future, the Point Loma WWTP will need to be upgraded to treat effluent to secondary levels. Reducing wastewater flows to the plant will ease this process by reducing the required secondary capacity and/or allow for a delay in those upgrades until after the City's Pure Water Program (potable reuse) is implemented. Given the Point Loma WWTP's location on the coast and surrounded by cliffs, the physical space limitations of the site make a secondary upgrade extremely costly and challenging, and any reduction of wastewater flows to the plant can help to make this process easier and less expensive.

The surface waters within the watersheds that encompass the City (San Dieguito, Peñasquitos, San Diego, Pueblo, Sweetwater, Otay, and Tijuana watersheds) have water quality issues that include nutrients, bacteria, TDS, turbidity, metals, trash, toxicity, and dissolved oxygen, among others.[68] These issues can be caused by or exacerbated by urban runoff, much of which is attributable to irrigation inefficiencies. Dry weather runoff can be reduced, however, as a result of: 1) compliance measures required for irrigation with greywater systems, 2) irrigation efficiencies required as part of the turf replacement rebate program, and 3) reduced irrigation needs of water-wise landscaping compared to conventional turf landscapes.

San Diego County is one of the most biodiverse areas of the country, with 492 bird species, 140 mammal species, 75 reptiles and amphibian species, 1,534 native plant species, and 20,000 insects. Over 200 of these species are listed as endangered, threatened, rare, or are candidates for listing.[69] Much of the City of San Diego is highly urbanized, but is interspersed with open space, particularly open space corridors along creeks and canyons. Turf is a monoculture that limits habitat availability and food sources for those species that used to live in what is now urbanized areas. Increasing habitat availability within urban areas, such as through replacement of turf

[62] Equinox Center. 2015. H2Overview Series: San Diego County Residential Water Use Trends. February.
[63] U.S. Census. Quick Facts – San Diego (city), California. Website. Accessed 20 July 2015. Available: http://quickfacts.census.gov/qfd/states/06/0666000.html
[64] City of San Diego. 2011. *2010 Urban Water Management Plan*.
[65] California Department of Water Resources. 2015. Notice to State Water Project Contractors – 2015 State Water Project Allocation Increase – 20 Percent. March 2.
[66] California Department of Water Resources. 2014. Notice to State Water Project Contractors – 2014 State Water Project Allocation Increase back to 5 Percent. April 18.
[67] City of San Diego. Rebate Programs. Website. Accessed 20 July 2015. Available: http://www.sandiego.gov/water/conservation/rebates/index.shtml
[68] San Diego RWMG. 2013. *2013 San Diego Integrated Regional Water Management Plan*.
[69] San Diego RWMG. 2013. *2013 San Diego Integrated Regional Water Management Plan*.

monoculture with a native and water-wise polyculture, would provide additional food sources and habitat for species as they live and travel between these existing corridors. A California Natural Diversity Database (CNDDB) query found 65 animal species and 82 plant species reported within the project area.[70] These species are present or could be supported by water-wise habitat if it existing within the project area. Potential wildlife species that could be supported by habitat created through turf conversion within the project area are listed in **Table 2-17**.

Table 2-17: Species Listed in the CNDDB Within or Near the Project Area

Animals		
Federal- or State-Listed Threatened, Endangered, or Candidate Species		
Hermes Copper Butterfly	Light-Footed Clapper Rail	Riverside Fairy Shrimp
Belding's Savannah Sparrow	Pacific Pocket Mouse	San Diego Fairy Shrimp
California Least Tern	Quino Checkerspot Butterfly	Western Yellow-Billed Cuckoo
Least Bell's Vireo	California Black Rail	Green Turtle
Western Snowy Plover	Coastal California Gnatcatcher	Swainson's Hawk
Non-Listed Species		
American Peregrine Falcon	Hoary Bat	Silvery Legless Lizard
American Badger	Least Bittern	Spotted Bat
Bell's Sage Sparrow	Northern Harrier	Thorne's Hairstreak
Big Free-Tailed Bat	Orangethroat Whiptail	Tricolored Blackbird
Burrowing Owl	Pallid Bat	Two-Striped Garter Snake
California Horned Lark	Pocketed Free-Tailed Bat	Western Beach Tiger Beetle
California Mellitid Bee	Prairie Falcon	Western Mastiff Bat
Coast Horned Lizard	Red-Diamond Rattlesnake	Western Red Bat
Coast Patch-Nosed Snake	Rosy Boa	Western Spadefoot
Coastal Cactus Wren	San Diego Desert Woodrat	Western Yellow Bat
Coastal Whiptail	San Diego Ringneck Snake	White-Tailed Kite
Cooper's Hawk	Sandy Beach Tiger Beetle	Yellow Warbler
Coronado Island Skink	Senile Tiger Beetle	Mesa Shoulderband
Dulzura Pocket Mouse	Silver-Haired Bat	Mexican Long-Tongued Bat
Globose Dune Beetle	Wandering (Saltmarsh) Skipper	Northwestern San Diego Pocket Mouse
Monarch - California Overwintering Population	Mimic Tryonia (California Brackishwater Snail)	Western Tidal-Flat Tiger Beetle
Southern California Rufous-Crowned Sparrow	San Diego Black-Tailed Jackrabbit	

Source: California Natural Diversity Database (CNDDB). RareFind 5 database query within Project Area (21 July 2015).

[70] California Natural Diversity Database. Rarefind 5. Database query within Project Area. Accessed 21 July 2015. Available with subscription: https://map.dfg.ca.gov/rarefind/view/RareFind.aspx

Without-Project Conditions

Without this project, the City of San Diego would need to find other ways to meet the State's mandatory use reductions, which may be less cost-effective, or take longer to implement if such efforts were starting from scratch, instead of expanding existing programs. The Garden's irrigation exhibit would not be built, and SDSLI's educational and training programs would not be expanded to provide customers with accessible and convenient resources to learn about ways to reduce water use and how to safely install and use greywater systems.

The City would not be able to continue the turf replacement rebate program to provide incentives for residential and commercial customers to conserve water, or would need to find other sources of funding to continue this effort, which could divert funds from other, equally valuable, projects. The City's greywater system rebate pilot program would need to seek other sources of funding to be implemented, which would delay implementation. While other entities (such as Metropolitan Water District of Southern California [MWD]) may offer similar turf rebates that City residents could apply for, these rebates are already running low or out. MWD's turf rebates have also run out of funds, and are no longer available, and uncertainty remains over whether rebates will become available in the future.[71] Although DWR is implementing a turf rebate program in the near future, only $12 million is available for "Non-Targeted California Counties", which includes all counties outside the San Joaquin Valley, and is likely to be highly competitive.[72] It is unlikely that a substantial amount of these funds would be distributed for turf conversion in the City of San Diego. Without these rebate programs, residents would be less likely to convert private landscapes to water-wise plantings and therefore be less likely to create an additional 6.5 acres of habitat.

High water demands for turf irrigation would continue, or property values would decrease as curb appeal diminishes when turf dies, especially if further water use restrictions are activated in response to the drought. Greywater would continue to be discharged as wastewater to the City's Point Loma WWTP.

Methods Used to Estimate the Physical Benefits

A primary (Water Supply) and secondary (Habitat Improved) physical benefit was quantified for this project and presented in **Table 2-15** and **Table 2-16**, above. The methodology used to calculate these benefits are described here. Note that the calculations show the annual benefits anticipated when the project is complete and 100% of the benefits are realized annually. Some difference may occur due to rounding.

Primary Benefit – Water Supply

The Water Supply benefit is achieved as a combination of conservation from the turf replacement rebate program and reuse from the greywater system rebate pilot program. Currently, the City's turf replacement rebate program guidelines[73] require that homeowners replace grass in their front, side, or backyards with specific minimums required for living plant material to receive up to $1.50 per sq ft rebate, up to $3,600 for residential and $15,000 for commercial. These guidelines are subject to change contingent on new rules and regulations that may impact the outdoor rebate program. Qualifying plants must be very low to moderate in water use and non-invasive. A portion of the project area must consist of pervious surface that helps reduce stormwater runoff. Published data from California Urban Water Conservation Council (CUWCC) shows conversion of turf to water-wise landscaping saves 34 gallons per square foot per year.[74] Expansion of the City's turf replacement rebate program will provide rebates to convert 440,000 square feet of turf to water-wise landscaping, saving 14,960,000 gallons per year, or 45.9 AFY. Assuming each participating homeowner converts approximately 1,000 sq ft of turf to water-wise and native plants, 440 households are anticipated to participate in the rebate program.

$$\frac{Water\ Savings}{Unit\ Area} * Area\ Converted = Total\ Water\ Savings$$

$$34\frac{gals}{sq\ ft * yr} * 440{,}000\ sq\ ft = 14{,}960{,}000\ \frac{gals}{yr} * \frac{1\ AF}{325{,}851\ gals} = \mathbf{45.9\ AFY}$$

[71] SoCal Water$mart. Turf Removal Program Update. Website. Accessed 20 July 2015. Available: http://socalwatersmart.com/?page_id=2967
[72] California Department of Water Resources. *California 2015 Turf Replacement Initiative – Guidelines*.
[73] City of San Diego. Grass Replacement Rebates. Website. http://www.sandiego.gov/water/conservation/rebates/grassreplacement.shtml
[74] CUWCC. 2015. Turf Removal & Replacement: Lessons Learned. March.

The City's draft greywater system rebate pilot program guidelines (under development) are considering an average $200 rebate for cost of materials only. Water reuse from greywater systems is calculated as the total volume of water reused by each greywater system and the total number of greywater systems to be installed. With implementation of a greywater system, all of the water used by washing machines or showers will be available for reuse. Greywater systems would only be installed if the water they make available for reuse is actually used (or the system owner would have no reason to install greywater), so all water available for reuse through the greywater system would offset potable water. Greywater systems will reuse water from washing machines or showers, for which water use varies depending on the type of washing machine being used. The range of standard washing machine water use is 27-54 gallons per load, for an average of approximately 41 gallons per load.[75] However, it is anticipated that residents who are "early adopters" of greywater systems, and most likely to participate in the greywater system rebate pilot program, may also have Energy-Star washing machines, which are low water/low energy appliances. These machines use approximately 13 gallons of water per load.[76] Averaging this with water use of traditional machines yields an average water use of 31 gallons per load. The average household runs 300 loads of laundry per year,[77] using 9,400 gallons per year. This project will fund rebates for 1,000 greywater systems, for a total reuse of 9,400,000 gallons per year, or 28.9 AFY.

$$\frac{Water\ Use}{Load} * \frac{Number\ of\ Loads}{House * year} * Number\ of\ Houses = Total\ Available\ Water\ for\ Reuse$$

$$31.3\frac{gals}{load} * 300\frac{loads}{house * yr} * 1{,}000\ houses = 9{,}400{,}000\frac{gals}{yr} * \frac{1\ AF}{325{,}851\ gals} = \mathbf{28.9\ AFY}$$

Together, the turf replacement rebate program and greywater system rebate pilot program will save 74.8 AFY of potable water.

Secondary Benefit - Habitat Improved

The secondary benefit of Habitat Improved is achieved through conversion of turf monoculture to water-wise and native landscaping. The total area to be converted through this project is 440,000 sq ft or 10.1 acres. Data generated by the City from the existing turf rebate program shows that past participants installed an average of 64% plant cover (31% with 25-49% plant coverage, 34% with 50-74% plant coverage, and 35% with 75-100% plant coverage).[78] Therefore, this analysis assumes 64% of the total converted area would qualify as habitat, and this factor was applied to the total converted area to give a total habitat area of 6.5 acres.

Water-wise and native vegetation have been shown to increase the number of bird species present compared to the same area when landscaped with turf.[79] Native plant gardens generally provide a more diverse mix of evergreen and flowering trees, shrubs, succulents and grasses, offering birds a wide range of textures and vertical variation for shelter and nesting opportunities. Additionally, varied food resources are provided, such as nectar, seeds, and the insects that will be attracted. Therefore, all of the converted landscape is considered habitat improvement, regardless of whether the landscape is purely native vegetation, or a mix of native and non-native water-wise vegetation. Bird species that were observed in a similar, water-wise landscape analyzed in the Haller study included Red-tailed Hawk, Bushtits, Black Phoebe, Anna's Hummingbird, Raves, Lesser Goldfinches,

[75] U.S. EPA. WaterSense: Indoor Water Use in the United States. Website. Accessed 20 July 2015. Available: http://www.epa.gov/WaterSense/pubs/indoor.html
[76] Energy Star. Clothes Washers for Consumers. Website. Accessed 20 July 2015. Available: https://www.energystar.gov/products/certified-products/detail/clothes-washers
[77] Energy Star. Clothes Washers for Consumers. Website. Accessed 20 July 2015. Available: https://www.energystar.gov/products/certified-products/detail/clothes-washers
[78] Pers Comm. Dianne Modelo. July 23, 2015. "Outdoor Res Rebate Data Area Dist.pdf"
[79] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.

Before and after photos of a grass replacement project funded through the City's rebate

Source: City of San Diego. Grass Replacement Rebates. Website.

Mourning Doves, House Finches, House Sparrows, and Tree Swallows. The presence of trees was also found to be beneficial to attracting bird species, as canopies can provide habitat for nesting, roosting, and protection.[80]

$$Total\ Area\ Converted * Percent\ Habitat\ Factor = Total\ Habitat\ Improved$$

$$440{,}000\ sq\ ft * 64\% = 281{,}600\ sq\ ft * \frac{1\ ac}{43{,}560\ sq\ ft} = \mathbf{6.5\ ac\ of\ habitat}$$

In sum, this project will create 6.5 acres of new habitat comprised of water-wise plantings.

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

To obtain the physical benefits of the *San Diego Water Conservation Program*'s Turf Replacement Rebate component, program participants will need to implement turf conversion projects (remove turf, install new landscaping, and install water-efficient irrigation systems in accordance with program guidelines). No additional policies, facilities, or actions would be required because this component is an expansion of an existing program, and would continue to use the same facilities, staff, and guidance. The Greywater System Rebate Program component will require completion of program guidelines, and installation of greywater systems and appropriate appurtenances by residents. All greywater systems will be installed compliant with the California Plumbing Code, and no additional policies would be required. The irrigation exhibit component will require installation of the exhibit itself, installed within The Garden's existing site, and all outreach and education benefits of this component of the project will be realized once all work included in the work plan (see *Attachment 3 Work Plan*) is completed.

Potential Adverse Physical Effects of the Project and Mitigation

There are no anticipated long-term adverse physical effects from this project. There may be temporary impacts associated with turf removal, such as air quality or noise impacts from removal and hauling of turf and installation of replacement landscaping. There may also be minor noise, odor, and air quality impacts from installation of the new irrigation exhibit at The Garden from trucks carrying materials, and equipment used to install the exhibit. However all adverse impacts are anticipated to be minor and temporary in nature.

Long-Term Drought Preparedness

This project will address long-term drought preparedness in four of the ways identified in Table 1 of the *2015 Guidelines*: 1) water conservation, 2) water reuse, 3) improve landscape irrigation efficiencies, and 4) achieve long-term reduction of water use. This project will promote water conservation through turf replacement conversions, education, and training. The project will also improve landscape irrigation efficiency by motivating customers to make long lasting changes to landscape and irrigation systems. The irrigation exhibit at The Garden, and SDSLI's outreach efforts will promote irrigation efficiency and show residents how these systems are installed and used to achieve water savings. Efficient irrigation systems are a requirement of the turf rebate program, encouraging conversion from inefficient irrigation (such as sprinklers) to efficient irrigation (such as drip irrigation or microspray sprinklers). Water reuse will be encouraged and achieved through installation of greywater systems

[80] Haller, Andrea D. 2012. *SmartScape Design Provides Improved Avian Habitat*. June.

under the greywater rebate pilot program, along with the outreach conducted by SDSLI. Greywater systems effectively reuse laundry water for on-site irrigation, which must also be applied using efficient systems as part of the safety measures implemented during greywater system installation (compliant with the California Plumbing Code). Turf conversion and greywater systems help achieve long-term reduction of water use, so long as these landscapes and systems remain in place. While homeowners typically stay in a house for 13 years (per a 2004 HUD study), and there is no guarantee that a new homeowner would keep these systems in place, it is reasonable to assume that some of these conversions and systems will remain intact and the water use reduction will be realized over the long-term. Particularly as conservation practices become the norm, rather than the exception, as rebate programs expand and more people become water-wise in their daily lives.

This project also indirectly addresses long-term drought preparedness by providing a new water supply through greywater system water reuse, and effective groundwater basin management. The "new" water supply from the greywater system is water that could have been recycled by the City for use in its recycled water distribution system, but is now being diverted from the wastewater flow for on-site reuse. While this water could have been reused elsewhere, diverting it at the point of origin does not diminish the recycled water availability within the City, which is limited by treatment and distribution capacity, rather than supply. Therefore, this is a "new" supply for residents. Groundwater basin management is improved indirectly by this project by reducing the pollutants entering local waterways and groundwater from urban runoff. The irrigation efficiencies, and required stormwater retention of the turf rebate program reduces urban runoff, while conversion to waterwise and native vegetation reduces the chemical inputs (fertilizer and pesticides) to the landscape, which also reduces the pollutants available to be conveyed by urban runoff.

Direct Water-Related Benefit to DACs

An analysis of the extent of DACs within the project area was completed in *Attachment 7 Disadvantaged Communities*. As demonstrated in that analysis, the City of San Diego is 28% DAC by population. The *San Diego Water Conservation Program* will be implemented throughout the City's service area, and is available for all customers, including DACs. Direct and indirect benefits are therefore anticipated to be distributed across the city, including its DACs. This project will directly address one urban DAC need (see **Table 7-2** of *Attachment 7 Disadvantaged Communities*). Direct benefits to DACs include funding support through rebates available to program participants. There is a need for financial assistance for conservation programs that DAC residents may not otherwise be able to afford. These rebates will help to overcome financial barriers to participation in water conservation efforts, and allow DAC residents to reap the benefits of participation in such efforts while allowing the City to help DACs contribute towards city-wide conservation goals.

Project Performance Monitoring Plan

Benefits will begin accruing as soon as turf conversions are completed or greywater systems are installed. For this reason, interim targets will be based on the number of greywater systems installed and the area of turf converted (based on rebates given out and/or rebate applications approved). Interim targets (by system and area) are provided in **Table 2-18**, along with annual benefits anticipated once 100% of the program is implemented. Note that these methods may change, pending development of the Project Performance Monitoring Plan under Task 9 of the Work Plan (see *Attachment 3 Work Plan*), and are presented as one option for measuring progress towards achieving the claimed benefits. Measurable targets for each benefit are also presented in the table.

As a water supplier, the City has access to metering data. This is the easiest way to determine how well the turf conversions and greywater systems contribute to potable water use reduction at participating residences. Because household compositions or circumstances can change over time, the City will follow up with residents whose water metering data show unusual or unanticipated changes in water use, in order to determine if these changes are beyond the influence or control of the project and how to address these differences when monitoring project performance.

For Habitat Improved, the City will ensure continued and on-going maintenance of vegetation installed as part of the turf rebate program. Turf conversion has been shown to create habitat and attract additional bird species. It is therefore presumed that maintenance of converted landscapes would continue to support these habitat improvements. The most appropriate way to determine continued maintenance of converted landscapes are site visits and/or visual inspections for rebate participant sites. The City may measure habitat by total vegetation cover included in the rebate application, and verified by site visits of photographs.

Table 2-18: Project Monitoring for *San Diego Water Conservation Program*

Proposed Physical Benefits	Measurement Tools and Methods	Targets		
		Per Area (Turf)	Per System (Greywater)	Total
Water Supply	The City will analyze water metering data for participating properties in both the turf rebate and greywater rebate programs. Metering data for the 12 months before turf conversion and/or greywater system installation will be used to establish a baseline, while metering data collected after conversion and/or installation will be used to measure post-project water consumption.	Average potable water offset of 34 gal/sq ft per year	Average potable water offset of 9,390 gal/system per year	74.8 AFY potable water offset (45.9 AFY from Turf, 28.8 AFY from Greywater)
Habitat Improved	The City will file copies of before and after conversion photos, along with rebate forms documenting total vegetation cover. Staff will conduct site visits to visually confirm vegetation maintenance.	Average 640 sq ft habitat per turf conversion	-	6.5 acres habitat

Cost Effectiveness Analysis

The *San Diego Water Conservation Program* project will achieve two quantifiable physical benefits described in detail in the sections above, and summarized in **Table 2-15 and 2-16**. During project development, no alternatives to the preferred project included in this application were considered as explained in **Table 2-19**. **Table 2-19** provides a cost effectiveness analysis consistent with Table 7 of the *2015 PSP*.

Table 2-19: Cost Effective Analysis for *San Diego Water Conservation Program*

Cost Effective Analysis	
Question 1 Physical Benefits Summary	*Types of benefits provided as shown in Table 2-15 and 2-16.* Benefit 1: Water Supply – 74.8 AFY of potable water conserved Benefit 2: Habitat Improvement – 6.5 acres of water-wise plantings
Question 2 Alternatives Considered	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* No.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs. No alternatives were considered for this project. The Turf Rebate Program component of this project is an extension of an existing rebate program, and does not require additional effort to develop or implement the rebate program. It would be inefficient and not cost-effective to develop an alternative program. The high success rate of the existing program, and relatively low rebate amounts ($1-$1.50/sq ft compared to Met's $2/sq ft), show that the program works well as it is currently designed. The Greywater Rebate Pilot Program is under development, and alternatives including how large each rebate should be will be considered during this process (Task 8 of the project's Work Plan in *Attachment 3 Work Plan*).
Question 3 Preferred Alternative	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* There is no least cost alternative identified for this project. The success of the existing Turf Rebate Program, and similar programs in southern California, shows that these types of programs are preferred mechanisms for encouraging individual conservation efforts. It is reasonable that a similar program for greywater systems would be successful as well, especially when coupled with outreach regarding safe installation and use of such systems. This project provides benefits beyond the two quantified benefits presented here, including water quality, water supply reliability, drought preparedness, and direct cost savings to customers (including DACs). Outdoor irrigation is a high water use for individual residences, and programs to reduce outdoor water use are generally effective for achieving substantial reductions in water use for relatively low effort and costs.

Project 4: Ms. Smarty-Plants Grows Water-Wise Schools

Local Project Sponsor: The Water Conservation Garden (The Garden)
Partners: Helix Water District, Otay Water District, and K-12 Schools within La Mesa-Spring Valley and Lemon Grove School Districts

Project Summary

The project will implement water conservation education, turf conversion, irrigation efficiency, and water-wise practices at 12 to 15 Title I schools.

Project Maps

Figure 2-5 shows the *Ms. Smarty-Plants Grows Water-Wise Schools* project area, the service areas of the project sponsor, the project facilities and the project's relation to groundwater basins and surface water, DACs, and proposed monitoring locations.

Students at Madison Elementary School preparing to convert from turf to water-wise landscaping

Water-wise landscaping at Madison Elementary School

Project Description

The *Ms. Smarty-Plants Grows Water-Wise Schools* project builds upon an award winning, nationally recognized education program for children and adults, and builds on a successful pilot project with four schools. In December 2013, Ms. Smarty-Plants™ received the State of California Governor's Excellence in Environmental Leadership Award (GEELA) in recognition of the success of this innovative program. Through this project, The Garden will deliver this program at its expanded Education Center classroom, with tours of The Garden, and at school assemblies. The Garden is a non-profit organization that uses educational programs and exhibits to promote water conservation and water-wise practices.

The *Ms. Smarty-Plants Grows Water-Wise Schools* program will be expanded to target K-12 schools in the Otay Water District and Helix Water District service areas, with a special emphasis on Title I low-income schools and in the disadvantaged communities (DAC) in the La Mesa-Spring Valley and Lemon Grove School Districts. Title I schools are those serving high numbers or high percentages of students from low-income families (schools with minimum of 40% of the student body from low-income families are eligible to receive U.S. Department of Education Title I funding for the entire school). Using The Garden – a living, breathing, hands-on demonstration garden that showcases six beautiful acres of innovative water conservation solutions as an outdoor classroom – program participants are transported to an environment where water conservation is "alive." The program engages students in learning about the adaptations of drought-tolerant plants, the role they play in conservation, and the value of water-wise landscaping in the region's local climate. Children are empowered to become part of the solution to the current water crisis in California by taking specific actions to change their behaviors related to how they use and value water. One of the goals of the Ms. Smarty-Plants program is to instill a conservation ethic in students who could translate this into conservation actions at home.

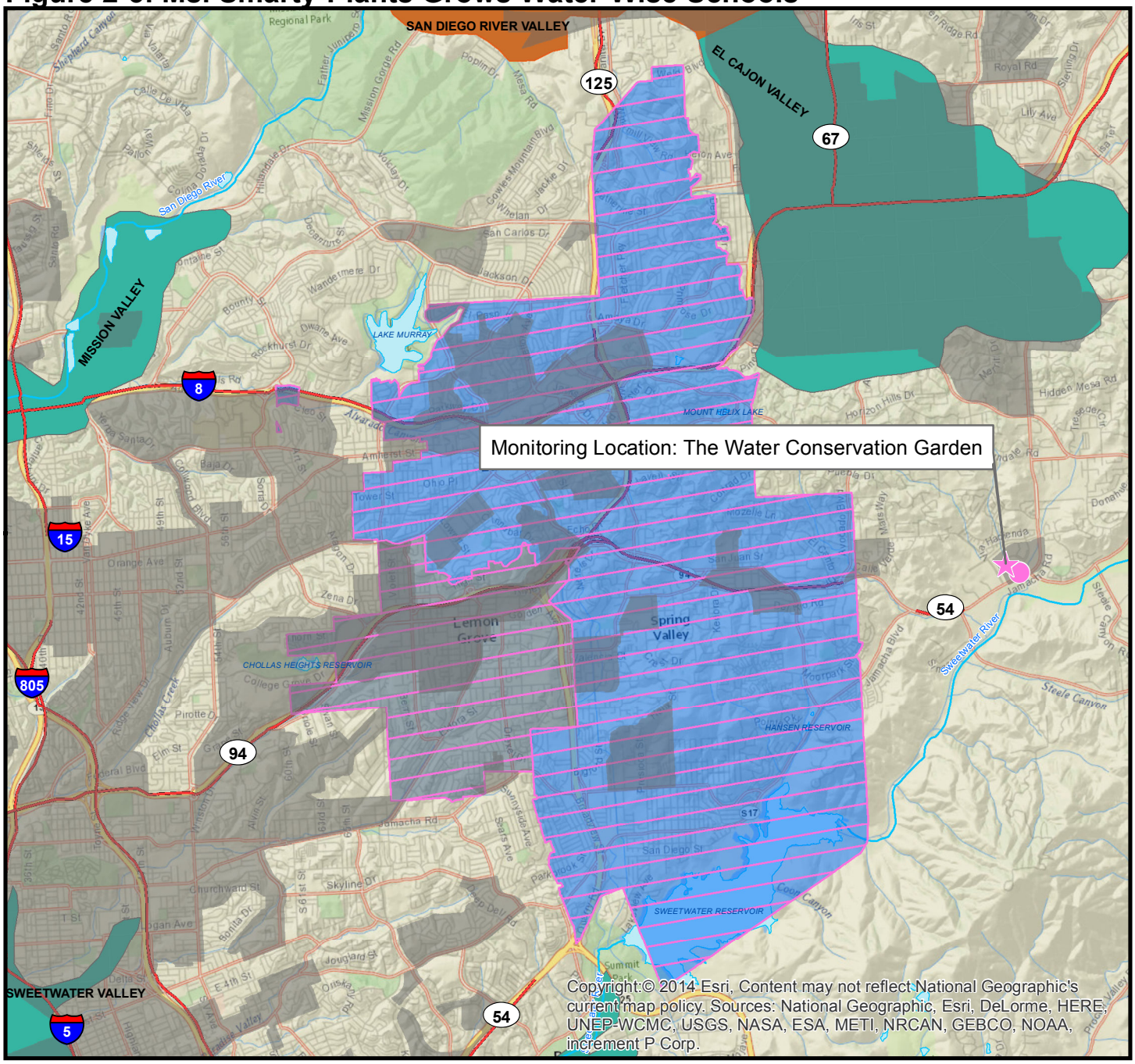
Component 1: The Garden will deliver the *Ms. Smarty-Plants Grows Water-Wise Schools* education program to 10,000-15,000 students at K-12 schools in Spring Valley and Lemon Grove that are served by the Otay Water District and Helix Water District. The education program involves critical thinking, hands-on exploration, water conservation education, citizen science, observation and investigation, spatial reasoning, and garden design. Some elements will include: 1) Lead school on a field trip tour of The Garden for ideas and design elements; 2) Perform a full School Assembly to kick off new garden and to excite students, teachers, and parents for "planting" day; and 3) Work with students and teachers on their onsite garden design and assist landscape designer with garden design.

Component 2: The Garden will identify and recruit twelve to fifteen K-12 schools identified in Component 1 to participate in the program to change out school grounds landscapes to water-wise plants, remove turf (approximately 20,000 square feet [sq ft] per school), upgrade irrigation systems (such as installation of drip irrigation), and adopt water-wise practices throughout school operations (such as identifying opportunities for low-flow or water-saving devices, modifying behaviors to reduce water use, or prioritizing water leaks during maintenance activities). This component includes development of site design, planting, and irrigation plans for each participating school. Installation of the landscape conversion will be conducted by volunteers from the schools (teachers, parents, students). Each school will recruit a "Garden Champion" who will be the point person for the school, organizer of volunteers, and schedule keeper. Community members and businesses may also join and support the school's efforts. The project will provide each school with a landscape design consultation, an irrigation audit, and incentives/rebates for turf removal and irrigation upgrades. The Otay and Helix Water Districts will send out flyers and newsletter articles to their ratepayers about the participating school projects to encourage residents to consider making changes to their home landscapes.

Component 3: The Garden will expand its onsite classroom by approximately 750 sq ft to accommodate more students and provide additional workshops and classes. The expanded classroom will be located in the central portion of The Garden's site and will be used broadly to deliver water conservation and irrigation efficiency classes to both youth and adults. The expanded classroom would allow The Garden to host classes of 70 students, up from its current capacity of 32 students.

This project will directly reduce water use at participating schools, and encourage long-term behavioral changes in students and families to implement water-wise practices in their daily lives. This project will address regional water supply and water use concerns during drought, as well as directly reach DACs, empowering the public to make an active change in their water use behavior.

Figure 2-5: Ms. Smarty-Plants Grows Water-Wise Schools



Coordinates: 32.74917, -116.9371

0 0.75 1.5 3
Miles

N

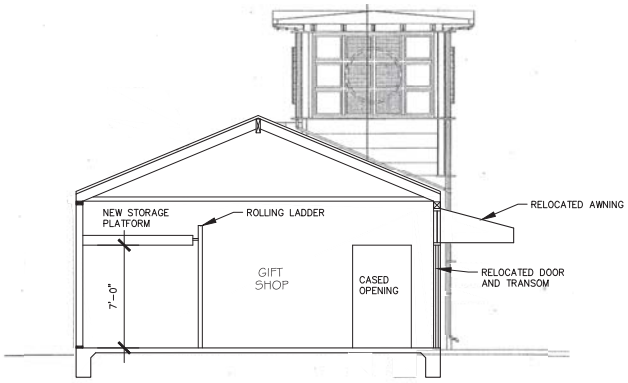
Legend

- Freeway
- Waterbody
- DAC Area*
- Medium Priority Groundwater Basin
- Very Low Priority Groundwater Basin
- Benefit Area: 4 Ms. Smarty-Plants Grows Water-Wise Schools
- The Water Conservation Garden
- Monitoring Location
- Lemon Grove School District
- La Mesa-Spring Valley School District

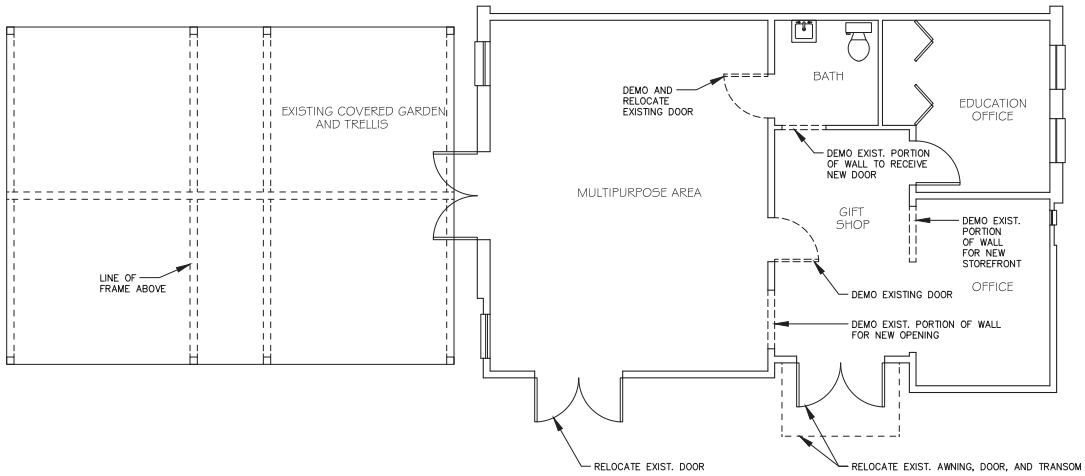
*Note: DAC as determined by census tract and block group data for the year 2013, from the American Community Survey 2009-2013 5-year results. DAC determined based on definition of median household incomes below 80% of the statewide MHI or $48,875.

Sources: U.S. Census 2013 ACS 5-year estimates; San Diego Association of Governments (SANDAG) - GIS Data Warehouse
Document Path: N:\Projects GIS\0188-003 SDIRWM Plan Update\Prop84_Rnd4\MXD\Project maps\2-5_WaterConsGarProject29072015.mxd

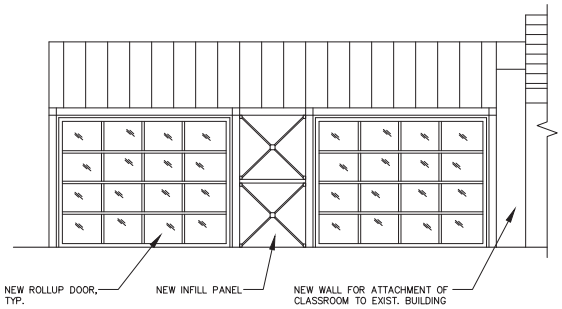
Figure 2-6: Education Center Expansion Design at The Garden



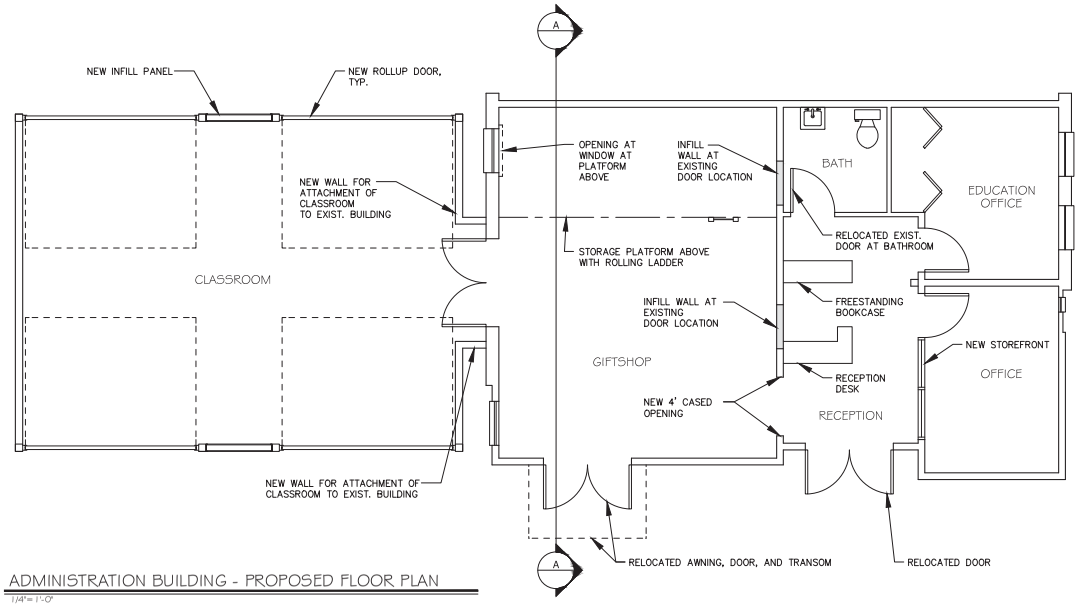
BUILDING SECTION - A
1/4"= 1'-0"



ADMINISTRATION BUILDING - DEMO FLOOR PLAN
1/4"= 1'-0"



CLASSROOM BUILDING ELEVATION
1/4"= 1'-0"



ADMINISTRATION BUILDING - PROPOSED FLOOR PLAN
1/4"= 1'-0"

Bennett+assoc. Architects
7755 Fay Avenue Suite C La Jolla, CA 92037
tel 858-454-9155 fax 858-454-9164
F H BENNETT, III Architect

REGISTERED ARCHITECT F. H. BENNETT, III No. C20963 Exp. 12-31-13 STATE OF CALIFORNIA

THE WATER CONSERVATION GARDEN
12122 CUYAMACA COLLEGE DRIVE WEST
EL CAJON, CALIFORNIA 92019

ISSUE DATES

REVISION DATES

DRAWN BY
PLOT SCALE
SHEET NUMBER
P-1
SHEET OF

Project Physical Benefits

The two quantified physical benefits of 25 acre feet per year (AFY) of Water Supply and 5.5 acres of Habitat Improved are presented in T**able 2-20** and **Table 2-21**, respectively. This analysis assumes a 30-year project life, given that the areas to be converted to water-wise landscaping are not areas likely to be repurposed for other uses (i.e., landscaping is anticipated to remain in place for the full 30 years) and the long-term land ownership at school sites.

The primary physical benefit of this project is Water Supply resulting from turf conversion. These savings are achieved through conservation from conversion of turf to water-wise landscaping at a minimum of 12 schools. The Pacific Institute reports that California's K-12 schools use a total of 214,600 AFY across the state[81], or an average of 20.7 AFY per school.[82] The proposed 12 schools currently use approximately 248.4 AFY water per year, up to 72% of which is used for irrigation.[83] The estimated water savings for the school conversions (25 AFY) is based on Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* and on CUWCC's *Turf Removal and Replacement: Lessons Learned.* Over the project's useful life, it is anticipated that turf conversions will offset a total of 726 AF potable water from 2017 to 2048.

Table 2-20: Primary Physical Benefit – Water Supply
Ms. Smarty-Plants Grows Water-Wise Schools

Project Name: Ms. Smarty-Plants Grows Water-Wise Schools
Type of Benefit Claimed: Water Supply – Conservation from turf conversion
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 30 years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2017	248 AFY	240 AFY	-8.3 AFY
2018	248 AFY	232 AFY	-16.5 AFY
2019-2046	248 AFY	223 AFY	-25 AFY
2047	248 AFY	232 AFY	-16.5 AFY
2048	248 AFY	240 AFY	-8.3 AFY

Comments: The project has an expected project life of 30 years. Benefits are assumed to begin accruing immediately following school conversion, and schools assumed to be converted 33% per year from 2017-2019. School conversions begin in Fall 2016, so benefits will begin accruing in 2017. Benefits will remain constant from 2019-2046. Benefits were phased out in a manner consistent with how they were phased in. Without project water use was calculated using the average water use per K-12 school in California.

Sources: Pacific Institute. 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California* – Appendix E: Commercial Water Use and Potential Savings. November.

California Urban Water Conservation Council. Briana Seapy. March 2015. *Turf Removal and Replacement: Lessons Learned*.

[81] Pacific Institute. 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California* – Appendix E: Commercial Water Use and Potential Savings. November.
[82] Calculated using a total of 10,336 California schools serving students in grades K-12. California Department of Education. *Enrollment/Number of Schools by Grade Span & Type – CalEdFacts*. Website. Accessed 21 July 2015.
[83] Pacific Institute. 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California* – Appendix E: Commercial Water Use and Potential Savings. November.

The secondary physical benefit of this project is Habitat Improved based on the area of new water-wise landscape plantings. This will be achieved through conversion from turf monoculture to a diverse array of water-wise and native vegetation that emphasize butterfly habitat. The without project baseline for this benefit was calculated using a geographic information system (GIS) analysis that determined the existing habitat available within the project area by calculating the Landscape Open Space, Open Space Park or Preserve, or Undevelopable Natural Area land use designations.[84] Within the project area, 18% currently falls within one of these three land use classifications, or 5,721 acres. The value of habitat created (5.5 acres) is based on program estimated of planted area.

In addition to the quantified benefits presented in **Tables 2-20** and **2-21**, this project would provide outreach and educational benefits to students and families in DACs, encourage individuals to make behavioral changes to conserve water, provide the tools to implement water-related change at home and in the community, reduce urban runoff, protect surface water quality, and promote a water-wise culture.

Table 2-21: Secondary Physical Benefit – Habitat Improved
Ms. Smarty-Plants Grows Water-Wise Schools

Project Name: Ms. Smarty-Plants Grows Water-Wise Schools
Type of Benefit Claimed: Habitat Improved – Water-wise and native plantings
Units of the Benefit Claimed: Acres
Anticipated Useful Life of the Project (years): 30 years

(a)	(b)	(c)	(d)
Year	**Annual Without Project**	**Annual With Project**	**Annual Change Resulting from Project (c) – (b)**
2017	5,721 acres	5,723 acres	1.8 acres
2018	5,721 acres	5,725 acres	3.6 acres
2019-2046	5,721 acres	5,727 acres	5.5 acres
2047	5,721 acres	5,725 acres	3.6 acres
2048	5,721 acres	5,723 acres	1.8 acres

Comments: This project has an expected project life of 30 years. Benefits are assumed to begin accruing immediately following each school conversion, and schools assumed to be converted 33% per year from 2017-2019. Each school assumed to provide an equal habitat benefit. The annual benefits will remain constant from 2019-2046. Benefits will phase out in a manner consistent with how they were phased in. The "Without Project" habitat area was calculated using a GIS analysis to determine the portion of the project area that fell within a land use designation that could reasonably be expected to provide habitat.

Sources: San Diego Association of Governments (SANDAG). SanGIS Data Warehouse – Landuse_Current. Available for download through the Regional GIS Data Warehouse.

[84] San Diego Association of Governments (SANDAG). SanGIS Data Warehouse – Landuse_Current. Available for download through the Regional GIS Data Warehouse.

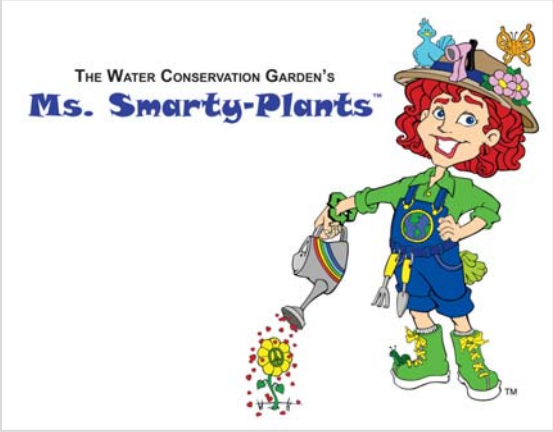
Technical Analysis of Physical Benefits Claimed

Project Need and Conditions

California is in the midst of one of its worst droughts in history, and reducing water use is a priority Statewide. In 2015, the State Water Resources Control Board issued mandatory water use reductions for all water supply agencies in California. Otay Water District and Helix Water District have both been directed to reduce water use by 20%.[85] Outdoor irrigation is one of the highest end uses of water, and represents some of the greatest opportunities for reducing water use.

Students make observations about a water-wise landscape

The Garden and its partners have identified an urgent need among K-12 schools in the La Mesa-Spring Valley and Lemon Grove School Districts to reduce water use in their landscapes because K-12 schools use up to 72% of their overall water use for outdoor irrigation.[86] Most of the schools in the target area, especially the Title I schools, do not currently have drought tolerant, water-wise landscapes on their grounds. Rather, school landscaping is dominated by turf. There is high demand from schools to implement turf conversions, with The Garden's very first water-wise school conversion initiated by the students themselves, asking their principal to have Ms. Smarty-Plants help them convert to water-wise landscaping. This first school removed turf, planted drought tolerant plants, and upgraded its irrigation systems. To-date, The Garden has successfully changed out landscapes in four schools and has received multiple requests from other schools for assistance. Demand for this project is high, with a proven need for such efforts. School districts lack the financial and technical resources to initiate landscape conversions, and need assistance to accomplish a transition to water-wise landscapes.



The Ms. Smarty-Plants program is an award winning, nationally recognized education program for children and adults

Turf landscapes are monocultures, which fail to provide diverse and complex habitats, and are not suitable for many native species. Turf conversions to water-wise and native vegetation is correlated with an increase in the number of bird species found within and near the site, when compared to the species present when the landscape was dominated by turf.[87] San Diego County is one of the most biodiverse areas of the country, with more threatened, endangered, rare, and species of concern than any other area of comparable size in the United States.[88] Within the project area lies potential habitat for 54 species (23 plants and 31 animals) listed on the California Natural Diversity Database (CNDDB).[89] These species are present or could be supported by habitat if it existed within the project area. Potential wildlife species that could be supported by habitat created at schools are listed in **Table 2-22**.

[85] State Water Resources Control Board. 2015. Urban Water Suppliers Conservation Tiers. Available: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/docs/supplier_tiers.pdf
[86] Pacific Institute. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California – Appendix E: Commercial Water Use and Potential Savings. November.
[87] Haller, A.D. 2012. SmartScape Design Provides Improved Avian Habitat. June.
[88] San Diego RWMG and RAC. 2013. 2013 San Diego Integrated Regional Water Management Plan. September.
[89] California Natural Diversity Database. Rarefind 5. Database query within Project Area. Accessed 21 July 2015. Available with subscription: https://map.dfg.ca.gov/rarefind/view/RareFind.aspx

Table 2-22: Species Listed in the CNDDB Within or Near the Project Area

Animals		
Federal- or State-Listed Threatened, Endangered, or Candidate Species		
Townsend's Big-Eared Bat	Southwestern Willow Flycatcher	Swainson's Hawk
Least Bell's Vireo	San Diego Fairy Shrimp	Coastal California Gnatcatcher
Non-Listed Species		
Orangethroat Whiptail	Thorne's Hairstreak	Yellow-Breasted Chat
Mexican Long-Tongued Bat	Coastal Cactus Wren	Western Yellow Bat
Coast Horned Lizard	Rosy Boa	San Diego Black-Tailed Jackrabbit
Cooper's Hawk	Western Beach Tiger Beetle	Pocketed Free-Tailed Bat
Tricolored Blackbird	Red-Diamond Rattlesnake	Big Free-Tailed Bat
Pallid Bat	California Horned Lark	Double-Crested Cormorant
Bell's Sage Sparrow	Prairie Falcon	Yellow Warbler
Coastal Whiptail	Western Tidal-Flat Tiger Beetle	Southern California Rufous-Crowned Sparrow
American Badger		

Source: California Natural Diversity Database (CNDDB). RareFind 5 database query within Project Area (21 July 2015).

The Garden currently provides educational programs to over 60,000 people each year, but the existing 452 sq ft classroom at The Garden's Education Center has a maximum capacity of 30 people. The facility's size limits the number of classes and students that can participate in The Garden's classes. Average class size in the La Mesa-Spring Valley School District ranges from 26-32 students, depending on grade.[90] Average class size in Lemon Valley School District for the 2013-2014 school year ranged between 15-34 students, depending on school and grade.[91] When factoring the range of class sizes in these Districts, along with teachers, chaperones, and The Garden's education team, the existing facility is clearly unable to reliably accommodate a full class of students. This has created an urgent need for a larger indoor classroom to deliver the education component of the project.

The space limitations of the existing classroom, which also functions as a multipurpose room, significantly restricts opportunities for program growth and participation. Further, this space is the only indoor meeting space at The Garden and is used for all staff meetings, board meetings, and workshops. As a consequence of the great demand on the space, scheduling conflicts have increasingly become an issue. Upgrades to The Garden's classroom space are also necessary to deliver classes year-round, such as late spring through late fall when extreme heat makes air-conditioning necessary.

Without-Project Conditions

Without the *Ms. Smarty-Plants Grows Water-Wise Schools* project, The Garden's Ms. Smarty-Plants education program would not be expanded to reach an additional 10,000-15,000 students. These children would not learn water conserving behaviors to continue water savings into the future, nor would they bring these lessons home to share with family and friends. Landscapes of 12 to 15 Title I K-12 schools would not have turf removed and replaced with water-wise plants, nor would their irrigation systems be upgraded to allow for efficient irrigation. Turf would remain the norm for school landscaping, and as such, potable water would be used to continue to irrigate these water intensive landscapes.

Without this project, The Garden's Education Center classroom would not be expanded to provide additional workshops and classes, and would not be able to accommodate more students. Opportunities for educational program growth and participation would remain limited. If The Garden wanted to target larger classes or student groups without this project, additional educators may be necessary to allow classes to be split into groups to accommodate space limitations. Ms. Smarty-Plants curriculum may need to be revised to accommodate this type of adjustment, which could be costly or time consuming. Without the education programs that would be available

[90] La Mesa-Spring Valley School District. About Us – District Profile. Website. Accessed 21 July 2015. Available: http://www.lmsvsd.k12.ca.us/domain/179
[91] Lemon Grove School District. School Accountability Report Cards for School Year 2012-2013. Available by school at: http://lgsd.schoolwires.net//site/Default.aspx?PageID=3423

as part of the classroom expansion, and the school conversion projects, students will not be able to access the tools that would empower them to implement change in their communities as easily, and an opportunity to create long-term changes in students' relationship with water resources would be missed.

In addition to the direct benefits of this project that would not be realized without this project, urban runoff would continue at schools from irrigation inefficiencies and landscapes not designed for stormwater retention. In addition, schools would continue to apply fertilizers and pesticides in quantities appropriate for turf maintenance, which can be conveyed to local waterways and stormwater systems, contributing to water quality impairments. Schools would not realize the direct cost savings associated with reduced water demand, and those funds which may otherwise have been reallocated to other programs (such as educational programs or the arts), would continue to be spent on landscape maintenance.

Methods Used to Estimate the Physical Benefits

Calculations for each of the two physical benefits of this project (Water Supply and Habitat Improved) are provided below. Note that these calculations show the annual benefits anticipated when the project is complete and 100% of the benefits are realized annually. Some differences may occur due to rounding.

Primary Benefit – Water Supply

The primary benefit of this project is Water Supply that is achieved through conservation. This project will conserve 25 AFY. According to Otay Water District's Senior Water Conservation Specialist, each school is anticipated to convert 20,000 sq ft of turf to water-wise landscaping, which could realize a water savings of up to 3 AFY.[92] Published data from CUWCC shows that conversion from turf to water-wise landscaping saves 34 gallons of water per sq ft[93], resulting in a savings of 680,000 gallons per school per year (2.1 AFY). This more conservative figure was used in this analysis to estimate the water supply benefit. Additional water savings will be achieved through personal behavior changes adopted by children and their families, although these savings cannot be reasonably estimated or monitored by The Garden.

$$\frac{Area\ Converted}{School} * \frac{Water\ Savings}{Area} * Number\ of\ Schools = Total\ Water\ Savings$$

$$20{,}000\frac{sq\ ft}{school} * 34\frac{gal}{sq\ ft * yr} * 12\ schools = 8{,}160{,}000\ \frac{gal}{yr} * \frac{1\ AF}{325{,}851\ gal} = \mathbf{25\ AFY}$$

Based on the experience of Madison Elementary School, which was the first school water-wise conversion completed by The Garden, each school conversion could save up to 3 AFY[94] when accounting for both the landscape conversion savings and implementation of water-wise fixtures and behaviors. If this 3 AFY savings is applied to the minimum 12 participating schools, actual water savings from this project would be 36 AFY. Should this project implement 15 school conversions, this benefit would be increased to 31-45 AFY (depending on estimate used). While The Garden acknowledges that actual water savings may be higher than reported here, to account for unforeseen complications, the conservative value for only 12 schools is used for this analysis.

Secondary Benefit - Habitat Improved

The secondary benefit of this project is Habitat Improved achieved through conversion of turf to water-wise and native vegetation. The Garden intends to emphasize bird- and butterfly-friendly plants to create additional learning opportunities for students. Each school that participates in the program is anticipated to convert 20,000 sq ft of turf. Because these turf conversions are generally implemented in areas that will be primarily habitat, rather than walkways, play space, or hardscape (based on the experience at Madison Elementary School), all 100% of the converted area is considered habitat. Converting sq ft to acres provides a total habitat area of 0.46 acres per school, or 5.5 acres of habitat (240,000 sq ft) when the minimum 12 schools are converted. The project could create as much as 6.9 acres habitat if all 15 schools are converted.

[92] Pers. Comm. Richard Namba, Senior Water Conservation Specialist, Otay Water District.
[93] CUWCC. 2015. Turf Removal & Replacement: Lessons Learned. March.
[94] Pers. Comm. Richard Namba, Senior Water Conservation Specialist, Otay Water District.

$$\frac{Area\ Converted}{School} * Number\ of\ Schools = Total\ Habitat$$

$$20{,}000\frac{sq\ ft}{school} * 12\ schools = \ 240{,}000\ sq\ ft * \frac{1\ acre}{43{,}560\ sq\ ft} = \mathbf{5.5\ acres}$$

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

To obtain the physical benefits of the *Ms. Smarty-Plants Grows Water-Wise Schools* project, the Water Conservation Garden's Education Center classroom will be expanded and school landscaping will be converted to water-wise landscapes. The Education Center expansion would require construction of the new classroom, installation of all necessary plumbing, electrical, and structural features, as well as all materials and equipment to create a finished educational space. Applicable construction-related permits would be required. All actions required to complete the classroom component are included in the project's Work Plan.

School water-wise conversions would require removal of turf, installation of water-wise plants, and upgrades to irrigation systems. Additional, unquantified, water savings could be achieved from additional water-wise changes at schools, including water audits, installation of water saving fixtures (e.g., low-flow fixtures and aerators), and behavioral changes inspired by the education and outreach conducted as part of this project. The project would require approval from appropriate school authorities, on a case-by-case basis. School conversions also require significant participation by the school's teachers and parents for labor during the "planting day", as well as materials donations from local businesses. Demand for school conversions is high, and approvals, participation, and donations are anticipated to be easily obtained.

Potential Adverse Physical Effects of the Project and Mitigation

There are no anticipated long-term adverse physical effects from this project. For the school conversions, there may be temporary noise, air quality, or odor impacts associated with turf replacement such as hauling and disposal of removed turf, and installation of water-wise vegetation; however these effects are anticipated to be minor and temporary in nature. Construction of the classroom could have short-term noise, traffic, and air quality impacts during construction from various equipment necessary to build the classroom, but these impacts would be felt primarily on-site (would have minimal effect on the surrounding community) and would be temporary in nature. Construction of the classroom would be completed in compliance with Cuyamaca College's 2013 Facilities Master Plan Environmental Impact Report (EIR).

Long-Term Drought Preparedness

This project directly promotes drought preparedness in three of the ways described in Table 1 of the *2015 Guidelines*: 1) water conservation, 2) improve landscape irrigation efficiencies, 3) long-term reduction of water use. The project will promote water conservation through delivery of the *Ms. Smarty-Plants Grows Water-Wise Schools* education program for K-12 students, working with school districts to transition to drought tolerant landscapes and remove turf, and encouraging water-wise practices at schools. By changing out just 20,000 sq ft of turf and mixed use plant materials on school grounds, each school can realize average savings of 2.1 AFY (see above), with a potential for 3 AFY savings when factoring in irrigation and behavior changes.[95] The project will improve landscape irrigation efficiency by providing financial incentives and technical assistance to schools to upgrade their irrigation systems during the landscape conversions. Long-term reduction of water use will be achieved by educating children and adults to change their personal behaviors to reduce water use, assisting schools to change out landscapes to water-wise plants, removal of turf, and creating a generation of Earth Heroes.

This project indirectly promotes long-term drought preparedness by protecting groundwater resources from pollution conveyed by urban runoff. Native and water-wise vegetation requires fewer chemical inputs (fertilizer and pesticides) than turf, meaning fewer pollutants are present in the watershed overall. Further, landscape designs would emphasize stormwater retention and infiltration to minimize runoff, and would install efficient irrigation which further minimizes dry-weather flows from participating schools. With fewer pollutants conveyed to waterways, and reduced urban runoff to local waterways, groundwater quality is indirectly protected. The San

[95] Schools who have participated in the conversion process already have realized an average 3 AFY savings. Pers. Comm. Richard Namza, Senior Water Conservation Specialist, Otay Water District.

Diego Formation (along the San Diego Bay) is a source of brackish groundwater that is desalinated and supplements the City of San Diego and Sweetwater Authority's potable water supply.

Direct Water-Related Benefit to DACs

Ms. Smarty-Plants Grows Water-Wise Schools targets Title I schools in the La Mesa-Spring Valley and Lemon Grove School Districts, portions of which fall within the service areas of Otay Water District and Helix Water District. These school districts are considered the project area, and are 25% DAC by population, as shown in the analysis completed in *Attachment 7, Table 7-1*. Title I schools are those schools serving high numbers or high percentages of children from low-income families. The U.S. Department of Education allows schools with at least 40% of their student population from low-income families to apply for Title I funding assistance for the entire school. According to the National Center for Education Statistics, in the 2012-2013 and 2012-2014 school years, there were six Title I schools in the Lemon Grove School District, and thirteen Title I schools in the La-Mesa Spring Valley School District. **Appendix 7-2** includes a list of all Title I schools located within these school districts, 12 to 15 of which will be selected for the water-wise school upgrades. Because all targeted schools will be Title I schools, and the project area is 25% DAC, all benefits from this project will be realized by DACs.

Students planting water-wise landscaping at Madison Elementary School

As shown in *Attachment 7 Disadvantaged Communities*, **Table 7-2**, this project will directly address three urban DAC needs: funding, flooding and impervious surfaces, and outreach. The turf conversions will cut expenses for the cash-strapped schools by reducing irrigation requirements, while at the same time making these conversions more affordable by providing financial incentives/rebates to participating schools, and covering the costs of professional landscape design. The conversion from turf will promote porous surfaces by reducing the potential for paving over existing turf to reduce water consumption, and will minimize runoff from the converted areas. In addition, the project will target DACs with its water conservation and water-wise landscaping outreach, and will implement the school conversions at Title I schools serving students from DACs.

Project Performance Monitoring Plan

Benefits will begin accruing as soon as each school's water-wise conversion is completed. For this reason, interim targets are based on the number of schools that have completed their conversions. It is anticipated that approximately 5 schools would be converted every 12 months. **Table 2-23**, below, describes the methods that will be used to measure the quantified benefits of this project. Note that these methods may change, pending development of the Project Performance Monitoring Plan under Task 9 of the Work Plan (see *Attachment 3 Work Plan*), and are presented as one option for measuring progress towards achieving the claimed benefits. Measurable targets for each benefit are also presented in the table.

The Garden has partnered with Otay Water District and Helix Water District, the two water suppliers that serve the schools that will be targeted by this project. These water districts have access to water meter data, which they will use to develop a pre-conversion baseline of water use for each school, and to track on-going water use following the landscape conversions. The habitat benefit is calculated as the total area converted to water-wise landscaping. Continued habitat benefits would be realized as long as this landscaping remains intact. Schools will be asked to submit photographs of the conversion areas to document sustained health of the habitat and to promote the conversion program. Staff from The Garden and/or the two water districts may also make periodic site visits to participating schools to visually confirm continued habitat health. As part of these visits, staff will look for opportunities to provide follow-on outreach or present educational programs to students who were not able to attend earlier programs.

Table 2-23: Project Monitoring for *Ms. Smarty-Plants Grows Water-Wise Schools*

Proposed Physical Benefits	Measurement Tools and Methods	Targets	
		Per School	Total (12 schools)
Water Supply	Otay Water District and Helix Water District will complete water audits before and after schools participate in landscape conversions. The Districts will collect and report water meter data for 10 years following each school conversion. Meter data for the year prior to conversion will be used as the baseline to determine overall reduction in water use. Should any outliers be noted in meter data, District staff will contact the school in question to attempt to determine why the unusual or unexpected water use occurred (i.e., pipe burst, substantial change in student body population). These outliers will be accounted for in project reporting.	2.1 AFY reduction in water use per school	25 AFY reduction in water use
Habitat Improved	Habitat improved is assumed to be equivalent to the area of turf converted to water-wise landscaping. So long as the area remains in water-wise and native vegetation, it would continue to provide habitat benefits for local bird and butterfly species. The Garden will require schools to submit photographs of converted land for 10 years to confirm continued health of the water-wise vegetation. Occasional site visits will be conducted by Otay and Helix Water District or The Garden staff to confirm the accuracy of the self-reporting.	20,000 sq ft per school (0.46 acres/school)	240,000 sq ft (5.5 acres)

Cost Effectiveness Analysis

The *Ms. Smarty-Plants Grows Water-Wise Schools* project will achieve two quantifiable physical benefits described in the sections above and summarized in **Table 2-20 and 2-21**. During project development, alternatives to the preferred project included in this application were not considered. **Table 2-24** provides a cost effectiveness analysis consistent with Table 7 of the *2015 PSP*.

Table 2-24: Cost Effective Analysis for *Ms. Smarty-Plant Grows Water-Wise Schools*

Cost Effective Analysis	
Question 1 Physical Benefits Summary	*Types of benefits provided as shown in Table 2-20 and 2-21.* Benefit 1: Water Supply – 25 AFY water conserved from turf conversions Benefit 2: Habitat Improved – 6.5 acres water-wise and native plantings
Question 2 Alternatives Considered	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* No.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs. No project alternatives were considered for the components that will directly contribute to the quantified physical benefits described above. These quantified benefits come from the water-wise school conversions. No alternatives were considered because this is an expansion of a pilot program that has been successfully implemented in four schools within the project area. There is documented high demand for expansion of the existing program, and no alternatives were deemed necessary to consider given the success of previous efforts. Specific alternatives for site design at each school may be considered during implementation of the conversion component, which includes landscape design. Bennett and Associates completed an extensive information gathering process to determine the actual needs of The Garden when developing *The Water Conservation Garden Master Plan*. The classroom design included in the Master Plan was developed in close coordination with The Garden, with preliminary design options vetted at workshops with staff.[96] The recommended classroom design was selected as the preferred design because it met the identified needs of The Garden and was developed in conjunction with key staff. No cost alternatives were included in the final Master Plan.
Question 3 Preferred Alternative	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* There is no least cost alternative identified for this project. The components included in this project were selected for their proven history of success (Ms. Smarty-Plants education program and school water-wise conversions) and high demand, as well as their ability to meet the identified needs of The Garden and its staff. Given the known successes of the existing outreach and education programs provided by The Garden, expansion of existing programs is preferred to development of new programs with unproven success. Similarly, the classroom expansion has been designed to meet the needs of the expanded education and outreach efforts of The Garden. Bidding for construction of the classroom will be done competitively, with a contractor selected in accordance with The Garden's existing policies for bid awards.

[96] Bennett and Associates. 2014. *The Water Conservation Garden Master Plan*. January.

Rural Water Infrastructure Program

Project 5: Rural Disadvantaged Community Partnership Project – Phase III

Local Project Sponsor: Rural Community Assistance Corporation (RCAC)
Partners: Alter Terra (and local communities), Indian Health Services (IHS), Bureau of Indian Affairs (BIA), San Diego County Water Authority (SDCWA), City of San Diego (City), County of San Diego Department of Environmental Health (DEH), State Water Resources Control Board (SWRCB)**,** Campo Kumeyaay Nation, La Jolla Band of Luiseno Indians, Nestor Community of San Diego, Pauma Band of Luiseno Indians, San Pasqual Band of Mission Indians, Quiet Oaks Mobile Home Park, Richardson Beardsley Park, and Willowside Terrace Water Association

Project Summary

The project will provide funding for ten sub-projects to improve water and wastewater infrastructure and address water quality concerns in underserved rural disadvantaged communities.

Project Maps

The ten disadvantaged community (DAC) components included in this project are described briefly below and represented in the project map in **Figure 2-7,** which shows the *Rural Disadvantaged Community Partnership Project – Phase III* area, service area of the project sponsor, project facilities, the project's relation to groundwater basins and surface water, DACs, and proposed monitoring locations. **Figure 2-8** provides additional detail on the location of Component 9 and Component 10, which will implement water quality improvement projects in the Tijuana River watershed.

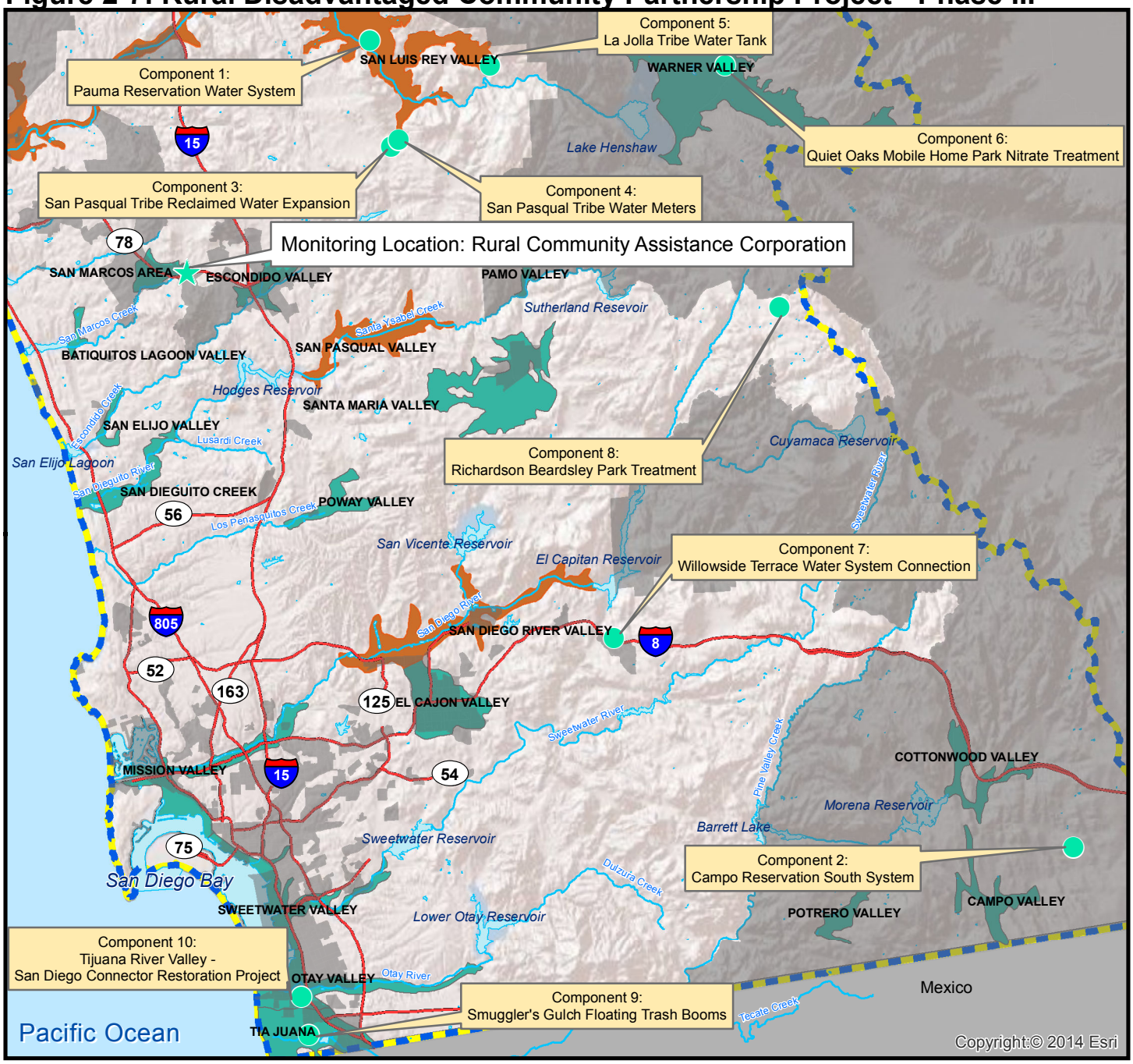
Project Description

This project is a continuation of RCAC's *Rural DAC Partnership Project Phase I and Phase II*. The three phases of Rural DAC Partnership Projects have collectively worked to meet the needs of rural DACs and Tribes in the Region. The *2013 IRWM Plan* discusses issues related to rural DACs that generally do not receive municipal water and sewer services because they are outside municipal agency service areas. The *2013 IRWM Plan* acknowledges that one of the greatest needs of rural DACs is technical support and capacity building to understand water-related issues and find long-term solutions. RCAC has worked to identify and address needs of rural DACs in the Region, focusing on solutions to resolve issues associated with accessibility to clean drinking water and wastewater services. RCAC established the Rural DAC Stakeholder Committee, comprising representatives from RCAC, IHS, SDCWA, the City, DEH, and SWRCB. In 2015, the Committee identified 24 critical, shovel-ready projects benefitting rural DACs that could be eligible for IRWM funding, and conducted additional refinement and prioritization and ultimately refined the list to 10 DAC components for this Proposal.

Table 2-25: Project Components - *Rural Disadvantaged Community Partnership Project – Phase III*

#	Brief Description
1	Pauma Reservation Water System • *Location*: Pauma Indian Reservation (population 150) • *Issue*: leaking water storage tank built in 1995 requires Tribe to pump more water than needed • *Resolution*: replace 111,000 gallon water storage tank that leaks as a result of a 2014 earthquake
2	Campo Reservation South System • *Location*: Campo Indian Reservation (population 45) • *Issue*: Tribe has struggled with water supply shortages for several years • *Resolution*: install a new 6-inch well, pump, motor, and piping to address water supply issue
3	San Pasqual Tribe Reclaimed Water Expansion • *Location*: San Pasqual Reservation (population 750) • *Issue*: reduce water costs by reducing demands for potable water through expansion of reclaimed water • *Resolution*: install 9,100 linear feet of pipe to bring reclaimed water to 45 households for irrigation
4	San Pasqual Tribe Water Meters • *Location*: San Pasqual Reservation (population 750) • *Issue*: reduce water costs by reducing demands for potable water through installing water meters • *Resolution*: install 245 water meters at each house on the reservation
5	La Jolla Tribe Water Tank • *Location*: La Jolla Indian Reservation (population 265) • *Issue*: Tribe has insufficient water storage capacity and frequently experiences water shortages • *Resolution*: design and construct a 80,000 gallon water storage tank
6	Quiet Oaks Mobile Home Park Nitrate Treatment • *Location*: Warner Springs (population 120) • *Issue*: groundwater exceeds Maximum Contaminant Levels (MCL) for nitrate • *Resolution*: install a nitrate treatment system
7	Willowside Terrace Water System Connection • *Location*: Alpine (population 100) • *Issue*: groundwater exceeds MCL for nitrate • *Resolution*: connect community to Padre Dam Municipal Water District's water system
8	Richardson Beardsley Park Treatment • *Location*: Julian (population 28) • *Issue*: groundwater exceeds secondary MCL for iron and manganese • *Resolution*: install an iron and manganese treatment system
9	Smuggler's Gulch Floating Trash Booms • *Location*: Tijuana River Valley • *Issue*: trash presents serious water quality and flood issues • *Resolution*: install trash removal system at the Smuggler's Gulch drainage
10	Tijuana River-San Diego Connector Restoration Project • *Location*: Tijuana River Valley • *Issue*: illegal dumping and trash present surface and groundwater quality issues in a seasonal stream • *Resolution*: conduct restoration, including bioswales, pervious pavers, plantings, and education

Figure 2-7: Rural Disadvantaged Community Partnership Project - Phase III



Coordinates: 33.138467, -117.154738

Legend

- San Diego IRWM Region
- Funding Area Boundary
- Freeway
- Waterbody
- County
- DAC Area*
- Medium Priority Groundwater Basin
- Very Low Priority Groundwater Basin
- Benefit Area: 5 Rural Disadvantaged Community Partnership Project - Phase III (Note: 10 project sites)
- Monitoring Location

0 3.5 7 14
Miles

N

*Note: DAC as determined by census tract and block group data for the year 2013, from the American Community Survey 2009-2013 5-year results. DAC determined based on definition of median household incomes below 80% of the statewide MHI or $48,875.

Sources: U.S. Census 2013 ACS 5-year estimates; San Diego Association of Governments (SANDAG) - GIS Data Warehouse
Document Path: N:\Projects GIS\0188-003 SDIRWM Plan Update\Prop84_Rnd4\MXD\Project maps\2-6_RCACProject29072015.mxd

Figure 2-8: Components 9 and 10 of the *Rural Disadvantaged Community Partnership Project - Phase III*

Project Physical Benefits

The *Rural Disadvantaged Community Partnership Project – Phase III* will provide multiple benefits, two of which have been quantified and are presented in **Tables 2-26** and **2-27**. The two quantified physical benefits are Water Quality (from providing drinking water treatment) and Water Supply (achieved through conservation, reuse, and supply development). Both of these benefits were calculated using the methodology described below, and benefits phased in accordance with the project schedule presented in *Attachment 5 Schedule*.

For the primary benefit (Water Quality), two of the DAC components will provide clean drinking water to DACs that currently do not receive clean drinking water. The components included in this analysis are Component 6 (*Quiet Oaks Mobile Home Park Nitrate System*) and Component 7 (*Willowside Terrace Water System Connection*), both of which provide benefits to DACs that have drinking water in excess of the primary Maximum Contaminant Levels (MCL) for nitrate. The baseline water quality value for both projects were provided by RCAC based on existing water quality data from 2015, which show 58 milligrams per liter (mg/L) of nitrate for Quiet Oaks and 204 mg/L of nitrate for Willowside Terrace[97]. The value of the benefit (108 mg/L reduction in nitrate) is calculated from conceptual and preliminary design provided by RCAC and the DACs.

Table 2-26: Primary Physical Benefit – Water Quality
Rural Disadvantaged Community Partnership Project – Phase III

Project Name: Rural Disadvantaged Community Partnership Project – Phase III
Type of Benefit Claimed: Water Quality - Nitrate Reduction
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 30 years

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2017	58 mg/L	30 mg/L	-28 mg/L
2018-2046	124 mg/L	16 mg/L	-108 mg/L
2047	66 mg/L	0 mg/L	-66 mg/L

Comments: The baseline water quality value for both projects were provided by RCAC based on existing water quality data from 2015, which show 58 milligrams per liter (mg/L) of nitrate for Quiet Oaks and 204 mg/L of nitrate for Willowside Terrace. Component 6 will be completed in August 2017 and will accrue benefits for 30 years, until 2046. Component 7 will be completed in March 2018 and will accrue benefits for 30 years, until 2047. The projects have separate water sources. In order to represent them as one benefit, a weighted average of their concentrations was used to determine a "without project" concentration and "with project" concentration.

Sources: Joni Johnson. *Rural DAC Partnership Application – Additional Data July 13, 2015 Project Benefits: Treatment.* Joni Johnson. *Rural DAC Partnership Project – Phase III Quantifiable Benefits Calculations.* April 22, 2014.

The baseline for the secondary benefit (Water Supply) is provided from on-the-ground conditions reported by RCAC and the Tribal Governments that would benefit from the projects. The components included in this analysis are Component 1 (*Pauma Reservation Water System*), Component 2 (*Campo Reservation South System*), and Component 3 (*San Pasqual Tribe Reclaimed Water*). The baseline water supply values for all three projects are considered to be zero. For Component 1, the Tribe currently has a leaking tank that wastes 3.2 acre-feet per year (AFY); once the project is implemented, the leak will be resolved and this amount of water will be saved. For Component 2, the 45 households that would be served by the project currently rely upon potable water for indoor and outdoor use and no alternative water sources are available; once the project is implemented the residents will have access to 24.2 AFY of recycled water and this amount of water will be reused. For Component 3, the Campo well is currently insufficient to provide an adequate supply for the Tribe; once the project is implemented the residents will have access to 4.8 AFY of groundwater produced by the well. The value of the benefit (32.2 AFY)

[97] Pers comm. Joni Johnson, RCAC Engineer.

is calculated from conceptual and preliminary design provided by RCAC and the DACs. Over the course of the 30-year project life, the cumulative water supply benefit is anticipated to be 955 AF.

Table 2-27: Secondary Physical Benefit – Water Supply
Rural Disadvantaged Community Partnership Project – Phase III

Project Name: Rural Disadvantaged Community Partnership Project – Phase III **Type of Benefit Claimed:** Water Supply – water saved from fixing leaks, recycled water, and groundwater **Units of the Benefit Claimed:** AFY **Anticipated Useful Life of Project (years):** 30 years			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2017	0 AFY	21.5 AFY	21.5 AFY
2018-2046	0 AFY	32.2 AFY	32.2 AFY
Comments: Components 1, 2, and 3 will be completed in March 2017 and will accrue 2/3 of the total project benefits in the first year of operation. After the first year of operation, all three components will provide project benefits through their 30-year useful life (through 2046). Sources: Joni Johnson. *Rural DAC Partnership Project – Phase III Quantifiable Benefits Calculations.* April 22, 2014.			

The primary and secondary benefits of nitrate reduction and water supply benefits are just two of the many benefits of this project. These two benefits are pivotal to increasing the sustainability of water use in San Diego County, as well as ensuring safe drinking water supplies are available to DACs. Additional benefits not quantified for the projects include:

- Component 1: Project will increase storage for the Pauma Tribe by 20.2 AFY, and therefore will substantially increase water supply reliability and prevent future water shortages.
- Component 4: Project will install 245 smart water meters, which will increase operational efficiency and promote water conservation by helping the Tribe and local residents detect leaks.
- Component 5: Project will increase storage for the La Jolla Tribe by 35.6 AFY, and therefore will substantially increase water supply reliability and resolve existing water shortage issues.
- Component 7: Project will connect a mobile home park to a municipal water supply system, and will therefore provide long-term water supply reliability and ensure clean drinking (potable) water is made available to 100 DAC residents on a long-term basis.
- Component 8: Project will treat water for iron and manganese. 3.8 AFY of water will be treated per year, and the project will ensure that drinking water remains usable to residents that do not currently drink the water due to its odor and brown appearance.
- Component 9: Project will remove 18,000 cubic yards of floating trash per year and help resolve local flooding issues.
- Component 10: Project will install bioswales that will improve infiltration and local water quality; it is estimated that 11,400 square feet of bioswales will be installed.

Technical Analysis of Physical Benefits Claimed

Project Need and Conditions

There are many rural DACs in the San Diego IRWM Region with water quantity and quality issues. These issues are detailed in the *2013 IRWM Plan*, and include potable water shortages, compliance with MCL of nitrates, bacteria, and other constituents, and technical capacity to complete projects. The limited resources available to DACs, both financially and organizationally, make it difficult for many communities to access funding and implement technical projects to resolve complex water-related issues.

RCAC has been working with IRWM stakeholders for several years to develop a team of experts that are collectively organized as the Rural DAC Stakeholder Committee, and include representatives from RCAC, IHS, SDCWA, the City, and SWRCB. The Committee solicited input from local DACs, agencies, and other stakeholders in the Region to solicit project components this Proposal. The Committee developed a set of both primary and secondary criteria that were used to evaluate projects and ultimately identified 24 critical, shovel-ready projects benefitting rural DACs in the Region that could be eligible for IRWM funding. The Committee conducted additional refinement and prioritization and refined the list to 10 DAC components for this Proposal. The Committee used the following primary criteria to select DAC projects in 2015: location in an economically disadvantaged community, construction projects or planning projects that will lead to construction projects, positive impact to public health or the environment, critical need with respect to water quantity, water quality, water reliability, or the environment, high likelihood of project success, and ability to be completed within the allowable grant project period. Secondary criteria used by the Committee to select projects included: leverage of other funds, low capital cost per connection, multiple benefits for DACs, green technology, and remedying past environmental injustice issues.

The ultimate purpose of the *Rural Disadvantaged Community Partnership Project – Phase III* is to provide resources to RCAC and local DACs to provide rural DACs with the organizational, funding, and technical support needed to implement high-priority projects that address critical water quality and water supply issues. Specific details about the project need and conditions associated with each DAC component are provided below.

Component 1: Pauma Reservation Water System

The Pauma Indian Reservation, located within Pauma Valley in unincorporated San Diego County, has a community water system that was originally constructed in the early 1990's. This system currently serves 150 people, 58 homes, and 3 non-residential units and includes two bolted steel tanks, distribution pipe ranging from 4" to 10", fire hydrants, two community water wells, and two pump houses.

The *Pauma Reservation Water System Project* includes activities to replace one of the bolted steel tanks that was built in 1995 and currently exhibits severe leaking at the base of the tank. The project has been assessed by IHS, which completed a Preliminary Engineering Report (PER) [98] for the project in May 2014. The PER reports that the leak was noticed a few days after an earthquake occurred in January 2014 and that the leak is very large (estimated at 2 gallons per minute or gpm), contributing to ponding water around the foundation of the tank. The leak is currently deteriorating the existing tank, which is anticipated to cause major issues over the next several years. If the tank is rendered insufficient to store water, the community will not have enough storage capacity. Further, the current leak presents water quality issues as it has the potential to introduce bacteria into the tank. For these reasons, the Tribe is concerned about the reliability of the water storage tank. If it were to completely fail, the system would not have the ability to store an adequate amount of water for the community and water shortage and potential outages would be a great threat to the health and safety of all 150 residents on the Pauma system.

The PER analyzed three different alternatives to address the issue of the existing leaking tank, ultimately finding that replacing the tank would be more economical and would have a longer useful life (thirty years) compared to rehabilitating the existing tank. IHS's final recommendation in the PER was that the tank be replaced with a bolted steel water storage tank of the same capacity as the existing tank (111,000 gallons).

[98] Indian Health Services. 2014. *Preliminary Engineering Report for the Pauma Small Tank Replacement Project – Pauma Indian Reservation.*

Component 2: Campo Reservation South System

The Campo Indian Reservation, located in eastern unincorporated San Diego County, has a small community water system that relies 100% on groundwater supplies and serves a total of 45 residents.[99] The Campo Valley Groundwater Basin (California Department of Water Resources [DWR] Bulletin 118 Basin 9-28) serves the community and is designated as a "very low" priority basin per DWR's groundwater basin prioritization.

The Campo Indian Reservation has struggled with water supply shortages for several years, and is currently working with IHS to address this issue by drilling a new 6-inch well that would serve all 17 homes and 45 residents. To date, IHS has completed a conceptual cost estimate for the project, but additional engineering and design has not been completed. The IHS cost estimate is for a well that would have capacity to produce 15 gpm of groundwater, which would be sufficient to provide supplies to the Reservation and replace existing inadequate well system. The IHS cost estimate also assumes that the useful life of the new well would be approximately 30 years.

Component 3: San Pasqual Tribe Reclaimed Water Expansion

The San Pasqual Reservation is located near Valley Center in unincorporated San Diego County. The Reservation currently purchases the majority of its water supplies from the Valley Center Municipal Water District (VCMWD); 100% of VCMWD's supplies are currently provided by treated imported water that is purchased from SDCWA.[100] Over the years, the San Pasqual Tribe has been actively implementing projects to reduce its reliance on supplies from VCMWD, and thus from imported sources.

The Valley View Casino is located within the San Pasqual Reservation; the casino currently treats all of its wastewater and uses it for landscaping and irrigation around the casino grounds. Currently, the casino produces over 30,000 gallons of excess treated wastewater every day; the project would extend pipelines from the casino to users in the Tribal community to make use of this excess water for irrigation purposes. [101] The recycled water would serve an area referred to as "District B" of the San Pasqual Reservation, which is located within closest proximity to the Valley View Casino of the three districts included within the San Pasqual Reservation. Through previous efforts completed for the *Rural Disadvantaged Community Partnership Project – Phase II*, the Tribe has constructed one booster pump and approximately 14,000 linear feet of pipeline from the casino into the District B area. Additional work is necessary to expand the existing pipeline an additional 9,100 linear feet to serve approximately 45 households and 120 residents recycled water for outdoor irrigation purposes.[102] Given that these households currently receive imported potable water from Valley Center MWD, the project will result in direct reuse and offset potable water use.

Component 4: San Pasqual Tribe Water Meters

The San Pasqual Tribe has installed water meters throughout the three districts (District A, District B, and District C) included in its Reservation and has metered 100% of homes on the Reservation. There are a total of 245 meters on the 245 households located within the Reservation, including 140 homes in District A, 125 homes in District B, and 45 homes in District C. [103]

The Tribal water operators manually read all 245 meters each month, which takes about two working days to complete. The project would transition the Tribe from "traditional" meters to "smart" meters on the Reservation. In addition to providing benefits associated with worker efficiency, customers will be able to better monitor their water consumption and conservation efforts with a smart meter. Furthermore, with the installation of smart water meters, both customers and water operators can more easily detect water leaks or breaks resulting in a financial savings for customers and reduced dependence upon purchased water from VCMWD.

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[99] Campo Environmental Protection Agency (CEPA). 2002. *Campo Indian Reservation.* Available: http://water.epa.gov/lawsregs/guidance/cwa/305b/upload/2002_04_08_305b_94report_campo.pdf

[100] Valley Center Municipal Water District (VCMWD). 2014. *Valley Center Municipal Water District 2014 Water Quality Report*. Available: http://www.vcmwd.org/Portals/0/PDF/CCR/WaterQualityReport.pdf

[101] San Pasqual Tribe. 2014. *San Pasqual Band of Kumeyaay Indians – RTOC Summer Meeting Presentation.* Available: http://www.epa.gov/region9/tribal/rtoc/sum14/pdf/rtoc2014-san-pasqual-water-presentation.pdf

[102] San Pasqual Tribe. 2014. *San Pasqual Band of Kumeyaay Indians – RTOC Summer Meeting Presentation.* Available: http://www.epa.gov/region9/tribal/rtoc/sum14/pdf/rtoc2014-san-pasqual-water-presentation.pdf

[103] San Pasqual Tribe. 2014. *San Pasqual Band of Kumeyaay Indians – RTOC Summer Meeting Presentation.* Available: http://www.epa.gov/region9/tribal/rtoc/sum14/pdf/rtoc2014-san-pasqual-water-presentation.pdf

Component 5: La Jolla Tribe Water Tank

The La Jolla Indian Reservation, located in the foothills of the Palomar Mountains in unincorporated San Diego County, is nearly 10,000 acres in size. The La Jolla Tribe operates three EPA-regulated Public Water Supply Systems that provide treated groundwater to approximately 390 Tribal residents.

The project would include construction of an 80,000 gallon bolted steel water tank, with associated distribution service lines to serve the 71 homes and 263 people that are served by the La Jolla Western Water System. The project is needed because the Tribe's Western Water System has insufficient water storage capacity, which results in frequent water shortages. The project will, therefore directly increase the reliability of water for the La Jolla Tribe and provide infrastructure to reduce water shortages that threaten the health and safety of all 263 residents on the La Jolla Western Water System. To date, only conceptual-level work has been completed for the project; no engineering or design work has been completed.

Component 6: Quiet Oaks Mobile Home Park Nitrate Treatment

The Quiet Oaks Mobile Home Park is a small mobile home park community located within Warner Springs in unincorporated San Diego County. The mobile home park community contains approximately 120 residents, is served water by a small local groundwater well, and is located at a substantial distance from any municipal water agency.

Local groundwater sampling data for the Quiet Oaks Mobile Home Park show a consistent nitrate concentration of 58 mg/L, which exceeds the MCL for nitrate of 45 mg/L. According to the Division of Drinking Water (DDW), nitrate levels above the MCL can cause health-related issues, especially for children and pregnant women.[104] In order to protect residents of the Quiet Oaks Mobile Home Park from potential health impacts associated with high nitrate levels, the project will involve installation of a reverse osmosis (RO) treatment system that will be designed to reduce nitrate levels to 30 mg/L to ensure that residents are not exposed to nitrate levels in excess of the MCL. Feasibility documents for the project recommended installation of onsite treatment, because such a system is relatively easy to maintain, and the site is located at such a large distance from local municipal services that a municipal water connection is not feasible.

Component 7: Willowside Terrace Water System Connection

The Willowside Terrace Water Association serves water to residents of Willowside Terrace Mobile Home Park Community located in the community of Alpine in unincorporated San Diego County. The Willowside Terrace Mobile Home Park is located within the Eastern Service Area of the Padre Dam Municipal Water District (PDMWD), approximately 6,500 linear feet from an existing PDMWD water main.

The Willowside Terrace Water Association serves water to residents via one groundwater well (California Water System No. CA3701995), which consistently has nitrate/nitrite concentrations of 46 mg/L. Converting this water quality value to nitrate as N demonstrates that nitrate levels in the well are 204 mg/L, well above the regulated standard of 45 mg/L. Given the close proximity to an existing municipal water main, the most feasible long-term solution for addressing water quality issues for this community is establishing a connection to PDMWD's water system. This connection will ensure that residents are provided clean drinking water on a long-term basis, because PDMWD's *2014 Water Quality Report* demonstrates that drinking water met all regulated standards; specifically, nitrate levels were found at non-detect levels.[105]

Component 8: Richardson Beardsley Park Treatment

The Richardson Beardsley Mobile Home Park is located within Julian in unincorporated San Diego County. The community consists of 28 residents that are provided water from a single groundwater well. The groundwater within the community has a history of compliance issues, including violations for coliform (2014, 2009, and 2008), gross alpha particles (2008), and lead and copper (2005).[106] Currently, residents report the appearance of brown

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[104] Division of Drinking Water (DDW). 2014. *Nitrate Fact Sheet.* Available: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/nitrate/Fact%20Sheet%20-%20Nitrate_May2014%20update.pdf

[105] Padre Dam Municipal Water District (PDMWD). 2014. *2014 Water Quality Report*. Available: http://www.padredam.org/DocumentCenter/View/1695

[106] California Environmental Protection Agency (EPA). 2015. *Envirofacts for the Richardson Beardsley Park, Inc.* Available: file:///Z:/Projects/0188%20-%20SDCWA/0188-004_SDIRWM%20Program%20Management/02_Project%20Work/2A_Prop%2084-Round%204%20Grant/08_Coordination%20with%20LPS/02_Info%20from%20LPS/10_RCAC/Additional%20Information/8_Richardson%20Beardsley/SDWIS%20Search%20Results%20_%20Envirofacts%20_%20US%20EPA.html

water, which has been verified to exceed the Secondary MCL for both iron and manganese. While the Secondary MCL standards are not considered mandatory as they are set for aesthetic considerations such as taste, color, and odor, the brown coloring and smell of the groundwater at the Richardson Beardsley Mobile Home Park has effectively made the water un-drinkable by residents.[107]

The project will provide a cost-effective way to reduce iron and manganese concentrations by installing a packaged treatment system. Feasibility assessments for the project recommended installation of onsite treatment, because such a system is relatively easy to maintain, and the site is located at such a large distance from local municipal services that a municipal water connection is not feasible.

Component 9: Smuggler's Gulch Floating Trash Booms

Smuggler's Gulch Channel is a drainage located on the United States side of the Tijuana River Valley. Smuggler's Gulch is a main tributary drainage of the Tijuana River Valley, which has been studied extensively by the Tijuana River Valley Recovery Team (TRVRT). This area has been an issue of local concern and focus due to the high presence of trash, waste, illegal dumping, and sediment that have accumulated and pose flood risks in the area.[108] Information from the TRVRT states that, "the majority of stormwater, sediment, and trash enter the U.S. through the main Tijuana River Channel. Over time, the downstream areas have served as a sink for accumulated sediment and trash, resulting in an increase in vegetation. This causes storm flows to flood and deposit additional sediment and trash." The issue in Smuggler's Gulch is considered an ongoing issue that is a continual problem in wet seasons as additional sediment and trash accumulate in the area and pose flood risks; a long-term solution is needed to remove these sources of debris.

The project will involve planning, design, manufacturing, and installation of a floating trash removal system comprised of three floating trash booms, constructed from repurposed plastic, to be placed at the Smuggler's Gulch drainage channel between the Border Patrol fence culvert and Monument Road. The project also includes post-storm trash removal for three years. The transportable floating trash removal system will be operational during the wet season and will be removed during regular channel maintenance. Based on preliminary estimates, this project is expected to remove 18,000 cubic yards of floating trash per year.

Component 10: Tijuana River-San Diego Connector Restoration Project

The Tijuana River-San Diego Connector is a seasonal stream 2,600 feet in length that connects the Tijuana River Watershed and the Otay River Watershed, and drains north to the San Diego Bay. The stream operates as a runoff channel for multiple residential neighborhoods, businesses, and adjacent roads in the community of Nestor, which is an economically disadvantaged area located in southern City of San Diego, and is bounded on the north by the City of Chula Vista, on the east by the community of Otay Mesa, on the south by Tijuana River Valley and the San Ysidro community, and on the west by the City of Imperial Beach.[109]

The Tijuana River-San Diego Connector is connected to the Tijuana River National Estuarine Reserve and is used heavily as a thoroughfare by residents, or is home to transients. The area is currently filled with trash, construction debris, invasive species, and urban runoff. The primary issue in this area is illegal dumping and trash in the waterway contributing to surface water and groundwater contamination, which also causes degradation of natural resources like the San Diego Bay. San Diego Bay is currently listed for several water quality impairments.

The project will remove trash and invasive species, followed by native revegetation with 1,000 native plants, construction of two vegetated bioswales, and installation of 3,000 pervious pavers that would help improve drainage in the area. The project will also involve hands-on community participation and environmental education to motivate local residents to modify behaviors that exacerbate pollution and water quality issues. Further, the project will include post-storm trash removal for three years. This project is designed to promote filtration of urban runoff through the use of pervious pavers and vegetated bioswales to reduce the flow of trash and pathogens into the San Diego Bay. A combination of construction projects and educational programs will teach residents about native and non-native plants and the importance of ecosystem conservation.

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[107] Pers comm. Joni Johnson, RCAC Engineer.
[108] California Department of Resources Recovery and Recycling. 2010. *Report of Trash, Waste Tire and Sediment Characterization Tijuana River Valley San Diego, California.*
[109] City of San Diego. 2015. *Community Profiles: Otay Mesa Nestor.* Available: http://www.sandiego.gov/planning/community/profiles/otaymesanestor/

Without-Project Conditions

Without the *Rural DAC Partnership Project – Phase III,* efforts to improve water systems in small (populations less than 10,000), rural, Tribal, and economically disadvantaged areas would be more difficult to implement. Without the project, RCAC would not provide technical and capacity-building support that is essential to overcome major obstacles that impede implementation of water projects in rural DACs. As such, without the project, the critical water and wastewater needs of the DACs benefitting from this project would not be met. If these needs are not met, water quality would continue to be at risk, human and environmental health would remain at risk, and anticipated physical benefits would not be obtained.

Without Components 6 and 7, the 120 residents of the Quiet Oaks Mobile Home Park and 100 residents of the Willowside Terrace Mobile Home Park would continue to be provided water that does not meet the primary MCL for nitrate. As substantially documented by DDW, high levels of nitrate (in excess of the MCL) can pose public health risks, especially to children and pregnant women. Rural DACs would remain at risk for public health issues or may be forced to spend their limited income on alternative water sources such as bottled water.

Without Components 1, 2 and 3, the DACs who would benefit from these projects would continue to have inefficient water storage facilities and distribution infrastructure and could experience public health issues associated with water shortages. Without Components 1, the 150 residents of the Pauma Reservation would continue to face water supply and public health issues associated with a leaking water storage tank. Water would continue to be wasted as a result of the leak and residents would continue to face impending water supply reliability issues associated with catastrophic failure of the leaking tank. Without Component 2, the 45 residents of the Campo Reservation would continue to face ongoing water supply shortages that force them to either go without water or spend their limited income on alternative water sources such as bottled water. Finally, without Component 3, the 130 residents of the San Pasqual Reservation would continue to use potable water purchased from VCMWD for all uses, including for outdoor irrigation. As such, the Tribe would continue to be reliant upon drought-susceptible imported water sources.

Although the remaining project components were not included in the quantified benefits analysis, failure to implement the proposed water and wastewater improvements would continue to stress these rural DAC communities. Without Component 4, the San Pasqual Tribe would continue to use traditional water meters, without access to water use data and associated incentives to conserve. Without Component 5, the La Jolla Tribe would continue to face frequent water shortage due to lack of water storage capacity. Without Component 8, the community of Julian would continue to receive groundwater supply that exceeds the secondary MCL for iron and manganese. Without Components 9 and 10, surface and groundwater quality in the Tijuana River Valley would remain degraded from ongoing trash and illegal dumping. Human and environmental health risks would continue unmitigated in these economically distressed areas.

Methods Used to Estimate the Physical Benefits

Primary Benefit - Water Quality

The primary benefit of Water Quality will come from the removal of an average of 108 mg/L of nitrate from potable water supplies. This number comes from two separate nitrate removal projects. In order to combine the benefits from these two projects, the average flow rate for each component had to be considered so that a weighted average water quality benefit could be calculated.

In Component 6, the Quiet Oaks Mobile Home Park currently has nitrate levels of 58 mg/L as reported by a local engineer.[110] The project would reduce nitrate levels from their current concentration to 30 mg/L using RO treatment, to ensure that residents receive water meeting the drinking water standard for nitrate of 45 mg/L. Once implemented, this project would reduce nitrate levels by 28 mg/L. There are currently 120 residents of the community that use approximately 120 gallons per capita per day (gpcd) of water.[111] In total, this translates to 19,896,128 liters per year. Taking into consideration the water use of residents, a total of -557,091,592 mg/year (or -28 mg/L) of nitrate will be removed as a result of the project.

[110] Pers comm. Joni Johnson, RCAC Engineer.
[111] Joni Johnson. *Rural DAC Partnership Project – Phase III Quantifiable Benefits Calculations.* April 22, 2014.

Baseline conditions for Component 6:

$$120\ people * 120\ gpcd * 365\frac{days}{yr} * 3.79\frac{L}{gal} *\ 58\frac{mg}{L} = 1{,}153{,}975{,}440\frac{mg}{yr}$$

With-project conditions for Component 6:

$$120\ people * 120\ gpcd * 365\frac{days}{yr} * 3.79\frac{L}{gal} *\ 30\frac{mg}{L} = 596{,}883{,}848\ \frac{mg}{yr}$$

With-project nitrate removal for Component 6:

$$1{,}153{,}975{,}440\frac{mg}{yr} -\ 596{,}883{,}848\frac{mg}{yr} = 557{,}091{,}592\frac{mg}{L}/36{,}476{,}235\frac{L}{yr} = 28\frac{mg}{L}$$

In Component 7, the Willowside Terrace Mobile Home Park currently has nitrate/nitrite levels of 46 mg/L as reported by a local engineer.[112] Converting this value to pure nitrate, the overall nitrate levels in the water are 204 mg/L. The project would connect residents to a municipal water system that has non-detectable levels of nitrates, effectively reducing nitrate levels from their current concentration to 0 mg/L. There are currently 100 residents of the community that use approximately 120 gpcd of water.[113] In total, this translates to 16,580,107 liters per year. Taking into consideration the water use of residents, a total of -3,377,604,634 mg/year (or -204 mg/L) of nitrate will be removed as a result of the project.

Baseline conditions for Component 7:

$$100\ people * 120\ gpcd * 365\frac{days}{yr} * 3.79\frac{L}{gal} *\ 204\frac{mg}{L} = 3{,}377{,}604{,}634\frac{mg}{yr}$$

With-project conditions for Component 7:

$100\ people * 120\ gpcd * 365\frac{days}{yr} * 3.79\frac{L}{gal} *\ 0\frac{mg}{L} = 0\frac{mg}{yr}$With-project nitrate removal for Component 7:

$$3{,}377{,}604{,}634\frac{mg}{year} -\ 0\frac{mg}{year} = 3{,}377{,}604{,}634\frac{mg}{year}/36{,}476{,}235\frac{liters}{year} = 204\frac{mg}{L}$$

Adding the nitrate savings for each project together, then accounting for the water use of each project, in total when both projects are implemented, the without-project (baseline) water quality is 124 mg/L and the with-project water quality is 16 mg/L, for a total water quality improvement of 108 mg/L.

Baseline conditions TOTAL:

$$1{,}153{,}975{,}440\frac{mg}{yr} + 3{,}377{,}604{,}634\frac{mg}{yr} = 4{,}531{,}580{,}074\frac{mg}{L}/36{,}476{,}235\frac{L}{yr} = 124\frac{mg}{L}$$

With-project conditions TOTAL:

$$596{,}883{,}848\frac{mg}{yr} + 0\frac{mg}{yr} = 596{,}883{,}848\frac{mg}{L}/36{,}476{,}235\frac{L}{yr} = 16\frac{mg}{L}$$

With-project nitrate removal TOTAL:

$$124\frac{mg}{L} - 16\frac{mg}{L} = \mathbf{108\frac{mg}{L}}\ \boldsymbol{reduction\ in\ nitrate}$$

[112] Pers comm. Joni Johnson, RCAC Engineer.
[113] Joni Johnson. *Rural DAC Partnership Project – Phase III Quantifiable Benefits Calculations.* April 22, 2014.

Secondary Benefit - Water Supply

The secondary benefit is the amount of water supply saved, produced, and recycled by Component 1, 2, and 3, respectively. For Component 1, the Pauma Reservation currently has a leaking tank that is leaking at an estimated rate of 2 gallons per minute (gpm) or 3.2 AFY. As a result of the project, this leak will no longer occur and 3.2 AFY of water will be saved.

$$2\frac{gal}{min} * 525{,}600\frac{min}{yr} = 1{,}051{,}200\frac{gal}{yr} * \frac{1\ AF}{325{,}851\ gal} = \mathbf{3.2\ AFY}$$

For Component 2, the Campo Reservation currently has a water supply deficit. As a result of the project, a well will be drilled that has a capacity of 15 gpm or 24.2 AFY. As a result of the project, this supply will be made available to the Tribe, so 24.2 AFY of water will be produced.

$$15\ \frac{gal}{min} * 525{,}600\frac{min}{yr} = 7{,}884{,}000\frac{gal}{yr} * \frac{1\ AF}{325{,}851\ gal} = \mathbf{24.2\ AFY}$$

For Component 3, the San Pasqual Tribe currently has wastewater available from the Valley View Casino, because the casino has an excess amount of recycled water that is not used. As a result of the project, recycled water will be made available to 45 homes. This analysis assumes that each household contains 2.5 people that use water at an average rate of 120 gpcd and that 35% of overall water use, or 1,724,625 gallons per year, is for outdoor irrigation.[114] As such, users use 4,927,500 gallons per year. Based upon previous experience implementing rural DAC recycled water systems, RCAC estimates that the recycled water project will provide 90% of the irrigation water used by households for a total recycled water use of 1,552,163 gallons per year (or 4.8 AFY) of water reused.

$$45\ homes * 2.5\frac{people}{home} * 120\ gpcd * 365\frac{days}{yr} = 4{,}927{,}500\frac{gal}{yr}$$

$$4{,}927{,}500\frac{gal}{yr} * 35\% = 1{,}724{,}625\frac{gal}{yr} * 90\% = 1{,}552{,}163\frac{gal}{yr} * \frac{1\ AF}{325{,}851\ gal} = \mathbf{4.8\ AFY}$$

In sum, the total amount of water supply benefits provided by Components 1, 2, and 3 is equal to the addition of each benefit for a total water supply saving of 32.2 AFY.

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

Attachment 3, Work Plan explains the work necessary to obtain the physical benefits described herein. The projects were all vetted by the Rural DAC Stakeholder Committee, which evaluated the projects substantially, including an assessment of work completed to date for each project. Each of the projects are in various developmental phases; however, work included in the Work Plan describes all work necessary to complete each component. Further, the project includes labor required by RCAC staff to provide technical and capacity-building support to ensure that each of the components is completed. Therefore, no additional facilities, policies, or actions are required to realize the benefits provided by the project.

Potential Adverse Physical Effects of the Project and Mitigation

There are no significant, long-term adverse physical effects anticipated from implementation of this project. There may be temporary effects associated with construction activities, such as temporary noise, traffic, and air quality impacts. However, all project components will be analyzed for potential environmental impacts such as those described above and mitigation will be implemented to reduce these impacts to less-than-significant levels. For temporary noise impacts, noise attenuation facilities will be erected or construction activities will be timed to reduce impacts to residents. For temporary traffic impacts, traffic control plans will be implemented to ensure that impacts are not significant and that any traffic closures do not impact emergency safety routes. For temporary air quality impacts, construction will take place in accordance with standards established by the San Diego Air Pollution Control District, which will ensure that long-term operational impacts do not occur.

[114] Joni Johnson. *Rural DAC Partnership Project – Phase III Quantifiable Benefits Calculations.* April 22, 2014.

Furthermore, RCAC will work with DACs to ensure that long-term operation of the projects is conducted in accordance with requisite regulations, and therefore will ensure that long-term adverse physical effects are not generated as a result of project implementation.

Long-Term Drought Preparedness

This project would effectively increase long-term drought preparedness in the project area by reducing potable water demands through implementation of Components 1, 3, 4, and 7. The project promotes drought preparedness in two of the ways described in in Table 1 of the *2015 Guidelines*: 1) promoting water conservation, conjunctive use, reuse, and recycling, and 2) establishing system interties.

Components 1, 3, and 4 will either conserve or reuse water. Component 1 will conserve 3.2 AFY on a long-term, permanent basis by replacing a leaking storage tank and therefore reducing water waste. Component 3 will reuse 4.8 AFY of water by implementing recycled water infrastructure that will allow Tribal residents to use available recycled water instead of potable water for outdoor irrigation. Component 4 will conserve water by implementing water meters that will increase operational efficiency and allow for leak detection that will help the San Pasqual Tribe save water on a long-term basis. Component 7 will establish a system intertie between the Willowside Terrace Mobile Home Park Community and the Padre Dam Municipal Water District, therefore ensuring long-term availability of municipal supplies for a disadvantaged community.

Combined, these efforts result in long-term reduction of potable water use by implementing projects that will conserve, reuse, and connect water users on a long-term basis. The project also lays the groundwork for future work efforts. As noted previously, this project is Phase III of ongoing efforts to improve water-related conditions in rural DACs in San Diego County. It is anticipated that the work completed through this phase will lead to additional projects in the future.

Direct Water-Related Benefit to DACs

The *Rural DAC Partnership Project – Phase III* specifically targets rural DACs throughout San Diego County. This project is a continuation of RCAC's *Rural DAC Partnership Project Phase I and Phase II*, both funded in earlier rounds of the Prop 84 grant program. These projects have collectively worked to meet the needs of rural DACs in the Region. The *2013 IRWM Plan* acknowledges that one of the greatest needs of rural DACs is technical support and capacity building to understand water-related issues and find long-term solutions. RCAC has completed multiple efforts throughout the San Diego Region to identify and address needs of rural DACs, with a focus on finding solutions to resolve issues associated with accessibility to clean drinking water and wastewater services. The components of the Rural *DAC Partnership Project – Phase III* were vetted by RCAC's DAC Stakeholder Committee, and explicitly selected because they would address at least one water-related need of a DAC. RCAC will provide technical assistance and capacity building support to ensure successful implementation of the ten components. RCAC has verified that 100% of the area served by the project is DAC. As shown in **Table 7-3** (see *Attachment 7*), this project will directly address nine rural DAC needs. **Table 2-28** provides information about the specific DAC water-related issue(s) that will be resolved by implementation of the *Rural DAC Partnership Project – Phase III.*

Table 2-28: Brief Description of DAC Issues Addressed by *Rural DAC Partnership Project – Phase III*

Brief Description of DAC Water-Related Needs Addressed by Project
Component 1: Pauma Reservation Water System • *Need*: leaking water storage tank built in 1995 requires Tribe to pump more water than needed. Leak also poses a public health risk associated with potential contamination and increases chance of tank failure. • *Resolution*: replace leaking storage tank with new 111,000 gallon tank
Component 2: Campo Reservation South System • *Need*: Tribe has struggled with water supply shortages for several years and needs a new water supply source. • *Resolution*: install a new well and pipelines to provide additional water supply
Component 3: San Pasqual Tribe Reclaimed Water Expansion • *Need*: Tribe relies almost solely on imported water from a municipal agency, and therefore does not consider its water supplies to be reliable on a long-term basis. • *Resolution*: install 9,100 linear feet of reclaimed water pipeline to expand recycled water use (more reliable water supply that conserves potable water for potable needs)
Component 4: San Pasqual Tribe Water Meters • *Need*: Tribe uses manual-read meters, and therefore is not efficient at leak detection as meters are read on a monthly basis. • *Resolution*: install automatic meters to enable residents to better manage water use, and detect leaks early to reduce water waste
Component 5: La Jolla Tribe Water Tank • *Need*: Tribe has insufficient water storage capacity and frequently experiences water shortages. • *Resolution*: install a new 80,000 gallon water storage tank to increase storage capacity
Component 6: Quiet Oaks Mobile Home Park Nitrate Treatment • *Need*: groundwater exceeds drinking water MCL for nitrate • *Resolution*: install a nitrate treatment system to remove excess nitrate and meet drinking water MCL
Component 7: Willowside Terrace Water System Connection • *Need*: groundwater exceeds drinking water MCL for nitrate • *Resolution*: connect community to Padre Dam MWD's system; Padre Dam MWD provides water that meets all applicable MCLs, including nitrate
Component 8: Richardson Beardsley Park Treatment • *Need*: groundwater exceeds secondary MCL for iron and manganese • *Resolution*: install an iron and manganese treatment system which will improve water quality such that this secondary MCL is met
Component 9: Smuggler's Gulch Floating Trash Booms • *Need*: trash presents serious water quality and flood issues • *Resolution*: install trash removal system at Smuggler's Gulch to reduce trash-related water quality and flood issues
Component 10: Tijuana River-San Diego Connector Restoration Project • *Need*: illegal dumping and trash present surface and groundwater quality issues in a seasonal stream • *Resolution*: conduct restoration, including bioswales and pervious surfaces, plantings, and education to reduce pollutants from entering surface and groundwater, and reduce improper trash disposal

Project Performance Monitoring Plan

Benefits will begin accruing as soon as project construction/implementation is complete for each component. Due to the small-scale nature of the project components, interim targets will not be provided; rather, RCAC will work with each DAC to ensure projects are completed and that monitoring efforts are established once projects are completed.

Table 2-29, below, describes the methods that will be used to measure the quantified benefits of this project and described in the sections above. Note that these methods may change, pending development of the Project Performance Monitoring Plan under Task 9 of the Work Plan (see *Attachment 3 Work Plan*), and are presented as one option for measuring progress towards achieving the claimed benefits. Measurable targets for each benefit are also presented in the table.

RCAC will continue to provide technical support, and will work with project proponents to produce Project Completion Reports (during contract term) and Post-Performance Reports (after contract term) to DWR per terms of the Grant Agreement.

Table 2-29: Project Monitoring for *Rural Disadvantaged Community Partnership Project – Phase III*

Proposed Physical Benefits	Measurement Tools and Methods	Targets
Water Quality	*Component 6*: The Quiet Oaks Mobile Home Park supplies water to residents via one well and regular monitoring takes place to determine water quality for local residents. Once the project is completed, RCAC will work with the community to ensure that monthly water quality samples are taken and reported in accordance with applicable regulations (e.g., monthly for bacteria, annually for nitrate). Data will be collected by RCAC through standard water quality monitoring methods. *Component 7*: The Willowside Terrace Water System will be connected to the Padre Dam MWD water system. Padre Dam MWD compiles annual *Water Quality Reports* for public dissemination. RCAC will compile data about the water quality of water provided to residents of Willowside Terrace from the Padre Dam MWD *Water Quality Reports*.	Reaching these targets indicates a total reduction of 108 mg/L nitrate: • 30 mg/L nitrate for Quiet Oaks Mobile Home Park water • 0 mg/L (non-detect) nitrate for Padre Dam MWD water
Water Supply	*Component 1*: IHS and RCAC will produce an Engineers Certification of completion. This certification will demonstrate that the new tank was constructed in accordance with design specifications. Given that there is well-established data of the tank leaking (3.2 AFY), it is reasonable to assume that once an Engineers Certification of completion is received, the leak issue and water waste associated with the leak will be resolved. Therefore, the final Engineers Certification of completion will be the basis for demonstrating that the project is performing as planned. RCAC will continue to report the status of the project for 10 years following completion per DWR standards; these Post-Performance Reports will explain the current status of the tank and indicate any leaks or associated issues if they arise. *Component 2*: IHS and RCAC will produce an Engineers Certification of completion. This certification will demonstrate that the new groundwater well was constructed in accordance with design specifications. Given that design specifications will require construction of a 15 gpm well, it is reasonable to assume that up to 24.2 AFY of groundwater will be produced and supplied to the Tribe. RCAC will work with the Tribe to collect and submit annual pumping logs for the new well. RCAC will continue to report the status of the project for 10 years following completion per DWR standards; these Post-Performance Reports will explain the current status of the well and indicate any changes in capacity. *Component 3*: BIA and RCAC will produce an Engineers Certification of completion and the La Jolla Band will ensure that all connections are metered. RCAC will work with the La Jolla Band to accumulate recycled water meter data that will demonstrate annual recycled water use. RCAC will continue to report the status of the project for ten years following completion per DWR standards; these Post-Performance Reports will explain the annual recycled water use and any changes in use that may arise.	Total = 32.2 AFY: • 3.2 AFY for the Pauma Reservation water system • 24.2 AFY for the Campo Reservation South water system • 4.8 AFY for the San Pasqual Reservation recycled water system

Cost Effectiveness Analysis

Through implementation of Components 1, 2, 3, 6, and 7, the *Rural Disadvantaged Community Partnership Project – Phase III* will achieve two quantifiable physical benefits described in detail in the sections above, and summarized in **Table 2-26 and 2-27**. During project development, alternatives to the preferred project included in this application were considered and, ultimately, rejected. Components 4, 5, 8, 9, and 10 are important to provide safe and reliable water to DACs, but did not contribute to the two selected benefits that were quantified for this project, and are therefore not included in this cost-effectiveness analysis. **Table 2-30** provides a cost effectiveness analysis consistent with Table 7 of the *2015 PSP*.

Table 2-30: Cost Effective Analysis ***Project Name:* Rural Disadvantaged Community Partnership Project – Phase III**	
Question 1 Physical Benefits Summary	*Types of benefits provided as shown in Table 2-25 and 2-26.* Benefit 1: Water Quality – 108 mg/L reduction in nitrate levels through Component 6 and 7 Benefit 2: Water Supply – 32.2 AFY conserved, produced, and reused water through Component 1, 2, and 3
Question 2 Alternatives Considered	*Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?* Yes for Component 1 No for Component 2, 3, 6, and 7
	If no, why? *Component 2:* The Campo Reservation is located in an isolated, rural portion of San Diego County at substantial distance from municipal water agencies. The entire Campo area is served water by groundwater and there are no alternative water supply options. While the Tribal members could potentially use bottled water as a supply alternative, this alternative was not formally considered as it is not sustainable or cost-effective for an economically disadvantaged Tribal community. *Component 3:* Existing conditions could effectively be considered as an alternative, because currently the San Pasqual Tribe relies upon imported water purchased by VCMWD. However, this alternative would not meet the project goals because it would not increase water supply reliability for the Tribe. Given the location of the Tribe, no other feasible alternatives exist to increase water reuse and provide the benefits described herein. *Component 6*: The Quiet Oaks Mobile Home Park is located in a rural portion of San Diego County at substantial distance from municipal water agencies. The entire Warner Springs area is served water by groundwater and there are no alternative water supply options. While the local residents of the mobile home park could potentially use bottled water as a supply alternative, this alternative was not formally considered as it is not sustainable or cost-effective for an economically disadvantaged rural community. *Component 7:* The Willowside Terrace Mobile Home Park is located in the service area of a municipal water agency, within 6,500 feet of an existing water main. Given the close proximity to an existing municipal water main, the most feasible long-term solution for addressing water quality issues for this community is establishing a connection to the nearby municipal system. While onsite treatment methods were not formally analyzed, it is well-known that establishing a municipal connection will ensure that residents are provided clean drinking water on a long-term basis.

Table 2-30: Cost Effective Analysis ***Project Name:* Rural Disadvantaged Community Partnership Project – Phase III**	
	If yes, list the methods (including the proposed project) and estimated costs *Component 1:* A Preliminary Engineering Report (PER) was completed by Indian Health Services in 2014. The PER evaluated three alternatives. Below are the three alternatives and estimated costs: • No Action: Leave existing leaking tank and head towards tank failure as the tank continues to corrode and degrade. Total costs would be associated with operations and maintenance (O&M) and would total $11,747 per year. • Refurbish Existing Tank: Leave existing leaking tank and rehabilitate the tank to correct existing leaks within the shell. Total life cycle costs were estimated by IHS to be $532,913. • Proposed Project – Install a New Tank: Remove existing tank and replace with a new steel tank. Total life cycle costs were estimated by IHS to be $542,313.
Question 3 Preferred Alternative	*If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.* There is no least cost alternative identified for Components 2, 3, 6, and 7. The projects identified in this project are known drinking water supply and quality issues and have been specifically selected for funding by IHS, BIA, SWRCB, and DEH, among with stakeholders. *Component 1:* The PER for the project concluded that while installation of a new tank vs. rehabilitation of the existing tank would not be the least cost alternative, it is the preferred alternative. IHS concluded that it would likely be more economical on a long-term basis to replace the tank than to rehabilitate the tank, even though the cost estimate for replacement is slightly higher. This is because the existing tank is 19 years old at present day, and could potentially be susceptible to additional failures not captured in the cost analysis. As such, the proposed project would provide an additional accomplishment of providing a long-term, reliable water supply and ensuring Tribal members that the community will be supplied with safe drinking water.