A7. Technical Justification

Attachment 7 presents the technical justifications with respect to claimed physical benefits for four out of five projects proposed for implementation in the Santa Barbara County Region Proposition 84 (Prop 84) Integrated Regional Water Management (IRWM) Implementation Grant Application – Round 2 (Proposal). Project 5, which provides funding for grant administration, is not required to complete this attachment.

Physical benefits are the expected measureable accomplishments of the projects and each of the physical benefits of the individual projects is adequately supported by technical reports and studies. Multiple projects provide the physical benefits of energy use reduction, groundwater quality improvement, groundwater recharge, and recycled water supply.

Narrative descriptions of the following are provided to demonstrate how each project achieves the physical benefits:

- Recent and historical conditions that provide background for the physical benefits to be claimed
- Without-project conditions
- Project description and its relationship to other Proposal projects
- Methods used to estimate physical benefits
- New facilities, policies, and actions required to obtain physical benefits
- Uncertainty of the benefits
- Potential adverse physical effects.

Department of Water Resources (DWR) Table 9, Annual Project Physical Benefits, is completed for each of the four projects' physical benefits. Table 9 presents the quantifiable benefits for each of the identified physical benefits under the without- and with-project conditions.

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Overview

The Recycled Water Enhancement Project (Project 1) will replace the existing failing tertiary filtration system at the El Estero Wastewater Treatment Plant (El Estero WWTP) with full microfiltration treatment, allowing the City of Santa Barbara (City) to restore and improve recycled water service. The existing system has reached the end of its useful life and is not currently operating. That means recycled water demands now have to be met using potable water.

Once on-line, Project 1 will not only meet existing recycled water demands of 800 acre-feet per year (AFY) but will provide supply capacity to expand the City's recycled water demands to 1,400 AFY by 2035 (Integrated Regional Water Management [IRWM] Plan 2013 goal). The 1,400 AFY by 2035 goal is very realistic and includes approximately 300 AFY for current El Estero process water demands as well as 300 AFY for additional customer demands that have been identified in several studies (see Appendix 3-1 for South Coast Recycled Water Development Plan, Draft. March 2013; City of Santa Barbara Long-Term Water Supply Plan. 2011; and Carollo Engineers, City of Santa Barbara Water Supply Planning Study. 2009). This Project is not only essential to meeting the IRWM Plan 2013 goal but is essential to the City being in compliance with 20x2020 water conservation mandates. Project 1 is consistent with the City's Long-Term Water Supply Plan 2011 and the City of Santa Barbara Urban Water Management Plan, 2010 (see Appendix 3-1), as the use of recycled water serves as a drought buffer and reduces reliance on imported State Water Project (SWP) water.

This attachment provides information and backup documentation for the claimed physical benefits (i.e., technical basis of the project and capability of yielding the benefits) for Project 1. The Project claims the physical benefits of increased recycled water supply and improved water quality (see Attachment 8 for detailed information).

The Project also will reduce energy use and avoid greenhouse gas emissions but this benefit is not monetized in Attachment 8 and therefore not included as a benefit in this attachment. Differences in energy cost are captured by the cost estimate for alternative water supply in Attachment 8 and the reduction in greenhouse gas is difficult as much of the SWP energy load is met by hydropower. However, there is less energy used to produce tertiary recycled water (approximately 1340 kilowatt hours (kWh) per acre-foot is used for treatment and distribution) than is used to export SWP (3250 kWh per acre-foot is used for pumping, treatment, and distribution) from the Delta to Santa Barbara County (see Appendix 3-1, Moffit and Mosley. May 2008).

Project Physical Benefits

The following is a list of each of the Project benefits, the measure of benefit claimed and the technical justification of the physical benefit.

FIGURE 7.1-1

Summary of Physical Benefits

Physical Benefit	Unit	Technical Justification
Water supply recycled	2.5 million gallons per day (mgd) of recycled water supply (to meet existing recycled water demands of 800 AFY that are expected to grow to 1,400 AFY by 2035 as the plant is configured to treat 1,400 AFY).	CDM Smith. (February 19, 2013). *El Estero Wastewater Treatment Plant Tertiary Filtration Facility, Engineering Assessment and Preliminary Design Services, Tertiary Filtration Facility Preliminary Design Report*. City of Santa Barbara. Section 4.2.3. City of Santa Barbara. (June, 2011). *Long-Term Water Supply Plan*. City of Santa Barbara Water Resources Division, Public Works Department. Pages 10-11, 21, and 25. City of Santa Barbara (June 2011; Addendum June 2012). *Urban Water Management Plan (2010 Update)*. City of Santa Barbara Water Resources Division, Public Works Department. Pages 27-28. *South Coast Recycled Water Development Plan, Santa Barbara County IRWM Plan 2013*, Section 6.3.2.
Water quality Improvement	Project will allow the City to reliably meet Title 22 recycled water standards for turbidity (<0.5 NTU for microfiltration technology)	CDM Smith. (February 19, 2013). *El Estero Wastewater Treatment Plant Tertiary Filtration Facility, Engineering Assessment and Preliminary Design Services, Tertiary Filtration Facility Preliminary Design Report*. City of Santa Barbara. Sections 1, 4, and Appendix B-3. South Coast Recycled Water Development Plan, Santa Barbara County IRWM Plan 2013, section 6.4. Carollo Engineers. (July 2008). *El Estero Wastewater Treatment Plant, Tertiary Filter Rehabilitation Project, Final Technical Memorandum*. City of Santa Barbara. Pages 24, 51, and 55.

Recent and Historical Conditions

Although the City has been using recycled water since 1989, the existing tertiary treatment system at the El Estero WWTP has reached the end of its useful life and is not currently operating. Therefore, recycled water demands have to be met using potable water. Once on-line, the Recycled Water Enhancement Project will not only meet existing demands of 800 AFY but will allow expansion to 1,400 AFY by 2035.

Effluent from existing recycled water treatment facilities does not reliably meet Title 22 recycled water quality standards for turbidity without blending with potable water. In addition, the recycled water effluent is high in total dissolved solids (TDS) and chloride. Due to these water quality issues, potable water is used to meet non-potable demands (e.g. irrigation). Project 1 will replace the existing failing tertiary filtration system,

allowing the City to restore and improve recycled water service. Recycled water is used to maintain open spaces, including the public golf course, city schools, public parks, medians, highways, and landscaping.

Description and Estimation of Without-Project Conditions

Without the Project, the City will not be able to provide recycled water supply. Recycled water supply is critical to the City's water supply reliability. Recycled water is available every year and allows the City to build cumulative storage in its surface reservoirs and groundwater. For every acre-foot of recycled water produced, an acre-foot of potable water can be stored. By preserving potable water supplies, potential supply shortages are reduced during extended drought periods, and groundwater basins are protected from overdraft and seawater intrusion.

Without recycled water supplies, the City is at risk of greater shortages during extended drought periods, and would be more reliant on imported water, groundwater, and other alternative supplies such as ocean desalination. Furthermore, imported water and ocean desalination are more energy-intensive than recycled water.

Project Relationship to Other Projects

Project 1 is synergetic with other efforts throughout the Santa Barbara County IRWM Region (Region) to augment water supplies through use of recycled water and to increase infrastructure reliability. The following identifies how Project 1 relates to other projects in this proposal.

- All four projects in this proposal seek to increase local water supply reliability by augmenting water supplies and increasing infrastructure reliability. Project 1 increases water supply reliability by producing recycled water and updating obsolete infrastructure. Project 2 seeks to avoid disruption to groundwater recharge operations. Project 3 seeks to increase the use of recycled water. Project 4, in a disadvantaged community, will update infrastructure at its wastewater treatment plant which will enable the City of Guadalupe to introduce recycled water to the area served by the plant.
- Both Project 1 and Project 3 (Recycled Water Expansion and Golf Course Retrofit Project, Laguna County Sanitation District) move the IRWM Region toward reaching its goal of recycling a total of 7,035 AFY by 2035.
- Both Project 1 and Project 3 (Recycled Water Expansion and Golf Course Retrofit Project, Laguna County Sanitation District) link with the state's "20x2020" goals and the CALFED Water Supply Objective, as they will reduce dependence on imported water from the State Water Project during times of drought.

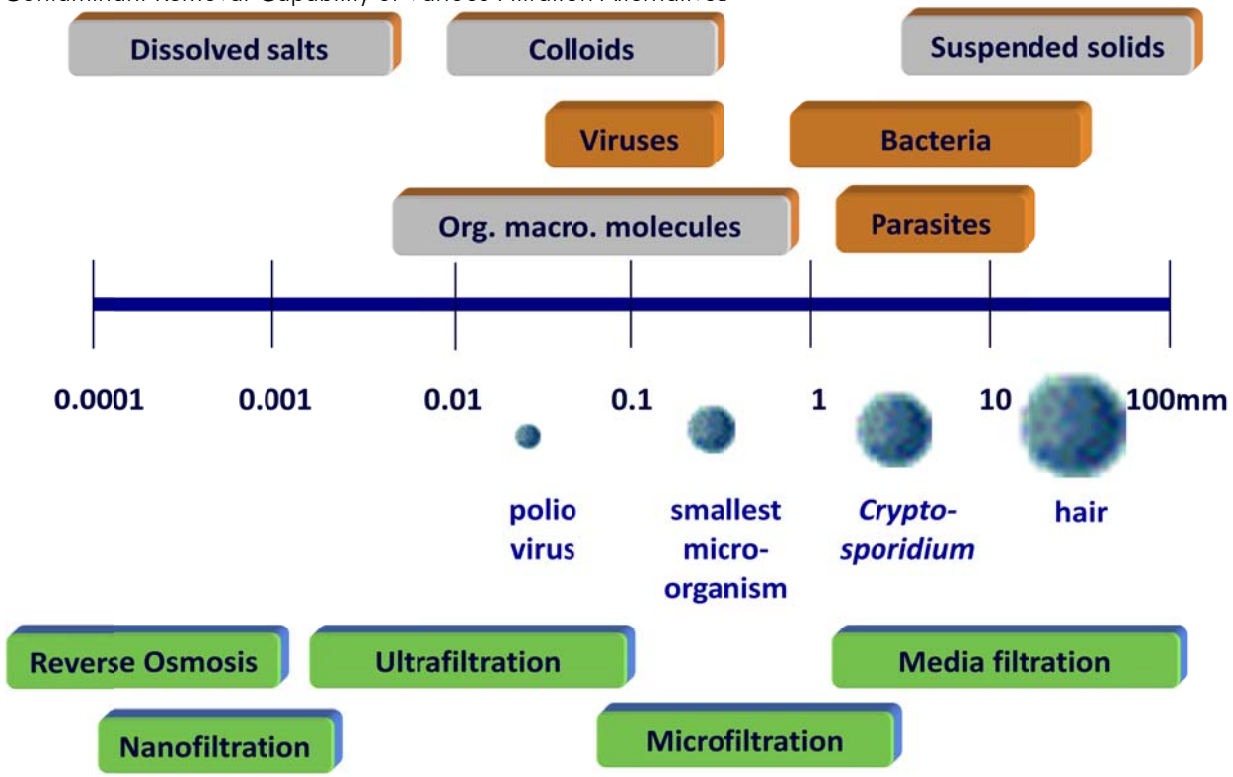
Methods Used to Estimate Physical Benefits

To replace the existing failing tertiary filtration system, the City considered several filtration technology alternatives and analyzed them against multiple evaluation criteria (including

operation and maintenance, safety, site layout, reduction in turbidity and TDS, life-cycle cost, and others). Full microfiltration technology was determined to be the preferred alternative to meet Title 22 recycled water quality standards. Membrane filtration has been successfully employed for several years in the treatment of secondary wastewater effluent.

Microfiltration (MF) technology is a process often associated with the term "membrane filtration." The membranes provide a physical barrier, resulting in more complete rejection of particles greater than a specified size (on the order of 0.1 micro-meters). Membranes of this kind remove particles down to such small sizes that they both remove pathogens and also particles that adversely affect the aesthetic appearance of water. Refer to Figure 7.1-1 for the contaminant removal capability of microfiltration compared with other filtration technology alternatives.

FIGURE 7.1-2
Contaminant Removal Capability of Various Filtration Alternatives



To appropriately size a microfiltration system, both the available influent wastewater flows and projected recycled water demands must be considered. A detailed facility sizing analysis was conducted as part of the CDM Smith, 2013 El Estero Wastewater Treatment Plant Tertiary Filtration Facility Preliminary Design Report, February 19, 2013 (see Appendix 3-1).

Average demands on the existing recycled water distribution system are currently about 800 AFY, and are expected to grow to 1,400 AFY by 2035 [South Coast Recycled Water Development Plan (Draft) (2013)]. However, recycled water demand is not constant

throughout the year; there are typically higher demands during the summer peak irrigation season. In addition to fluctuating seasonal demands, the primary concern for available water for the recycled water system is the ability to meet recycled water demands at night when influent flows to the wastewater treatment plant are low. To determine the amount of flow available for the recycled water system during these low flow conditions, effluent flow data from the El Estero Wastewater Treatment Plant for April-May 2011 and July-August 2012 were analyzed. These months were used since they are typically the higher demand months, instead of winter months when demand was lower. The proposed tertiary filtration facilities (2.5 mgd capacity) have been sized to accommodate fluctuating daily recycled water demands and wastewater influent flow conditions.

New Facilities, Policies, and Action Required to Obtain Physical Benefit

The existing tertiary filtration system will be replaced with microfiltration technology. This will restore and enhance the City's recycled water supply, helping to achieve existing policies adopted in the City of Santa Barbara's 2011 Long-Tterm Water Supply Plan and 2010 Urban Water Management Plan.

Furthermore, the filtration project will enhance water quality and reliably meet water quality criteria specified in Title 22, Division 4 of the California Code of Regulations. The Central Coast Region of the RWQCB lists the current recycled water requirements in the Waste Discharge Requirements and Master Reclamation Permit (WDR/MRP) Order No. 97-44. The WDR/MRP will need to be modified as part of the project (to reflect reclamation specifications for microfiltration technology and to obtain authorization for additional approved uses of recycled water).

Uncertainties in Physical Benefits

With the Project, the City will have a reliable recycled water supply that will offset demands on potable water resources. The proposed microfiltration technology has been successfully employed for several years and is a proven technology. The Carollo Engineers, July 2008, *El Estero Wastewater Treatment Plant, Tertiary Filter Rehabilitation Project, Final Technical Memorandum* (pages 5-9) evaluates filter upgrade and demineralization alternatives and provided recommendations for microfiltration technology with reverse osmosis pending future water resources management decisions. Microfiltration is a proven technology for meeting Title 22 recycled water standards, as referenced in the CDM Smith, February 2013, *El Estero Wastewater Treatment Plant Tertiary Filtration Facility, Tertiary Filtration Facility Preliminary Design Report*, Section 1 and Appendix B-3 (see Appendix 3-1).

Potential Adverse Physical Effects

None.

Annual Physical Benefit

The following figures provide the quantifiable benefits for each of the physical benefits identified above for the without- and with-project conditions.

FIGURE 7.1-3
Physical Benefit – Recycled Water Supply

Recycled Water Enhancement Project, City of Santa Barbara Physical Benefit: Water Supply Recycled Measure of Benefit Claimed – acre-feet per year (AFY)			
Year	Physical Benefits		
	Without Project	With Project	Difference
2017	0 AFY	905 AFY	905 AFY
2022	0 AFY	980 AFY	980 AFY
2027	0 AFY	1055 AFY	1055 AFY
2032	0 AFY	1220 AFY	1220 AFY
2037	0 AFY	1400 AFY	1400 AFY
Last Year of Project Life (2039)	0 AFY	1,400 AFY	1,400 AFY

Supporting sources and references that support the numbers listed in this figure include:

CDM Smith. (February 19, 2013). *El Estero Wastewater Treatment Plant Tertiary Filtration Facility, Engineering Assessment and Preliminary Design Services, Tertiary Filtration Facility Preliminary Design Report.* City of Santa Barbara.

City of Santa Barbara. (June, 2011). *Long-Term Water Supply Plan*. City of Santa Barbara Water Resources Division, Public Works Department.

City of Santa Barbara (June 2011; Addendum June 2012). *Urban Water Management Plan (2010 Update)*. City of Santa Barbara Water Resources Division, Public Works Department.

FIGURE 7.1-4
Physical Benefit – Water Quality Improvement

Recycled Water Enhancement Project, City of Santa Barbara Physical Benefit: Water Quality Improvement Measure of Benefit Claimed - Nephelometric Turbidity Units (NTU)			
Years	Physical Benefits		
	Without Project	With Project	Difference
2017 - 2041	Turbidity > 2 NTU; Requires blending	Turbidity < 0.5 NTU and removal of pathogens Microfiltration treatment technology in place to produce Title 22 recycled water	Excellent recycled water quality that meets Title 22 requirements for turbidity without blending

Supporting sources and references that support the numbers listed in this figure:

CDM Smith. (February 19, 2013). *El Estero Wastewater Treatment Plant Tertiary Filtration Facility, Engineering Assessment and Preliminary Design Services, Tertiary Filtration Facility Preliminary Design Report.* City of Santa Barbara.

City of Santa Barbara. (June, 2011). *Long-Term Water Supply Plan*. City of Santa Barbara Water Resources Division, Public Works Department.

City of Santa Barbara (June 2011; Addendum June 2012). *Urban Water Management Plan (2010 Update)*. City of Santa Barbara Water Resources Division, Public Works Department.

Project 2: Twitchell Reservoir Sedimentation Management and Groundwater Recharge Project, Santa Maria Valley Water Conservation District

This section provides a discussion of the technical justification for the physical benefits of the Twitchell Reservoir Sedimentation Management and Groundwater Recharge Project, Santa Maria Valley Water Conservation District (Project 2 or Project). This section references all the reports and technical memoranda that form the foundation upon which the physical benefits have been derived.

The Project consists of the removal approximately 9,000 cubic yards of sediment that has accumulated in the Reservoir. Currently, water from the Reservoir drains through the intake structure of the outlet works to a tunnel under the Dam and discharges to a stilling basin and the Cuyama River. Reservoir operators have experienced significant sediment buildup in the intake structure of the outlet works in the past and predict that sediment will continue to impact the river and habitat areas, impact the outlet tunnel, and severely disrupt recharge operations.

Project Physical Benefits

There are four physical benefits provided by the Project. Each physical benefit is summarized in Figure 7.2-1 and categorized into the type of physical benefit, how the benefit is being measured, and the document(s) that provides the justification of the physical benefit. The supporting documents can be found in Appendix 7-2.

FIGURE 7.2-1
Summary of Physical Benefits

	Type of Physical Benefit	Unit of Measurement	Technical Justification
1	Groundwater Recharge	Acre-feet per year (AFY)	*Development of a Numerical Ground-Water Flow Model and Assessment of Ground-Water Basin Yield, Santa Maria Valley Ground-Water Basin*. The results from the *Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies, and Disposition* detail the level of the water in the Santa Maria Groundwater Basin (Basin). This information is used to quantify the quantity of water in the Basin and the recharge that has occurred over the last year.

FIGURE 7.2-1
Summary of Physical Benefits

	Type of Physical Benefit	Unit of Measurement	Technical Justification
2	Groundwater Quality Improvement	mg/L of Nitrate (as $NO3^-$) µmho/cm of specific conductance	The results from the *Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies, and Disposition* detail the quality of water at different locations in the groundwater basin. This information is used to quantify the quality of water is being improved by the releases from Twitchell Reservoir.
3	Flood Management Improvement	Acres of flood damage	Figure 2.2-1a in the 2010 *Twitchell Project Manual* (Appendix 3-2) provides data about the flood control pool storage volume in the Reservoir, which contributes to the frequency of ordered releases.
4	Habitat Protection	Acres of sensitive habitat	*Biological Assessment for the Twitchell Dam Watercourse Project.* *Biological Resources Assessment, Twitchell Dam Dredging Project, San Luis Obispo County.*

Recent and Historical Conditions

Sedimentation has reduced the capacity of the Twitchell Reservoir (Reservoir) and has impacted the functionality of the outlet works. In 2000, sediment removal was conducted at the upstream inlet structure, downstream stilling basin, and the Cuyama River Channel after a large storm in 1998 brought huge amounts of sediment into the Reservoir. An even larger sediment removal project was conducted in 2010 after an annual flushing of Twitchell Dam (Dam) brought an excessive volume of sediment that entered the 1,200-foot long, 16-foot diameter Dam tunnel and caused tunnel clearing work blockage. The project took approximately five months to complete. Therefore, considerable time, money, and resources have been spent in recent years to clean up the outlet works and downstream area.

When sediment reduces the amount of water being released from the Reservoir, the groundwater is not recharged with the expected 32,000 acre-feet per year of water, as calculated in the *Development of a Numerical Ground-Water Flow Model and Assessment of Ground-Water Basin Yield* report. This reduces the quantity and quality of water in the Santa Maria Valley Groundwater Basin (Basin). Additionally, a decrease in water released from the Reservoir may theoretically lead to an increased frequency of large, uncontrolled releases of water. This may cause significant flood damage to the downstream properties and inundate the habitats of important species, including the California red-legged frog, Southwestern pond turtle, and coast horned lizard.

Description and Estimation of Without-Project Conditions

Without the Project, the following detrimental consequences are likely to occur:

- Decrease or loss of groundwater recharge due to the accumulation of sediment in the Cuyama and Santa Maria Rivers
- Poorer groundwater quality due to significant decrease of natural rainwater released from the Reservoir, which help to improves the Basin's water quality
- Accumulation of sediment in the Dam tunnel
- Sediment obstruction in the Dam outlet works
- Loss of flood control and management operational flexibility due to sediment obstruction in the Dam outlet works
- Damage to habitats of federally threatened species and California Species of Special Concern due to accumulation of settled sediment in the Cuyama River

Project Relationship to Other Projects

Project 2 provides synergies with other projects in this Proposal. Project 2 is integrated with the Recycled Water Enhancement Project, City of Santa Barbara (Project 1) as they both strive to improve operational efficiency, improve water quality, and increase water supplies. Lastly, Project 2 and the Secondary Treatment Reliability Project, City of Guadalupe (Project 4) both aim to improve the Basin's water quality and operational efficiency and infrastructure.

Methods Used to Estimate Physical Benefits

Listed in Figure 7.2-2 are specific engineering studies and documents consulted that substantiate the associated physical benefits of the Project.

FIGURE 7.2-2
Basis of Physical Benefits

Document	Date of Completion	Proposal Location
Luhdorff and Scalmanini, Consulting Engineers. 2000. *Development of a Numerical Ground-Water Flow Model and Assessment of Ground-Water Basin Yield, Santa Maria Valley Ground-Water Basin*. Prepared for the Santa Maria Valley Water Conservation District. March 2000.	March 2000	Appendix 3-2
Santa Maria Valley Water Conservation District v. City of Santa Maria, et al. Superior Court of the State of California, County of Santa Clara, June 30, 2005. Lead Case No. CV770214. Stipulation for the Santa Maria Valley Water Conservation District v. City of Santa Maria, et al.	June 2005	Appendix 3-2
Althouse and Meade Inc. 2008. *Biological Assessment for the Twitchell Dam Watercourse Project*. APN 014-271-031. Prepared for the Santa	September 2008	Appendix 7-2

FIGURE 7.2-2
Basis of Physical Benefits

Document	Date of Completion	Proposal Location
Maria Water Conservation District. Paso Robles, Calif.: Althouse and Meade Inc. September 2008.		
Luhdorff and Scalmanini, Consulting Engineers. 2012. *2011 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition; Santa Maria Valley Management Area*. April 2012.	April 2012	Appendix 3-2
Rincon Consultants Inc. 2013. *Urban Planning Concepts Twitchell Dam Dredging Project Biological Resources Assessment*. Prepared for the Santa Maria Water Conservation District. Santa Maria, Calif.: Rincon Consultants Inc. January 2013.	January 2013	Appendix 7-2

New Facilities, Policies, and Action Required to Obtain Physical Benefit

Obtaining the physical benefits does not require new facilities, policies, and actions.

Uncertainties in Physical Benefits

A major uncertainty is the number of years that the Project's strategic sediment removal will be effective. If more fires occur in the tributary area of the Reservoir, combined with a big rainfall year, the need for major sedimentation management may arise earlier than expected.

There are some other uncertainties associated with the physical benefits, including climate change, which affects the frequency and magnitude of flood events, and financial constraints that could reduce the partnering agencies' ability to follow through with the Project. For the Project, however, matching funds are committed, and there is great certainty that this project will be completed.

Potential Adverse Physical Effects

Adverse physical effects will be temporary and will be mitigated as listed in the Mitigated Negative Declaration (Appendix 3-2). Sediment to be removed from the Reservoir will be stockpiled downstream in an area outside of the floodplain. The sediment will be placed in the stockpile per the Grading and Drainage Plan and seeded after the project to retain it in place.

Annual Physical Benefit

DWR Table 9, provided as Figure 7.2-3, shows the possible negative impact of losing the groundwater recharge physical benefit of the Reservoir. Without the project, by the year 2018, the Santa Maria Groundwater Basin will be losing 32,000 acre-feet of much-needed groundwater recharge annually.

FIGURE 7.2-3
Annual Physical Benefits -Groundwater Recharge

Project Name: Twitchell Reservoir Sedimentation Management and Groundwater Recharge Project, Santa Maria Valley Water Conservation District

Physical Benefit: Groundwater Recharge

Measure of Benefit Claimed: acre-feet of groundwater recharge

Year	Physical Benefits		
	Without Project	With Project	Difference
2012	32,000	32,000	0
2013	23,548	23,548	0
2014	19,328	30,698	-11,370
2015	27,115	30,708	-3,593
2016	29,691	30,699	-1,008
2017	30,475	30,698	-223
2018	30,666	30,707	-41
2019	30,700	30,706	-6
2020	30,696	30,696	0
2021	30,710	30,710	0
2022	30,703	30,703	0
2023	30,698	30,698	0
2024	30,687	30,687	0
2025	30,698	30,698	0
2026	30,694	30,694	0
2027	30,693	30,693	0
2028	30,700	30,700	0
2029	30,694	30,694	0
2030	30,699	30,699	0
2031	30,697	30,697	0
2032	30,705	30,705	0
2033	30,702	30,702	0

Comments:
The with-project physical benefit value is supported on page 23 of the Development of a Numerical Ground-Water Flow Model and Assessment of Ground-Water Basin Yield report and page 12 of the Stipulation for the Santa Maria Valley Water Conservation District v. City of Santa Maria, et al.
Expected values were calculated from a 10,000 draw Monte Carlo simulation using Frontline System's Risk Solver Platform version 12.

The groundwater quality physical benefit cannot be simply quantified in tabular format because there is significant variation in water quality depending upon depth and location of the monitoring wells throughout the Basin. Every year, the *Santa Maria Valley Management Area Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition* (Annual Report) provides a quantitative and qualitative assessment of the water quality in the basin (Appendix 3-2). In addition, with natural

variability and various sources and sinks of water quality constituents, it is impossible to accurately predict the potential increase in chemical constituents for the without-project condition.

Regarding the flood management physical benefit, the Project decreases the likelihood of an ordered release that can cause downstream flooding. Depending upon the level of storage in the reservoir prior to a storm event and the amount of inflow into the reservoir during the event, the Army Corps of Engineers may order a release, which may potentially damage agricultural lands and structures downstream of the Dam. The Project aims to reduce obstructions in the outlet works, allowing more groundwater recharge and less water sitting in the Reservoir and, thereby, reducing the likelihood of these ordered releases. However, because the with-project condition will continue to protect property from experiencing more frequent flood damage events, it is difficult to accurately estimate the area of potential flood damage. Thus, the flood management physical benefit cannot be accurately quantified.

Similarly, the habitat protection physical benefits cannot be quantified because the with-project condition will continue to prevent sediment from accumulating and disrupting habitats downstream. There is no accurate method for quantifying the total impacts to the numerous and diverse habitats downstream. Thus, because the with-project condition effectively protects downstream habitat, it is infeasible to estimate the area of potential habitat deterioration.

However, the *Biological Assessment for the Twitchell Dam Watercourse Project* provides the order of magnitude about the area of habitats that would potentially be impacted by the Project. The study examined the botanical and zoological resources associated with a project to excavate accumulated sediment from the stream bottom below the Dam. From a map on page 68 of this study, it is clear that the majority of the 390-acre study area downstream of the dam is composed of important habitat areas. Because this assessment was limited to studying this 390-acre study area, it is likely that additional habitats further downstream are protected from sediment by the sediment management projects like this Project. Therefore, this Project likely reduces impacts to hundreds of acres of significant habitats.

Overview

This section provides a discussion of the technical justification for the Recycled Water Pipeline Extension/Retrofit at Rancho Maria Golf Course's (Project 3's) physical benefits or the Project's measurable accomplishments. This section references all the reports and technical memoranda that form the foundation upon which the physical benefits have been derived.

Project Physical Benefits

Project 3 has two defined physical benefits. These physical benefits are summarized in the Figure 7.3-1 and are categorized by the type of physical benefit, how the benefit is being measured, and the document that provides the justification for the physical benefit.

FIGURE 7.3-1
Summary of Physical Benefits

Type of Physical Benefit		Unit of Measurement	Technical Justification
	Increased Wastewater Discharge Capacity for the District: Increased average daily discharge estimated to be 500,000 gallons per day (GPD)	GPD	Recycled Water System Analysis (Penfield & Smith 2009); Recycled Water Agronomic Investigation (CH2M HILL 2009)
	Offset groundwater usage	AFY	Chapter 4 of *2008 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies, and Disposition: Santa Maria Valley Management Area* (Luhdorff and Scalmanini 2009)

Recent and Historical Conditions

The Laguna County Sanitation District (District) has historically relied on recycled water irrigation as its means of discharge. The Union/Holly Sugar factory processed sugar beets to make sugar, and the recycled water was used on sugar beet crops near the plant. The sugar factory closed in the 1980s, and the District switched to irrigating beef cattle pasture, an uneconomical venture. Also in the 1980s, regulatory criteria changed related to Basin Plan Objectives for salinity. A treatment upgrade in 2002 changed the treatment level to disinfected tertiary and some salt reduction to meet the Basin Plan Objectives. This treatment upgrade has allowed the District to supply recycled water to a greater number of beneficial uses including unrestricted access golf course irrigation. At this time, the wastewater treatment plant's (WWTP's) treatment capacity is 3.7 million gallons per day (mgd), and the discharge capacity is 2.4 mgd. Projected development through the Orcutt Community Plan and other planned developments will eventually require the treatment and discharge

capacities to be between 4.5 and 5.0 mgd. It is the immediate goal of this Project to increase discharge capacity that will meet the projected increase in wastewater flows, which is about 0.5 mgd.

The District is in great need of additional discharge capacity, and it is therefore critical to increase the distribution of recycled water to new users. The benefits of the recent plant upgrade provided new outlets for discharge of the disinfected tertiary recycled water via distribution to off-site users as the mechanism for effluent discharge. A recycled water market study prepared by CH2M HILL in 2000 helped to identify neighboring land uses and potential recycled water use sites. A first phase distribution project was completed with the plant upgrade, which conveys water to agricultural land owned by the Santa Maria Public Airport District. This second phase project is an expansion of services for the distribution of recycled water to the Rancho Maria Golf Course. This golf course comprises approximately 86 acres and uses approximately 175 million gallons of well water per year.

Description and Estimation of Without-Project Conditions

The District must plan for an increase in irrigation discharge uses. If this Project is not initiated, discharge by other means must be procured, i.e., other recycled water use sites. However, golf courses are ideal compared to crops because there is no down time for planting or harvesting. Therefore, using recycled water at the golf course would allow for more consistent year-round application, and the Project does not require a change in any land use that could have deleterious economic impacts.

Without the project, the District would need to implement an alternative project to increase WWTP discharge capacity. The District's Discharge Requirements and Master Recycling Permit allow for recycled water reuse involving irrigation of landscape and crop and pastureland on district-owned property, approved user sites as they become available, and other uses approved by the Regional Water Quality Control Board (RWQCB) (CH2M HILL Inc. 2009). The proposed Project falls into the second category—approved user sites as they become available. The next best alternative to the proposed Project is to expand the District's spray fields onto adjacent farmland (CH2M HILL Inc. 2008). This alternative would require the purchase of 200 acres of prime farmland currently used for row crop production, is expected to cost more than double the proposed Project, may require use of eminent domain to implement, and would negatively impact the local economy by shifting prime farmland into less productive pasture.[1] Irrigated vegeFigure and strawberry acreage in the Santa Maria Valley currently sells for between $30,000 and $60,000 per acre and is in restricted supply (American Society of Farm Managers and Rural Appraisers 2011). Using the midpoint of the current price range, land acquisition alone is expected to cost $9,000,000.

[1] Another potential alternative is to use the recycled effluent to recharge the adjudicated Santa Maria Groundwater Basin that underlies the District's service area. This alternative was evaluated and deemed infeasible due to cost and jurisdictional issues (CH2M HILL, Inc, 2008). Construction of the necessary infiltration basins alone was estimated to cost $24.4 million, about eight times more than the proposed Project.

Because prime farmland in the valley is in limited supply and there have been few willing sellers in recent years, it is possible that land acquisition would require use of eminent domain.[2,3] Implementation of the proposed Project would avoid this possibility and the legal and administrative costs associated with it. Expected costs of eminent domain proceedings are more speculative and, therefore, excluded from the analysis. But it is nonetheless a potential non-quantified avoided cost of the Project.

In addition to costs for land acquisition, the District would have to install new spray irrigation distribution infrastructure on the land and make other improvements prior to planting the land to pasture. These one-time costs are expected to total about $100,000.[4]

Net operating cost for the District's existing 370-acre spray field averages about $243 per acre.[5] Annual operating cost for an additional 200 acres, assuming a similar unit cost, would be about $48,600 per year.

In total, the present value equivalent of future avoided costs is $9,275,062.

Project Relationship to Other Projects

Project 3 has an interrelationship and synergy with Project 2, Twitchell Reservoir Sediment Management and Groundwater Recharge Project (Santa Maria Valley Water Conservation District (SMVWCD)), and Project 4, Secondary Treatment Reliability Project (City of Guadalupe). Both of these projects will increase the groundwater quality and quantity in the Santa Maria Groundwater Basin (Basin) and therefore, mutually reinforce one another, improve the underlying groundwater quality, and assist in attaining Integrated Regional Water Management (IRWM) regional goals, including: 1) to protect, manage, and increase groundwater supplies; 2) protect, conserve, and augment water supplies; 3) protect and improve water quality; and 4) maintain and enhance water and wastewater infrastructure efficiency and reliability. In the case of this Project 3 and Project 2, a further goal that is synergized is that of ensuring the equiFigure distribution of benefits.

Methods Used to Estimate Physical Benefits

Figure 7.3-2 summarizes the specific engineering studies consulted that substantiate the associated physical benefits of the Project.

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[2] Personal communication, Marty Wilder, County of Santa Barbara Public Works, March 6, 2013.

[3] See p. 69 of *American Society of Farm Managers and Rural Appraisers* (2011) for history of recent agricultural land transactions in the Santa Maria Valley.

[4] Personal communication, Marty Wilder, County of Santa Barbara Public Works, March 6, 2013.

[5] Historically, the district has received about $60,000 per year in rent and paid out about $200,000 per year for labor and incidentals for irrigation, resulting in a net cost of about $378/acre. However, the District recently renegotiated with its tenant to take over the irrigation operation at a net cost to the District of about $243 per acre. The lower per acre cost is assumed for this analysis.

FIGURE 7.3-2
Basis of Physical Benefits

Studies	Date
American Society of Farm Managers and Rural Appraisers.*Trends in Agricultural Land and Lease Values in California and Nevada 2011*. California Chapter of American Society of Farm Managers and Rural Appraisers. www.calasfmra.com.	2011
Central Coast Water Authority. *Comprehensive Annual Financial Report Fiscal Year Ending June 30, 2012*. Central Coast Water Authority.	2012
CH2M HILL Inc. *Feasibility Study of Treated Wastewater Discharge Options*. Prepared for County of Santa Barbara Public Works, Laguna Sanitation District.	2008
CH2M HILL Inc. *Recycled Water Agronomic Investigation Final Report*. Prepared for Laguna County Sanitation District	2009
CH2M HILL Inc. *Wastewater Reclamation Plant Facilities and Financial Master Plan*. Prepared for Laguna County Sanitation District.	2010
County of Santa Barbara. *Agricultural Production Report 2011*. Santa Barbara, California: Agricultural Commissioner's Office, Santa Barbara County.	2011
Luhdorff and Scalmanini Inc. *2008 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies, and Disposition: Santa Maria Valley Management Area*.	2009
State Water Resources Control Board. *Policy for Implementing the State Revolving Fund for Construction of Wastewater Treatment Facilities*.98-2 CWP. Sacramento, California: State Water Resources Control Board. February 1995, amended June 18, 1998.	1998

New Facilities, Policies, and Action Required to Obtain Physical Benefit

There are policies or actions required to obtain the physical benefits of the Project. The pipeline extension is a new facility.

Uncertainties in Physical Benefits

There are no uncertainties of benefits.

Potential Adverse Physical Effects

There are no anticipated adverse physical effects associated with the Project.

Annual Physical Benefit

The Figures below have been provided to present the physically quantifiable benefits of District's Project.

FIGURE 7.3-3

Annual Physical Benefit – Discharge Capacity

Physical Benefit: Discharge Capacity			
Year	Physical Benefits		
	Without Project[6]	With Project[7]	Difference
2012	0	537 AFY	537
2013	0	537 AFY	537
2014	0	537 AFY	537
2015 and beyond	0	537 AFY	537
Last Year of Project Life	0	537 AFY	537
See referenced Market Assessment for Recycled Water.			

FIGURE 7.3-4

Annual Physical Benefit – Discharge Capacity

Physical Benefit: Offset Groundwater Demand			
Year	Physical Benefits		
	Without Project	With Project	Difference
2012	0	537 AFY	537
2013	0	537 AFY	537
2014	0	537 AFY	537
2015 and beyond	0	537 AFY	537
Last Year of Project Life	0	537 AFY	537
See http://www.ci.santa-maria.ca.us/Twichell-04.html for data on Santa Maria Groundwater Basin adjudication.			

References

CH2M HILL Inc. 2008. *Feasibility Study of Treated Wastewater Discharge Options*. Prepared for County of Santa Barbara Public Works, Laguna Sanitation District.

CH2M HILL Inc. 2009. *Recycled Water Agronomic Investigation Final Report*. Prepared for Laguna County Sanitation District. February 10, 2009.

American Society of Farm Managers and Rural Appraisers. 2011. *Trends in Agricultural Land and Lease Values in California and Nevada 2011*. California Chapter of American Society of Farm Managers and Rural Appraisers. www.calasfmra.com.

[6] This should be filled in if the Project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

[7] Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the Project.

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Overview

This section provides a discussion of the technical justification for Project 4's physical benefits or the projects measurable accomplishments. This section references all the reports and technical memoranda that form the foundation upon which the physical benefits have been derived.

Project Physical Benefits

There are three physical benefits of the Project. These physical benefits are summarized in the Figure 7.4-1 and are categorized into the type of physical benefit, how the benefit is being measured, and the document that provides the justification of the physical benefit.

FIGURE 7.4-1
Summary of Physical Benefits

Type of Physical Benefit	Unit of Measurement	Technical Justification
 Increase the operational efficiency of the WWTP and extend the useable life of the facility	Reducing abrasion in the piping, pumps, and aeration system and associated maintenance and repair costs	Technical memoranda have been prepared by California Registered Civil Engineers (Dudek)
 Optimize the functioning of facility and reduce operation and maintenance	Number of years required between dredging of the Biolac pond	The plant is operating under a Regional Water Quality Control Board Waste Discharge Permit Order No. R3-2005-0015.
 Reduction in electrical energy use/reduction in GHG emissions.	Reduction of approximately 90 kwh per day at full capacity	Engineer's evaluation

Recent and Historical Conditions

The WWTP was first constructed in the 1960s to serve the City of Guadalupe and since has gone through multiple renovations and upgrades. The original design included headworks, aerator, two clarifiers, digester, sludge drying beds, and holding ponds. In 1979, various facilities were refurbished and upgraded, along with the demolition of the aerator, construction of new headworks and lagoons, spray distribution system and off-site holding ponds. The plant upgrade in 1992 included new headworks, Pista® grit removal system, new sludge drying beds, irrigation pump station, and spray distribution system across the river. In 2004, the aerated lagoons were converted to an advanced integrated pond system, and in 2011, the WWTP was upgraded with a Biolac system, which has greatly increased the quality of wastewater effluent and the ease of operation of the plant. The Project is a step in a series of steady upgrades to the WWTP to improve the operational reliability, decrease operational costs, and extend the useful life of the facility.

The shallow portions of the Santa Maria Groundwater Basin are impaired by nitrates as evidenced by the City's need to close a well due to nitrate problems. Consistently increasing the effluent quality of the WWTP will incrementally increase the quality of the shallow groundwater. Moreover, the higher the effluent quality that the WWTP discharges on a consistent and reliable basis, the greater the likelihood and ability there is to upgrade to full tertiary for water recycling.

The Santa Maria Groundwater Basin is an adjudicated basin and was adjudicated as a result of a long and costly court procedure. Any reduction in the pumping of groundwater and production of reclaimed water will assist in the long-term use and sustainability of the basin as well as the avoidance of further conflict.

Description and Estimation of Without-Project Conditions

Project 4 does not provide for immediate and direct water reuses such as the irrigation of local parks or schools, however, the Project provides a critical component for the potential for full Title 22 recycled water capabilities. Without the Project, the existing facilities would continue to operate, but the influent pumps, which are severely worn would jeopardize the effluent water quality and the reliability of the facility. Moreover, the treatment process would be compromised with the accumulation of grit in the biological system and the increase in associated costs of cleaning the pond would be crippling for the DAC. Without installation of a new grit removal system, it is estimated that dredging of the Biolac basin will need to be done on an 8 year cycle (Falk & Hill, 2012) to maintain the system's treatment capacity. Basin dredging is estimated to cost $350,000 per event (as of 2012) (Falk & Hill, 2012). This cost is expected to escalate at a real rate of 0.5% over the project's lifecycle.[1] Further, the energy used and the associated energy costs of operating the facility would continue to rise and impact the DAC.

The new influent pumps will initially reduce the WWTP's electricity requirements by 60 KWh/day based on current influent levels. This is forecasted to increase in line with plant production to 90 KWh/day by 2020 (Falk & Hill, 2012). Electricity cost savings are valued at $0.202/KWh, the average cost of electricity in Southern California (U.S. Department of Labor, 2013). The present value equivalent of future avoided costs is $67,084.

Project Relationship to Other Projects

Project 4 has an interrelationship and synergy with Project 2, Twitchell Reservoir Sediment Management and Groundwater Recharge Project, Santa Maria Valley Water Conservation District and Project 3, Recycled Water Expansion and Golf Course Retrofit Project, Laguna County Sanitation District. Both of these projects will increase the

[1] The escalation rate is based on the difference between a forecasted nominal rate of increase in WWTP maintenance costs of 3% (Falk & Hill, 2012) and a long-term inflation rate of 2.5%. The long-term inflation rate is based on the current spread between 30-Year Treasury Inflation Protected Securities (TIPS) and regular 30-year Treasuries. This is a somewhat more conservative forecast of long-term inflation (e.g. higher) than forecast by the Federal Reserve Bank of Philadelphia http://www.phil.frb.org/research-and-data/real-time-center/survey-of-professional-forecasters/2013/survq113.cfm).

groundwater quality and quantity in the Santa Maria Groundwater Basin and therefore, mutually reinforce one another, the underlying groundwater quality and assist in attaining IRWM regional goals, including: 1) to protect, manage and increase groundwater supplies, 2) protect conserve and augment water supplies, 3) protect and improve water quality, and 4) maintain and enhance water and wastewater infrastructure efficiency and reliability. In the case of this project and Project 2, a further goal that is synergized is that of ensuring the equiFigure distribution of benefits.

Methods Used to Estimate Physical Benefits

Summarized in Figure 7.4-2 below are the specific engineering studies consulted that substantiate the associated physical benefits of the Project.

FIGURE 7.4-2
Basis of Physical Benefits

Studies	Date
Santa Maria Valley Management Area 2011 Annual Report of Hydrologic Conditions, Water Requirements, Supplies and Disposition	April 2012
Guadalupe WWTP Technical Memorandum #1-Conceptual Design Report, prepared by Dudek	May 2010
Guadalupe WWTP Technical Memorandum #2- Basis of Design, prepared by Dudek	August 2010
Guadalupe WWTP Technical Memorandum #2, Addendum-Dudek	October 2010
Guadalupe WWTP Design/Construction Plans	September 2012
Engineer's Report, in conjunction with the issuance of new Waste Discharge Requirements-Dudek	October 2011
Proposition 84, Round 1 Grant: Recycled Water Feasibility Analysis	In preparation

New Facilities, Policies, and Action Required to Obtain Physical Benefit

There are no new facilities, policies, or actions required to obtain the physical benefits of the project.

Uncertainties in Physical Benefits

There are no uncertainties of benefits or factors that lead to uncertainty for the project.

Potential Adverse Physical Effects

There are no anticipated uncertainties associated with the Project.

Annual Physical Benefit

The Figures below have been provided to present the physically quantifiable benefits of City of Guadalupe's Secondary Treatment Reliability Project.

FIGURE 7.4-3
Annual Physical Benefit – Reduction in Power Consumption

City of Guadalupe's Secondary Treatment Reliability Project			
Physical Benefit: Reduction in power consumption			
Year	Physical Benefits		
	Without Project[2]	With Project[3]	Difference
Upon Completion of Construction in 2015:			60 kwh per day energy savings/ 32,850 kwh per year
Last Year of Project Life			90 kwh per day energy savings/ 32,850 kwh per year

FIGURE 7.4-4
Annual Physical Benefit – Grit Removal

City of Guadalupe's Secondary Treatment Reliability Project			
Physical Benefit: Grit Removal System reduces the accumulation of solids in the biological processing unit.			
Year	Physical Benefits		
	Without Project	With Project	Difference
When the project is completed in 2015	The bio pond would be cleaned and dredged every 8 years at a cost of $280,000	Cleaning frequency would be every 15 to 20 years	Reduced cost and increased reliability and treatment efficiency.
Last Year of Project Life	Same as above	Same as above	Same as above

FIGURE 7.4-5
Annual Physical Benefit – Optimize the functioning of facility and reduce operation and maintenance

City of Guadalupe's Secondary Treatment Reliability Project			
Physical Benefit: Optimize the functioning of facility and reduce operation and maintenance			
Year	Physical Benefits		
	Without Project	With Project	Difference
2014	The treatment process would be subject to breakdowns and potentially inconsistent quality treatment.	The reliability of the treatment process would be improved and serve as a potential source of recycled water estimated at 130 acre feet per year.	Without the project, plans for water reuse would not be practical due to the unreliable existing treatment system.
Last Year of Project Life			

[2] This should be filled in if the project will increase physical benefits of an existing project, facility, or program. Enter the level (units) of the physical benefit for the without-project condition.

[3] Enter the total amount of the physical benefit provided in the without-project condition plus the amount of benefit provided by the project.